

Dollar Debt and the Inefficient Global Financial Cycle^{*}

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Abstract

This paper proposes a tractable model of the Global Financial Cycle for emerging market economies (EMEs), with frictions in global financial intermediation. When local firms borrow in dollars, central banks must defend their currencies in order to offset balance sheet effects. If global financial markets are imperfect, a novel externality emerges through the balance sheet of global intermediaries: a greater aggregate quantity of capital flows must be intermediated, which leads to a higher premium on the dollar interest rate. This feedback exacerbates the Global Financial Cycle and results in inefficiently low levels of output and employment in EMEs. Conversely, discouraging debt issuance in dollars through macroprudential policy has positive spillovers. Its optimal use dampens the Global Financial Cycle and its inefficiencies.

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1 Introduction

In May 2013, the US Federal Reserve announced it would start tapering its large-scale asset purchases. Financial conditions in emerging market economies (EMEs) immediately deteriorated: currencies depreciated, stock markets fell, and bond yields rose. This “taper tantrum” episode highlighted how EMEs may be severely affected by US domestic policy decisions: when private debt is denominated in dollars (Bocola and Lorenzoni 2020, Florez-Orrego, Maggiori, Schreger, Sun and Tinda 2023) a depreciation of the currency weakens balance sheets, which hurts financially constrained firms. To fight such depreciations, central banks in EMEs often rely on interest rate policy, putting a drag on aggregate demand (Calvo and Reinhart 2002).

Although it is now understood that central banks in EMEs are constrained by the actions of the Federal Reserve (Rey 2013, Bruno and Shin 2015b, Kalemli-Özcan 2019, Obstfeld and Zhou 2023), their synchronized response to the Global Financial Cycle raises new questions. First, under which conditions are there spillovers from EMEs’ monetary policy response to the actions of the Federal Reserve? Second, what role do global intermediaries play in shaping those externalities? And third, can macroprudential policies help smooth the inefficiencies associated with the Global Financial Cycle?

This paper proposes a tractable model that allows one to answer these questions. The central result of the paper is that, when global financial markets are imperfect (Gabaix and Maggiori 2015), a novel “bottleneck externality” appears, operating directly through the balance sheet of global intermediaries, and exacerbating the Global Financial Cycle. Central banks in EMEs raise domestic policy rates to counter depreciationary pressures in response to a Fed hike, and they do this by trying to attract more capital inflows. When this occurs in multiple EMEs at the same time, the global intermediary sector needs to intermediate a higher quantity of capital flows. When international financial markets are frictional, these intermediaries charge a higher premium to intermediate more flows.

This feeds back into domestic conditions by creating additional depreciationary pressures in emerging economies, which require even more restrictive monetary policy. In contrast, discouraging debt issuance in dollars through macroprudential policy has *positive* spillovers. Issuing less in dollars ex-ante eases the trade-off faced by individual central banks in the future, reducing the aggregate demand for intermediation. This also eases the job of other central banks, as there is now less congestion in capital flows. Thus, the optimal use of macroprudential policy in EMEs can dampen the Global Financial Cycle and its inefficiencies.

I start by developing in Section 2 a model of a small open economy that reflects the different forces at play, building on [Bianchi and Lorenzoni \(2022\)](#). The model is characterized by two key departures from the neo-classical benchmark: financial frictions and nominal rigidities. The presence of financial frictions implies that the net worth of entrepreneurs plays a crucial role ([Tirole 2010](#), [Bernanke and Gertler 1990](#)): increasing it allows entrepreneurs to lever up more and invest more into productive assets. This channel naturally interacts with the existence of debt denominated in dollars. When entrepreneurs' revenues are in local currency, any movement in the exchange rate *vis-à-vis* the dollar impacts the net worth of entrepreneurs, leading to balance sheet effects.¹ An increase in the US interest rate provokes capital outflows that depreciate the local currency, weakening entrepreneurs, forcing them to delever and invest less in productive capital, leading to lower output later on.²

The central bank can counter these depreciationary pressures with a restrictive monetary policy. But the existence of nominal rigidities — modeled as rigid wages — implies

¹These effects have been documented in a host of different countries, see e.g. [Harvey and Roper \(1999\)](#), [Aguiar \(2005\)](#), [Bruno and Shin \(2020\)](#) and [Rodnyansky, Timmer and Yago \(2022\)](#). I do not take a stance on the fundamental reason behind dollarized liabilities in EMEs (see the literature review below).

²[Caballero, Fernández and Park \(2019\)](#) construct an external financial indicator for EMEs, using data on foreign financing by the corporate sector. They show that an adverse shock to this indicator “generates a long and prolonged decline in real output growth in these economies.” [Acharya, Bhadury and Surti \(2020\)](#) find that including the cost of hedging dollar exposure significantly improves the performance of their financial vulnerability index.

that there is a monetary policy trade-off, fleshed out in Section 3. By increasing its interest rate, the EME is able to appreciate its currency, lowering the repayment burden imposed on entrepreneurs, and thus leading to higher investment through the net worth effect described above (a “fear-of-floating,” Calvo and Reinhart 2002). This restrictive policy, however, also leads to involuntary unemployment and lower output in other sectors, because of rigid wages. This optimal interest rate is naturally increasing in the size of dollar debt held by entrepreneurs and in the US interest rate. The higher the Fed rate, the more difficult it is for the EM central bank to achieve full employment for a given level of dollar debt.

Since many EMEs are characterized by high levels of dollarized liabilities, all will implement relatively restrictive monetary policies in response to a Fed tightening at the same time. Section 4 looks at the effects of this synchronized policy response, which is the main contribution of the paper. In particular, I show that monetary policy spillovers in this context are a cause of concern, but only when global financial markets are imperfect. If global capital flows have to go through financial intermediaries that face financial frictions (Gabaix and Maggiori 2015, Coimbra and Rey 2024) or intermediation costs (Bianchi and Lorenzoni 2022, Fanelli and Straub 2021), then the aggregate size of capital flows affects the external interest rate faced by EMEs.³ When central banks seek to counteract depreciationary pressures and balance sheet effects, they need to attract more capital inflows. This change in global capital flows, if it occurs in all EMEs at the same time, increases the interest rate they face because of the intermediation friction. This feeds back into domestic conditions by creating further depreciationary pressures: it weakens entrepreneurs’ net worth, and thus requires another round of tightening. At the heart of this feedback is a “bottleneck” externality: all individual EMEs seek to attract capital

³Morelli, Ottonello and Perez (2022) show quantitatively that global financial intermediaries play an important role in driving borrowing costs in emerging market economies. Kekre and Lenel (2024a) suggest that global intermediation shocks matter more for the dollar/EM exchange rate than for advanced economies. Schnabl (2012) shows that negative liquidity shocks to international banks transmit to emerging markets.

inflows when the Fed tightens, since all of their foreign-currency debt is denominated in the same currency: the dollar. But because they all draw capital from the same pool (the inelastic intermediary), they do so at the expense of one another, increasing the premium on the dollar interest rate. The Global Financial Cycle is therefore exacerbated, resulting in inefficiently low levels of employment and output in EMEs.⁴

Since the driving force of the fear-of-floating is the presence of private debt issued in dollars, I pursue with a study of ex-ante policies in Section 5.⁵ With frictional global capital markets creating negative spillovers from monetary policy, a natural question is whether macroprudential policies suffer from the same issues. I show that, perhaps surprisingly, the implementation of macroprudential policies has *positive* spillovers on the rest of the EMEs. This is because reducing the amount issued in dollars in its own country allows the central bank to hike less in response to the Fed's actions. By tightening less, the country attracts fewer capital flows, relaxing the pressure on the balance sheet of global intermediaries. This marginally lowers the interest rate faced by other countries, reducing the depreciationary pressures that central banks are fighting against. By optimally lowering the amount of corporate debt issued in dollars, each country ameliorates the trade-off that all central banks face, resulting in higher output and employment levels in EMEs. It therefore dampens the Global Financial Cycle and its associated inefficiencies.

