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Abstract

We study how stablecoins impact global capital flows by constructing a novel wallet-level dataset linking geotagged Ethereum Name Service registrations to stablecoin transactions around banking restrictions, currency crises, sanctions, and monetary disruptions. We find that crisis-country wallets experience significant increases in USD stablecoin inflows and receipt activity during crisis weeks. Motivated by this evidence, we develop a small-open-economy New Keynesian model in which household adoption of programmable stablecoins weakens the government's enforcement technology for capital controls by making capital mobility endogenous. The empirical evidence validates the model's central assumption that flight pressure increases stablecoin adoption. Stablecoins therefore tighten the Mundell–Fleming trilemma by reducing the government's ability to sustain independent monetary policy under a fixed exchange-rate regime.

JEL classification: F32, F33, F38, E58, G28
Key words: Mundell–Fleming trilemma, capital controls, blockchain, stablecoins, financial infrastructure

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1 Introduction

The Mundell–Fleming trilemma is one of the central results in international macroeconomics. It states that a country cannot simultaneously maintain a fixed exchange rate, free capital mobility, and independent monetary policy. The classical framework has shaped the analysis of exchange-rate regimes, capital controls, and international monetary policy for decades. At its core lies the assumption that the degree of capital mobility is largely determined by policy or by the structure of international financial markets. Governments that wish to preserve monetary autonomy under a fixed exchange-rate regime can, in principle, do so by imposing and enforcing capital controls.

The emergence of blockchain-based payment infrastructure raises a natural question: does this assumption remain valid? Stablecoins provide households and firms with a programmable cross-border payment rail that operates largely outside the traditional banking system. During recent episodes of banking restrictions, currency crises, sanctions, and monetary instability, stablecoins have increasingly served as a mechanism for moving dollar-denominated value across borders. If households can circumvent the financial infrastructure through which capital controls are enforced, then capital mobility itself becomes an endogenous outcome of private technology adoption rather than an exogenous policy parameter. This paper argues that this change has a fundamental impact on the nature of the Mundell–Fleming trilemma.

The paper makes two main contributions. First, we construct a new dataset to study how blockchain-based capital flows respond to episodes of monetary and banking stress. We combine the historical archive of Ethereum Name Service (ENS) registrations with complete ERC-20 transaction histories for the nineteen largest USD-denominated stablecoins. Using Unicode flags, language scripts, and country-specific textual signals embedded in ENS names, we geotag blockchain wallets and construct a novel wallet–event–week panel centered around major episodes of banking restrictions, sanctions, currency crises, and monetary disruption during the 2021-2025 period. The resulting dataset links blockchain activity to macroeconomic events at a level of geographic and temporal granularity that has not previously been available. More broadly, it provides new empirical infrastructure for studying how decentralized payment systems interact with macroeconomic events and government policy. We view this dataset as an independent contribution of the paper that should be useful well beyond the application studied here.

Our second contribution is theoretical. We develop a small-open-economy New Keynesian model in which stablecoin adoption makes capital mobility endogenous. Households choose whether to adopt programmable stablecoins as a cross-border payment technology. Greater adoption weakens the government's enforcement technology for capital controls because a larger share of international transactions migrates onto payment rails outside the domestic banking system. As a consequence, the effective degree of capital mobility is determined jointly by government enforcement and household technology adoption.

This seemingly modest modification has deep consequences for the interpretation of the Mundell–Fleming trilemma. In the classical framework, capital mobility is taken as given. In our framework, it is itself an equilibrium outcome. Stablecoins therefore do not merely increase capital mobility; they change who determines it. Monetary sovereignty depends not only on government policy, but also on households' willingness to migrate toward programmable cross-border payment infrastructure. The impossible trinity consequently becomes tighter precisely during periods of financial stress, when incentives to adopt stablecoins are strongest.

To make this mechanism transparent, the model nests a household adoption problem within an otherwise standard small-open-economy New Keynesian framework. Households choose whether to use the domestic banking system or blockchain-based payment rails for international value transfer. Aggregate adoption determines the effectiveness of capital controls, which in turn determines the feasible set of monetary policy and exchange-rate outcomes. The model therefore preserves the familiar Mundell–Fleming logic while replacing exogenous capital mobility with endogenous household technology adoption. We show that the resulting equilibrium admits a simple reduced-form representation in which the government's effective enforcement wedge declines with aggregate stablecoin adoption.

The model delivers several interesting implications. Government enforcement responds nonmonotonically to adoption: when the user base is small, governments optimally strengthen enforcement, whereas beyond a threshold the enforcement technology becomes sufficiently diluted that governments optimally accommodate additional adoption. More generally, the model shows how stablecoin adoption tightens the Mundell–Fleming trilemma. As households migrate toward blockchain-based payment rails, the effective degree of capital mobility rises, forcing the government to absorb a larger fraction of external pressure through either the exchange rate or the domestic policy rate. Stablecoins therefore affect monetary sovereignty not simply by facilitating international payments, but by changing the equilibrium mapping between exchange-rate policy, capital mobility, and monetary independence.

Finally, we use our dataset to provide novel event-study evidence that validates the central behavioral assumption of the theoretical model. The model posits that greater flight pressure induces households to adopt stablecoins. The empirical evidence is consistent with exactly this mechanism: crisis-country wallets experience a sharp increase in USD stablecoin receipt activity precisely during crisis weeks, with little evidence of pre-trends and with sending activity following only subsequently. We therefore interpret the empirical evidence as validating the model's adoption mechanism rather than as an independent causal result about stablecoins. The empirical contribution of the paper is thus to discipline the theoretical model with novel blockchain evidence.

Our paper contributes to three strands of literature. First, it contributes to the literature on the Mundell–Fleming trilemma by making capital mobility an endogenous equilibrium object. Second, it contributes to the literature on international monetary sovereignty and the global financial cycle by identifying blockchain payment infrastructure as a new source of international capital mobility. Third, it contributes to the emerging literature on stablecoins by showing how programmable digital money affects macroeconomic policy constraints rather than merely payment efficiency.

1.1 Related Literature

This paper relates to the classic Mundell–Fleming trilemma literature and to recent work on international financial cycles, capital controls, and digital money. Mundell (1963) and Fleming (1962) established the standard impossibility result that a fixed exchange rate, free capital mobility, and monetary autonomy cannot all be simultaneously maintained. Obstfeld et al. (2005) revisited that framework empirically, while Rey (2015) emphasized how global financial conditions can constrain domestic policy even outside hard exchange-rate pegs. The open-economy New Keynesian blocks used here build on Galí and Monacelli (2005) and Galí (2015), with the welfare and stabilization logic following the standard NK tradition in Woodford and Walsh (2005).

