Fool's Gold?
How the US Dollar Lost its Shine☆

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May 31, 2026

Abstract

This paper investigates the determinants of international investors' portfolio choices between gold and sovereign bonds in an environment shaped by economic and geopolitical shocks. We develop an endogenous portfolio choice model where reserve safety has a political dimension — sovereign bonds issued by the dominant reserve country are more liquid but exposed to the issuer's sanctions authority, while gold offers sanctions protection at the cost of lower liquidity. Our model implies that US convenience yields fall during periods of high sanction risk, as safe-asset demand fragments along geopolitical lines. Empirically, periods of elevated geopolitical risk coincide with higher gold prices and 10-year Treasury yields. In such periods, the average composition of official reserves shifts toward gold, with countries less aligned with the US in UN voting patterns increasing their holdings by a greater extent.

Keywords: Dominant Currency, Safe Assets, Sanctions, Geopolitics, Gold

JEL Classification: E42, F02, F33, N10

☆We thank Massimo Ferrari-Minesso, Georgios Georgiadis, Alejandro van der Ghote, Enrico Mallucci and Arnaud Mehl for helpful comments and suggestions. The views expressed in this paper are those of the authors, and not necessarily those of the Banque de France, the European Central Bank, the Eurosystem, or their committees.

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1 Introduction

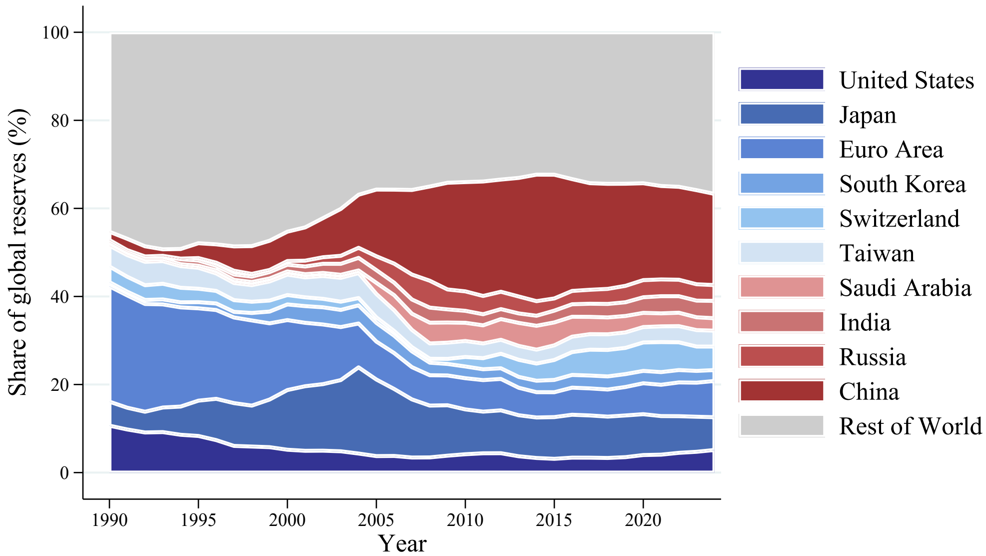
The international monetary system relies on a narrow class of assets that combine liquidity, safety, and global acceptability. For decades, US Treasury securities have occupied this role as the dominant reserve asset, supported by deep markets, a stable institutional environment, and the centrality of the dollar in global financial markets. Yet the structure of global reserves is highly concentrated. Figure 1 shows that a small number of economies account for the bulk of official reserve holdings, with China emerging as the dominant marginal accumulator since the early 2000s. This concentration implies that shifts in the preferences of a few large reserve managers can have first-order effects on global safe asset demand.

At the same time, recent geopolitical events—notably the freezing of Russia's foreign reserves in 2022—have exposed a neglected dimension of reserve safety: political control. An asset may be safe from a financial perspective while remaining vulnerable to foreign jurisdictional, custodial, or sanctions risk. However, for countries facing such risks, the supposedly safest asset in the world — the US Treasury bond — may not be as safe as generally assumed. In a system with concentrated reserve supply and demand, geoeconomic shocks can reshape global portfolio allocations. This distinction has renewed interest in gold as a reserve asset that remains sufficiently liquid while being insulated from the institutions of any single sovereign.

Against this backdrop, we study how geopolitical risk reshapes the global demand for safe assets. The central idea is that reserve safety depends not only on default risk and market liquidity, but also on *political neutrality*. Sovereign bonds issued by the dominant reserve country offer superior liquidity services in normal times, yet remain contingent on access to legal and payment infrastructures controlled by that sovereign. Gold provides lower transactional convenience, but preserves value outside foreign jurisdictional reach. As geopolitical tensions rise, reserve managers therefore face an increasingly important trade-off between liquidity and custodial sovereignty.

This mechanism is visible in the evolution of reserve portfolios across the world's largest reserve managers. Figure 2 plots the gold share of total reserves normalized to 100 in 2013 for the ten largest reserve holders from 2013 to 2025. It highlights a sharp asymme-

Figure 1 GLOBAL RESERVE COMPOSITION



NOTE. The figure reports the country composition of global official reserve holdings since 1990, valued at market prices. The data highlight the strong concentration of global reserves in a small number of economies and the rise of China as the marginal reserve holder after 2000.

try. Traditional reserve issuers and close US allies[1]—such as the Euro Area, Switzerland, Japan and Taiwan—display structurally stable shares of gold in their reserves. By contrast, the strongest upward reallocations toward gold are concentrated among countries that are geopolitically more distant from the United States or more exposed to sanctions risk after major geopolitical events, most notably China, Saudi Arabia, and especially Russia after 2022. These are economically large reallocations, in some cases amounting to shifts of nearly one-third of total reserve portfolios away from foreign-currency claims and toward bullion.

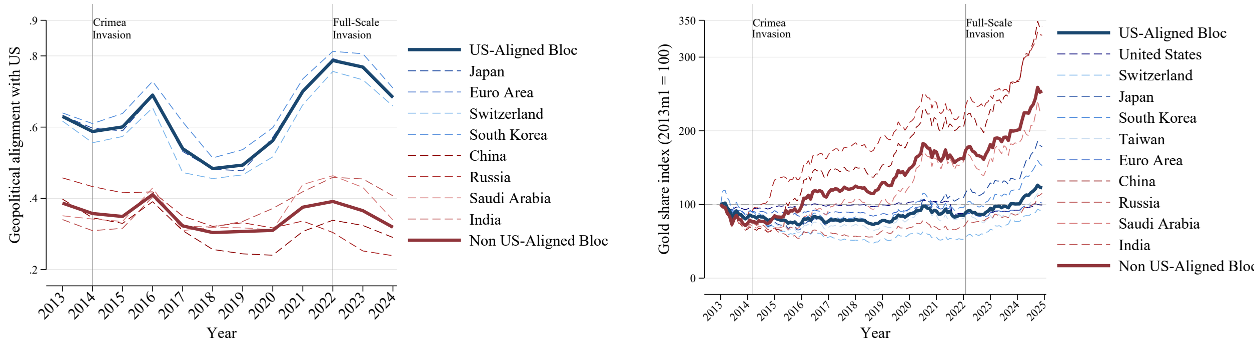
Taken together, Figures 1 and 2 point to a common force: in a concentrated reserve system, geopolitical risk does not only affect prices—it reshapes the portfolio choices of the marginal reserve holders that drive global demand. This heterogeneity strongly suggests that reserve demand increasingly reflects concerns over political access and sovereign control.

We develop a general equilibrium model that rationalizes this pattern. Reserve managers choose between sovereign bonds that provide liquidity services but are exposed to selective

[1] Based on voting patterns in the UN General Assembly following Voeten (2009) and Bailey et al. (2017) – see Figure 2 (a).

Figure 2 Cross-country heterogeneity in gold reserve accumulation

(a) Alignment with the US **(b) Gold share in total reserves**



Note. Panel (a) shows UN voting alignment of major reserve holders relative to the US (1 = full alignment). Panel (b) reports the gold share of total reserves for the ten largest reserve managers, standardized to 100 in January 2013. Sources: Voeten (2009), Bailey et al. (2017), IMF

freezing and sanctions, and gold, which is politically neutral but less liquid and costly to store. Convenience yields arise endogenously, so the relative liquidity value of bonds and gold depends on equilibrium portfolio composition. The sovereign issuer acts strategically as a Stackelberg leader which means that it internalizes how its sanction choice and debt issuance affect the portfolio composition of its creditors and therefore its own future borrowing costs.

The model delivers a simple mechanism. In tranquil geopolitical states, reserve managers tilt portfolios toward sovereign bonds because liquidity services dominate. When geopolitical tensions rise, the expected political vulnerability of foreign bonds increases, reducing their effective safety. As reserve managers sell their bond positions, they try to satisfy their liquidity needs with politically neutral gold, inducing substitution toward bullion. Because convenience yields are portfolio-dependent, this reallocation amplifies the relative attractiveness of gold, particularly for countries more exposed to the legal and custodial reach of the dominant reserve issuer. At the moment of regime shift, gold prices spike and bond prices fall — a joint repricing consistent with a substitution away from sanctionable bonds toward the geopolitically neutral store of value

We validate this mechanism empirically in three steps. First, using daily local projections, we show that exogenous geopolitical shocks immediately raise gold prices and increase the geopolitical premium embedded in US Treasury yields. This high-frequency evidence establishes the asset-pricing channel implied by the model. Second, in a quarterly panel of

37 reserve managers from 1985 to 2024, we show that the same shocks increase gold shares and gold holdings while reducing foreign-exchange reserve exposure. Third, we show that these responses are substantially stronger for countries that are less aligned with the United States in United Nations voting data, precisely where sanctions vulnerability is most salient.

Our paper contributes to three strands of literature. First, it contributes to the literature on international safe assets, reserve composition, and dominant currencies, including Farhi and Maggiori (2018), Broner et al. (2010), Chahrour and Valchev (2022), and Corsetti and Maeng (2024). Our key innovation is to endogenize political safety as a determinant of reserve demand rather than treating the safety of dollar assets as exogenous. Second, we contribute to the empirical literature on reserve diversification and gold demand, including Arslanalp et al. (2023), Chinn et al. (2025), and Goldberg and Hannaoui (2026), by identifying dynamic reserve responses to exogenous geopolitical shocks and documenting that the adjustment is strongest among countries geopolitically distant from the United States. Third, we contribute to the literature on sanctions and geoeconomic power, including Itskhoki and Mukhin (2025), Bianchi and Sosa-Padilla (2025), Bianchi and Sosa-Padilla (2024) Clayton et al. (2026), Ferrari Minesso et al. (2025), Broner et al. (2025), Chahrour and Valchev (2023), Eichengreen et al. (2024) and Garofalo et al. (2025), by showing how sanctions risk induces substitution toward geopolitically neutral assets such as gold. This can have consequences for the international monetary system in the long run.

The broader policy implication is that reserve management increasingly involves a trade-off between liquidity and custodial sovereignty. As geopolitical fragmentation rises, reserve managers may place greater value on assets insulated from foreign political control, gradually weakening the dominance of reserve instruments tied to a single legal jurisdiction.

The remainder of the paper is organized as follows. Section 2 develops the theoretical framework and quantitative solution while Section 3 shows the corresponding result and Section 4 illustrates an extension with stablecoins. The data are presented in Section 5 and Section 6 shows the empirical validation of the asset-pricing and reserve-composition mechanisms. Section 7 concludes.

2 Model

2.1 Environment

The model features an infinite-horizon discrete-time economy populated by a sovereign borrower H (the hegemon) and two representative investors: a domestic representative household (e.g. the private sector of H) and a foreign representative household F (the geopolitical rival). There are two tradable assets: gold A, with a fixed global supply $\bar{A}$, and one-period, non-contingent bonds B issued by the sovereign borrower. An important distinction between the two assets is that the hegemon can decide to implement financial sanctions on its geopolitical rival, in which case they are subject to a haircut of κ. This haircut represents the financial losses of the geopolitical rival, and can be seen as a reduced form featuring a combination of asset freezes or seizures, with possible fire sales in the secondary market at discount prices or limited quantities.

Moreover, the H economy also features an additional geopolitical shock G_t. G_t is an utility shock that captures the utility of imposing an endogenous sanction event. This represents the geopolitical benefit of imposing sanctions, beyond the economic value of the seizures or asset freezes, and is highest during times of high geopolitical tensions. G follows a Markov-switching process, governed by the Markov chain $M_t \in \{0, 1\}$. Here, M_t dictates the overarching geopolitical regime (0 for *tranquil*, 1 for *turbulent*). The realizations of G_t, the geopolitical gain, depend crucially on the respective regime:

- **Tranquil Regime ($M_t = 0$):** There is no geopolitical benefit of sanctions in this regime and therefore $G_t = 0$. Moreover, the probability of transitioning to a very high sanction utility state in the immediate next period is zero.
- **Turbulent Regime ($M_t = 1$):** The economy is subject to fluctuating, strictly positive geopolitical gains. Upon transition the value of $G = \bar{G}$, its unconditional mean and is then driven by an underlying auto-regressive process in logs as long as the economy stays in this regime.

2.2 The Sovereign Borrower

The sovereign borrower acts as a Stackelberg leader, maximizing flow utility from consumption while internalizing the followers' pricing schedules. In each period, it observes the state of the economy and decides whether to sanction F or comply with its debt obligations, as well as how much debt B_t to emit. Its flow utility is a standard CRRA over government consumption, but augmented by a possible geopolitical gain G in case of sanctions.

$$u(C_t) = \frac{C_t^{1-\gamma}}{1-\gamma} + \mathbb{1}_t^S G_t \tag{1}$$

where $\mathbb{1}_t^S = \{0, 1\}$ is an indicator variable representing the decision of the government to sanction or not. As is the case in the sovereign default literature, the decision to sanction or not is a combination of short-term benefits of expropriation and the dynamic benefits of global financial integration.