In Section 6, I provide suggestive empirical evidence for the key building blocks of my

⁴Importantly, this effect goes through the balance sheet of global intermediaries. As such, it does not depend on whether the set of EMEs is large enough to influence the equilibrium determination of the world interest rate, or the equilibrium determination of tradable goods prices. Additionally, it is not important for my results that EMEs actually *tighten* when the Fed does: what matters is that EMEs implement a relatively more restrictive monetary policy to avoid too much depreciation, compared to the case without dollar debt. See the discussion in Section 4.5 as well as Appendix H.

⁵The issuance of dollar-denominated debt naturally creates externalities when the central bank cannot commit to target only inflation in the future (Drenik, Kirpalani and Perez 2022), with entrepreneurs failing to take into account the general equilibrium policy response. This externality calls for specific macroprudential regulation ex-ante: only debt issued in dollars needs to be discouraged with the appropriate tax, rather than all types of short-term borrowing (Farhi and Werning 2016). See Bianchi (2011), Bianchi and Mendoza (2018), Jeanne and Korinek (2019) and Ottonello, Perez and Varraso (2022) on macroprudential policy in small open economies with a pecuniary externality.

novel mechanism. Because the bottleneck externality operates through the balance sheet of global intermediaries, a consistent implication is that intermediary capacity should shape the behavior of EME currencies. I show that a Fed tightening depreciates EME currencies more when intermediary balance sheets are constrained, and that EME currencies comove more strongly with one another in exactly those states. This pattern is instead absent for G10 currencies. Importantly for the externality, I show that this comovement is stronger when the *aggregate* quantity of EME exposure intermediated by global banks is larger: as global banks absorb more EME flows, EME currencies load more strongly on their common factor, whereas the same measure constructed from advanced-economy exposures has no such effect. This is in line with the model’s central premise that EMEs draw on a common pool of intermediation capacity, susceptible to congestion.

Finally, Section 7 presents several extensions and in particular considers the welfare properties of using FX interventions (FXI), in addition to the domestic interest rate. When FXI are constrained in size, selling reserves is still valuable because it relaxes the trade-off faced by the central bank between aggregate demand and the exchange rate. These FXIs have *positive* spillovers to the rest of the EMEs (Itskhoki and Mukhin 2023). FX interventions do, however, incentivize more dollar issuance ex-ante, since firms anticipate an appreciated currency. This feeds back into the optimal monetary policy of the central bank and can even result in welfare losses. This result highlights the need for strong macroprudential measures when FXI are part of the planner’s toolkit.

Related Literature: The starting motivation of this paper is the conjunction of three well-established facts: the issuance of corporate debt in dollars in EMEs, the Global Financial Cycle, and intermediation frictions in global financial markets. First, a large amount of corporate borrowing in emerging markets is denominated in dollars and in an outsized proportion relative to the wealth share of the US in the world (Bruno and Shin 2015b, McCauley, McGuire and Sushko 2015, Maggiori, Neiman and Schreger 2020, Acharya and

Vij 2022).⁶ Second, the US's domestic monetary policy drives a Global Financial Cycle in capital flows, monetary policies, asset prices, and credit growth (Rey 2013; Kalemli-Özcan 2019; Miranda-Agrippino and Rey 2020; Bräuning and Ivashina 2020; Miranda-Agrippino and Rey 2022, Di Giovanni, Kalemli-Özcan, Ulu and Baskaya 2022; Obstfeld and Zhou 2023; Cristi, Kalemli-Özcan, Sans and Unsal 2024). My paper explains the latter fact with the former, and draws normative implications for emerging markets. Being forced to respond to interest rate movements in the US, an *inefficient* Global Financial Cycle appears when global financial markets are imperfect.⁷

The presence of dollar debt generates balance-sheet effects. This has been studied in response to the East Asian crisis, by Krugman (1999), Caballero and Krishnamurthy (2003), Céspedes, Chang and Velasco (2004), Aghion, Bacchetta and Banerjee (2004), and Chamon and Hausmann (2005). Recent papers have focused on the determination of optimal policy under foreign-denominated debt in modern models. Ottonello (2021), Matsumoto (2021), and Coulibaly (2021) show that discretionary monetary policy is contractionary during crises, in order to mitigate balance sheet effects originating from exchange rate depreciations, and my model features the same forces. Due to this currency mismatch, monetary policy decisions in the US can have financial spillovers for other countries, as also shown by Bruno and Shin (2015b), Akinci and Queralto (2021), and Jiang et al. (2024). Closely related to my paper, Basu, Boz, Gopinath, Roch and Unsal (2025) and Itskhoki and Mukhin (2023) study optimal policy in a small open economy with frictional

⁶The literature has proposed several explanations for why firms in emerging markets tend to issue in dollars rather than in their domestic currency, exposing themselves to currency mismatches (McKinnon and Pill 1998, Burnside, Eichenbaum and Rebelo 2001, Jeanne 2002, Caballero and Krishnamurthy 2003, Bocola and Lorenzoni 2020, Coppola, Krishnamurthy and Xu 2023, Belz and Thomas 2023, Belz, Thomas and Montamat 2024). My paper does not take a stance: it takes this fact as given and explores its welfare consequences for the Global Financial Cycle.

⁷For models of the Global Financial Cycle (based on special dollar safe assets, US safe-asset supply, or heterogeneous intermediary risk-taking) see the survey of Miranda-Agrippino and Rey (2022) and Bianchi, Bigio and Engel (2021), Gopinath and Stein (2021), Jiang, Krishnamurthy and Lustig (2024), Farhi and Maggiori (2018), Kekre and Lenel (2024b), Gourinchas and Rey (2022), Coimbra and Rey (2024). My deliberately stylized model abstracts from asset prices and risk-taking (Akinci, Kalemli-Özcan and Queralto 2022).

global intermediaries, and focus on the use of FX interventions. More generally, [Bianchi and Lorenzoni \(2022\)](#) review the literature on optimal policy under “fear-of-floating.”⁸ My paper builds on this previous work, and pushes its implications further: my main contribution is to show that EME policy responses affect one another by changing the dollar premium charged by a constrained intermediary sector.

My results are thus linked to a vast literature on international policy spillovers, starting with [Obstfeld and Rogoff \(2002\)](#), [Devereux and Engel \(2003\)](#) and [Benigno and Benigno \(2006\)](#).⁹ Importantly, the seminal work of [Korinek \(2017\)](#) sets out the conditions that must be violated to generate inefficiencies. In my paper, this stems from the use of a single instrument (monetary policy) to control both employment and the exchange rate.¹⁰ [Fornaro and Romei \(2022\)](#) study monetary policy when there is excessive demand for tradable goods. They show that the optimal response is to run a trade deficit in order to sustain tradable consumption, which boosts employment in the non-tradable sector. This entails negative spillovers to the rest of the world: each country seeks to create a trade deficit, but since trade has to be balanced, the world interest rate increases.¹¹ Relative to this literature, my paper emphasizes the response of central banks in EMEs to

⁸On optimal monetary policy under financial fragility, see [Boissay, Collard, Galí and Manea \(2021\)](#), [Farhi and Werning \(2020\)](#), [Asriyan, Fornaro, Martin and Ventura \(2021\)](#), [Kashyap and Stein \(2023\)](#), [Acharya, Plantin and Wang \(2026\)](#); [Bianchi and Coulibaly \(2023\)](#) on fear-of-floating from an aggregate-demand/credit feedback; and [Wang \(2019\)](#) on balance-sheet effects from incomplete pass-through.

⁹[Caldara, Ferrante, Iacoviello, Prestipino and Queralto \(2024\)](#) show empirically that synchronous tightening episodes are associated with larger effects on output. They build a model where large policy shocks can cause a decline in asset valuations, potentially triggering leverage constraints.