Our contribution is also related to the emerging literature on the international macroeconomic consequences of stablecoins. Reuter (2025) develops methods to measure international stablecoin flows. Aramonte et al. (2022) emphasize that dollar-denominated stablecoins can provide households in emerging markets with an alternative vehicle for currency substitution, particularly in environments with volatile exchange rates and capital controls. More recently, Aldasoro et al. (2026b) document that stablecoin flows interact directly with conventional foreign-exchange markets: increases in stablecoin demand generate exchange-rate depreciation and affect dollar funding conditions. Aldasoro et al. (2026a) study the broader implications of stablecoins for the international monetary system and emphasize the risk of digital dollarization and reduced monetary sovereignty in emerging markets. Hofmann et al. (2026) provide complementary evidence that stablecoin dollarization responds to macro-financial stress and, unlike conventional deposit dollarization, appears relatively insensitive to capital-flow restrictions. Our paper complements this literature by focusing on the endogenous interaction between household stablecoin adoption and government enforcement: stablecoins provide households with an alternative financial rail that weakens the effectiveness of capital controls and thereby tightens the Mundell–Fleming trilemma.

Table 1: **Crisis events used in the empirical panel.**

Country	Crisis Week 0	Crisis description
Myanmar	Feb 1, 2021	Military coup / bank freeze
Turkey	Mar 20, 2021	Central bank governor dismissed
Russia	Feb 24, 2022	Ukraine invasion / international sanctions
Egypt	Mar 21, 2022	Egyptian pound devaluation
United Kingdom	Sep 23, 2022	Mini-budget / gilt crisis
Nigeria	Jun 14, 2023	Naira float / devaluation
Argentina	Dec 12, 2023	Peso devaluation after Milei inauguration
Iran (wave 1)	Feb 4, 2025	Rial crash
Iran (wave 2)	Dec 28, 2025	Rial crash (second wave)

Notes: "Crisis Week 0" is the event-start date entered in the empirical panel; relative week is measured as the calendar week (Monday-anchored) containing that date. Events are sorted chronologically.

The remainder of the paper proceeds as follows. Section 2 describes the construction of the geotagged blockchain dataset. Section 3 develops the theoretical framework. Section 4 characterizes the equilibrium and derives the model's main predictions. Section 5 presents the empirical validation of the model's adoption mechanism. Section 6 concludes.

2 A New Geotagged Dataset

In this section, we construct a novel dataset that we use in Section 5 to understand how stablecoin demand responds to banking and monetary crises. In particular, we link two large-scale blockchain datasets to build an international panel indexed by wallet, event, and week: historical Ethereum Name Service (ENS) registrations, which we use to identify "treated" wallets with latent ties to specific crisis countries, and granular ERC-20 transaction records for major USD stablecoins. The panel is built around the nine events listed in Table 1, spanning eight countries—Myanmar, Turkey, Russia, Egypt, the United Kingdom, Nigeria, Argentina, and Iran—between 2021 and 2025. Iran contributes two distinct crisis waves. The events comprise banking restrictions, capital-flight episodes, currency-control episodes, and severe monetary shocks that increase the incentive to move capital offshore while banking frictions or capital controls become binding.

ENS-Based Treatment Definition Our treatment indicator exploits the fact that many households register ENS names that embed country-specific signals (national flag emojis or language/script patterns). We begin with the full historical archive of ENS label registrations (approximately 3 million name–owner pairs). We extract two distinct signals for each ENS

Table 2: **ENS geotagging signals for the crisis countries.** Column "Flag" shows the Unicode regional-indicator emoji rendered from the ISO-2 code. "Script / Language" lists the Unicode script block used by the deterministic classifier. "Example ENS domains" gives illustrative registrations from each country's wallet cohort.

Country	Flag	ISO-2	Script / Language	Example ENS domains
Iran	🇮🇷	IR	Persian (Perso-Arabic)	پندار.eth, یادگاری.eth, پیمان.eth
Myanmar	🇲🇲	MM	Myanmar (U+1000–109F)	မြန်မာ.eth, ဘုရားသခ.eth
Turkey	🇹🇷	TR	Latin (Turkish: İ ı ş ç ğ ö ü)	beşiktaş.eth, çeşme.eth, kırşehir.eth
Russia	🇷🇺	RU	Cyrillic (U+0400–04FF)	альфабанк.eth, монета.eth

name: flag emojis (pairs of regional-indicator Unicode characters mapped to ISO-2 country codes) and script/language hints (deterministic Unicode-script classifier supplemented by small country-specific character sets and token-set matching). Table 2 summarizes the two signal types for a selected set of crisis countries that have somewhat unique alphabets. For countries with widespread languages such as Argentina, Egypt, and the UK, we only use flag emojis to detect wallets.

We then merge these decoded ENS records with an event metadata file containing each crisis country's name, ISO-3 code, crisis start date, and currency code. For each event we define a wallet as treated if its most recent ENS name (prior to a pre-specified cutoff) satisfies at least one of the following country-specific rules: flag match, language/script hint, or country hint.

Stablecoin Transaction Data Stablecoin flows are drawn from the complete set of ERC-20 transfer events for the 19 largest USD-pegged stablecoins.[1] The raw data come from parsed Ethereum transaction logs in Google BigQuery. We retain only transfers labeled "receive" or "send" in the direction field, filter to the 19 stablecoin contract addresses, and convert raw token units to USD using each token's fixed decimal precision. We aggregate the filtered transfers to the wallet–week–direction level. For each wallet we compute USD received, USD sent, transaction counts, net and total flows, binary activity indicators, and log transformations for robustness to extreme values.

Stacked Event-Study Panel Construction For each crisis, we define a separate 53-week event window centered on the crisis start date (±26 weeks). A wallet–country pair enters a given event stack only if the underlying wallet receives at least one stablecoin at some point during that event-specific window. We then cross every retained treated or control

[1]These are USDC, USDT, DAI, BUSD, TUSD, FRAX, LUSD, GUSD, sUSD, USDP, MIM, UST, USDD, crvUSD, GHO, PYUSD, DOLA, alUSD, USDe.

Table 3: Summary statistics: baseline, wallet-country tags

	Mean	SD	Median	P90	P99	Max
USD received (000s)	4.278	117.036	0.000	0.000	55.646	49,582.323
USD sent (000s)	4.706	118.670	0.000	0.016	75.441	49,903.149
USD net (000s)	-0.428	47.674	0.000	0.000	5.824	16,025.000
USD total volume (000s)	8.984	230.840	0.000	0.261	147.293	99,164.645
Number of receives	0.239	1.890	0.000	0.000	5.000	1,860.000
Number of sends	0.303	2.907	0.000	1.000	6.000	453.000
Any receive	0.098	0.297	0.000	0.000	1.000	1.000
Any send	0.103	0.304	0.000	1.000	1.000	1.000
Any activity	0.123	0.328	0.000	1.000	1.000	1.000
log(1+USD received)	0.739	2.406	0.000	0.000	10.927	17.719
log(1+USD sent)	0.803	2.508	0.000	2.814	11.231	17.726

Observations: 4,475,214. Panel is wallet $\times$ event $\times$ week.
USD variables are reported in thousands.

pair with all 53 calendar weeks in the window, including weeks with zero activity, to produce the wallet–event–week panel. Thus sample entry is event-specific and conditioned on at least one receipt during the corresponding 53-week window.