In the case of contractual compliance, the sovereign maintains access to both domestic and foreign investors. It chooses its level of next period debt B_t, internalizing the impact on domestic and foreign demand for bonds. In this case, it internalizes not just the effect on the price Q_B but also on the share of F bond holdings going forward, which is also determining the likelihood of future sanctions. Let $\mathcal{S}_t = \{\mathcal{B}_{t-1}, S_t\}$ be the state space of the economy, composed of the endogenous asset holdings at the beginning of period $\mathcal{B}_{t-1} = (B_{H,t-1}, B_{F,t-1}, A_{F,t-1})$ and the exogenous states $S_t = (Z_t, Z_{F,t}, M_t, G_t)$. The value of compliance is as follows:

$$V_{com}(\mathcal{S}_t) = \max_{B_t} U(C_{com}) + \beta_g \mathbb{E}\left[V(\mathcal{S}_{t+1})|S_t\right] \tag{2}$$

$$\text{s.t. } C_{com} = \tau Z_t + Q_B(B_t, \mathcal{S}_t)B_t - B_{t-1} \tag{3}$$

$$B_t = B_{H,t}(B_t, \mathcal{S}_t) + B_{F,t}(B_t, \mathcal{S}_t) \tag{4}$$

$$\overline{A} = A_{H,t}(B_t, \mathcal{S}_t) + A_{F,t}(B_t, \mathcal{S}_t) \tag{5}$$

where Z_t indicates domestic output and τ is the share of output allocated to the government. On the other hand, if the borrower imposes sanctions (V_{san}), they restrict the foreign investor from the bond market and therefore $\mathcal{B}_t = (B_t, 0, A_{F,t})$. Sanctioning triggers several simultaneous effects. First, it benefits from the geopolitical utility gain G_t, which is positive in the turbulent regime. Secondly, the sovereign also earns a financial benefit by imposing a haircut κ on foreign holdings of debt $B_{F,t-1}$. It contrasts those benefits with the losses from the aggregate output disruption ψ and the exclusion of F from its pool of investors. When deciding how much debt to emit at t, the government takes into account the impact on not just bond prices (Q_B) but also on the international allocation of debt and gold ($B_{H,t}, B_{F,t}, A_{F,t}, A_{H,t}$), which might affect its decision to sanction in the future.

The value of sanctioning is then:

$$V_{san}(\mathcal{S}_t) = \max_{B_t} U(C_{san}) + G_t + \beta_g \mathbb{E}\left[\theta V(\mathcal{S}_{t+1}) + (1-\theta) V_{aut}(\mathcal{S}_{t+1}) | S_t\right] \tag{6}$$

$$\text{s.t. } C_{san} = \tau(1-\psi)Z_t + Q_B^{san}(B_t, \mathcal{S}_t)B_t - B_{H,t-1} - (1-\kappa)B_{F,t-1} \tag{7}$$

$$B_t = B_{H,t}^{san}(B_t, \mathcal{S}_t) \tag{8}$$

$$\overline{A} = A_{H,t}^{san}(B_t, \mathcal{S}_t) + A_{F,t}^{san}(B_t, \mathcal{S}_t) \tag{9}$$

where $\psi \in (0,1)$ is the output loss when sanctioning. The parameter θ represents the exogenous probability of market normalization and re-entry. The effective haircut is a function of the allocation of debt, so the larger the share of debt held by F, the more appealing is the decision to sanction.

In the periods following the sanctioning event, the sovereign has a probability $(1-\theta)$ of not normalizing relations with F, thus remaining in financial autarky. The problem that defines V_{aut} is structurally similar to V_{san}, but without the one-time geopolitical gain nor the haircut on the debt.

$$V_{aut}(\mathcal{S}_t) = \max_{B_t} U(C_{aut}) + \beta_g \mathbb{E}\left[\theta V(\mathcal{S}_{t+1}) + (1-\theta) V_{aut}(\mathcal{S}_{t+1}) | S_t\right] \tag{10}$$

$$\text{s.t. } C_{aut} = \tau(1-\psi)Z_t + Q_B^{aut}(B_t, \mathcal{S}_t)B_t - B_{H,t-1} \tag{11}$$

$$B_t = B_{H,t}^{aut}(B_t, \mathcal{S}_t) \tag{12}$$

$$\overline{A} = A_{H,t}^{aut}(B_t, \mathcal{S}_t) + A_{F,t}^{aut}(B_t, \mathcal{S}_t) \tag{13}$$

While the fundamental sanction decision is driven by the economic and geopolitical trade-offs described above, standard discrete-choice default models generate discontinuous policy functions that complicate numerical solutions of the investors' portfolio problem. To ensure differentiability and unique pricing schedules, we follow Dvorkin et al. (2021) and the recent quantitative sovereign debt literature, assuming the sovereign's decision is additionally perturbed by additive, idiosyncratic Extreme Value Type I (Gumbel) preference shocks, scaled by a dispersion parameter σ_V. This implies that the sanctioning decision becomes probabilistic from the perspective of the investors, instead of a deterministic one given ($\mathcal{S}$). The ex-ante continuation value $V(B, S)$ takes a closed-form log-sum-exp formulation over V_{com} and V_{san}, and the probability of sanctions is a straightforward function of the relative fundamental value of each choice.[2]

2.3 The Investors

In the economy there are two types of investors: domestic and foreign $i = \{H, F\}$. Each receives their idiosyncratic exogenous endowments $Z_{i,t}$ and derive utility from both consumption $C_{i,t}$ and liquidity services $L_{i,t}$ provided by their portfolio of assets. Liquidity services are a function of gold $A_{i,t}$ and sovereign bond $B_{i,t}$ holdings. Finally, households are risk-averse in both consumption and liquidity services.

For expositional purposes, we explain first the foreign investors' optimization problem as they are the ones subject to sanction risk. F maximizes expected utility U_F:

$$U_F = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_F^t \left[\log(C_{F,t}) + \phi \frac{L_{F,t}^{1-\eta}}{1-\eta} \right] \tag{14}$$

where the inner liquidity index $L_{F,t}$ is:

$$L_{F,t} = \left[\omega A_{F,t}^{\rho} + (1-\omega) B_{F,t}^{\rho} \right]^{\frac{1}{\rho}} \tag{15}$$

We model liquidity services using a Constant Elasticity of Substitution (CES) aggregator nested inside a Constant Relative Risk Aversion (CRRA) utility framework with curvature parameter η. This flexible functional form allows us to capture the imperfect substitutability between physical gold and sovereign bonds in satisfying the investors' liquidity needs, as well

[2] The explicit formulation of the smoothed value function and the resulting logistic probabilities are detailed in Appendix A.

as risk aversion and willingness to smooth intertemporally. The parameter $\rho < 1$ governs the elasticity of substitution $1/(1-\rho)$ between the two safe assets, while ω determines the relative importance of an asset in satisfying liquidity needs. The budget constraint is given by:

$$C_{F,t} + Q_{A,t}A_{F,t} + Q_{B,t}B_{F,t} + \frac{\tau_g}{2}\left(\min\{0, \Delta A_{F,t}\}\right)^2 = Z_{F,t} + B_{F,t-1}(1 - \mathbb{1}_t^S \kappa) + Q_{A,t}A_{F,t-1} \quad (16)$$

where $Q_{A,t}$ is the price of gold and $Q_{B,t}$ the price of H bonds. In addition, gold transactions are subject to quadratic shipping costs, parameterized by τ_g. $\Delta A_{F,t} = A_{F,t} - A_{F,t-1}$ is the total change in gold holdings of F and τ_g scales the importance of these costs. These costs capture the physical, legal, and logistical frictions involved in moving physical gold across borders. We assume that the transport costs are borne by the seller and included in the market price $Q_{A,t}$. The min operator ensures that the transaction cost is only paid by the seller, i.e. when $\Delta A < 0$. $\mathbb{1}_t^S \in \{0, 1\}$ is an indicator variable representing the sovereign's endogenous decision to impose sanctions (or not), and κ is the financial haircut applied to sanctioned foreign-held bonds[3].

Taking first-order conditions yields the asset pricing equations.

$$Q_{A,t} + \xi_{F,t} = C_{F,t}\left(\beta_F \mathbb{E}_t\left[\frac{Q_{A,t+1} + \xi_{F,t+1}}{C_{F,t+1}}\right] + \mathcal{L}_{A,F,t}\right) \quad (17)$$

$$Q_{B,t} = C_{F,t}\left(\beta_F \mathbb{E}_t\left[\frac{1 - \mathbb{1}_{t+1}^S \kappa}{C_{F,t+1}}\right] + \mathcal{L}_{B,F,t}\right) \quad (18)$$

where $\xi_{F,t} = \tau_g \min\{0, \Delta A_{F,t}\}$ and $\mathcal{L}_i$ represents the marginal utility derived from the liquidity services of asset i:

$$\mathcal{L}_{A,F,t} = \phi\left[\omega A_{F,t}^{\rho} + (1-\omega)B_{F,t}^{\rho}\right]^{\frac{1-\eta}{\rho}-1} \omega A_{F,t}^{\rho-1} \quad (19)$$

$$\mathcal{L}_{B,F,t} = \phi\left[\omega A_{F,t}^{\rho} + (1-\omega)B_{F,t}^{\rho}\right]^{\frac{1-\eta}{\rho}-1} (1-\omega)B_{F,t}^{\rho-1} \quad (20)$$

[3]The model can be easily extended to add a stochastic κ. While this adds some additional realism to the model, the main mechanisms and dynamics of the model remain very similar so we abstract from it in the calibration.

The domestic investor has an identical preference structure, maximizing:

$$U_H = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_H^t \left[\log(C_{H,t}) + \phi \frac{L_{H,t}^{1-\eta}}{1-\eta} \right], \qquad L_{H,t} = \left[\omega A_{H,t}^{\rho} + (1-\omega) B_{H,t}^{\rho} \right]^{\frac{1}{\rho}} \tag{21}$$

subject to the budget constraint:

$$C_{H,t} + Q_{A,t} A_{H,t} + Q_{B,t} B_{H,t} + \frac{\tau_g}{2} \left(\min\{0, \Delta A_{H,t}\} \right)^2 = (1 - \mathbb{1}_t^S \psi)(1-\tau) Z_t + B_{H,t-1} + Q_{A,t} A_{H,t-1} \tag{22}$$

One important difference with respect to the foreign investor's problem is that in case of sanctions $\mathbb{1}^S = 1$ the output loss ψ is economy-wide. It reduces total endowment in the economy Z_t in the sanctioning period, shrinking both the government's tax revenue τZ_t and the private sector's endowment $(1-\tau)Z_t$. F's endowment $Z_{F,t}$ is unaffected, as the output disruption is purely domestic. Two further features distinguish the domestic investor from the foreign investor. First, domestically held debt carries no sanction risk so the sovereign never imposes a haircut on B_H and its bond payoff is always $B_{H,t}$ regardless of $\mathbb{1}_t^S$. Finally, the domestic investor is less patient ($\beta_H < \beta_F$), reflecting strong demand for savings of foreign investors ensuring a positive international investment position by F. The first-order conditions mirror the one of F, just with $\kappa = 0$:

$$Q_{B,t} = C_{H,t} \left(\beta_H \mathbb{E}_t \left[\frac{1}{C_{H,t+1}} \right] + \mathcal{L}_{B,H,t} \right) \tag{23}$$

$$Q_{A,t} + \xi_{H,t} = C_{H,t} \left(\beta_H \mathbb{E}_t \left[\frac{Q_{A,t+1} + \xi_{H,t+1}}{C_{H,t+1}} \right] + \mathcal{L}_{A,H,t} \right) \tag{24}$$

where $\xi_{H,t}$ indicate transport costs for gold.

Finally, in equilibrium, bond and gold prices clear the market, ensuring global demand for each asset equals supply.

$$A_{F,t} + A_{H,t} = \bar{A} \tag{25}$$

$$B_{F,t} + B_{H,t} = B_t \tag{26}$$

2.4 Imperfect Substitutability and Liquidity Scarcity

Gold and bonds are imperfect substitutes within the bundle of liquidity services L_F if $\rho < 1$. In case H chooses to impose sanctions, foreign-held bond wealth is reduced and access to new sovereign debt is restricted. This loss of bond wealth causes the total liquidity index L_F to shrink significantly.

The reaction of gold holdings due to a drop in bond holdings is determined by two competing partial equilibrium effects on the marginal liquidity yield of gold $\mathcal{L}_{A,F,t} = \frac{\partial U}{\partial L}\frac{\partial L}{\partial A}$. On the one hand, the marginal liquidity value of gold becomes lower due to the suboptimal portfolio allocation ($\frac{\partial L}{\partial A}$ declines) imposed by the restricted access to B. On the other hand, the overall scarcity of liquidity services $L_{F,t}$ increases the marginal utility of total liquidity itself ($\frac{\partial U}{\partial L}$ rises)

Which of these two forces dominate can be directly understood by inspecting the cross-derivative of the gold Equation (19):

$$\frac{\partial \mathcal{L}_{A,F,t}}{\partial B_{F,t}} = \phi\omega A_{F,t}^{\rho-1}(1-\eta-\rho)L_{F,t}^{-\eta-\rho}\frac{\partial L_{F,t}}{\partial B_{F,t}} \tag{27}$$

The sign of the impact is given by the combination of parameters η and ρ. If $\eta + \rho > 1$, we have flight-to-gold, as the liquidity scarcity effect dominates the portfolio allocation effect. The stronger the aversion to liquidity shortages η and the higher the elasticity of substitution ρ, the more amplified the shift in demand towards gold will be.