¹⁰My paper also connects to the literature on FX interventions ([Jeanne 2016](#), [Acharya and Krishnamurthy 2019](#), [Cavallino 2019](#), [Amador, Bianchi, Bocola and Perri 2020](#), [Fanelli and Straub 2021](#), [Bacchetta, Benhima and Berthold 2023](#), [Ottonello, Perez and Witheridge 2023](#)); see Section 7.1. [Basu et al. \(2025\)](#) also show that FX mismatch regulations and domestic macroprudential measures can help the central bank focus on closing the output gap, a result also present in my framework. In addition, I show that these measures can have *positive* spillovers across EMEs.

¹¹[Bianchi and Coulibaly \(2024\)](#) further show that this depends on the differences in labor intensities across the tradable and non-tradable sectors. A notable difference in my framework is that spillovers go through the balance sheet of constrained intermediaries: as such, it does not require a condition of balanced trade among the set of EMEs considered, or necessitate that the group of countries is large enough to influence the determination of the world interest rate faced by all countries. [Guerrieri, Lorenzoni and Werning \(2025\)](#) propose instead a model of expansionary bias after global supply shocks.

US monetary policy shocks and a different driving force (dollar debt). As such, it allows me to study the optimal use of macroprudential policy and its positive spillovers, as well as the moral hazard implications of FX interventions. By contrast, [Fornaro and Romei \(2019\)](#) show that, in a global liquidity trap environment, capital account policies can have negative spillovers by exacerbating the zero lower bound constraint. My paper thus suggests that the coordination of macroprudential policies might be highly sensitive to the type of shocks and global conditions.¹² Finally, [Das, Gopinath, Kim and Stein \(2024\)](#) study spillovers in ex-ante reserve accumulation: they show that central banks over-accumulate dollar assets, which lowers the dollar interest rate and encourages further issuance in dollars. This is an additional mechanism to the one I highlight, that would also apply in my setup and reinforce the need for macroprudential policy.

2 A Small Open Economy Model

Structure We consider a small open economy that can be thought of as an emerging economy. The model builds on [Bianchi and Lorenzoni \(2022\)](#), but endogenizes “fear-of-floating” through the issuance of debt denominated in dollars by entrepreneurs. Time is discrete and indexed by $t \in \{1, 2, 3\}$. Since the presence of risk only obfuscates the results, agents have perfect foresight. There are two types of agents. Households consume and provide labor in periods 2 and 3. Entrepreneurs issue debt in period 1 in order to finance investment in a capital stock that will produce goods in periods 2 and 3. Entrepreneurs simply seek to maximize profits, which are fully rebated to households. There is a single tradable good. The price of tradables is normalized to one in dollars, so using the law of

¹²On the interaction of macroprudential and monetary policies, see also [Farhi and Werning \(2020\)](#), [Devereux, Young and Yu \(2019\)](#), [Fanelli \(2023\)](#), [Fontanier \(2024\)](#), [Egorov and Mukhin \(2023\)](#), [Bianchi and Coulibaly \(2022\)](#).

one price, the price of tradable goods in pesos is:

$$p_t^T = e_t \quad (1)$$

where e_t is the nominal exchange rate, i.e. the price of a dollar in pesos. There is a single non-tradable (NT) good that is produced in two ways: by competitive firms employing the labor of households paying rigid wages, and by entrepreneurs utilizing their capital. Separating these two production technologies allows the model to isolate the financial channel from the New-Keynesian channel, resulting in a clean characterization of the central bank trade-off.

The main insights of the paper come from the behavior of the equilibrium in the intermediate period, when entrepreneurs have some dollar debt to repay and need to make investments. This section thus describes the period $t = 2$, in order to characterize optimal monetary policy and spillovers between EMEs. The optimal issuance strategy at $t = 1$ and the implications for macroprudential policy are then presented in Section 5.

2.1 The economy at $t = 2$

Entrepreneurs Entrepreneurs enter period 2 each with a capital stock K_1 , as well as dollar and peso debts to repay, b_1^* and b_1 . Their existing capital produces η_2 units of NT goods per unit of capital. The net worth of entrepreneurs is thus denoted by:

$$n_2 = \eta_2 K_1 - b_1 - e_2 b_1^* \quad (2)$$

After η_2 is realized, a random fraction κ of firms are still productive and can produce in period 3 if they maintain their capital stock, and the remaining fraction $1 - \kappa$ is unproductive: their capital depreciates entirely and they stop producing. Unproductive firms repay their debt, lend to other firms, and rebate the rest of their profits to households.

To maintain their existing stock of capital to continue producing in period 3, productive entrepreneurs must invest s units of non-tradable goods per unit of capital: to maintain k_2 they need to pay sk_2 , which will pay off r_1k_2 units of non-tradables at $t = 3$. Unmaintained capital fully depreciates. To finance this investment, entrepreneurs can borrow b_2 from other unproductive firms at a 0 interest rate but are subject to a classic monitoring problem (Tirole 2010) that limits the amount they can borrow:

$$b_2 \leq r_0 k_2 \quad (3)$$

where r_0 is the pledgeable part of the project, with $r_0 < s < 1$.¹³ Since entrepreneurs seek to maximize future output, their budget constraint is:

$$n_2 + b_2 = sk_2 \quad \text{s.t.} \quad k_2 \leq K_1 ; b_2 \leq r_0 k_2 \quad (4)$$

The case of interest will be when entrepreneurs are constrained by the pledgeability limit, which will imply that:

$$k_2 = \frac{n_2}{s - r_0} \quad (5)$$

As is common in these models, net worth plays a crucial role. Entrepreneurs can leverage their wealth with a multiplier $1/(s - r_0)$. By improving entrepreneurs' net worth, monetary policy will thus be able to prop up investment in the capital stock. Since only a fraction κ of entrepreneurs are productive, the aggregate stock of capital used for production at

¹³The credit market between entrepreneurs is deliberately segmented from households, such that it does not affect their Euler equations. Appendix D.3 studies the case where the inter-firm interest rate is the nominal interest rate set by the central bank, i_2 , instead of 0. This complicates the analysis, since the central bank also needs to take into account a third effect: by increasing the interest rate, it tightens the financial friction. However, Appendix D.3 shows that identical forces are at play: the optimal policy solution takes the same form, only with an additional term pertaining to this third effect. The cost of this extension is that the model loses tractability. See also Appendix D.4 for a version without aggregate demand, such that the trade-off of the central bank is between these two investment forces.

$t = 3$, when entrepreneurs are constrained, will be given by:

$$K_2 = \kappa \frac{n_2}{s - r_0} \quad (6)$$

while the amount of non-tradable goods used for maintaining capital is sK_2 .

Households Households receive an endowment of tradable goods y_2^T . They have the following utility function, Cobb-Douglas at $t = 2$ and linear at $t = 3$ for tractability:

$$U_2 = \frac{1}{1 - \rho} \left((c_2^T)^\phi (c_2^N)^{1 - \phi} \right)^{1 - \rho} + \beta (c_3^N + c_3^T) \quad (7)$$

with $\rho \geq 1$. Households have an inelastic supply of labor $\bar{l}$ in each period. They can save and borrow in peso-denominated bonds (a_3) or dollar-denominated bonds (a_3^*), at respective interest rates i_2 and i_2^* .¹⁴ The central bank sets the domestic interest rate i_2 . We keep the same convention as for entrepreneurs: a positive position $a_3^* > 0$ means that households are borrowing in dollars. They thus have the following budget constraint:

$$p^T c_2^T + p^N c_2^N = e_2 y^T + w_2 l_2 + \frac{1}{1 + i_2} a_3 + \frac{1}{1 + i_2^*} e_2 a_3^* + \Pi_2 \quad (8)$$

Under these conditions, the standard UIP condition holds:

$$1 + i_2 = (1 + i_2^*) \frac{e_3}{e_2} \quad (9)$$

Peso-denominated bonds are only traded domestically. Since households are symmetric and cannot lend to entrepreneurs, we have $a_3 = 0$ in equilibrium.