Treatment status is event-specific, and the stacking unit is a wallet–country pair because one address may carry more than one country assignment (e.g., if two flags are posted in its ENS address). In a given crisis stack, the treated group consists of retained wallet–country pairs whose assigned country matches the crisis country. The control pool consists of retained pairs tagged to other countries whose underlying wallets also satisfy the receipt-based entry rule during the focal event window. Thus a wallet–country pair is treated in the event stack for its assigned country and serves as a control in every other event stack for which it satisfies the same entry rule. Because inclusion requires at least one receipt somewhere in the 53-week window, the weekly any-receipt outcome measures the timing of receipts among eventual receivers in that window; it is not an unconditional estimate of adoption in the full ENS-tagged cohort.

Table 3 reports summary statistics for the main panel. The median wallet–event–week observation has zero stablecoin activity, reflecting the sparsity of the panel: 9.8% of observations record any stablecoin receipt in a given week. Across all observations, weekly USD receipts are highly right-skewed: mean USD received is $4,278, whereas the median is zero. This skewness motivates the $\log(1 + x)$ transformation used in the regressions.

3 Model

We embed the possibility of stablecoin adoption by households into a two-period small-open-economy New Keynesian model to study the joint determination of stablecoin adoption, the exchange rate, effective currency-control constraints, and monetary policy in equilibrium.

3.1 Environment

We consider a two-period small open economy, $t = \{0, 1\}$, with a final date 2 period used only for terminal expectations.[2] The open economy consists of a domestic and a foreign country. The domestic country is populated by a unit measure of households and a government. Households choose whether to adopt programmable stablecoins as a cross-border payment technology, while the government chooses the monetary policy rate, the exchange rate, and the degree of capital-control enforcement. International financial arbitrage is governed by the uncovered interest parity (UIP) condition, but capital controls allow the government to sustain a wedge between domestic and foreign returns whose magnitude depends on the effectiveness of enforcement. The exchange rate is jointly determined with the domestic interest rate through the government's stabilization problem, subject to the UIP constraint and the feasible capital-control wedge.

Throughout the paper, we denote variables that correspond to the log-linearized realized quantities and rates in domestic and foreign countries without a superscript and with superscript w, respectively. Thus, x_t, r_t, i_t, π_t, e_t denote output gap, real rate, nominal rate, inflation and nominal exchange rate, expressed as units of domestic currency per unit of foreign currency, respectively. Furthermore, let q_t denote the increase in e_t (relative to parity), which is a depreciation. We denote the domestic target quantities by superscript ^{T}: i_t^T, π_t^T and e_t^T, and we let $\pi_t^e = \pi_t - \pi_t^T$ denote the domestic inflation gap. Finally r_t^w, i_t^w, and π_t^w denote the corresponding foreign variable.

There are only two active decision periods in the economy, $t = \{0, 1\}$. Date-2 objects appear only as terminal boundary values in the one-step-ahead NK and exchange-rate equations; they do not represent a third decision period. Specifically, we impose

$$\mathbb{E}_1 x_2 = 0, \qquad \mathbb{E}_1 \pi_2^e = 0, \qquad \mathbb{E}_1 e_2 = \bar{e}.$$

These restrictions eliminate forward-looking terms at $t = 1$ and allow us to write the macro block in static reduced form.

[2] Our model is effectively a static model. The third period is only to close the New Keynesian block of the model, and the first two periods can be thought of as two stages in a single period.

The domestic government operates under an explicit anchor. The central bank announces an inflation target π^* to which private expectations are anchored. We assume that rates are far from the zero lower bound and normalize both the domestic and world inflation targets to zero, $\pi^* = 0$ and $\pi^{w,*} = 0$; with anchored expectations this implies $\pi^e = \pi^{e,w} = 0$ and, by the Fisher relation, $i_1^w = r_1^w$. As such, the policy tools available to the government are the policy rate and exchange rate.

We start with two definitions and then explain the household and government problems.

Definition 1 (Programmability ρ) *A programmable coin refers to a digital currency such as a stablecoin, built on a blockchain. Stablecoin programmability is the integration of conditional logic and automated execution into digital money via smart contracts that allows value to move based on specific, verifiable events. In our context, programmability refers to the pass-through of the real-rate gap into stablecoin adoption, indexed by ρ.*

Definition 2 (Fundamental Flight Pressure θ) *The fundamental flight pressure $\theta \in \mathbb{R}$ is defined as the gap between the world real rate and the domestic natural rate:*

$$\theta \equiv r_1^w - r_1^n > 0.$$

Domestic Households There is a continuum of households $j \in [0, 1]$. Households are active in period $t = 0$ and they decide whether to adopt the stablecoin–*the stablecoin adoption decision*. We assume the benefit of adoption is common among all households and is given by

$$B_t \equiv \alpha_0 + \rho\theta,$$

with $\alpha_0 \in (0, 1)$. At $t = 0$, households observe r_1^w, r_1^n and ρ, and each draws an idiosyncratic adoption cost $\nu_j \sim U[0, 1]$ at $t = 0$. A household adopts the stablecoin if and only if its net benefit from adoption exceeds its cost. Let α denote the aggregate stablecoin adoption in the domestic country.

The above equation encompasses the mechanism that makes capital mobility endogenous to the policy choices made by the government. It simply says that two factors increase the benefit of stablecoin adoption for households. First, if the stablecoin is more programmable, i.e. more functionally flexible and better able to automate and integrate with smart contracts, its benefit of adoption rises. Second, a larger gap between the world real rate and the domestic rate increases the fundamental flight pressure and makes adoption of stablecoins to facilitate capital flow more beneficial to households. In Section 5 we use our novel dataset to provide empirical evidence for this assumption.

Domestic Government In period $t = 1$, the government observes aggregate household stablecoin adoption α and makes its choices. It chooses enforcement effort $f \geq 0$, nominal rate i_1 and exchange rate depreciation q_1 to solve a stabilization problem. We next explain these choices in detail.

Enforcement effort $f \geq 0$ has a convex cost $c(f) = \frac{1}{2}f^2$ and determines the *effective capital control*:

$$m = \phi(f, \alpha) \equiv \frac{f}{\alpha}. \tag{1}$$

The effective capital control bounds the size of the wedge that can be sustained in the uncovered-interest-parity (UIP) relation.

We augment the canonical small open economy New Keynesian model of Galí and Monacelli (2005) and Galí (2015) with the capital control above. First, evaluating the Investment-Saving (IS) and New Keynesian Phillips Curve (NKPC) at $t = 1$, with terminal conditions $\mathbb{E}_1 y_2^e = \mathbb{E}_1 \pi_2^e = 0$, and $\mathbb{E}_1[e_2] = \bar{e}$, gives:

$$\pi_1 = \kappa \, x_1, \tag{2}$$

$$x_1 = -\sigma^{-1}\big(i_1 - r_1^n\big), \tag{3}$$

where $\kappa > 0$ is the NKPC slope, $\sigma > 0$ is the inverse EIS, and r_1^n is the period-1 natural real rate. The policy target rate is the Fisher nominal neutral rate

$$i_1^T = r_1^n + \pi^*, \tag{4}$$

which implements the announced inflation target.