In the case where agents have log-utility over the liquidity bundle ($\eta = 1$), the flight-to-gold condition ($\eta + \rho > 1$) is strictly satisfied for any $\rho \in (0, 1)$. In the log case, the above expression simplifies to the following function of the individual asset positions:

$$\frac{\partial \mathcal{L}_{A,F,t}}{\partial B_{F,t}} = -\phi\omega(1-\omega)\rho\frac{(A_{F,t}B_{F,t})^{\rho-1}}{\left[\omega A_{F,t}^{\rho} + (1-\omega)B_{F,t}^{\rho}\right]^2} < 0 \tag{28}$$

When H imposes a sanction, it not only expropriates a fraction of existing foreign wealth but excludes F from its debt markets, constraining their forward-looking portfolio choice to $B_F = 0$. This strictly increases the marginal liquidity value of gold. This formulation illustrates the mechanics of the liquidity scarcity premium. As wealth is lower and exclusion forces foreign bond holdings $B_{F,t}$ to be 0, the liquidity bundle contracts, generating convex upward pressure on the marginal yield of the safe asset. The higher the ρ, the stronger the substitution effect toward the sanction-proof asset to compensate for loss of bond market access.

2.5 Asset Demand and Rising Geopolitical Risk

In this section, we derive predictions for a regime shift from tranquility ($M = 0$) to turbulence ($M = 1$). Let $\mathbb{P}(\mathbb{1}_{t+1} = 1)$ denote the conditional probability of sanctions in $t+1$. The transition to turbulence triggers an immediate repricing of sovereign debt, driven not just by the higher probability of sanctions, but by the endogenous amplification of geopolitical risk and liquidity scarcity.

The transition to turbulence triggers a repricing of sovereign debt, driven by both an endogenous geopolitical risk premium and a shift in the marginal liquidity yield. Applying a covariance decomposition to the foreign investor's bond Euler equation (Equation 18) isolates these distinct pricing channels:

$$Q_{B,t} = \underbrace{\mathbb{E}_t[\mathcal{M}_{F,t+1}]\mathbb{E}_t\left[1 - \mathbb{1}^S_{t+1}\kappa\right]}_{\text{Risk Neutral Value}} + \underbrace{\mathrm{Cov}_t\left(\mathcal{M}_{F,t+1}, 1 - \mathbb{1}^S_{t+1}\kappa\right)}_{\text{Geopolitical Risk Premium}} + \underbrace{C_{F,t}\mathcal{L}_{B,F,t}}_{\text{Liquidity Value}} \tag{29}$$

where $\mathcal{M}_{F,t+1} \equiv \beta_F(C_{F,t}/C_{F,t+1})$ is the foreign investor's stochastic discount factor. In the turbulent regime, the covariance term $\mathrm{Cov}_t(\mathcal{M}_{F,t+1}, 1 - \mathbb{1}^S_{t+1}\kappa)$ becomes more negative as endogenous sanction risk rises. Since sanctions are in effect a targeted wealth shock, they compress foreign consumption and cause the SDF to rise exactly when the bond payoff drops. This negative comovement drives the price $Q_{B,t}$ lower than the probability of sanctions alone would imply. The final term $C_{F,t}\mathcal{L}_{B,F,t}$ mitigates this effect. As geopolitical tensions rise, F rebalances away from sanctionable bonds and the scarcity effect drives up their marginal liquidity value. As F sells bonds to buy gold, the opposite is happening in H's Euler Equation. Bonds become a larger share of H's portfolio, reducing their liquidity value. This clears the market, despite the different risk neutral valuations for H and F investors.

The size of the portfolio reallocation is determined by the relative convenience yields of the two assets. Dividing F's bond first-order condition (18) by gold's first-order condition

(17) and rearranging terms:

$$\frac{Q_{B,t} - \mathbb{E}_t[\mathcal{M}_{F,t+1}(1 - \mathbb{1}^S_{t+1}\kappa)]}{Q_{A,t} + \xi_{F,t} - \mathbb{E}_t[\mathcal{M}_{F,t+1}\left(Q_{A,t+1} + \xi_{F,t+1}\right)]} = \frac{\mathcal{L}_{B,F,t}}{\mathcal{L}_{A,F,t}} = \frac{1-\omega}{\omega}\left(\frac{B_{F,t}}{A_{F,t}}\right)^{\rho-1} \tag{30}$$

As the sanction probability rises in the turbulent regime, the expected payoff of the bond falls, which *ceteris paribus* compresses the numerator on the left-hand side. At the initial asset allocation, the investor's ratio of marginal liquidity yields on the right-hand side is now too high relative to the risk-adjusted market pricing. To restore equilibrium, asset allocations and prices need to adjust. As assets are imperfect substitutes ($\rho < 1$), this requires a reduction in the quantity ratio $B_{F,t}/A_{F,t}$. This is the flight-to-gold rebalancing: F sells bonds to purchase geopolitically safe gold, and trading liquidity for geopolitical safety.

Unlike bonds, gold prices are predicted to appreciate during the turbulent transition from $M = 0$ to $M = 1$. This is driven by gold's political neutrality and rising scarcity value. In states where bond wealth is at risk of being expropriated, gold provides higher return and high liquidity services precisely when the marginal utility of wealth is highest.

$$Q_{A,t} + \xi_{F,t} = \underbrace{\mathbb{E}_t[\mathcal{M}_{F,t+1}]\mathbb{E}_t\left[Q_{A,t+1} + \xi_{F,t+1}\right]}_{\text{Risk-Neutral Value}} + \underbrace{\mathrm{Cov}_t\left(\mathcal{M}_{F,t+1}, Q_{A,t+1} + \xi_{F,t+1}\right)}_{\text{Geopolitical Hedge Premium}} + \underbrace{C_{F,t}\mathcal{L}_{A,F,t}}_{\text{Liquidity Value}} \tag{31}$$

In contrast to sovereign bonds, the covariance term for gold is strictly positive and grows with sanction risk. Because gold is a bearer asset immune to geopolitical sanctions, it retains its value precisely in the states where F's consumption is compressed and the SDF spikes. Moreover, the liquidity premium $C_{F,t}\mathcal{L}_{A,F,t}$ acts as an amplification mechanism for the price $Q_{A,t}$. As flight-to-gold reduces F's bond holdings, the contraction of the aggregate liquidity bundle triggers the scarcity effect and generates upward pressure on the marginal liquidity yield of the only remaining safe asset, and gold prices go up. Gold serves as a *geopolitical hedge*, its price movements providing insurance against the rise of sanction risk, commanding an additional geopolitical hedge premium.

2.6 Equilibrium

Let $\mathcal{S}_t = (\mathcal{B}_{t-1}, S_t)$ represent the vector of endogenous and exogenous states at the beginning of period t. A recursive Markov perfect equilibrium consists of value functions $V(\mathcal{S}_t), V_{com}(\mathcal{S}_t), V_{san}(\mathcal{S}_t), V_{aut}(\mathcal{S}_t)$, government policy functions $B_t(\mathcal{S}_t), \mathbb{1}_t^S(\mathcal{S}_t)$, investor portfolio policies $\{A_{i,t}(\mathcal{S}_t), B_{i,t}(\mathcal{S}_t)\}_{i\in\{H,F\}}$, and pricing schedules $Q_A(\mathcal{S}_t), Q_B(\mathcal{S}_t)$ such that:

1. The borrower maximizes its value function, internalizing the demand schedules of both investors
2. Asset pricing schedules satisfy the investors' Euler equations (17),(18),(24) and (23).
3. Markets for goods clear, and market clearing conditions for gold (25) and bonds (26) hold.
4. The probability of sanctions satisfies the logistic distribution derived from the preference shocks: $\Pr(\mathbb{1}_t^S = 1|\mathcal{S}_t) = \left[1 + \exp\left(\frac{V_{com}(\mathcal{S}_t) - V_{san}(\mathcal{S}_t)}{\sigma_V}\right)\right]^{-1}$.

2.7 Calibration

The parameters are displayed in Table 1 and organized into four groups: preference parameters, the CES liquidity bloc, asset-market and default parameters, and the stochastic environment.

The government's discount factor $\beta_g = 0.95$ is set slightly below the standard value to reflect the short political horizon of policymakers. The foreign investor is nearly perfectly patient, with $\beta_F = 0.997$, consistent with the view that China's structural current-account surplus generates a strong and persistent demand for US dollar assets. The domestic H private sector discount factor is set to $\beta_H = 0.95$, reflecting a higher opportunity cost of holding long-duration safe assets. The CRRA coefficient is set to $\gamma = 2$, a standard value in international macroeconomics.

The liquidity aggregator $L_t = [\omega A_t^\rho + (1-\omega)B_t^\rho]^{1/\rho}$ is calibrated with weight $\omega = 0.4$ on gold and $1-\omega = 0.6$ on bonds, reflecting the larger role sovereign bonds play in international liquidity portfolios relative to physical gold. The substitution parameter $\rho = 0.5$ implies an elasticity of substitution $1/(1-\rho) = 2$, reflecting meaningful but imperfect substitutability between the two safe assets. The outer curvature parameter $\eta = 1.0$ delivers log-aversion in

Table 1 Baseline Calibration

Group	Parameter	Symbol	Value
Preferences			
	Government discount factor	β_g	0.95
	F discount factor	β_F	0.997
	H private discount factor	β_H	0.95
	CRRA coefficient	γ	2.00
CES Liquidity			
	Liquidity scale	ϕ	0.001
	Gold weight in CES	ω	0.40
	CES substitution parameter	ρ	0.50
	Outer curvature	η	1.00
Asset Market & Default			
	Global gold supply	$\bar{A}$	0.30
	Haircut on F's bonds	κ	0.30
	Market re-entry probability	θ	0.05
	Output loss (default)	ψ	0.002
	Gold transportation cost	τ_g	0.03
	Maximum debt (grid bound)	$B_{\max}$	0.10
	Government revenue share	τ	1/3
Stochastic Environment			
	H TFP persistence	ρ_Z	0.80
	H TFP standard deviation	σ_Z	0.03
	F TFP persistence	ρ_Z^F	0.80
	F TFP standard deviation	σ_Z^F	0.05
	Tranquil regime persistence	p_{LL}	0.92
	Turbulent regime persistence	p_{HH}	0.72
	GPR log-mean	$\mu_{\ln G}$	−0.32
	GPR log-dispersion	$\sigma_{\ln G}$	0.28
	GPR persistence	ρ_G	0.74
	G scale factor	ς	1.911

total liquidity, so that reductions in the liquidity index generate spikes in safe-asset demand. The scale parameter $\phi = 0.001$ is chosen to match a moderate convenience yield in normal times without allowing liquidity motives to dominate consumption.

The global supply of gold is normalized to $\bar{A} = 0.30$. The selective haircut $\kappa = 0.30$ is applied exclusively to F's bond holdings upon default, consistent with the legal and institutional barriers that prevent full enforcement of sovereign debt claims across borders. This value is lower than historical haircut estimates for sovereign defaults of Graf von Luckner et al. (2025) as we consider sanctions and not outright default. We use the historical evidence on freezes and seizures of central-bank assets in Ferrari Minesso et al. (2025) and set the re-entry probability to $\theta = 0.05$. This implies that the expected normalization of international bond markets lasts twenty periods, matching a representative freezing duration of roughly five to six years, capturing the persistent nature of geopolitical freezes in practice. The output loss parameter is $\psi = 0.002$, a 0.2% TFP contraction in the sanctioning period that is assumed to be economy-wide, reducing both government tax revenue τZ_t and the domestic private-sector endowment $(1 - \tau)Z_t$ by the same factor. The transportation cost is set to $\tau_g = 0.03$, a small quadratic friction that allows nearly immediate gold reallocation while preventing numerically degenerate corner solutions. The maximum debt is capped at $B_{\max} = 0.10$ to focus computational resources on the relevant debt range while providing high grid resolution.