¹⁴The rate i_2^* should be interpreted as the dollar rate faced by residents of the small open economy. This rate will later be endogenized and will differ from the US rate because of intermediation frictions.

Competitive Firms Perfectly competitive firms also produce non-tradable goods (in addition to the ones produced by entrepreneurs) using household labor with a linear technology $y_2^N = l_2$. Wages are fully rigid at $\bar{w} = 1$, so their output is demand-determined and involuntary unemployment ($l_2 < \bar{l}$) occurs when the interest rate is too high. Firms are competitive, so the price of the non-tradable good is $p_t^N = \bar{w} = 1$.

The total output at time $t = 2$ of non-tradable goods is thus the sum of the output of competitive firms and the output of entrepreneurs:

$$y_2^N = l_2 + \eta_2 K_1 \quad (10)$$

The resource constraints are then given by:

$$c_2^N + sK_2 = l_2 + \eta_2 K_1, \quad (11)$$

$$c_2^T + b_1^* = y_2^T + \frac{a_3^*}{1 + i_2^*} \quad (12)$$

2.2 The economy at $t = 3$

In the last period, productive entrepreneurs produce and rebate profits to households. Households receive an endowment of tradable goods y_3^T , provide labor to fully competitive firms, settle their foreign currency debt, and consume. Since there are no savings decisions to be made, there is full employment $l_3 = \bar{l}$.¹⁵ The budget constraint is simply:

$$p_3^N c_3^N + p_3^T c_3^T + a_3 + e_3 a_3^* = p_3^T y_3^T + \bar{w} \bar{l} + \Pi_3 \quad (13)$$

¹⁵Note that since preferences are linear, the exchange rate is pinned down at $e_3 = \bar{w} = 1$. An immediate implication will be that interest rate decisions at $t = 2$ will immediately translate into exchange rate movements of e_2 , in order for the UIP condition to hold. In other words, interest decisions will only impact the spot exchange rate and not the forward rate, substantially simplifying the analysis.

while the resource constraints are:

$$c_3^N = \bar{l} + r_1 K_2 \quad (14)$$

$$c_3^T + a_3^* = y_3^T \quad (15)$$

We can now formally define the competitive equilibrium.

Definition 1. *A competitive equilibrium is a path of real allocations $\{c_t^N, c_t^T, l_t\}_{(t=2,3)}$, capital K_2 and capital flows a_3^* , such that, given a domestic policy rate i_2 , a dollar interest rate i_2^* and legacy debt b_1 and b_1^* : (i) households maximize (7) under their budget constraints (8) and (13); (ii) entrepreneurs invest K_2 according to (6); (iii) firms maximize profits; and the resource constraints (11), (12), (14) and (15) are satisfied.*

The small-open-economy equilibrium takes i_2^* as given. Section 4 closes the dollar market across the continuum of EMEs through global intermediaries. In what follows, we restrict ourselves to situations where: (i) there is a unique equilibrium ; and (ii) productive entrepreneurs are against their borrowing constraint (3).¹⁶ Unless stated otherwise, all derivations and proofs are in Appendix A.

3 Dollar Debt and Monetary Policy

This section studies the optimal policy problem, when the only available instrument is conventional monetary policy.

¹⁶This financial friction generates asymmetric effects in general: an appreciation of the currency when firms are not against the constraint does not have an amplification effect. This is in line with the findings of Kalemli-Ozcan, Liu and Shim (2021), who find that the effects of depreciations are quantitatively larger than those of appreciations.

Planner's Problem The central bank seeks to maximize the welfare of the representative consumer by choosing i_2 :

$$\max_{i_2} \frac{1}{1-\rho} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{1-\rho} + \beta (c_3^N + c_3^T) \quad (16)$$

since entrepreneurs are rebating all of their profits to households. Supporting the wealth of entrepreneurs will, however, enter the central bank problem by increasing the output in period $t = 3$. The key premise of this model is that the presence of dollar debt creates a trade-off for the central bank. The first channel works through aggregate demand: changing the domestic interest rate rebalances demand between non-tradable and tradable goods (expenditure switching):

$$c_2^N = \left(\frac{1-\phi}{\phi} \frac{(1+i_2^*)}{(1+i_2)} \right) c_2^T \quad (17)$$

When i_2 decreases, the demand for non-tradables rises relative to tradables which can increase non-tradable output (i.e. lower unemployment) since wages are rigid.

At the same time, a decrease in i_2 has an impact on the exchange rate through the usual UIP condition:

$$1 + i_2 = (1 + i_2^*) \frac{e_3}{e_2} \quad (18)$$

which mechanically increases e_2 , i.e. depreciates the currency. Because of dollar debt repayments, however, this change in the exchange rate weakens the balance sheet of entrepreneurs that need to borrow subject to the financial friction (3) in order to maintain their capital stock:

$$\frac{dK_2}{d \ln(1 + i_2)} = \frac{e_2 \kappa b_1^*}{s - r_0} \quad (19)$$

Thus, when entrepreneurs are constrained, a depreciation of the domestic currency *vis-à-vis* the dollar results in a lower capital stock at $t = 2$. Finally, this decrease in capital has

a negative impact on welfare, by lowering output at $t = 3$.

Optimal Monetary Policy The central bank needs to trade off these two channels. The following proposition characterizes that, when dollar debt is large enough, it becomes optimal to raise the interest rate above the natural rate, creating unemployment, in order to appreciate the currency.

Proposition 1 (Optimal Monetary Policy at $t = 2$). *There exists a level of dollar debt $\tilde{b}^*$ such that, when $b_1^* > \tilde{b}^*$, the optimal monetary policy allows for underemployment ($l_2 < \bar{l}$) in order to appreciate the currency. When this is the case, the optimal interest rate i_2^{opt} is increasing in both: (i) the level of dollar debt, b_1^* , and (ii) the external interest rate i_2^* .*

All proofs are detailed in Appendix A. These comparative statics are intuitive: when b_1^* is high, the balance sheet effect is stronger, reinforcing the need to appreciate the currency. Similarly, a higher external interest rate i_2^* creates a stronger depreciationary pressure, which reinforces the balance sheet effect and thus also calls for a higher domestic interest rate. As a result, an increase in the Federal Reserve rate worsens the emerging market's monetary policy dilemma: it becomes harder to achieve full employment because of balance sheet effects. These effects can be seen analytically by looking at the simplifying case where preferences are separable ($\rho = 1$).

Corollary 1 (Optimal Monetary Policy when $\rho = 1$). *When $\rho = 1$, the domestic interest rate set by the central bank to maximize welfare when $b_1^* > \tilde{b}^*$ can be expressed as:*

$$1 + i_2^{opt} = \frac{\beta}{1 - \phi} \left(r_1 \kappa \frac{b_1^*}{s - r_0} \right) (1 + i_2^*) \quad (20)$$

This expression visually links the forces at play. The level of dollar debt directly matters to monetary policy. It is amplified by the net worth multiplier $1/(s - r_0)$: when $s - r_0$ is low, a shock to net worth transmits to investment in capital more strongly, magnifying the effects of a policy hike. At the same time, aggregate demand is hurt by an

increase in the interest rate, and here this effect is disciplined by $1 - \phi$, the weight on non-tradable goods in the consumption basket at $t = 2$ of households. When $1 - \phi$ is larger, non-tradable consumption is relatively more important at $t = 2$, so the central bank puts more weight on aggregate demand, and implements a lower interest rate to minimize unemployment. Finally, the level of US interest rates matters: the domestic central bank is forced to follow the actions of the Fed to prevent excessive devaluation of its currency that results in adverse balance sheet effects, which is of course costly for aggregate demand.¹⁷

The Global Financial Cycle An immediate implication of Proposition 1 is that the presence of dollar debt creates a synchronization between the domestic policy decisions of emerging markets. Regardless of their own aggregate demand shocks, all central banks fearing balance sheet effects from dollar debt optimally respond in the face of tighter financial conditions in the US. For example, Proposition 1 illustrates the “taper tantrum” episode of 2013, where the central banks of emerging markets hiked after the Fed hinted that it would raise rates in the near future (Sahay, Arora, Arvanitis, Faruquee, N’Diaye and Griffole 2014). The following corollary provides an analytical expression for the cyclical behavior, and highlights that its strength depends directly on b_1^* .