Next, recall that date-1 depreciation relative to parity is given by

$$q_1 = e_1 - \mathbb{E}_1[e_2] = e_1 - \bar{e} > 0$$

Because $\mathbb{E}_1 e_2 = \bar{e}$, this depreciation is expected to reverse, $\mathbb{E}_1(e_2 - e_1) = -q_1$.

If capital were perfectly mobile, UIP constraint would simply imply:

$$i_1 + q_1 = i_1^w. \tag{5}$$

More generally, capital controls bound the size of the wedge between the two sides of Equation (5), $i_1^w - m \leq i_1 + q_1 \leq i_1^w + m$.[3] With positive flight pressure and capital outflows, only

[3] This is illustrated in Figure 3.

the lower bound binds. As such, the UIP constraint with a capital mobility wedge can be written as

$$i_1 + q_1 \geq i_1^w - m. \tag{6}$$

The government chooses the enforcement effort f, nominal rate i_1 and exchange rate depreciation q_1, subject to the UIP constraint in Equation (6). Output gap x_1 and inflation π_1 are realized, and the government pays the stabilization loss $\ell(x_1, \pi_1) = \frac{1}{2}(\beta x_1^2 + \gamma \pi_1^2)$ where β and γ are parameters that depend on the production structure and the degree of price stickiness. Furthermore, let the government attach weight $\Psi > 0$ in its objective function to deviations from the exchange-rate peg $\bar{e}$.

Thus, the overall government problem is given by:

$$\begin{aligned} \min \quad & L(f, x_1, \pi_1, i_1, q_1) = \frac{1}{2}\left[\beta x_1^2 + \gamma \pi_1^2 + \Psi q_1^2 + f^2\right] \\ & \text{subject to Equations (2) - (3) - (6).} \end{aligned} \tag{7}$$

3.2 Timing

We end the section by summarizing the time-line of the model. We call periods $t = 0, 1$ the *adoption stage* and the *macro stage*, respectively.

Adoption Stage (Period 0) At $t = 0$, households observe r_1^w and r_1^n and decide whether to adopt programmable stablecoins or not to move wealth abroad when the domestic real rate is expected to fall below the world real rate. This leads to aggregate adoption rate α.

Macro Stage (Period 1) No further aggregate shock arrives at $t = 1$. The government observes α and chooses enforcement effort $f \geq 0$, nominal rate i_1 and exchange rate depreciation q_1 to solve its stabilization problem subject to UIP constraint with capital control $m(f, \alpha)$.

4 Results

We start by solving household and government problems.

4.1 Household Stablecoin Adoption Choice

Recall that in the adoption stage, a household adopts the stablecoin if and only if its net benefit from adoption exceeds its cost, which in turn determines the aggregate rate of domestic

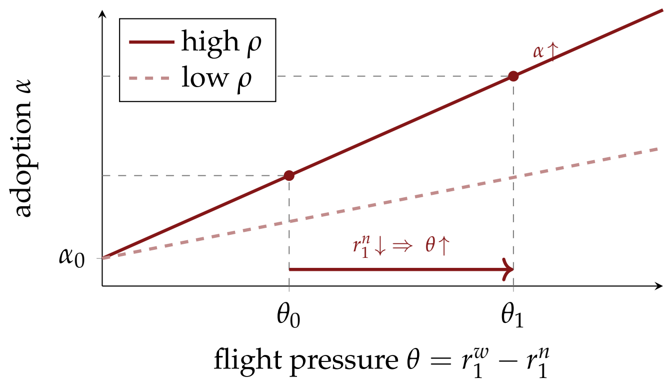

Figure 1: Stablecoin adoption increases in flight pressure and programmability.

stablecoin adoption:

$$\alpha = \Pr(\nu_j \leq \alpha_0 + \rho\theta)$$

The next lemma formally states this result.

Lemma 1 (Household Choice of Stablecoin Adoption) *The aggregate stablecoin adoption in the domestic country is give by*

$$\alpha = \alpha_0 + \rho\theta, \tag{8}$$

provided $\alpha_0 + \rho\theta \in [0, 1]$.

Figure 1 illustrates Equation (8). It shows that adoption rises with flight pressure, and that higher programmability steepens the response. It is the bridge between the crisis environment and the endogenous adoption margin.

This choice is made at the adoption stage, before the macro-stage policy and exchange-rate adjustment. The key point is that adoption rises with flight pressure, so a larger world-vs-domestic rate gap makes stablecoin use more attractive.

4.2 The Government Problem

With anchored expectations—$\pi^e = \pi^* = 0$, Equations (2)-(4) imply that setting $i_1 = i_1^T$ closes the output gap and delivers $\pi_1 = \pi^*$. Furthermore, Equations (2) and (3) imply that the policy rate chosen by the government, i_1, uniquely determines the x_1 and π_1. This reduces the set of choice variables $(f, x_1, \pi_1, i_1, q_1)$ in the government's objective function (7) to the triple (f, i_1, q_1).

Next, we note that the UIP constraint in Equation (6) holds with equality, and rewrite it in terms of the domestic policy wedge, $i_1 - i_1^T$.

$$(i_1^w - i_1^T) + (i_1^T - i_1) = q_1 + m$$

Next, let

$$\Delta \equiv i_1^w - i_1^T \tag{9}$$

Substitute Equations (1) and (9) into the above to get

$$(i_1 - i_1^T) + q_1 = \Delta - \frac{f}{\alpha}. \tag{10}$$

Equation (10) is a direct rewrite of the UIP constraint (6) in terms of the deviation of the domestic nominal rate from target nominal rate, domestic currency depreciation, and government enforcement effort.

Note that if there is perfect capital mobility, Equation (10) reduces to $(i_1 - i_1^T) + q_1 = \Delta$: when capital is free to move, all the difference between the world and target interest rate, $i_1^w - i^T$ has to be absorbed either by the domestic nominal rate deviation from the target, $i_1 - i^T$, or by a domestic currency depreciation q_1.

Capital control m alleviates some of this pressure by limiting capital mobility, so the domestic government would need to deviate less from its policy targets. We call $\Delta - m$ *"residual pressure."* In what follows, we derive the residual pressure in our environment when capital mobility is endogenized through stablecoin adoption, and discuss how it is absorbed by the domestic government interest rate and exchange rate policy.

The sequence of Equations (5) $\to$ (6) $\to$ (10) illustrates the main logic of the model. This logic starts from the most basic UIP condition in the special case that the government defends the peg, progresses to the classic Mundell–Fleming trilemma, and finally highlights our endogenous version of the Mundell—Fleming trilemma.

Start with the most basic UIP constraint (5). It simply says that with perfect capital mobility, interest rate differences between two countries must equal expected changes in their exchange rates. Put differently, either the policy rate should match the world rate, or if the domestic interest rate is lower than the world interest rate, the domestic currency is expected to depreciate now ($q_1 > 0$) and appreciate in the future.