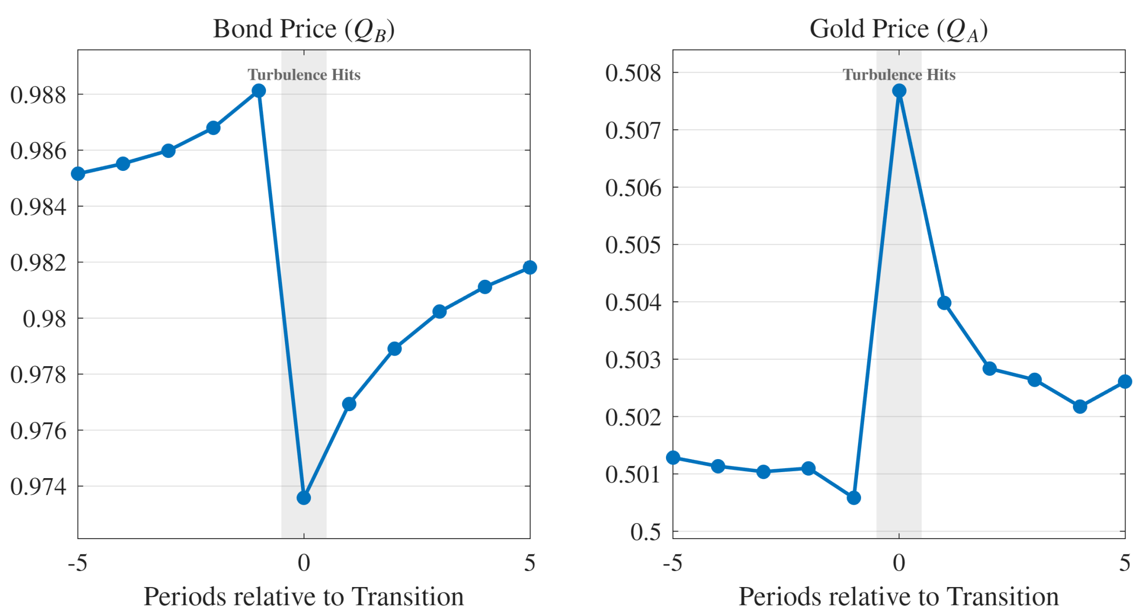
The government's revenue share of output is fixed at $\tau = 1/3$. US TFP follows an AR(1) in logs with mean one, persistence $\rho_Z = 0.80$, and standard deviation $\sigma_Z = 0.03$. F's TFP similarly follows an AR(1) with mean $1 - \tau \approx 0.67$ (calibrated so that in the symmetric steady state F's endowment equals the private share of US output), persistence $\rho_Z^F = 0.80$, and standard deviation $\sigma_Z^F = 0.05$. The geopolitical regime M_t switches between tranquility ($M = 0$) and turbulence ($M = 1$) with asymmetric persistence: the tranquil regime is highly persistent ($p_{LL} = 0.92$), reflecting the historical rarity of sustained geopolitical crises, while the turbulent regime is less persistent ($p_{HH} = 0.72$), capturing the tendency for crises to eventually resolve. Within the turbulent regime, we assume G_t follows an AR(1) process. This is an unobserved variable, but in order to discipline it we assume that it is reflected in geopolitical risk indices and calibrate by scaling an estimated AR(1) process in logs of the geopolitical risk index of Caldara and Iacoviello (2022). We then set $G_t = \varsigma_G GPR_t$ to scale the process, such that the model matches the sanction frequency of 15 percent per quarter in turbulent times, in line with Ferrari Minesso et al. (2025). In the tranquil regime we assume $G_t \equiv 0$.

3 Main Results

3.1 Asset Prices and Reallocation Around Regime Change

In Figures 3 and 4 we show what happens to asset prices and portfolio holdings around transitions from tranquil ($M = 0$) to the turbulent ($M = 1$) regime. Using an event study approach, each panel plots the mean of the relevant variable over a window of five periods before and five periods after the transition date ($t = 0$).

Figure 3 Asset Prices Around the Transition to Geopolitical Turbulence



Note. The figure reports mean bond and gold prices in an event window centered on transitions from the tranquil regime ($M = 0$) to the turbulent regime ($M = 1$), where $t = 0$ denotes the transition date. Moments are computed from simulations of 100,000 periods.

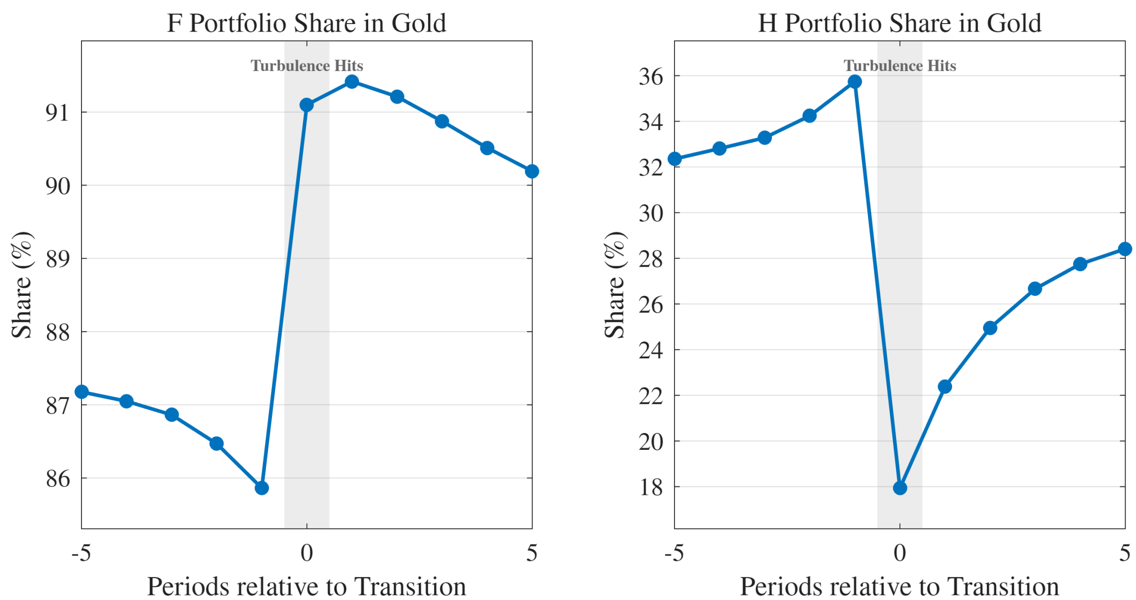
The left panel of Figure 3 illustrates the dynamics of the bond price, Q_B, with the right panel describing the gold price Q_A dynamics. In the tranquil periods preceding the shift, Q_B rises gradually and Q_A slowly drifts down. The closer to the transition, the less likely it is that the economy was in a turbulent state before, and so the higher (lower) the average bond (gold) prices. This also illustrates that in prolonged periods of peace, bond prices and convenience yields are elevated, while gold prices are relatively low. Enticed by high liquidity yields and low confiscation risk, the foreign investor tilts demand towards bonds and progressively sells gold to do so. Consequently, bond prices are at their highest during these periods, and gold prices at their lowest.

At $t = 0$ the change in regime leads to a quick adjustment. The expected probability of sanctions increases, implying that foreign investors now require a non-negligible geopolitical risk premium to hold H bonds, triggering a bond selloff that decreases prices by approximately 1.4 percentage points, as described in the geopolitical risk premium mechanism of equation (29). At the same time, F investors seek geopolitical safety and another source of liquidity now that bonds, their preferred source for liquidity services, is no longer safe. This reallocation leads to a spike in gold prices Q_A, which appreciate around 1.5 percentage points. This valuation effect at impact reflects the complementary forces described in sections 2.4 and 2.5. On one hand, there is a positive hedge covariance to sanction events, since gold delivers high returns precisely in the states where F's marginal utility of wealth is highest. On the other hand, there is the scarcity premium, since F's reallocation out of bonds leaves them low on liquidity services. This increases the marginal utility of liquidity services, further increasing their demand for gold. The high volume of trade around the transition further pushes up gold prices due to convex transaction costs. Gold prices ease after impact, as portfolios progressively complete their adjustment in subsequent periods.

Turning to portfolio allocations, Figure 4 illustrates the stark divergence in behavior between foreign and domestic investors. In the pre-transition periods, F's portfolio share of gold drifts downward. As with asset prices, this pre-event drift is driven by the accumulation of sovereign bonds during consecutive tranquil periods. Because the environment is safe, F shifts its portfolio towards liquid, yielding-bearing bonds. Meanwhile, the H investor acts as the natural counterparty, increasing its share of gold as it takes advantage of low prices.

Upon regime shift, the two investors diverge sharply. F's gold share jumps by approximately 5 percentage points, as it rapidly reallocates away from sanctions-exposed bonds, while H investors gold share falls sharply from 35% to 18% on impact. Attracted by the steep discount on domestic bonds combined with high gold price, H investors absorb the

Figure 4 Portfolio Allocation Around the Transition to Geopolitical Turbulence



Note. The figure reports mean portfolio shares of gold for the foreign investor (F, left panel) and the domestic US private investor (H, right panel) in an event window centered on transitions from the tranquil regime ($M = 0$) to the turbulent regime ($M = 1$), where $t = 0$ denotes the transition date. Moments are computed from simulations of 100,000 periods. The model includes a small quadratic gold transportation cost ($\tau_g = 0.03$).

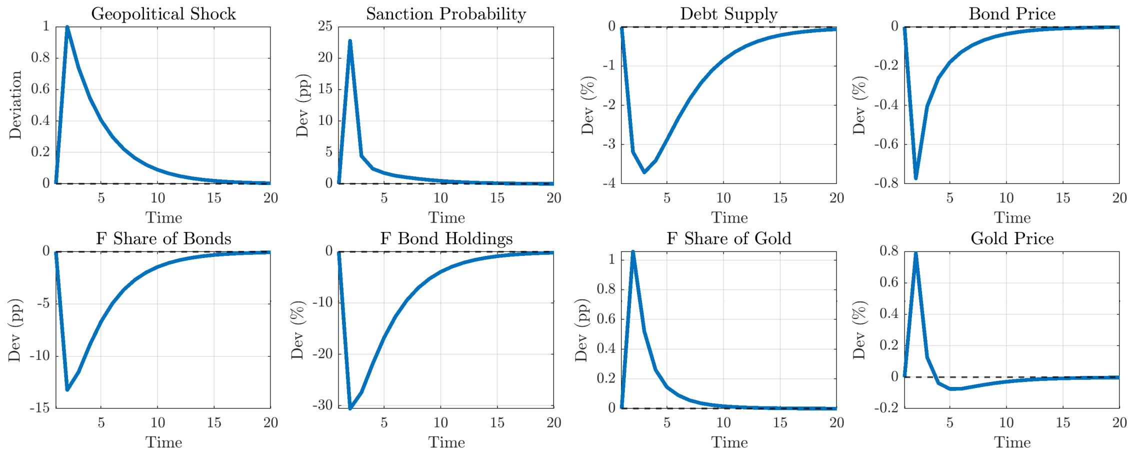
excess debt supply and offload their bullion. The resulting portfolio adjustments are stark: the foreign investor rapidly concentrates its wealth in gold to secure custodial sovereignty, abandoning yield and liquidity for political safety. Conversely, the domestic sector assumes the shunned sovereign debt, effectively providing an outlet (and profitting from it) for F investors during a geopolitical run.

3.2 Reaction to a Geopolitical Shock in Turbulent Times

While the regime transition describes the change to a geopolitically risky world, the impulse responses in Figure 5 highlight the economy's dynamic reaction to a temporary escalation of geopolitical tensions within the turbulent regime. They trace how the equilibrium responds to a one-standard-deviation shock to the geopolitical utility of sanctions G_t, holding the economy in the turbulent regime ($M = 1$) throughout.[4]

[4]The pre-shock baseline is the turbulent steady state, which evaluates policy functions at mean TFP levels ($Z = \bar{Z}$, $Z_F = \bar{Z}_F$) and the mean G within the turbulent regime. The shock itself enters as a one-standard-deviation impulse to the AR(1) geopolitical process in logs.

Figure 5 IMPULSE RESPONSES TO A GEOPOLITICAL SHOCK IN THE TURBULENT REGIME



NOTE. The figure reports deterministic impulse responses to a one-standard-deviation shock to the geopolitical utility process G_t within the turbulent regime ($M = 1$). All variables are shown as deviations from the turbulent steady state. Total factor productivity and the geopolitical regime are held fixed.

The impulse responses in Figure 5 demonstrate how a heightened geopolitical threat propagates through global asset markets, highlighting the pricing and liquidity mechanisms outlined in Sections 2.4 and 2.5.

The positive shock triggers a shift in the sovereign's strategic incentives. As the geopolitical utility of imposing sanctions (G_t) rises, the sovereign is increasingly tempted to impose sanctions, driving up the equilibrium probability of a sanction event. Foreign investors, anticipating this heightened confiscation risk, immediately reduce their valuation of H bonds. Moreover, since sanction events represent a negative wealth shock to the foreign investor, their stochastic discount factor covaries negatively with the expected bond payoff. This also expands the geopolitical risk premium embedded in sovereign debt, amplifying their unwillingness to hold these bonds beyond the first-order fall in expected returns. This downward shift in the aggregate demand schedule will be at the source of the observed fall in the market price of bonds Q_B.

However, because bonds and gold are imperfect substitutes for facilitating transactions, this retreat from the bond market creates a scarcity of liquidity services within the foreign portfolio. To compensate for this liquidity shortfall, the foreign investor is forced to substitute toward the politically neutral safe haven: physical gold. As F investors' demand for shifts towards gold, we observe a joint rise in gold prices (Q_A) and their portfolio share of gold. This reallocation towards gold and its impact on price are the source of gold's "geopolitical hedge premium". Not only is it safe from sanctioning, but it also provides high returns when geopolitical tensions escalate.

Finally, this global flight to safety acts as disciplinary mechanism on the sovereign issuer. As foreign demand for bonds shrinks and borrowing costs surge, the domestic sovereign faces a constrained debt capacity. In response, the government is forced to optimally reduce their debt supply B, scaling back total debt issuance until geopolitical tensions cool.

As the shock slowly reverts to its mean, the sanction threat recedes, the geopolitical risk premium compresses, and the foreign investor gradually returns to the bond market, selling gold to do so. This generates an overshoot of gold prices on the path to convergence, but ultimately allows global asset prices and debt issuance to normalize.

4 Stablebonds and Sanction Risk

In recent years, the use of stablecoins and similar crypto-assets—designed to mimic the behavior of traditional financial instruments—has increased significantly. In this extension, we examine a setup that may allow investors to shield themselves from sanction risk, albeit potentially at the expense of some liquidity value.

To capture the recent emergence of these alternative financial assets, we extend the baseline model by introducing a crypto-asset to our economy: *stablebonds*. Stablebonds represent claims on assets that track the price of H bonds, which are cleared through decentralized, sanction-proof financial infrastructures, rendering them difficult to sanction or monitor.