Corollary 2. *The sensitivity of the domestic interest rate in an EME with respect to the dollar interest rate i_2^* is given by:*

$$\frac{d(1 + i_2)}{d(1 + i_2^*)} \propto \left[(b_1^*)^\rho (1 + i_2^*)^{1-\rho} \right]^{\frac{1}{\rho-1+\rho(1-\phi)+\phi}} \quad (21)$$

The fact that all countries privately act in a manner consistent with Proposition 1 can however create coordination issues. This is the focus of the next Section.

¹⁷Appendix D.1 additionally connects to the aggregate demand externality literature (Korinek and Simsek 2016, Farhi and Werning 2016, Guerrieri and Lorenzoni 2017, Fornaro and Romei 2019).

Discussion of Assumptions The model contains several assumptions to keep the results tractable, especially once we shift the focus to an equilibrium with a continuum of SOEs. In particular, the linearity of utility in the last period will allow for tractable expressions of capital flows, without altering the presence of a trade-off between balance sheet effects and aggregate demand. The fact that entrepreneurs need to borrow to finance production in period $t = 3$ while wages are rigid in period $t = 2$ allows for a clean separation of the two effects across time, resulting in analytical expressions. The fact that there is a single traded good (whose price is fixed by international conditions) eliminates terms-of-trade manipulation motives, such that the only reason to affect the exchange rate is because of the dollar debt revaluation channel. Similarly, the trade-off of the central bank is posited to be between aggregate demand and investment, but Appendix D.4 studies a version of the model with flexible wages (no aggregate demand shortfalls), but where the central bank trades off a higher cost of investment for unconstrained firms with relaxing financial frictions through the exchange rate for constrained firms. This leads to a similar expression for optimal monetary policy, featuring the exact same forces.

I also assumed an extreme form of currency mismatch: entrepreneurs only have revenues in local currency, and cannot hedge their exposure.¹⁸ It is straightforward to extend the framework to include a less extreme form of currency mismatch (see Appendix D.2), which only weakens the strength of the balance sheet effect. In a similar vein, it is assumed that the debt in dollars is due to foreigners: if the debt was due to households, the central bank should take into account the loss incurred by households by the appreciation of the currency. This would once again weaken the balance sheet effects, but given that entrepreneurs are constrained and households are not, an appreciation of the currency on the margin would still be desirable (in other words, redistribution from households to constrained entrepreneurs is valuable).

¹⁸See Alfaro, Calani and Varela (2021), Du and Huber (2023) , and Levin-Konigsberg, Stein, Averell and Castañon (2023) for work using micro-data to understand the heterogeneity of firms' hedging behavior.

4 Spillovers

The previous analysis studied a small open economy in isolation, taking the dollar rate i_2^* as given. In practice, many emerging economies are characterized by a high level of corporate debt dollarization (Benetrix, Gautam, Juvenal and Schmitz 2019). This raises questions about possible spillovers: when the Federal Reserve hikes US interest rates, they all face depreciationary pressures. Each of these countries would then find it optimal to implement a more restrictive policy in order to counter the net worth effects, as highlighted in Proposition 1. If global financial markets are frictional, this general movement towards higher rates will backfire through a novel bottleneck externality and create even further depreciationary pressures.

4.1 The World Economy

We keep the setup of Section 2, but this time with a continuum of identical and symmetric SOEs. Each country is indexed by j . In particular, country j at time $t = 2$ sets its nominal interest rate at $i_{2,j}$, taking all other interest rates as given. SOEs are in mass of 1, and we denote the aggregate variables without the subscript: $b_{1,j}^*$ thus refers to the dollar-denominated debt of country j , and b_1^* to the aggregate dollar debt of emerging economies. Importantly, we still assume that this continuum of small open economies is small relative to the rest of the world, such that the decision of this continuum has no impact on the price of tradables in dollars, still set to 1.¹⁹

¹⁹This distinguishes the spillovers identified in this paper from the work of Fornaro and Romei (2022) and Itskhoki and Mukhin (2023), where spillovers go through tradables inflation. In my framework, externalities arise even if the set of EMEs is too small to affect the equilibrium world price of tradable goods. See Section 4.5 for a discussion of the mechanisms and assumptions.

4.2 Global Financial Markets

We assume that global financial markets are frictional in the spirit of [Gabaix and Maggiori \(2015\)](#). Each country can only trade dollar-denominated bonds with a global arbitrageur that intermediates all capital flows from the continuum of EMEs to the rest of the world. The global arbitrageur offers an interest rate i_2^* that differs from the rate set by the Fed, $i_2^\$$, as compensation for intermediation. The key premise of [Gabaix and Maggiori \(2015\)](#) is that the *size* of capital flows drives this premium: in other words, intermediaries need to be compensated more if they do more intermediation. Appendix B offers several micro-foundations following [Gabaix and Maggiori \(2015\)](#), [Fanelli and Straub \(2021\)](#), [Bianchi and Lorenzoni \(2022\)](#), [Itskhoki and Mukhin \(2023\)](#) and [Coimbra and Rey \(2024\)](#) that all lead to the following expression for the rate offered by intermediaries:

$$i_2^* = i_2^\$ + \Gamma \cdot \int_j \left(c_{2,j}^T - y_{2,j}^T \right) dj \quad (22)$$

where $\int_j \left(c_{2,j}^T - y_{2,j}^T \right) dj$ is the aggregate net capital flow from the EMEs to the rest of the world. This expression simply states that, the larger the capital flows between our EMEs and the rest of the world, the larger the premium intermediaries need to charge individual countries for compensation. This can be due to agency frictions ([Gabaix and Maggiori 2015](#), [Coimbra and Rey 2024](#)) or intermediation costs ([Bianchi and Lorenzoni 2022](#), [Fanelli and Straub 2021](#), [Itskhoki and Mukhin \(2023\)](#)), as developed in detail in Appendix B.²⁰

²⁰Note that we assumed that households were starting at time $t = 2$ without any legacy debt, and hence the net capital flows $c_{2,j}^T - y_{2,j}^T$ correspond to the actual change in international lending that needs to be intermediated. It is straightforward to include past international debt or savings in this framework, and equation (22) would instead involve $c_{2,j}^T - y_{2,j}^T + d_1$, where d_1 denotes previous borrowing decisions. As will be clear in the rest of the paper, the spillovers come from the marginal *change* in net capital flow when central banks move the policy rate, and therefore the results are entirely unchanged.

4.3 Limit Case: a No-Spillover Result

Before studying spillovers in response to the Global Financial Cycle, it is instructive to look at the limiting case where spillovers are absent even with frictional intermediation, and to understand why. Therefore, I start by studying the case where preferences are separable between tradable and non-tradable consumption, i.e. when $\rho = 1$.

Since each country takes i_2^* as given, the optimal policy program is completely unchanged from the perspective of a single monetary authority. Now, however, the part $(1 + i_2^*)$ in Corollary 1 is endogenous. It must be determined by the aggregation of all capital flows from EMEs, as explicitly stated in the next lemma.