Next, assume there is an effective capital control level m that bounds the capital mobility between the domestic country and abroad, which can be endogenous or exogenous. It intro-

Flight pressure

$\downarrow$

Household stablecoin adoption

$\downarrow$

FX demand outside banks

$\downarrow$

Effective capital mobility

$\downarrow$

Weaker enforcement

$\downarrow$

Smaller feasible policy set for (i_1, q_1)

Figure 2: Stablecoins tighten the trilemma by making capital mobility endogenous.

duces wedge in the UIP constraint, as illustrated in Equation (6).

Equation (10) encompasses the two main components of the novel mechanism of the paper: 1) endogenizing the strength of the capital control as a function of the pair government enforcement and stablecoin adoption by households; and 2) adjustment of the wedge in the UIP constraint with the endogenous capital control. Furthermore, it rewrites the endogenous UIP constraint, which is an arbitrage condition, into the government choice of policy gap, $i_1 - i_1^T$. Figure 2 demonstrates this mechanism visually.

Substituting these expressions into the government problem (7) simplifies it to:

$$\begin{aligned} &\min \quad L(f, i_1, q_1) = \frac{1}{2}\left[\Omega(i_1 - i_1^T)^2 + \Psi q_1^2 + f^2\right] \\ &\text{subject to Equation (10)} \\ &\text{where} \quad \Omega \equiv \frac{\beta}{\sigma^2} + \frac{\gamma\kappa^2}{\sigma^2}. \end{aligned} \tag{11}$$

Proposition 1 uses the simplified government objective function in (11) to state the first result of the paper.

Proposition 1 (Optimal Government Policy with Endogenous Capital Mobility due to Stablecoin Adoption) *Let* $K \equiv \frac{\Omega\Psi}{\Omega+\Psi} > 0$*. For any* $\alpha > 0$ *and* $\Delta > 0$*, the unique equilibrium is given*

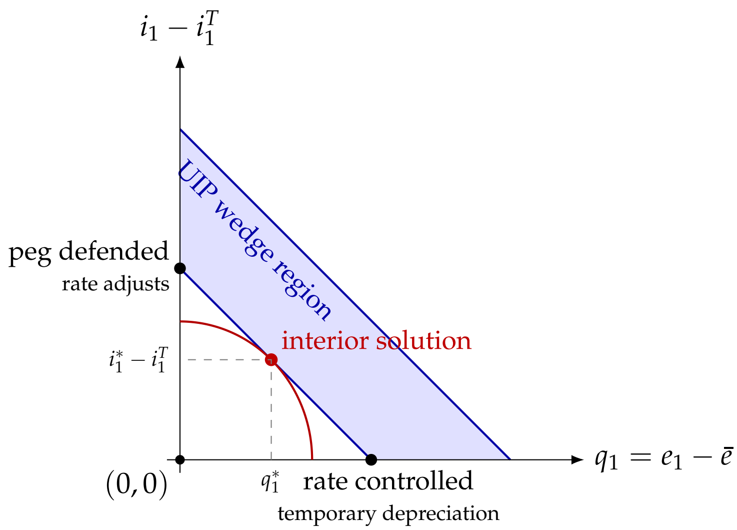

Figure 3: **The interest-rate–exchange-rate policy region.** Capital controls permit policy pairs inside the blue UIP band, $i_1^w - m \le i_1 + q_1 \le i_1^w + m$. When $i_1 < i_1^w$, the lower bound binds and implies Equation (10). The two black points are the polar adjustments: defend the peg and accept a higher interest rate, or retain interest-rate control and allow a temporary date-1 depreciation. The red point is the interior allocation in Proposition 1, where an iso-loss curve is tangent to the relevant boundary.

by

$$f^*(\alpha) = \frac{K\Delta\alpha}{\alpha^2 + K} \tag{12}$$

$$i_1^* - i_1^T = \frac{\Psi}{\Omega + \Psi} h^*(\alpha)$$

$$q_1^* = \frac{\Omega}{\Omega + \Psi} h^*(\alpha)$$

$$\textit{where} \quad h^*(\alpha) = \frac{\Delta\alpha^2}{\alpha^2 + K}. \tag{13}$$

Proposition 1 uses Lemma 1 to show that the capital control constraint binds at the optimum. Stronger enforcement reduces the total adjustment h^*, while Ω and Ψ determine how that adjustment is divided between interest rates and the exchange rate.

Figure 3 makes the policy tradeoff concrete: with imperfect enforcement, the government cannot hit both the target rate and the peg, so it splits adjustment between the interest rate and a temporary exchange-rate deviation. Stablecoin adoption shifts the feasible set inward by lowering the effective wedge $m = \frac{f}{\alpha}$.

Proposition 1 and Figure 3 emphasize that the realized rate exceeds the government's target; hence $i_1^* - i_1^T > 0$. Under a hard peg ($\Psi \to \infty$), $q_1^* \to 0$ and the entire residual pressure appears as an interest-rate gap. With full interest-rate control ($\Omega \to \infty$), $i_1 - i_1^T \to 0$ and residual pressure appears as a temporary date-1 depreciation.

When both weights are finite, both domestic rate and exchange rate adjust. The associated output gap is

$$|x_1^*| = \frac{1}{\sigma} \frac{\Psi}{\Omega + \Psi} \frac{\Delta \alpha^2}{\alpha^2 + K},$$

which is smaller than in the fixed-peg case because exchange-rate adjustment absorbs part of the pressure.

It is straightforward to verify that the *residual pressure* is given by $\Delta - m = h^*(\alpha) = \frac{\Delta \alpha^2}{\alpha^2 + K}$, for every level of stablecoin adoption α. This residual pressure is the equilibrium outcome that follows the optimal response of government enforcement to the level of stablecoin adoption.

Proposition 1 illustrates how the *residual pressure* is shared among the two policy tools. Recall that the simplified government objective (11) punishes the government with weights Ω and Ψ for deviating from the nominal target rate r_1^T and the peg $\bar{s}$. Proposition 1 shows that a larger welfare cost on deviation from nominal rate leads more of the residual pressure to be absorbed through an exchange-rate deviation, and vice versa.

The next proposition highlights how stablecoin adoption affects government enforcement effort, as well as the optimal nominal rate gap and domestic currency depreciation.

Proposition 2 (Stablecoin Adoption and Government Policy) *Let constant $K \equiv \frac{\Omega \Psi}{\Omega + \Psi}$. Te equilibrium level of enforcement is non-monotonic in stablecoin adoption rate and responds to adoption according to*

$$\frac{df^*}{d\alpha} = \frac{K \Delta (K - \alpha^2)}{(\alpha^2 + K)^2}.$$

Thus enforcement increases with adoption when $\alpha < \sqrt{K}$, is maximized at $\alpha = \sqrt{K}$, and decreases with adoption when $\alpha > \sqrt{K}$.

By contrast the interest-rate gap $i_1^* - i_1^T$, and the temporary date-1 currency depreciation q_1^* are both strictly increasing in α.