These assets can be issued freely by crypto intermediaries but these must hold collateral in order to ensure the price of stablebonds correctly tracks the price of regular bonds. For simplicity, we assume a perfectly competitive environment of risk-neutral crypto intermediaries, which emit a unit of stablebonds for every unit of bonds that they hold. This one-to-one ability to convert bonds into stablebonds ensures that $Q_{SB} = Q_B$, that is the price of stablebonds Q_{SB} equals the price of regular bonds Q_B.[5]

Both investors now choose how to allocate their total bond portfolio between regular bonds and stablebonds, as well as gold. Because regular bonds and stablebonds are both fiat-denominated debt instruments, we assume they are more substitutable with each other than with physical gold. To capture this hierarchical substitutability, we replace the baseline liquidity index with a nested CES aggregator. Let B^{agg} denote the *effective* aggregate amount of bonds for liquidity purposes, which is composed of regular bonds B^{reg} and stablebonds B^{SB}. The inner aggregator bundles the two types of bonds:

$$B_{agg,t} = \left[\omega_B B_{reg,t}^{\rho_B} + (1-\omega_B) B_{SB,t}^{\rho_B}\right]^{\frac{1}{\rho_B}} \tag{32}$$

where ω_B is the weight on regular bonds and ρ_B governs the inner elasticity of substitution. The overall liquidity services are then given by the outer aggregator combining gold and the bond aggregate:

$$L_{F,t} = \left[\omega_L A_{F,t}^{\rho_L} + (1-\omega_L) B_{agg,t}^{\rho_L}\right]^{\frac{1}{\rho_L}} \tag{33}$$

where $\rho_L < \rho_B$, ensuring that the two types of bonds are closer substitutes to each other than either is to gold.

4.1 Sanction Immunity and Liquidity Arbitrage

The key distinction between the two bond types materializes in the turbulent regime when the sovereign decides to impose a sanction ($\mathbb{1}_t^S = 1$). Regular bonds are subject to the financial haircut κ, while stablebonds are potentially insulated, but can still be confiscated with probability π^{SB}. This parameter captures the sovereign's imperfect capacity to enforce sanctions on decentralized crypto-assets. The post-sanction expected recovery payment to the foreign investor becomes $B_{reg,t}(1-\kappa) + B_{SB,t}(1-\pi^{SB}\kappa)$. As long as $\pi^{SB} < 1$, then the larger the share of stablebonds in F portfolio, the harder it is for H to extract sanctions from the foreign investor, reducing the effective haircut on foreign holdings of government debt.

[5] This equality in prices hold as long as there is no shorting or we reach the collateral limit given by the total supply of regular bonds. Given the CES assumption and the low weight of stablebonds in the bond aggregator, we focus purely on the interior solutions and abstract from those limits.

Because stablebonds provide stronger political safety but have potentially lower baseline liquidity ($\omega_B < 0.5$) and imperfect substitutability with respect to regular bonds ($\rho_B < 1$), the foreign investor faces a trade-off, evident in the optimality conditions of F's portfolio choices. Let $M_{t,t+1} \equiv \beta_F U'(C_{F,t+1})/U'(C_{F,t})$ denote F's stochastic discount factor. In equilibrium, the investor must be indifferent at the margin between holding regular sovereign bonds and stablebonds. Since both assets trade at the same aggregate price $Q_{B,t}$, their expected payoffs (including marginal convenience yields) must equalize. In other words, the difference in (risk-adjusted) expected financial returns must equal the liquidity difference for both assets.

$$\mathbb{E}_t \left[M_{t,t+1} \left(\kappa(1 - \pi^{SB}) \right) \mathbb{1}^S_{t+1} \right] = \mathbb{E}_t \left[M_{t,t+1} \right] \left(\mathcal{L}_{B,t} - \mathcal{L}_{SB,t} \right) \tag{34}$$

When geopolitical risk rises, the expected financial wedge (the left-hand side) increases. In equilibrium, the foreign investor must alter its portfolio composition, substituting away from regular bonds and into stablebonds. Because the assets are imperfect substitutes, this leads to a rise in the differential of marginal liquidity values between regular bonds and stablebonds, $\mathcal{L}_B - \mathcal{L}_{SB}$.

Importantly, this substitution acts as a shock absorber for the broader macroeconomy. By shifting the internal split towards stablebonds instead of gold, the investor is able to sustain a higher liquidity level $L_{F,t}$, diminishing the scarcity effect that led to strong flight-to-gold dynamics. By muting the flight-to-safety into gold, the relative price of liquidity is maintained. This, combined with the one-to-one collateralization of stablebonds with regular bonds, mutes the fall in demand for regular bonds and stabilizes their price $Q_{B,t}$. By the same token, since the flight-to-gold effect is diminished, the gold price $Q_{A,t}$ is also stabilized and so are capital flows.

These dynamics depend crucially on both the substitutability of stablebonds with regular bonds (ρ_B) and its ability to evade sanctions π^{SB}. If stablebonds and regular bonds are almost perfect substitutes ($\rho_B \approx 1$), then the liquidity cost is minimal and there will only be minimal price and capital flows in response to changes in geopolitical tensions. On the other hand, if stablebonds are very transparent and unable to shield investors ($\pi^{SB} \approx 1$), then we would be back to a world closer to our baseline model. Ultimately, the stabilizing power of these alternative assets hinges on their capacity to deliver geopolitical insulation while retaining high liquidity value.

5 Data and Measurement

This section maps the model's portfolio choice into observable reserve data and describes the construction of the key variables used in the empirical analysis. The main empirical patterns are illustrated in the introduction, while in this section we focus on the underlying data construction and measurement.

5.1 Reserve portfolios, asset decomposition, and cross-country heterogeneity

Our core dataset is a quarterly panel of official reserve portfolios covering foreign currency, gold, and total holdings for 37 countries over the period 1985Q1–2024Q4. Official reserve composition data are obtained from the IMF's International Financial Statistics (IFS), which provides country-level data on reserve asset classes at quarterly frequency reported on a voluntary disclosure basis.[6] As the country-level allocation across currencies is strictly confidential, and existing country-level reconstructions are limited in coverage (e.g. Ito and McCauley, 2020), we rely on IFS data and focus on the allocation margin of official reserves across all assets denominated in foreign currency and gold, in the spirit of the model's core mechanism.[7]

We employ in parallel two specifications of reserve measures – shares and holdings. The first is defined as the ratio of each asset class to total reserves at market value. The second captures reserve quantities through constant-price gold holdings (and real foreign-exchange reserves in the Appendix), expressed in logarithms. When using the first measure, we take care of valuation effects by using the interaction of valuation factors with country-specific fixed effects. The second measure, instead, is immune to valuation effects by construction.

[6] In order to circumvent potential data quality concerns, we exclude China from the sample.

[7] We include SDRs and IMF reserve positions within our total holdings measure, but we do not study them explicitly as these components of official reserves are typically smaller and not allocated on a strategic basis.

Before moving to the methodology, it is worth spending a few lines recalling the main patterns in official reserve data, as they lie at the core of the empirical analysis. At the aggregate level, Figure 1, in the Introduction, shows that global reserves are highly concentrated in a small number of economies and that the identity of the marginal reserve holder changes markedly over time. The share of emerging markets rises sharply after 2000, reflecting sustained current account surpluses and exchange rate management policies. Over the same period, the role of gold follows a non-monotonic pattern: gold shares decline before the Global Financial Crisis, stabilize thereafter, and rise again from the mid-2010s, coinciding with heightened geopolitical tensions and the expanding use of financial sanctions.

These aggregate patterns, however, mask substantial cross-country heterogeneity. Figure 2 shows that the rise in gold reserve demand is not broad-based, but concentrated among a relatively small group of reserve managers. Advanced economies and traditional reserve issuers—including the United States, the Euro Area, Japan, and Switzerland—display relatively stable gold shares over time. By contrast, countries whose geopolitical alignment with the United States deteriorates more visibly exhibit stronger increases in gold exposure, consistent with the view that reserve composition becomes more politically salient when access to foreign reserve assets is perceived as contingent. By contrast, reallocations toward gold are concentrated among countries in a handful of emerging economies, whose gold shares rise during periods of heightened geopolitical tension. These shifts coincide with major events such as the annexation of Crimea in 2014 and the full-scale invasion of Ukraine in 2022, both associated with the expanded use of financial sanctions and reserve freezes.

5.2 Geopolitical alignment

To measure cross-country differences in geopolitical exposure, we use country-level alignment scores with the United States derived from United Nations General Assembly voting data. Following Voeten (2009) and Bailey et al. (2017), these measures are constructed using an ideal-point framework that summarizes countries' voting behavior across a large set of resolutions.

Formally, each country is assigned a latent position in a low-dimensional policy space, estimated from observed voting patterns. Alignment with the United States is then measured as the proximity between a country's estimated ideal point and that of the United States. This approach provides a continuous and comparable measure of geopolitical alignment across countries and over time.

A key advantage of this measure is that it captures revealed preferences over a broad set of international issues, rather than relying on formal alliances or treaty-based indicators. As such, it reflects a comprehensive notion of geopolitical proximity that is directly relevant for assessing exposure to the political influence of the dominant reserve issuer.

We merge these annual alignment scores into the quarterly reserve panel and treat them as a slow-moving state variable. Lower alignment implies greater perceived vulnerability of foreign-currency reserve claims to sanctions, asset freezes, or other forms of financial coercion. The measure exhibits substantial and persistent cross-country variation, which we exploit to study heterogeneous responses in reserve allocation.

5.3 Geopolitical risk and macro controls

Our main shock variable is the country-specific geopolitical risk (GPR) index developed by Caldara and Iacoviello (2022). The index is constructed by counting the frequency of newspaper articles that discuss adverse geopolitical events, including wars, military tensions, terrorist attacks, and diplomatic conflicts, across a large set of international newspapers.

The raw index is available at monthly frequency and is comparable across countries due to standardized text classification procedures, so that estimated coefficients can be interpreted as responses to a one-standard-deviation shock. Furthermore, we apply a statistical standardization so that the series is transformed into country-specific standard-deviation units. This normalization allows coefficients to be interpreted as responses to a one-standard-deviation shock and prevents differences in the scale or volatility of geopolitical risk across countries from driving the results.

Finally, we include standard macroeconomic controls borrowed from the quarterly cross-country macro-financial dataset by Camous et al. (2026), including real GDP, CPI, and domestic credit to the private sector. These variables help isolate the response of reserve behavior to geopolitical shocks from contemporaneous country-specific macroeconomic and financial fluctuations. The final dataset combines reserve outcomes, geopolitical shocks, alignment measures, and macroeconomic controls in a quarterly cross-country panel.

6 Empirical Validation

This section brings the model's central mechanism to the data. We proceed in three steps. First, we examine whether unexpected geopolitical shocks reprice safe assets in daily financial markets, focusing on gold and US Treasury yields. Second, we test whether the same shocks translate into systematic reallocation in official reserve portfolios at the quarterly country level. Third, we study whether these reserve responses are stronger for countries that are geopolitically less aligned with the United States.

6.1 Safe-Asset Repricing in Daily Financial Markets

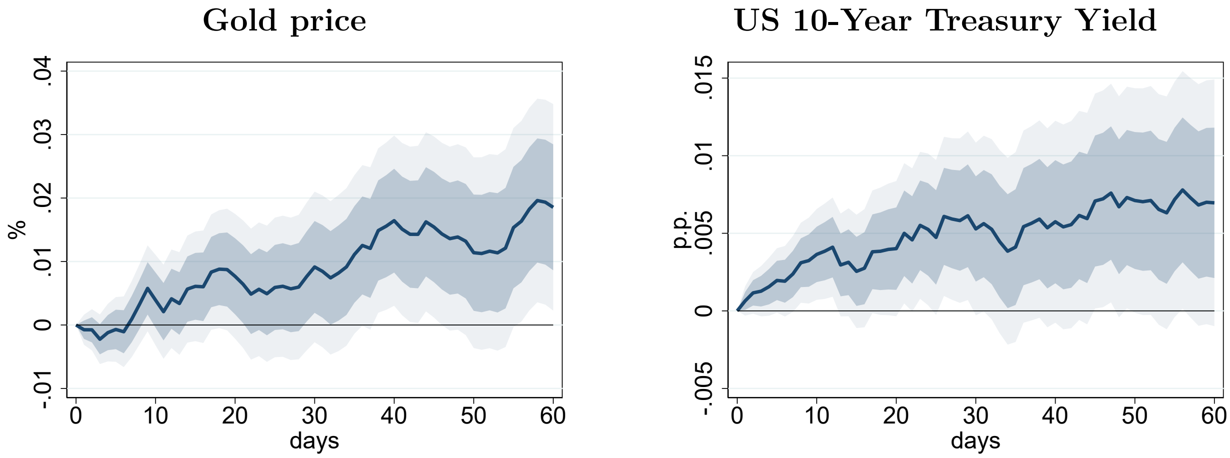
We begin by validating the model's core mechanism in high-frequency financial data. The central prediction is that unexpected geopolitical shocks should increase the relative attractiveness of politically neutral safe assets. To test this implication, we estimate daily local projections of cumulative asset-price responses to exogenous geopolitical-risk shocks on a sample ranging from January 1990 to December 2025. Specifically, for horizons $h = 0, \ldots, 60$, we estimate

$$y_{t+h} - y_{t-1} = \alpha_h + \beta_h \, GPR^w_t + \Gamma_h X_t + \varepsilon_{t+h},$$

where y_t denotes either the log gold price or the US 10-year Treasury yield, and $\widehat{u}_t^{GPR}$ is a one-standard-deviation global geopolitical risk shock. The control vector includes five lags of the dependent variable, the GPR shock, the 1-year Treasury rate, oil prices, the S&P 500, and the VIX.