Lemma 1 (Limit Case: Equilibrium Capital Flows). *For $\rho = 1$, the aggregate capital flow from emerging economies towards the rest of the world at period $t = 2$ is given by:*

$$\frac{\phi}{\beta(1 + i_2^*)} - y_2^T \quad (23)$$

where the interest rate i_2^* can be approximated to, when small enough:

$$i_2^* = \frac{i_2^\$ + \Gamma \left(\frac{\phi}{\beta} - y_2^T \right)}{1 + \frac{\Gamma\phi}{\beta}} \quad (24)$$

A high Γ indicates a large friction on global financial markets, such that global intermediaries must be compensated more for intermediating capital flows from emerging economies. This results in a higher i_2^* compared to the Fed nominal rate when the group of EMEs is a net borrower, and vice versa.

The key feature of Lemma 1, however, is that the equation determining the capital flow of an EME, (23), does not depend on the domestic interest rate i_2 . This is a consequence of separable preferences, rather than a robust and general result. Indeed, when $\rho = 1$, the marginal utility of tradable consumption is independent of non-tradable consumption

(see Lane 2001, Bianchi and Lorenzoni 2022). This, in turn, means that any variation in the domestic policy rates of emerging economies will have no impact on aggregate capital flows, and thus on the dollar interest rate offered by intermediaries.²¹ In other words, there are no spillover effects on the exchange rates of other EMEs. The presence of dollar debt does create a Global Financial Cycle in which all central banks act synchronously after a US monetary policy shock (Corollary 2), but this is an efficient outcome.

4.4 Bottleneck Externalities

We are now ready to develop the main result of the paper. The previous part showed how aggregate capital flows were independent of the monetary policy stance of individual EMEs in the particular case of $\rho = 1$. However, as soon as $\rho > 1$, the opposite is true: an increase in the domestic policy rate, through the expenditure switching condition, increases the consumption of tradable goods. Through the lens of this model, this is equivalent to saying that the central bank seeks to appreciate its currency *via* a capital inflow. Since all central banks act in this way, each EME seeks to attract capital flows at the same time, in response to a US monetary policy shock. Due to limited space on the balance sheet of international intermediaries, this results in spillovers.

The intuition for this result comes from the juxtaposition of the three main equilibrium conditions, linking the Fed policy rate to the domestic policy rate of each EME:

$$\frac{d \ln(1 + i_{2,j})}{d \ln(1 + i_2^*)} = \frac{\rho(1 - \phi) + \phi}{\rho + (\rho - 1)(1 - \phi)} > 0 \quad (25)$$

$$c_{2,j}^T = \frac{\phi}{1 - \phi} \frac{1 + i_{2,j}}{1 + i_2^*} c_{2,j}^N \quad (26)$$

$$i_2^* = i_2^\$ + \Gamma \int_j \left(c_{2,j}^T - y_{2,j}^T \right) dj \quad (27)$$

²¹This is true whether central banks in EMEs are following the optimal policy result of Proposition 1 or not.

The first equation, (25), links the domestic policy rate to the dollar interest rate by trading off balance sheet effects and aggregate demand. The second equation, (26), is the usual expenditure switching condition. The last equation, (27), links the US rate to the dollar interest rate charged by global intermediaries given the aggregate size of capital flows.

A shock to the US domestic policy rate then transmits through EMEs by trickling down these equilibrium conditions. An EME central bank increases its domestic policy rate to counter depreciationary pressures and balance sheet effects, and attracts more capital inflows as a result. This change in global capital flows, if it occurs in all small emerging economies at the same time, increases the dollar rate they face because of frictions in international financial markets. This feeds back into domestic conditions by creating further depreciationary pressures in emerging economies, through UIP, requiring another round of tightening. At the heart of this feedback is a *bottleneck externality*: individual emerging countries do not internalize that their domestic policy rate decisions have spillovers on the aggregate size of capital flows, which impact the equilibrium determination of the dollar interest rate i_2^* through the balance sheet of global intermediaries.

Proposition 2 (Monetary Policy Spillovers). *If all EMEs increase their policy rates infinitesimally, the dollar rate also increases through a global intermediary feedback elasticity:*

$$\mathcal{C}(i_2, i_2^*) = \frac{d \ln(1 + i_2^*)}{d \ln(1 + i_2)} = \Gamma(\rho - 1) \frac{c_2^T}{1 + i_2^*} \frac{1 - \phi}{\rho} \quad (28)$$

The result of Proposition 2 highlights why two features are necessary to give rise to spillovers. First, if $\rho = 1$, then changes in the domestic rate do not affect the size of global capital flows that need to be intermediated, leaving the dollar interest rate constant. Second, if $\Gamma = 0$, global arbitrageurs do not face intermediation costs or frictions, and changes in flows do not affect the dollar interest rate they offer to EMEs. It is the combination of those two ingredients that yields the spillover result.

Because of these spillovers, one can understand the monetary policy response of indi-

vidual EMEs in rounds. At first, a US monetary policy shock translates one-for-one into a higher i_2^* , through the funding costs of intermediaries, which depreciates EME currencies. Each country then optimally follows Proposition 1 to fight the depreciation, at the cost of lowering aggregate demand. This monetary policy response however translates into a higher i_2^* because of this bottleneck externality: every country seeks to appreciate its currency by attracting capital flows, but they all draw capital flows from the same pool: the intermediary, with an inelastic supply of funds. Once again, faced with a higher i_2^* , each country tightens further, and we repeat this until convergence to the new equilibrium i_2^* . The following highlights how monetary policy responses are more aggressive in response to a Fed shock, when global financial markets are frictional ($\Gamma > 0$).

Proposition 3 (Spillovers and Tighter Monetary Policy). *The response of individual EMEs is amplified by the intermediation friction Γ on global financial markets:*

$$\frac{d \ln(1 + i_{2,j})}{di_2^\$} = \frac{\frac{d \ln(1+i_{2,j})}{di_2^*}}{1 - \mathcal{C}(i_2, i_2^*) \frac{d \ln(1+i_{2,j})}{d \ln(1+i_2^*)}} \quad (29)$$

where $\frac{d \ln(1+i_{2,j})}{d \ln(i_2^*)}$ was expressed in Corollary 2, and is the optimal policy response of a single EME to a shock to i_2^* .

This proposition directly implies that the Global Financial Cycle is amplified by the friction on global intermediation of capital flows. Each individual EME responds more to a Fed shock, resulting in higher unemployment in each EME. The bottleneck externality of Proposition 2 exactly quantifies this exacerbation of the Global Financial Cycle. The way it enters the expression through the denominator represents the convergence of the feedback effect of domestic decisions on the interest rate offered by intermediaries. The bigger the intermediary friction Γ , the larger the feedback effect. A corollary of this result is that Fed shocks will translate into more severe depreciations of EME currencies when

intermediary frictions are greater, something we verify in the data in Section 6.

This bottleneck externality immediately generates gains from coordination. In Appendix C, I show that the optimal interest rate implemented by central banks is lower when the response to a US tightening is coordinated. Here too, the gap between the two solutions is quantified by Γ and $\rho - 1$. This naturally leads to higher employment and higher output in EMEs, and dampens the Global Financial Cycle.²² Coordination is evidently hard to achieve and unrealistic in this setup. For this reason, Section 5 instead studies macroprudential policy and its associated spillovers.

4.5 Discussion of Results

Mechanisms and Assumptions Because the model presented here is stylized and has many moving parts, it is useful to detail which assumptions matter and which do not matter for the results. The conceptual point made in this paper is straightforward: if several countries adopt a policy stance that is more restrictive than their employment-stabilizing benchmark in order to limit depreciation, then pecuniary spillovers arise between these countries if two conditions are met: (i) increasing their policy rate results in more capital *inflow* ; and (ii) global financial markets are frictional, such that the size of *aggregate* capital flows determines the external interest rate at which these countries can finance themselves.