Proposition 2 illustrates that stablecoin adoption has two distinct effects on government problem (11). More adoption tightens the range of possible pairs of (monetary, exchange rate) policy, calling for more government enforcement effort. At the same time it reduces the effectiveness of a given enforcement effort in strengthening the capital controls while the cost of enforcement is convex, attenuating the government's incentive to supply enforcement. As

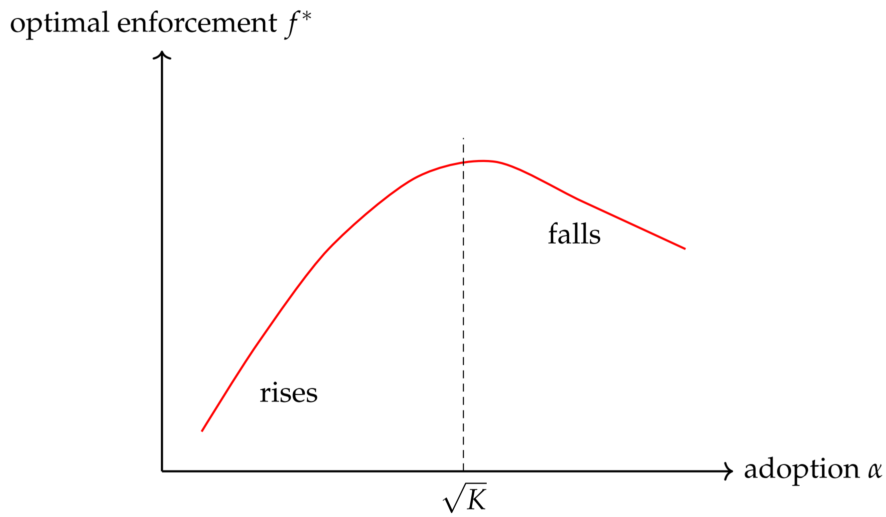

Figure 4: Equilibrium enforcement is hump-shaped in stablecoin adoption.

such, the impact of stablecoin adoption on government enforcement of capital controls is non-monotone.

Figure 4 shows the non-monotone response of equilibrium level of government enforcement to adoption. At low levels of stablecoin adoption, government enforcement rises with adoption because stablecoins are still a thin rail that the government can partly discipline with aggressive enforcement. Put differently, the government *"resists"* stablecoin adoption when adoption is low.

There is an interior adoption threshold: once stablecoins are adopted more widely than this threshold, government enforcement effort falls as adoption rises further. At this level of adoption, the enforcement technology is heavily diluted by widespread on-chain substitution, making a stronger enforcement effort suboptimal because of the convexity of enforcement costs. It follows that the government *"accommodates"* stablecoin adoption beyond a certain threshold.

However, despite the non-monotonic impact on the government effort to enforce capital controls, more stablecoin adoption makes it uniformly harder for the government to satisfy the Mundell–Fleming trilemma. As more households adopt stablecoins, the equilibrium monetary and exchange rate policy deviates further from their corresponding targets.

4.3 Connection with the Classical Mundell–Fleming Trilemma

The model nests the classical Mundell–Fleming trilemma as a special case. The only structural departure is that capital mobility is no longer perfect, neither taken as exogenous. Instead, it is jointly determined by household adoption of blockchain-based payment rails and government enforcement of capital controls.

To see the connection, consider a benchmark case in which stablecoin adoption is exogenous. Suppose that aggregate adoption is fixed at some constant level $\bar{\alpha}$, independent of flight pressure, and that households do not respond to changes in international financial conditions. The UIP condition is given by Equation (6), where the government's effective enforcement technology is determined by $m = \frac{f}{\bar{\alpha}}$, which is simply a monotone transformation of enforcement effort. If, in addition, government enforcement is taken as exogenous, the effective capital-control wedge m becomes fixed. The policy problem therefore reduces to the standard Mundell–Fleming trilemma in which the government takes the degree of capital mobility as given.

Now, consider the special case that we are in a fixed exchange-rate regime. The uncovered interest parity implies that the sustainable wedge satisfies $i_1 \geq i_1^w - m$. When $m = 0$, capital is perfectly mobile and the domestic interest rate is pinned down by the world interest rate, reproducing the textbook trilemma result that a country cannot simultaneously maintain a fixed exchange rate and independent monetary policy. More generally, larger values of m relax this constraint by allowing larger departures of the domestic interest rate from its world counterpart.

Our framework preserves exactly this logic. The difference is that the feasible wedge is no longer fixed. Instead, it is determined by the degree of stablecoin adoption by households:

$$m = \frac{f}{\alpha}, \qquad \text{where } \alpha = \alpha_0 + \rho\theta.$$

As flight pressure increases, households optimally adopt stablecoins, reducing the effectiveness of any given enforcement effort. Consequently, the feasible policy set shrinks endogenously during periods of financial stress. Stablecoins therefore do not change the structure of the Mundell–Fleming trilemma; rather, they endogenize one of its three vertices. Capital mobility is no longer an exogenous policy parameter but an equilibrium outcome of household adoption decisions.

5 Empirical Evidence for Increased Stablecoin Demand Pressure

In this section, we document a stylized fact that motivates the key mechanism of the model, the household stablecoin adoption decision: when a country is hit with a banking or monetary crisis, stablecoin receipt activity among crisis-country wallets increases relative to control wallets. As such, this section empirically validates the model's adoption mechanism. Specif-

Table 4: Stablecoin flows in crisis week: baseline, wallet-country tags

	(1) Log Received	(2) Any Received	(3) Log Sent	(4) Any Sent
Treated country	0.052***	0.005***	0.046***	0.004***
	(0.010)	(0.001)	(0.010)	(0.001)
Crisis week	0.071	0.003	0.069	0.004
	(0.090)	(0.008)	(0.074)	(0.008)
Treated × crisis week	0.127***	0.018**	0.124	0.018
	(0.047)	(0.008)	(0.084)	(0.015)
Wallet FE	✓	✓	✓	✓
Observations	4,475,214	4,475,214	4,475,214	4,475,214
R^2	0.149	0.117	0.179	0.126

Standard errors, clustered by calendar week, in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

ically, it asks whether crisis-country wallets increase stablecoin receipt activity when flight pressure rises. The wallet-level event-study evidence is designed to discipline the assumption $\alpha = \alpha_0 + \rho\theta$ by showing that stablecoin inflows spike in crisis weeks and are otherwise flat in the narrow event window.

We use the following empirical strategy. For each event we define a 53-week window (±26 weeks). A wallet enters the panel if it receives any stablecoins during this window. Accordingly, the weekly any-receipt outcome captures the timing of receipts among wallets that receive at least once during the event window; it does not estimate unconditional adoption in the full ENS-tagged wallet cohort. Our specification estimates the effect of crisis events on four outcomes: $\log(1 + \text{USD received})$, an indicator for any receipt, $\log(1 + \text{USD sent})$, and an indicator for any send. For a given outcome $y_{i,e,t}$, the baseline regression is:

$$\begin{aligned} y_{i,e,t} &= \beta_1 Treat_{i,e} + \beta_2 \mathbf{1}[\tau_{e,t} = 0] \\ &\quad + \beta_3 \big(Treat_{i,e} \times \mathbf{1}[\tau_{e,t} = 0]\big) + \alpha_i + \varepsilon_{i,e,t} \end{aligned} \tag{14}$$

Here $Treat_{i,e}$ indicates that wallet i is tagged to the country associated with event e, and $\mathbf{1}[\tau_{e,t} = 0]$ indicates the event's crisis week. The coefficient β_1 captures the treated-country difference outside the crisis week, β_2 captures the common crisis-week change, and the coefficient of interest, β_3, captures the additional crisis-week change among treated-country wallets. All specifications absorb wallet fixed effects α_i, and standard errors are clustered by calendar week. Specifications do not include event or calendar-week fixed effects.