Figure 6 reports the estimated responses. Gold prices rise persistently after an exogenous geopolitical shock, while the US 10-Year Treasury Yield also increases. These high-frequency responses provide direct market-based evidence for the mechanism developed in the model. In particular, the appreciation of gold supports the view that geopolitical risk increases demand for assets insulated from foreign legal and custodial infrastructures. At the same

Figure 6 Safe-asset repricing after exogenous geopolitical shocks



Note. The figure reports daily local projections of the cumulative response of gold prices and the US 10-year Treasury yield to a one-standard-deviation global geopolitical-risk shock. Gold responses are cumulative percent changes while Treasury responses are cumulative changes in percentage points. Shaded bands denote 68 and 90 percent confidence intervals based on Newey-West standard errors.

time, the increase in Treasury yields suggests that geopolitical shocks alter the pricing of dollar-denominated safe assets, consistent with a geopolitical premium embedded in the global reserve currency system.

Two features of these results deserve to be discussed. First, the use of the 1-year Treasury rate and oil prices help controlling for the effect of monetary policy and the inflationary pressures associated with geopolitical episodes – documented inter alia by Caldara et al. (2026) and Pinchetti (2025) – suggesting that these results are unlikely to be driven by the inflationary channel of geopolitical risk. Second, the rise in 10-year Treasuries yields align well with Georgiadis et al. (2024), who find that treasury rates rise persistently for two weeks following a global risk shock, corroborating the credibility of these results.

6.2 Average Reserve Portfolio Reallocation

We next examine whether the repricing of safe assets documented in financial markets translates into active portfolio adjustment by reserve managers. Unlike asset prices, the reserve portfolio composition reflects deliberate policy choices. This makes them a natural object to test the mechanism: if geopolitical shocks reduce the relative attractiveness of foreign-currency assets, central banks should reallocate toward politically neutral stores of value such as gold.

Our empirical strategy consists of estimating dynamic responses of reserve outcomes to country-specific geopolitical shocks using local projections. The objective is to trace out how reserve portfolios adjust over time following an exogenous change in geopolitical risk, while controlling for persistence and macroeconomic conditions.

For each horizon $h = 1, \ldots, 12$, we estimate cumulative responses of the form

$$y_{i,t+h-1} - y_{i,t-1} = \alpha_i + \gamma_t + \beta_h \, GPR_{i,t} + \sum_{\ell=1}^{p} \rho_{\ell,h} y_{i,t-\ell} + \Gamma_h X_{i,t} + \Phi_h(\alpha_i \times Z_t) + \varepsilon_{i,t+h} \quad (35)$$

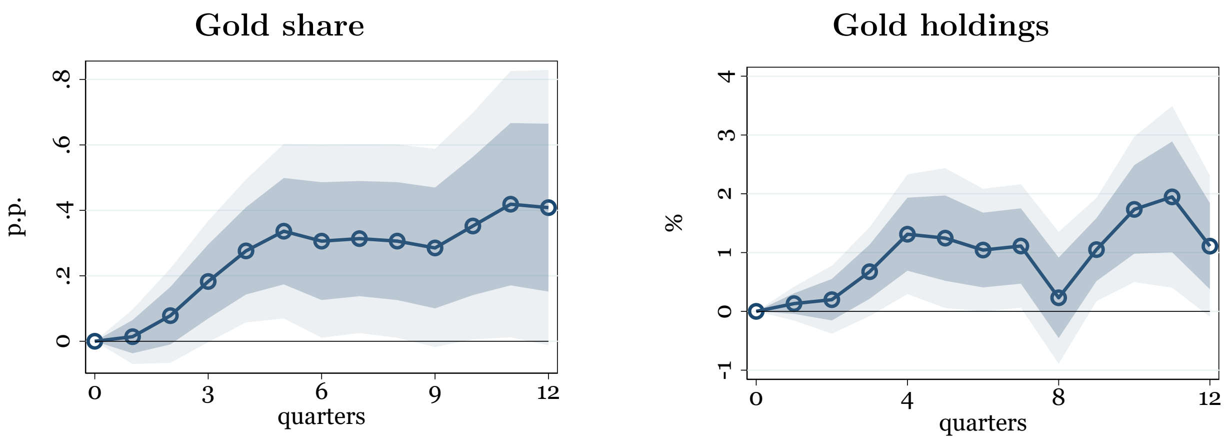
where $y_{i,t}$ denotes a reserve outcome for country i at time t, and the left-hand side measures the cumulative change between $t-1$ and $t+h-1$. The coefficient β_h therefore traces the impulse response at horizon h to a one-standard-deviation increase in geopolitical risk.

The specification includes country fixed effects α_i and time fixed effects γ_t, which absorb time-invariant heterogeneity and global shocks. Lagged dependent variables account for the strong persistence in reserve portfolios, ensuring that estimated responses reflect deviations from country-specific adjustment dynamics. The control vector $X_{i,t}$ includes lags of geopolitical risk and standard macroeconomic variables. Standard errors are clustered at the country level.

We consider two complementary outcome variables: the gold share of reserves (in percentage points), which captures the portfolio allocation margin, and gold holdings (in percent), which capture active balance-sheet adjustment. For gold shares, we augment the baseline specification with interactions between country fixed effects and global valuation factors—specifically changes in the USD, the EUR, and the gold price. These interactions allow for country-specific exposure to common price movements and absorb heterogeneous valuation effects that could otherwise mechanically affect reserve shares. For gold holdings, we do not include these interactions, as valuation effects are already mitigated by expressing holdings in real terms and by focusing on quantities rather than portfolio weights.

Figure 7 reports the responses of gold shares and gold holdings. Gold shares rise gradually and persistently following the shock, reaching about 0.1 to 0.7 percentage points at longer horizons. Because the specification absorbs heterogeneous exposure to global valua-

Figure 7 Gold reserve responses to geopolitical shocks



Note. Quarterly local projections of cumulative responses to a one-standard-deviation country-specific geopolitical-risk shock. The left panel reports gold shares (percentage points), while the right panel reports gold holdings (percent changes). Shaded bands denote 68 and 90 percent confidence intervals.

tion factors through country-specific loadings, this increase is consistent with active portfolio reallocation rather than a mechanical response to common price movements.

Gold holdings display a similar dynamic pattern. The response is initially modest, but becomes positive and statistically significant after several quarters. At horizons of two to three years, gold holdings are approximately 0.5 to 1.5 percent above their pre-shock level, with no evidence of reversal.

The joint increase in shares and holdings provides direct evidence that reserve managers respond to geopolitical shocks by reallocating toward politically neutral reserve assets. While the share specification isolates portfolio rebalancing by controlling for valuation effects, the holdings specification confirms that this reallocation is accompanied by active accumulation of gold. Overall, the combined behavior of gold shares and gold holdings supports the view that geopolitical shocks induce persistent reserve reallocation toward assets insulated from foreign political and legal risk.

For completeness, Appendix C.1 reports the corresponding responses of foreign-exchange reserves, which move in the opposite direction and are consistent with a reallocation away from externally custodied assets.

6.3 Heterogeneous Reserve Responses by US Alignment

The average responses mask substantial cross-country heterogeneity in exposure to geopolitical risk. The mechanism developed in the model implies that this heterogeneity should matter for reserve management: countries that are more exposed to potential sanctions or restrictions on access to foreign-currency assets should respond more strongly to geopolitical shocks by reallocating toward politically neutral stores of value.

We operationalize this idea using cross-country variation in geopolitical alignment with the United States, the issuer and custodian of the dominant reserve currency. Alignment is measured using similarity in United Nations General Assembly voting patterns following Voeten (2009). Lower alignment is interpreted as greater geopolitical distance from the United States, and therefore higher exposure to sanction risk or to disruptions in access to dollar-denominated reserve assets.

Our empirical strategy is to compare the dynamic response of reserve portfolios to a common geopolitical shock across countries with different levels of alignment. This allows us to isolate whether the reallocation toward gold documented in the previous subsection is concentrated among countries that are more exposed to geopolitical frictions.

For each horizon $h = 1, \ldots, 12$, we estimate heterogeneous local projections of the form

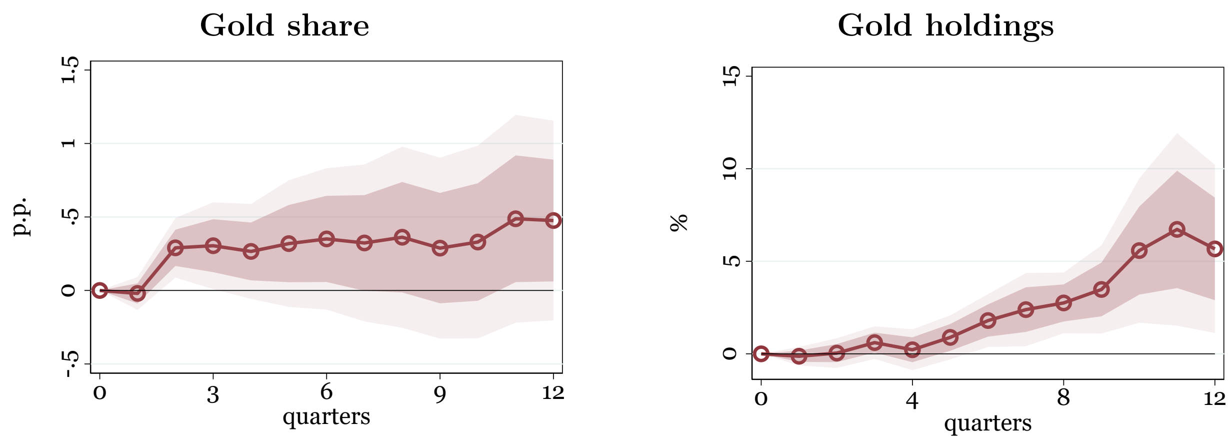
$$y_{i,t+h-1}-y_{i,t-1} = \alpha_i+\gamma_t+\beta_h GPR_{i,t}+\theta_h \left(GPR_{i,t} \times D^{US}_{i,t-1}\right)+\sum_{\ell=1}^{p}\rho_{\ell,h}y_{i,t-\ell}+\Gamma_h X_{i,t}+\Phi_h(\alpha_i\times Z_t)+\varepsilon_{i,t+h} \quad (36)$$

where $y_{i,t}$ denotes a reserve outcome and the left-hand side measures the cumulative change between $t-1$ and $t+h-1$, as in the baseline specification.

The indicator $D^{US}_{i,t-1}$ takes value one for countries with below-median alignment with the United States, and zero otherwise. The coefficient β_h captures the response to a geopolitical shock for relatively aligned countries, while θ_h measures the additional response for less aligned countries. The coefficient of interest is therefore θ_h, which traces the differential response of the low-alignment group at each horizon.

As in the baseline, the specification includes country fixed effects α_i and time fixed effects γ_t, which absorb time-invariant heterogeneity and common global shocks. Lagged dependent variables capture persistence in reserve dynamics, and the control vector $X_{i,t}$ includes lags

Figure 8 Differential gold reserve responses by US alignment



Note. Quarterly local projections of differential cumulative responses to a one-standard-deviation country-specific geopolitical-risk shock for countries with below-median US alignment. The left panel reports gold shares (percentage points), while the right panel reports gold holdings (percent changes). Shaded bands denote 68 and 90 percent confidence intervals.

of geopolitical risk and standard macroeconomic controls. Standard errors are clustered at the country level.

For gold shares, we augment this specification with interactions between country fixed effects and global valuation factors—specifically changes in the USD, the EUR, and the price of gold. These interactions absorb heterogeneous exposure to common price movements and ensure that estimated differences across countries reflect active portfolio reallocation rather than differential valuation effects. For gold holdings, we do not include these interactions, as valuation effects are already taken care of by focusing on quantities.

This empirical design isolates cross-sectional differences in responses to the same underlying shock. Identification comes from comparing how countries with different levels of geopolitical alignment adjust their reserve portfolios following similar realizations of $GPR_{i,t}$, while controlling for global shocks, domestic macroeconomic conditions, and heterogeneous exposure to valuation effects.

Under a purely financial hedging motive driven by global factors, one would expect similar responses across countries once common shocks are accounted for. In contrast, a mechanism driven by geopolitical risk predicts systematically larger responses among countries that are more exposed to potential sanctions or restrictions on asset access.

Figure 8 reports the differential responses of gold shares and gold holdings for low-alignment countries relative to more aligned countries. The left panel shows that low-alignment countries exhibit a significantly stronger increase in gold shares following geopolitical shocks. The differential response rises gradually over the projection horizon and reaches roughly 0 to 0.8 percentage points after three years. Because the specification controls for heterogeneous valuation exposure, this pattern reflects active portfolio reallocation rather than differential sensitivity to global price movements.

The right panel shows a corresponding differential persistent, and gradual increase in gold holdings, up to 5% compared to the pre-shock level. This confirms that the stronger gold-share response among less aligned countries is not merely a compositional effect, but is also reflected in active balance-sheet adjustment. Taken together, the two panels indicate that countries more exposed to geopolitical vulnerability respond to adverse shocks by increasing both the quantity of gold they hold and its weight within the reserve portfolio.[8]

This cross-sectional pattern is central to the validation of the identified mechanism. Because the response is stronger precisely among countries with lower geopolitical alignment, the evidence points to a mechanism driven by concerns of geopolitical nature over access to foreign-currency reserve assets, rather than by common global financial conditions alone.