Condition (i) depends on parameters in a conventional model with non-separable preferences: it is the case when the elasticity of intertemporal substitution is lower than the elasticity of substitution between tradable and non-tradable goods. In the Cobb-

²²This force is related but different from the theory of dynamic terms-of-trade manipulation of Costinot, Lorenzoni and Werning (2014). In Costinot et al. (2014), a country has an incentive to manipulate the interest rate to promote savings if it grows faster than the rest of the world, or borrowing if it grows more slowly. In my theory, countries have an incentive to coordinate in order to appreciate their currencies, irrespective of their relative growth levels. See Appendix C for a further discussion of this point.

Douglas/linear framework of my model, this is equivalent to $\rho > 1$.²³

Condition (ii) is met when global arbitrageurs view capital flows from different symmetric SOEs as substitutes. This condition would not be satisfied if one were to write a model where markets are segmented *among* symmetric SOEs. For instance, if we assume that each country faces a different arbitrageur that has costs of intermediation, each country would face a different interest rate $i_{2,j}^*$ determined by its own capital flows, but would not create spillovers on the dollar premium faced by other countries. My paper thus highlights the importance of looking at the entire portfolio of intermediaries rather than a country-by-country view. The magnitude of these spillovers is then directly linked to *cross-elasticities*: how much a shock to flows from one EME impacts the price of other emerging market currencies. [An and Huber \(2024\)](#) show that these cross-elasticities can be large even across G10 currencies.²⁴ [Bräuning, Du and Stein \(2026\)](#) document significant spillovers across desks within a bank: a shock to one asset class propagates to others through risk allocation. [Caldara et al. \(2024\)](#) show empirically that a synchronous tightening is associated with a more pronounced deterioration in financial conditions, consistent with my mechanism. This cross-elasticity logic has a direct implication for exchange-rate comovement: if EME currencies are priced through a *common* intermediary balance sheet, then EME currencies should move more together when intermediation frictions are greater. We show that this is the case in Section 6.

My paper thus connects to the literature on the importance of investor base ([Bertaut, Bruno and Shin 2021](#); [Burger, Warnock and Warnock 2018](#); [Belz and Breckenfelder 2025](#);

²³This case seems more relevant for EMEs, who typically fight capital outflows by raising rates ([Matschke, Sattiraju and von Ende-Becker 2023](#)). See [Bianchi and Coulibaly \(2022\)](#) on how the prudential role of monetary policy depends on the relative value of these parameters in a model with aggregate demand externalities.

²⁴Deviations from the frictionless benchmark are likely to be much greater for EMEs than for advanced economies. For example, [Cerutti and Zhou \(2024\)](#), [De Leo, Keller and Zou \(2024b\)](#) and [Dao and Gourinchas \(2025\)](#) show that CIP deviations in EMEs are larger and more volatile than most G10 currencies. Around the 2013 Taper Tantrum episode, where many EMEs synchronously tightened their policy rates to contain the depreciation of their currencies, [Cerutti and Zhou \(2024\)](#) show that the average CIP deviation in their sample of EMEs increased to 300 basis points in September 2013.

Haddad and Muir 2025) and highlights its central role in generating spillovers across EMEs. This brings a new perspective in the study of spillovers: in earlier models as in Fornaro and Romei (2022) and Bianchi and Coulibaly (2024) spillovers arise because all countries try to run a trade deficit, but in equilibrium trade has to be balanced. In my model, all economies in the continuum of EMEs can attract capital flows in equilibrium (and they do). But because of the friction in global financial markets, this can still entail inefficiencies among them, through the premium on the dollar rate.

I also assumed that the continuum of EMEs is small relative to the rest of the world, which implies that the price of tradable goods is fixed and exogenous. This served two purposes: first, it substantially simplifies the analysis. Second, it helps to demonstrate that my spillovers do not come from tradable price inflation (as in Itskhoki and Mukhin 2023). I discuss in Appendix G an extension that allows for tradable price inflation.

Capital Inflows vs. Outflows While the externality uncovered here works through the *marginal change* in capital flows caused by movements in the policy rate, it is actually independent of the sign and size of these flows in equilibrium. What matters is that a monetary tightening attracts relatively more capital flows, leading to an increase in i_2^* . For instance, it is perfectly possible that, in equilibrium, the set of EMEs considered is a net saver, and so the wedge $i_2^* - i_2^\$$ is negative: these EMEs face a lower interest rate on their savings than if they had access directly to the Fed rate. By tightening simultaneously, the EMEs end up saving less, which brings the wedge between the two rates $i_2^* - i_2^\$$ closer to zero. This increase in i_2^* still results in a more depreciated currency for each country, triggering the same balance sheet effects for firms exposed to dollar liabilities.

Synchronisation and Direction of Monetary Policy Response in EMEs In my model, the synchronization of policy rates arises because of the presence of dollar debt on the balance sheet of corporations. This is, of course, not the only way to arrive at such a result:

for instance, [Fornaro and Romei \(2022\)](#) consider a shock to the global demand for tradables. Using the prevalence of dollar debt in EMEs (see the literature review) as the main building block of the model serves two purposes. First, it creates synchronization specifically vis-a-vis US monetary policy shock, consistent with the Global Financial Cycle ([Rey 2013](#), [Cristi et al. 2024](#)), and shifts the focus of monetary policy coordination between EMEs to the response to dollar shocks. Second, it allows me to study ex-ante policies, which is the focus of the next section. Finally, notice that it is not important for my results that EMEs actually *tighten* when the Fed does: what matters is that EMEs implement a *relatively more* restrictive monetary policy to avoid too much depreciation, compared to the case where they would only target full employment. Individual central banks do not internalize that by all easing even more, the premium on the dollar interest rate would be even lower, helping the constrained entrepreneurs as well as aggregate demand. See Section [7.3](#) for further discussion, and Appendix [H](#) for the formal analysis.

5 Excessive Dollar Debt and Macroprudential Policy

The previous analysis derived the welfare implications of having an outstanding level of dollar debt b_1^* on the balance sheet of entrepreneurs. This level, however, is the result of a maximization problem by the same entrepreneurs at $t = 1$, which can also be influenced by policy. We relegate the analytical details of this part to the appendix for conciseness, and only highlight the main results here.

Supply of Funds Entrepreneurs must issue debt to finance an investment of fixed size, K_1 . They can either issue in local currency, or in dollars to foreign investors.²⁵ Various papers in the literature have proposed theories that explain why firms issue debt in dol-

²⁵Whether the debt in local currency is due to foreign or domestic investors does not matter for the results. For dollar debt, see the discussion at the end of Section [3](#).

lars, exposing themselves to a currency mismatch (McKinnon and Pill 1998; Burnside et al. 2001; Schneider and Tornell 2004; Gutierrez, Ivashina and Salomao 2023). I remain agnostic about the underlying mechanism as my work focuses on the global consequences for monetary policy. As such, I assume a linear supply of funds for both peso and dollar liabilities:

$$\frac{b_1^*}{1 + \hat{i}_1^*} = \omega^*(\hat{i}_1^* - i_1^*) \quad \text{and} \quad \frac{b_1}{1 + \hat{i}_1} = \omega(\hat{i}_1 - i_1) \quad (30)$$

To issue debt in some currency, investors need to compensate lenders with a premium over the relevant interest rate, promising a rate that is linearly increasing with the size of issuance. Entrepreneurs then issue debt to minimize repayments, taking into account the equilibrium exchange rate at $t = 2$, e_2 . We ignore in the rest of the paper limit cases where all issuance is done in only one currency.²⁶

Issuance Externalities and Moral Hazard Dollar issuance creates a time-consistency problem. At $t = 2$, a larger stock of dollar debt, b_1^* , gives the central bank a stronger incentive to support the currency, since an appreciation relaxes entrepreneurs' financing constraint and raises productive investment. Anticipating this response, entrepreneurs find dollar borrowing more attractive at $t = 1$: a stronger expected currency lowers the domestic-currency value of repayment.