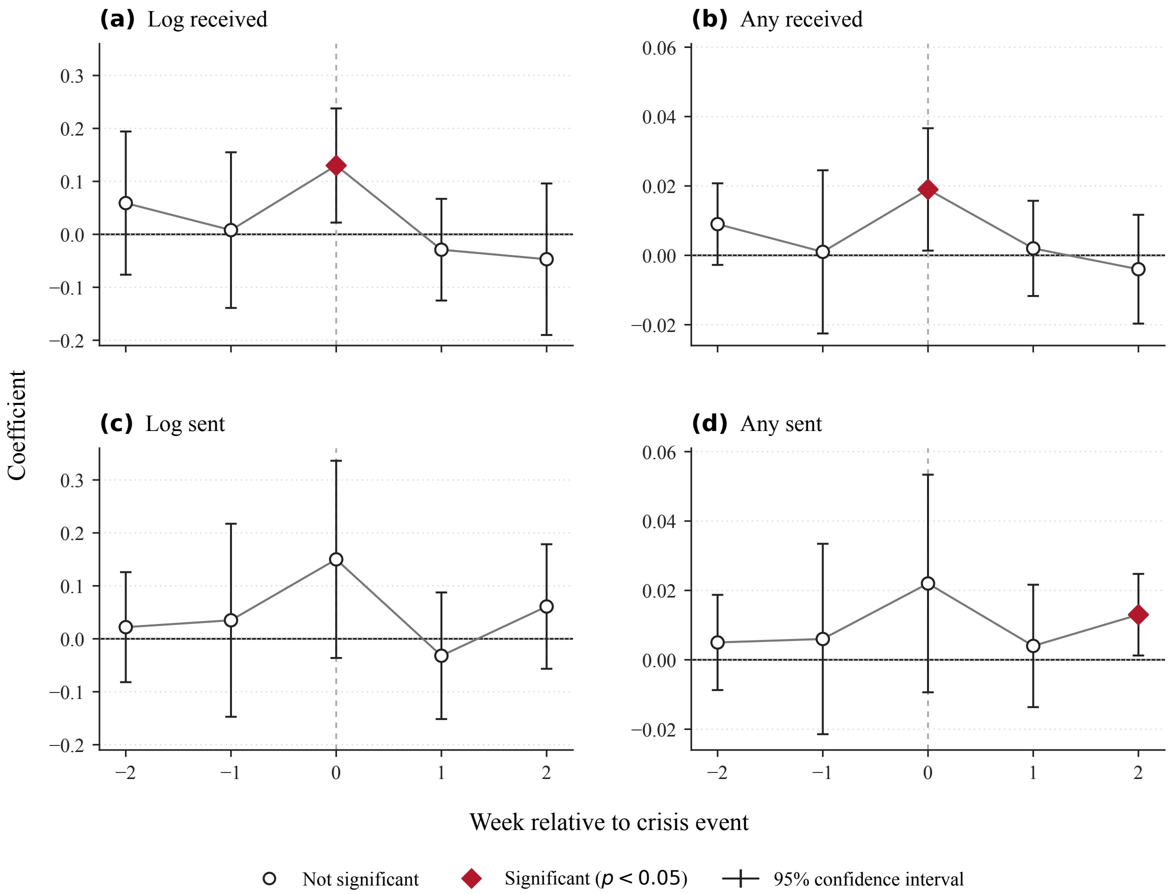

Figure 5: **Stablecoin activity around crisis events by country-tag status.** This figure reports event-time coefficients for the interaction between country-tag treatment status and weeks relative to the crisis event. Panels (a) and (b) show log received volume and the probability of receiving, respectively; panels (c) and (d) show log sent volume and the probability of sending. Vertical bars denote 95% confidence intervals. Red diamonds identify coefficients statistically significant at the 5% level, while open circles denote coefficients that are not statistically significant. The vertical dashed line marks the crisis week, and the horizontal solid line marks a coefficient of zero.

Main Estimates Table 4 reports $\hat{\beta}_3$ from Equation (14). In the receipt outcomes, treated-country wallets receive 0.127 log points more during the crisis week and are 1.8 percentage points more likely to receive a stablecoin. Both estimates are statistically significant. The corresponding send interactions are 0.124 log points and 1.8 percentage points; neither is statistically significant. The treated-country coefficients are positive and statistically significant in all four columns, including 0.005 for any receipt. This indicates that, outside of the event window, treated countries are more likely to send and receive stablecoins.

Table 5: Stablecoin flows around crisis week relative to a clean pre-period: baseline, wallet-country tags

	(1) Log Received	(2) Any Received	(3) Log Sent	(4) Any Sent
Treat × week -2	0.059	0.009	0.022	0.005
	(0.069)	(0.006)	(0.053)	(0.007)
Treat × week -1	0.008	0.001	0.035	0.006
	(0.075)	(0.012)	(0.093)	(0.014)
Treat × week 0	0.130**	0.019**	0.150	0.022
	(0.055)	(0.009)	(0.095)	(0.016)
Treat × week 1	-0.029	0.002	-0.032	0.004
	(0.049)	(0.007)	(0.061)	(0.009)
Treat × week 2	-0.047	-0.004	0.061	0.013**
	(0.073)	(0.008)	(0.060)	(0.006)
Observations	2,279,826	2,279,826	2,279,826	2,279,826

Standard errors in parentheses.
The five relative-week interactions are estimated jointly in one regression per outcome.
The omitted comparison period pools clean pre-event weeks -26 through -5; weeks -4, -3, and $+3$ through $+26$ are excluded.
All specifications include Treat, relative-week indicators, wallet fixed effects, and standard errors clustered by calendar week.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Temporal Pattern: Sends vs. Receives Let $\mathcal{K} = \{-2, -1, 0, 1, 2\}$ denote the five reported relative weeks. For each Received or Sent outcome, Table 5 estimates the joint specification

$$y_{i,e,t} = \alpha_i + \beta\, Treat_{i,e} + \sum_{k \in \mathcal{K}} \gamma_k \mathbf{1}[\tau_{e,t} = k] + \sum_{k \in \mathcal{K}} \delta_k \big(Treat_{i,e} \times \mathbf{1}[\tau_{e,t} = k]\big) + \varepsilon_{i,e,t}.$$

The regression uses observations with $\tau \in \mathcal{B} \cup \mathcal{K}$, where $\mathcal{B} = \{-26, \ldots, -5\}$ is the pooled clean omitted period. Weeks -4, -3, and $+3$ through $+26$ are excluded. The wallet fixed effects are α_i, and standard errors are clustered by calendar week. Table 5 reports $\widehat{\delta}_k$, so every coefficient is measured relative to the same clean pre-event baseline. The estimates at $\tau = -2$ and $\tau = -1$ are insignificant for all four outcomes. At $\tau = 0$, crisis-country wallets receive 0.130 log points more stablecoins and are 1.9 percentage points more likely to receive them, with both estimates significant at the 5% level; neither sending outcome moves significantly. At $\tau = +2$, the probability of sending is 1.3 percentage points higher, although the amount sent is insignificant. These dynamics provide limited evidence that receipts rise on impact and sending activity follows with a lag.