7 Conclusion

This paper develops and quantitatively evaluates a general equilibrium model of international safe-asset choice in which sovereign reserve managers allocate across politically exposed and politically neutral assets under the threat of selective default and geopolitical sanctions. Two features distinguish the framework from the existing literature. First, liquidity services arise endogenously, so that the convenience yield of each asset depends on portfolio composition rather than being imposed exogenously. Gold is politically neutral and sanction-insulated, but offers inferior liquidity services and incurs storage and transportation costs. Second, the sovereign moves first, making strategic and probabilistic decisions about default and sanctions, generating endogenous geopolitical state transitions.

The model delivers a regime-contingent amplification mechanism. In tranquil states,

[8] Appendix C.1 reports the corresponding foreign-exchange responses, which display symmetric patterns consistent with a reallocation away from externally custodied assets.

reserve managers coordinate on sovereign bonds because liquidity services dominate. When the geopolitical regime shifts to turbulence, the relative safety value of politically neutral gold rises sharply, especially for countries facing greater sanctions exposure. This produces a large and persistent reallocation away from foreign-exchange claims and toward gold.

The empirical evidence strongly supports this mechanism. At daily frequency, exogenous geopolitical shocks immediately reprice safe assets, raising gold prices and increasing the geopolitical premium embedded in US Treasury yields. In the quarterly cross-country panel, the same shocks lead central banks to increase gold shares and gold holdings while reducing foreign-exchange reserve exposure. These responses are significantly stronger for countries that are less aligned with the United States, precisely where exposure to dollar-based custodial and legal infrastructures is most salient.

The results carry important policy implications. For reserve managers, geopolitical risk is not merely a source of valuation volatility but a structural determinant of optimal reserve composition. The traditional trade-off between liquidity and return must therefore be augmented to account for custodial sovereignty, sanctions vulnerability, and legal control over reserve assets. More broadly, the findings suggest that rising geopolitical fragmentation may gradually weaken the dominance of reserve assets tied to foreign political jurisdictions, increasing demand for politically neutral stores of value and potentially accelerating changes in the international monetary system.

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Appendix

A Numerical Implementation of Preference Smoothing

Standard sovereign debt and sanction models feature a discrete choice $d \in \{0, 1\}$ over whether to comply or impose sanctions. This generates non-convexities and discontinuous policy functions, which complicate numerical convergence. To ensure differentiability and stability, the borrower's choice is smoothed by assuming they draw idiosyncratic, additive taste shocks ϵ_{com} and ϵ_{san} for each option before making a decision.

A.1 Theoretical Formulation

Let $V_{com}(x)$ and $V_{san}(x)$ denote the fundamental values of compliance and sanctioning in state $x = (B, S)$. The realized value of choosing option $j \in \{com, san\}$ is given by $\tilde{V}_j(x) = V_j(x) + \epsilon_j$, where ϵ_j is drawn independently from an Extreme Value Type I (Gumbel) distribution with location 0 and scale parameter $\sigma > 0$.

In this nested optimization framework, these fundamental values are calculated by optimizing over the continuous control variable B', taking tomorrow's smoothed expected value function $V(x')$ as the continuation value. Specifically, the compliance value evaluates the maximum utility over the choice of total debt issuance:

$$V_{com}(B, S) = \max_{B'} \{u(C_{com}) + \beta \mathbb{E}_{S'} [V(B', S')|S]\} \tag{A.1}$$

Similarly, the sanction value optimizes over domestic debt B' (with $B'_F = 0$ imposed by market exclusion):

$$V_{san}(B, S) = \max_{B'} \{u(C_{san}) + G + \beta \mathbb{E}_{S'} [\theta V(B', S') + (1 - \theta) V_{aut}(B', S')|S]\} \tag{A.2}$$

Following the continuous portfolio choices, the borrower makes the discrete decision by choosing the option that maximizes $\tilde{V}_j(x)$. By the properties of the Gumbel distribution, the ex-ante expected value function (prior to observing the taste shocks) has a closed-form analytical solution known as the log-sum-exp function:

$$V(x) = \mathbb{E}_\epsilon [\max \{V_{com}(x) + \epsilon_{com},\ V_{san}(x) + \epsilon_{san}\}] = \sigma \log \left(\exp\left(\frac{V_{com}(x)}{\sigma}\right) + \exp\left(\frac{V_{san}(x)}{\sigma}\right) \right) \tag{A.3}$$

Note: A standard Euler-Mascheroni constant shift is conventionally omitted for brevity, as it does not affect optimal policies or relative probabilities.

The probability of choosing to sanction, evaluated before the realization of the shocks, is given by the standard logistic function:

$$P_S(x) = \Pr\left(V_{san}(x) + \epsilon_{san} > V_{com}(x) + \epsilon_{com}\right) = \frac{\exp\left(\frac{V_{san}(x)}{\sigma}\right)}{\exp\left(\frac{V_{com}(x)}{\sigma}\right) + \exp\left(\frac{V_{san}(x)}{\sigma}\right)} \tag{A.4}$$

A.2 Computational Implementation

Evaluating Equation A.3 directly in computational software often leads to numerical overflow (evaluating to `Inf` or `NaN`). This occurs when the fundamental values $V_j(x)$ are large or, equivalently, when the smoothing parameter σ approaches zero (reflecting a highly precise choice), causing the term $\exp(V_j(x)/\sigma)$ to exceed machine precision.

To guarantee numerical stability, the model code does the following: We define the maximum fundamental value as $\bar{V}(x) = \max\{V_{com}(x), V_{san}(x)\}$. By factoring $\exp(\bar{V}(x)/\sigma)$ out of the logarithm, the value function is identically rewritten as:

$$V(x) = \bar{V}(x) + \sigma \log\left(\exp\left(\frac{V_{com}(x) - \bar{V}(x)}{\sigma}\right) + \exp\left(\frac{V_{san}(x) - \bar{V}(x)}{\sigma}\right)\right) \tag{A.5}$$

Because the maximum exponent in the sum is exactly 0 (which evaluates to $\exp(0) = 1$), and all other exponents are strictly negative, the terms inside the logarithm are bounded between 1 and 2. This prevents overflow regardless of the scale of σ.

Similarly, to prevent overflow or divide-by-zero errors when computing the probability of sanctions, the fraction is rearranged by dividing the numerator and denominator by $\exp(V_{com}(x)/\sigma)$, yielding a highly stable logistic form:

$$P_S(x) = \frac{1}{1 + \exp\left(\frac{V_{com}(x) - V_{san}(x)}{\sigma}\right)} \tag{A.6}$$

This formulation ensures that if $V_{com} \gg V_{san}$ (compliance is heavily favored), the exponent grows large and positive, driving the denominator to infinity and $P_S(x)$ cleanly to 0 without numerical instability. The formulation is equally well behaved in the other extreme case when the exponent is large and negative, in which case the probability converges to 1.

B Data and Sources

Table B.1 Data and Sources – Asset Prices

Data	Source	Description	Sample	Freq
GPR Index	Caldara and Iacoviello (2022)	Daily index of adverse geopolitical events.	1985–2025	D
Gold Price	LBMA	Daily US dollar gold fixing price, in logs.	1985–2025	D
US 10-Year Yield	Board of Governors	Daily constant-maturity Treasury yield.	1990–2025	D
WTI Oil Price	US EIA	Daily WTI crude oil spot price, in logs.	1990–2025	D
S&P 500	S&P Dow Jones Indices	Daily stock price index, in logs.	1990–2025	D
VIX	Cboe	Daily implied equity-market volatility index.	1990–2025	D

Table B.2 Data and Sources – Reserve Composition Panel

Data	Source	Description	Sample	Freq
Total Reserves	IMF IFS	Gold and foreign exchange reserves held by monetary authorities.	1985q1–2024q4	M
Gold Reserve Holdings	IMF IFS	Gold reserve holdings in tons and at market value in real US dollars, expressed in logs.	1985q1–2024q4	M
FX Reserve Holdings	IMF IFS	FX reserve holdings at market value in real US dollars, expressed in logs.	1985q1–2024q4	M

Table B.3 Data and Sources – Country-Level Variables

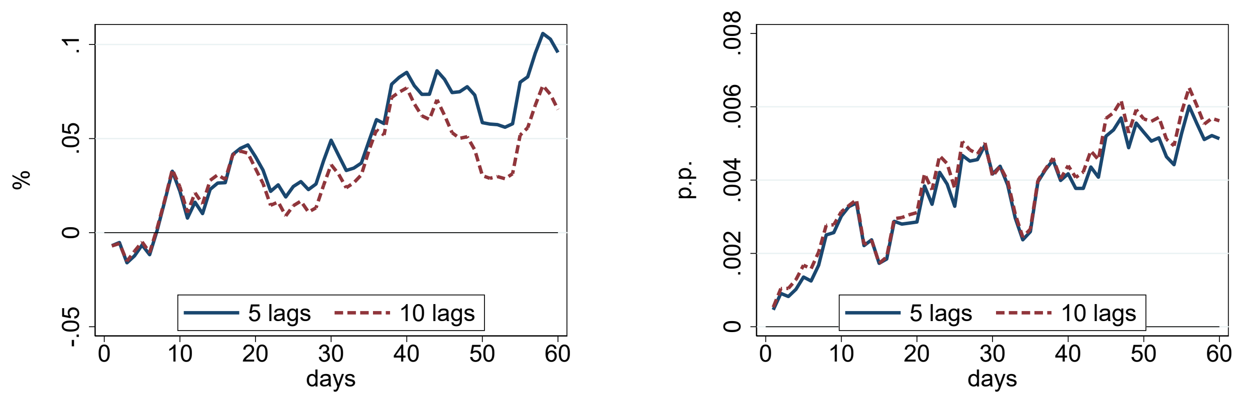
Data	Source	Description	Sample	Freq
US Geopolitical Alignment	Voeten (2009) Bailey et al. (2017)	Country-level proximity to the United States in United Nations General Assembly voting.	1985–2024	Y
Country-level GPR Index	Caldara and Iacoviello (2022)	Country-level GPR exposure and global stress indicator.	1985q1–2024q4	Q
Macro-financial Controls	Camous et al. (2026)	Country-level GDP, CPI, Real Credit.	1985q1–2024q4	Q

Legend: D=Daily, M=Monthly, Q=Quarterly, Y=Yearly

C Robustness

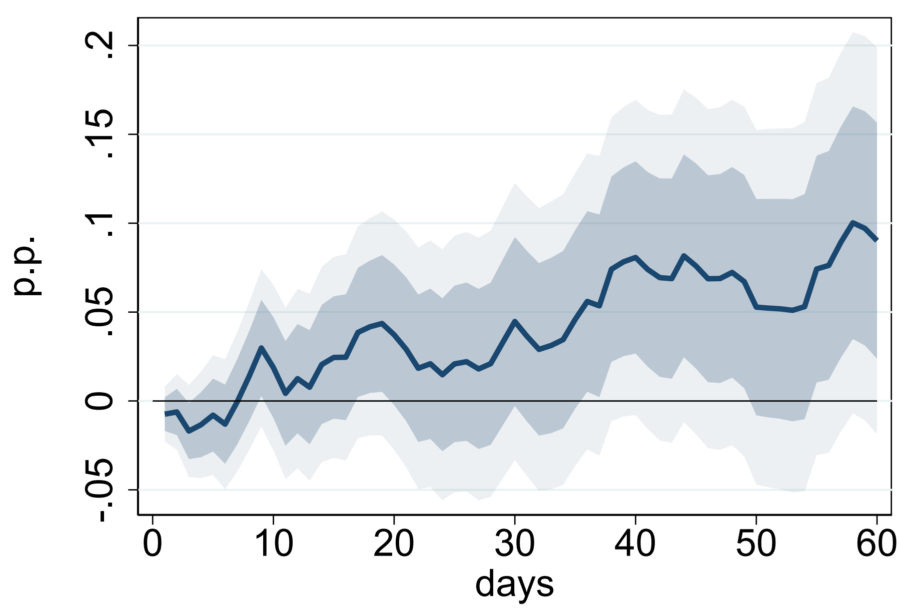
Figure C.1 Asset Prices: Alternative LP Control Lag Lengths

(a) Gold Price **(b) US 10-Year Treasury Yield**



Note. Daily local projections of the cumulative response of gold prices and the US 10-Year Treasury Yield to a one-standard-deviation exogenous GPR shock under alternative lag lengths for the local-projection controls. Shaded areas report 68% and 90% confidence bands.

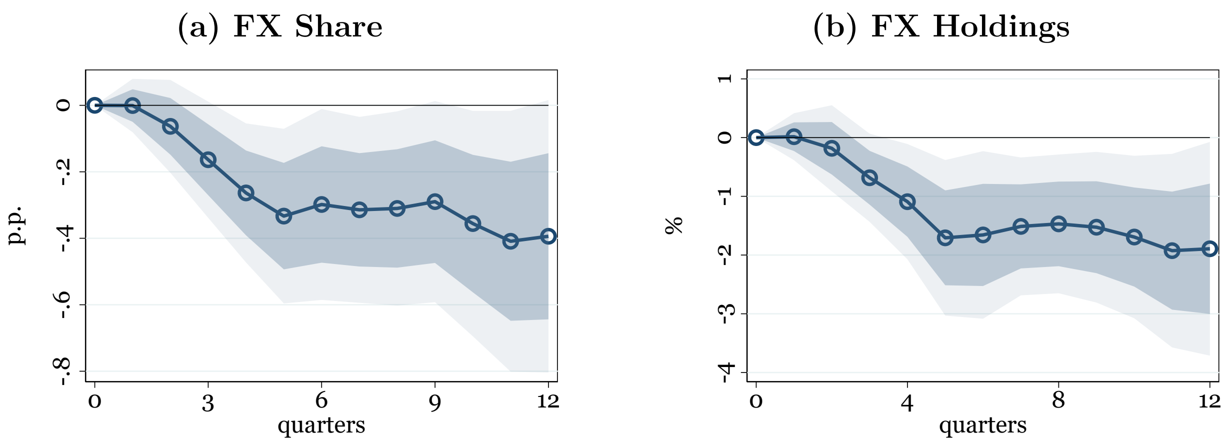
Figure C.2 Asset Prices: Relative Safe-Asset Response



Note. Daily local projections of the cumulative response of the gold-minus-US-10-year-yield spread to a one-standard-deviation exogenous GPR shock. Shaded areas report 68% and 90% confidence bands.