Table 6: WBTC flows in crisis week

	(1) log Received	(2) Any Received	(3) Log Sent	(4) Any Sent
Treated country	0.006**	-0.005*	0.006**	-0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Crisis week	-0.031*	-0.000	-0.030**	0.014
	(0.016)	(0.031)	(0.015)	(0.030)
Treated × crisis week	0.036	0.007	0.041	-0.004
	(0.037)	(0.015)	(0.036)	(0.015)
Wallet FE	✓	✓	✓	✓
Observations	296,376	296,376	296,376	296,376
R^2	0.049	0.066	0.045	0.041

Standard errors, clustered by calendar week, in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Stablecoins vs. Bitcoin One might wonder whether the stablecoin demand pressure documented in this section is specific to stablecoins. Alternatively, wallets in crisis-hit countries may simply increase their holdings of cryptocurrencies more broadly following a crisis. As a final exercise, we test this hypothesis.

Table 6 repeats the crisis-week regression using WBTC receives. The table shows that there is no comparable effect for Wrapped Bitcoin. Wallets do not appear to accumulate non-stablecoin cryptocurrencies in response to a crisis.

Notes: Same specification as Table 4 with WBTC receives as the outcome. All specifications include wallet fixed effects.

6 Conclusion

This paper studies how programmable stablecoins affect the Mundell–Fleming trilemma. We first construct a novel wallet–event–week dataset linking geotagged Ethereum Name Service registrations to stablecoin transactions around episodes of banking restrictions, currency crises, sanctions, and monetary disruption. We then develop a two-period small-open-economy New Keynesian model in which household adoption of programmable stablecoins makes capital mobility endogenous by weakening the government's enforcement technology for capital controls. The empirical evidence validates the model's key behavioral assumption that flight pressure increases stablecoin adoption. Together, the theory and evidence suggest that the recent wave of digital financial innovation has important implications for monetary sovereignty by reshaping the effectiveness of capital controls and the scope for independent monetary policy.

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Appendix

A Proofs

Proof of Lemma 1. The result follows directly from the fact that $\nu_j \sim U[0,1]$ and the benefit of stablecoin adoption is common across households, equal to $\alpha_0 + \rho\theta$. As such, we have

$$\alpha = \Pr(\nu_j \leq \alpha_0 + \rho\theta) = \alpha_0 + \rho\theta.$$

$\square$

Proof of Proposition 1. Fix $\alpha > 0$ and $\Delta > 0$, and define

$$K \equiv \frac{\Omega\Psi}{\Omega + \Psi} > 0.$$

Conditional on f, the residual pressure is

$$h(f, \alpha) \equiv \max\left\{0, \Delta - \frac{f}{\alpha}\right\}.$$

Taking the optimal effort level f as given, for $m < \Delta$, the government minimizes

$$\frac{1}{2}\Omega(i_1 - i_1^*)^2 + \frac{1}{2}\Psi q_1^2$$

subject to

$$(i_1 - i_1^*) + q_1 = \Delta - m.$$

The first-order conditions imply

$$\Omega(i_1 - i_1^*) = \Psi q_1.$$

Combining this with the constraint gives

$$i_1 - i_1^* = \frac{\Psi}{\Omega + \Psi}(\Delta - m), \qquad q_1 = \frac{\Omega}{\Omega + \Psi}(\Delta - m).$$

If $m \geq \Delta$, the target policy pair is feasible and is trivially optimal because the loss is strictly convex and nonnegative.

Substituting the optimal allocation gives the reduced-form objective

$$G(f; \alpha, \Delta) = \frac{1}{2}K\, h(f, \alpha)^2 + \frac{1}{2}f^2.$$

In the binding region, $0 \le f < \alpha\Delta$, so

$$G(f;\alpha,\Delta) = \frac{1}{2}K\left(\Delta - \frac{f}{\alpha}\right)^2 + \frac{1}{2}f^2.$$

Differentiating yields

$$G_f(f;\alpha,\Delta) = -K\frac{1}{\alpha}\left(\Delta - \frac{f}{\alpha}\right) + f = -\frac{K\Delta}{\alpha} + \left(1 + \frac{K}{\alpha^2}\right)f.$$

Setting this equal to zero gives

$$f^*(\alpha) = \frac{K\Delta\alpha}{\alpha^2 + K}.$$

This satisfies $0 < f^*(\alpha) < \alpha\Delta$, so it lies in the binding region. In the slack region, $G(f;\alpha,\Delta) = \frac{1}{2}f^2$, which is increasing for $f > 0$. Hence $f^*(\alpha)$ is the unique global optimum.

Substituting back,

$$h^*(\alpha) = \Delta - \frac{f^*(\alpha)}{\alpha} = \frac{\Delta\alpha^2}{\alpha^2 + K},$$

$$i_1^*(f^*,\alpha) - i_1^* = \frac{\Psi}{\Omega + \Psi}h^*(\alpha), \qquad q_1^* = \frac{\Omega}{\Omega + \Psi}h^*(\alpha).$$

□

Proof of Proposition 2. Fix Δ, Ω, and Ψ, so K is constant. Differentiate

$$f^*(\alpha) = \frac{K\Delta\alpha}{\alpha^2 + K}.$$

The quotient rule gives

$$\frac{df^*}{d\alpha} = \frac{K\Delta(\alpha^2 + K) - K\Delta\alpha(2\alpha)}{(\alpha^2 + K)^2} = \frac{K\Delta(K - \alpha^2)}{(\alpha^2 + K)^2}.$$

Therefore $df^*/d\alpha > 0$ if and only if $\alpha < \sqrt{K}$, and $df^*/d\alpha < 0$ if and only if $\alpha > \sqrt{K}$.

Now differentiate

$$h^*(\alpha) = \frac{\Delta\alpha^2}{\alpha^2 + K}.$$

We get

$$\frac{dh^*}{d\alpha} = \frac{2\Delta\alpha(\alpha^2 + K) - \Delta\alpha^2(2\alpha)}{(\alpha^2 + K)^2} = \frac{2\Delta\alpha K}{(\alpha^2 + K)^2} > 0.$$

Since both policy margins are positive multiples of $h^*(\alpha)$, both $i_1 - i_1^*$ and q_1 are strictly increasing in α. □