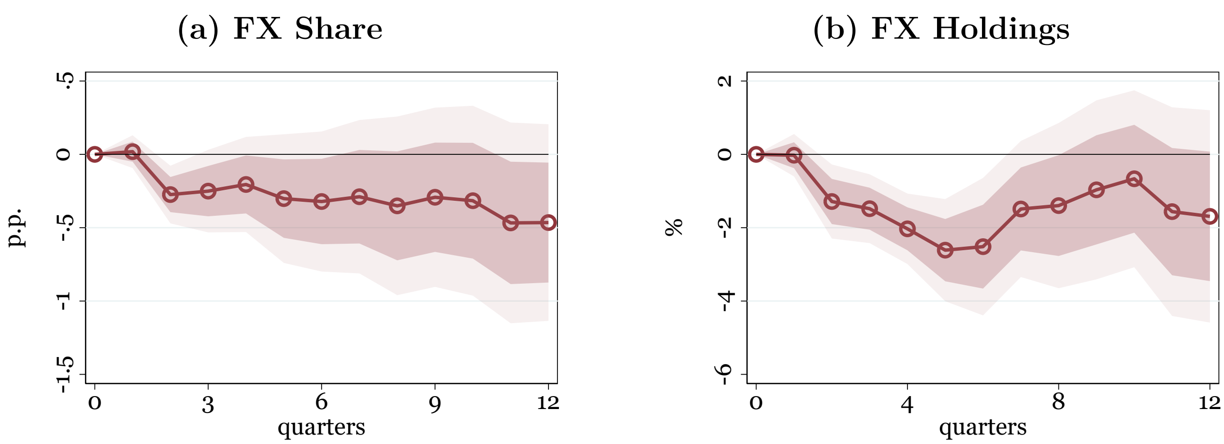
C.1 Foreign-Exchange Reserve Responses

Figure C.3 FX Responses to Geopolitical Risk



Note. Quarterly local projections of foreign-exchange reserve responses to a one-standard-deviation geopolitical-risk shock. Panel (a) reports responses of foreign-exchange shares, measured in percentage points; panel (b) reports responses of foreign-exchange holdings in percent. Shaded areas report 68% and 90% confidence bands.

Figure C.4 FX Responses by US Alignment

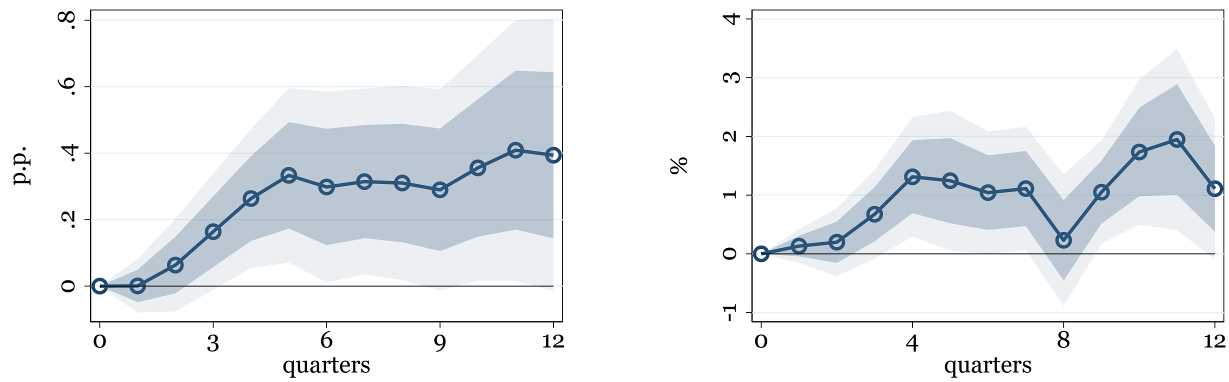


Note. Quarterly local projections of the differential foreign-exchange reserve response to a one-standard-deviation geopolitical-risk shock for countries with below-median alignment with the United States. Panel (a) reports responses of foreign-exchange shares, measured in percentage points; panel (b) reports responses of foreign-exchange holdings in percent. Shaded areas report 68% and 90% confidence bands.

C.2 Robustness of the Baseline Gold Results

Figure C.5 Average Effect on Reserves: Without Lagged Dependent Variables

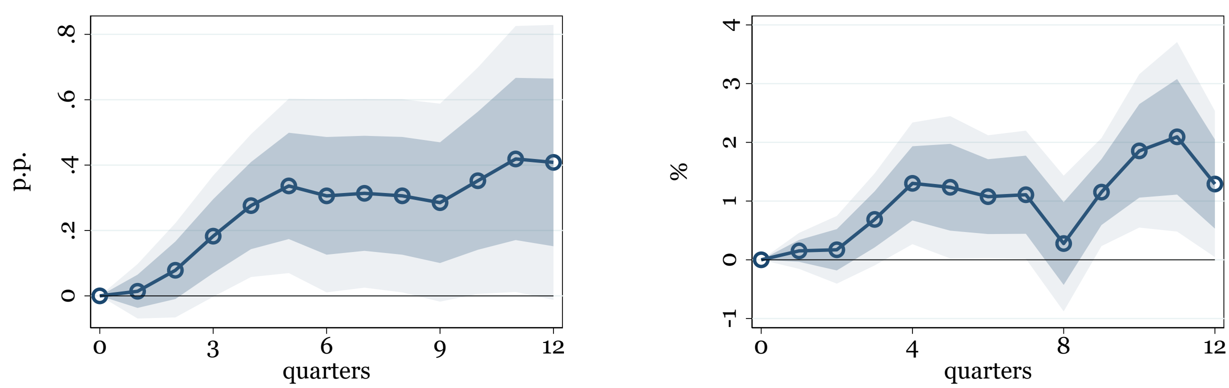
(a) Gold Share **(b) Gold Holdings**



Note. Quarterly local projections of gold reserve responses to a one-standard-deviation geopolitical-risk shock estimated without lagged dependent variables. Panel (a) reports responses of gold shares, measured in percentage points; panel (b) reports responses of gold holdings in percent. Shaded areas report 68% and 90% confidence bands.

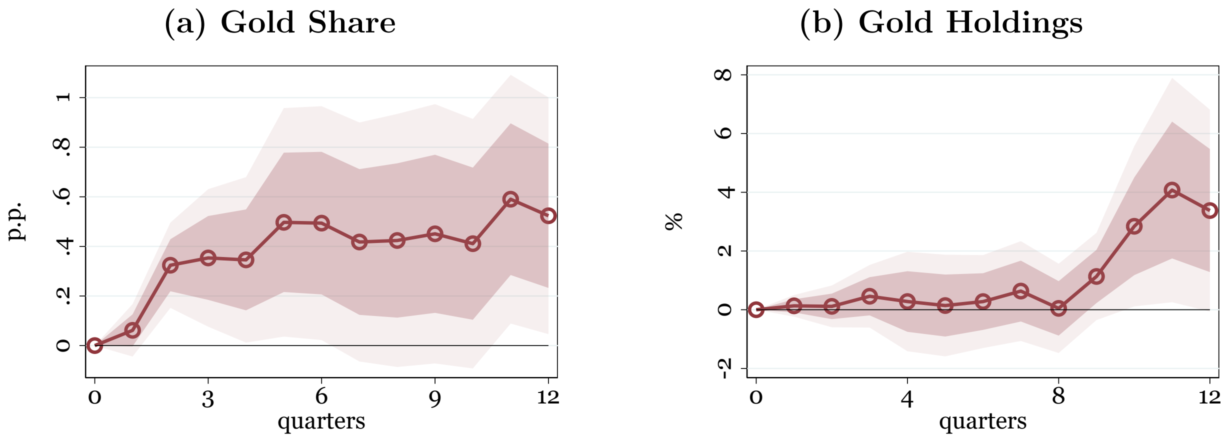
Figure C.6 Average Effect on Reserves: Specification in Levels

(a) Gold Share **(b) Gold Holdings**



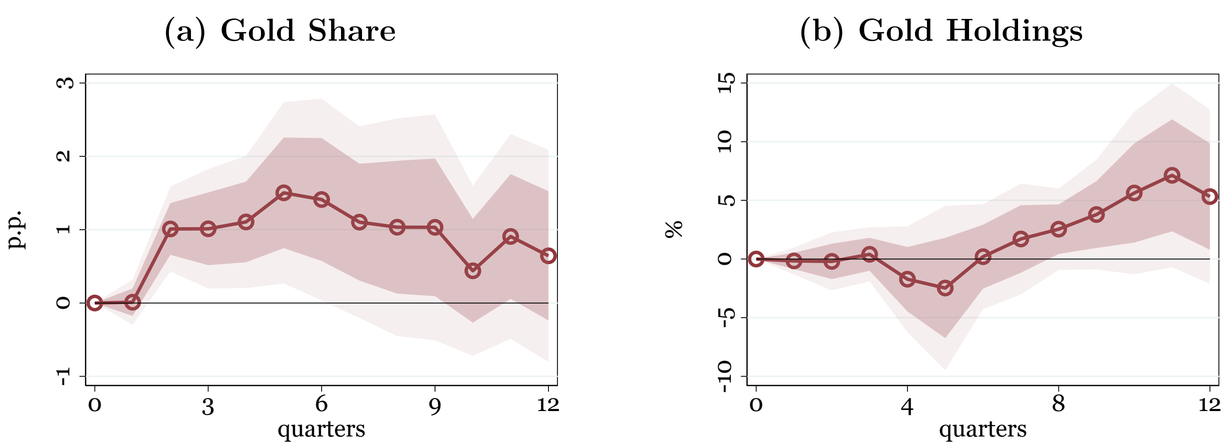
Note. Quarterly local projections of gold reserve responses to a one-standard-deviation geopolitical-risk shock under a specification in levels. Panel (a) reports responses of gold shares, measured in percentage points; panel (b) reports responses of gold holdings in percent. This specification serves as a robustness to the baseline model with lagged dependent variables. Shaded areas report 68% and 90% confidence bands.

Figure C.7 Heterogeneous Gold Response: Global Median Robustness



Note. Quarterly local projections of the differential gold reserve response to a one-standard-deviation geopolitical-risk shock for countries classified as below the global median of alignment with the United States. Panel (a) reports responses of gold shares, measured in percentage points; panel (b) reports responses of gold holdings in percent. Shaded areas report 68% and 90% confidence bands.

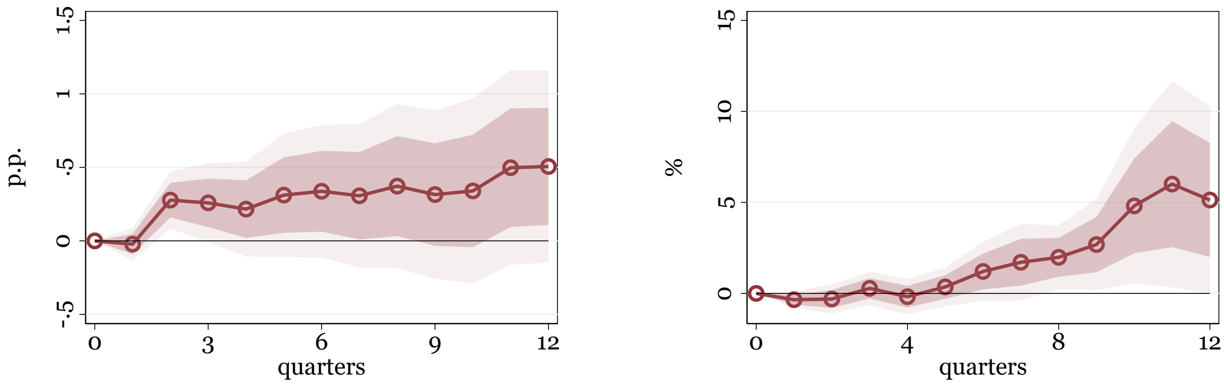
Figure C.8 Heterogeneous Gold Response: Continuous Interaction



Note. Quarterly local projections of the differential gold reserve response to a one-standard-deviation geopolitical-risk shock under a continuous interaction with alignment with the United States. Panel (a) reports responses of gold shares, measured in percentage points; panel (b) reports responses of gold holdings in percent. Shaded areas report 68% and 90% confidence bands.

Figure C.9 Heterogeneous Gold Response: Without Lagged Dependent Variables

(a) Gold Share (b) Gold Holdings



Note. Quarterly local projections of the differential gold reserve response to a one-standard-deviation geopolitical-risk shock for countries with below-median alignment with the United States, estimated without lagged dependent variables. Panel (a) reports responses of gold shares, measured in percentage points; panel (b) reports responses of gold holdings in percent. Shaded areas report 68% and 90% confidence bands.