These two relations reinforce one another. A policy that would deliver full employment for a threshold debt level $\tilde{b}^*$ cannot generally be sustained: if entrepreneurs expect that policy, they choose dollar debt above $\tilde{b}^*$; once that debt is outstanding, the central bank optimally tightens more to mitigate the balance-sheet effect. The resulting equilibrium features excessive dollar issuance ex-ante and inefficiently tight monetary policy

²⁶If all debt is issued in local currency, monetary policy does not face a trade-off at $t = 2$ in response to a Fed tightening, and so there are no bottleneck externalities or need for macroprudential policies. If all issuance is done in dollars, the social planner can only mitigate the previous externalities by discouraging dollar issuance so much that we are back to an interior solution, which is what we study here.

ex-post.²⁷

Proposition 4 (Dollar Debt Issuance Externalities). *Entrepreneurs do not internalize that issuance denominated in dollars has a pecuniary effect on future policy rates, which then reduces aggregate demand and employment in equilibrium:*

$$\frac{dl_2}{db_1^*} < 0 \quad (31)$$

Making entrepreneurs internalize these externalities can be achieved through a simple tax on dollar debt issuance, whose proceeds are rebated lump-sum to entrepreneurs. It is important to note, however, that such a policy has a cost: entrepreneurs optimally issue debt in dollars up to the point where the interest rates are equalized. As such, forcing entrepreneurs to issue more in domestic currency will result in a more expensive cost of debt and therefore in lower net worth in period $t = 2$. These costs must be balanced by the benefits of relaxing the constraint faced by the central bank at $t = 2$.

Proposition 5 (Macroprudential Trade-off). *When $\rho = 1$, the optimal tax on dollar issuance reduces the amount issued in dollars, b_1^* , such that:*

$$\frac{1 - \phi}{b_1^*} = -\beta \frac{r_1 \kappa}{s - r_0} \frac{db_1}{db_1^*} \quad (32)$$

The left-hand side of this expression encodes the benefits of a lower debt in dollars: less forced to resist the depreciation of its currency, the central bank can hike less and thus stay closer to full employment. The right-hand side expresses the other side of the trade-off: by discouraging dollar debt issuance, the social planner makes it more expensive for entrepreneurs to issue debt in general, resulting in lower net worth and thus lower

²⁷For sufficiently strong strategic complementarities, issuance can instead admit multiple equilibria. We focus on the unique-equilibrium case. See [Chang and Velasco \(2006\)](#) and [Coppola et al. \(2023\)](#) for related analyses of multiplicity in currency-denominated borrowing.

investment in productive capital.²⁸

Macroprudential Policies on the Global Scale With a continuum of EMEs and frictional global financial markets, what is the impact of these macroprudential policies? The main insight of this section is that, while monetary policy has negative spillovers on other EMEs, macroprudential policies aimed at reducing dollar debt issuance have *positive* spillovers. Their implementation dampens the coordination problems of central banks. The following proposition expresses how a tax on dollar issuance spills over to the determination of the dollar interest rate faced by all EMEs, through a reduction of b_1^* .

Proposition 6 (Macroprudential Policy Spillovers). *Individual policymakers in EMEs do not internalize that their tax on dollar debt issuance spills over to the equilibrium determination of the external interest rate they will later face:*

$$\frac{d(1 + i_2^*)}{db_1^*} = \Gamma(\rho - 1) \frac{(1 - \phi)}{\rho + (\rho - 1)(1 - \phi)} \frac{c_2^T}{b_1^*} \quad (33)$$

The reduction of b_1^* through the use of ex-ante macroprudential policies automatically allows the central bank to be less hawkish at $t = 2$. By tightening less, the EME attracts less capital flows (as long as $\rho > 1$), reducing the premium that global intermediaries require as compensation (as long as $\Gamma > 0$). This marginally lowers the dollar interest rate when implemented on an EME scale, reducing the depreciationary pressures that each central bank is trying to combat. By implementing macroprudential policies aimed at lowering the amount of corporate debt issued in dollars, each country ameliorates the

²⁸ **Acharya and Vij (2022)** show that interest rate caps on foreign currency debt issuance were successful in limiting access to dollar borrowing by riskier firms in India. Consistent with these results, **Bergant, Grigoli, Hansen and Sandri (2024)** empirically show that tighter macroprudential regulation allows monetary policy in EMEs to respond more countercyclically to global financial shocks, but do not find evidence that capital controls provide similar benefits. In addition, they show that macroprudential measures targeted at FX exposure are particularly effective. Through the lens of my model, this is because the externalities constraining the central banks are rooted in the presence of dollar-denominated debt on private balance sheets, which in itself is orthogonal to the question of whether capital inflows are excessive.

trade-off that all central banks face in the future. However, due to positive spillovers, the *globally optimal* level of macroprudential policy is even higher.²⁹

6 Suggestive Evidence of the Mechanism

While it is hard to find direct evidence of the externality highlighted in this paper, this section proposes three exercises that are aimed at testing the key building blocks and mechanisms of the model. Data description and robustness checks are relegated to Appendix I.

As explained in Section 4.5, the externality exists when the intermediation between EMEs and the rest of the world is frictional, and when the aggregate quantity intermediated is what matters for the pricing of EME currencies. I start by showing a natural result that is consistent with the intermediary asset pricing view and the discussion after Proposition 3 (Haddad and Muir 2021, Coimbra and Rey 2024): a Fed tightening depreciates EME currencies substantially more when intermediary balance sheets are more constrained. Table 1 shows this by interacting standard US monetary surprises with a measure of intermediary tightness from He, Kelly and Manela (2017).

Next, we test whether EME currencies behave as if they are tied to a common intermediary balance sheet, and whether that link becomes stronger when intermediary capital is scarce.³⁰ Table 2 shows that the loading on the common FX factor for EME currencies rises sharply when intermediary capital is scarce, even controlling for VIX. Thus, in states where the intermediary is severely constrained, EME currencies become more tightly tied together. We repeat the same exercise for G10 currencies, and find that the

²⁹Bergant et al. (2024) also find evidence of positive cross-country spillovers for macroprudential policy among emerging markets. See Jeanne (2014), Acharya and Bengui (2018) and Caballero and Simsek (2020) for other channels of macroprudential policy spillovers.

³⁰On the factor structure of currencies, see, e.g. Lustig, Roussanov and Verdelhan (2011); Mueller, Stathopoulos and Vedolin (2017); Verdelhan (2018); Chernov, Dahlquist and Lochstoer (2023); and in particular Kalemli-Özcan and Varela (2024) for EMEs.

Table 1: Fed shock amplification through the intermediary balance sheet

	(1): B.S.	(2): J.K.
Fed shock	10.2*** (4.26)	10.4*** (3.40)
Fed shock $\times$ Intermediary tightness	5.5*** (3.24)	4.2** (2.45)
Observations	2592	2728
Within R^2	0.089	0.082

Notes. The dependent variable is the monthly percent depreciation of each EME currency against the USD, $100(\ln e_{i,t} - \ln e_{i,t-1})$. The table estimates panel regressions of these returns on a US monetary-policy surprise, its interaction with lagged intermediary tightness, as well as standard controls: lagged tightness, the change in VIX, and the lagged own currency return. Intermediary tightness is defined as minus the standardized [He et al. \(2017\)](#) intermediary capital ratio, so higher values correspond to tighter balance sheets. Column (1) uses the [Bauer and Swanson \(2023\)](#) monetary surprise; column (2) uses the [Jarociński and Karadi \(2020\)](#) pure-monetary shock. All regressions include currency fixed effects. t -statistics in parentheses use standard errors clustered by month. Sample 1997–2023 for (1) and 1997–2025 for (2).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

loading on the common factor is much less sensitive to intermediary tightness, consistent with the idea that these balance sheets are fairly segmented between advanced and emerging economies, and that global intermediation frictions mainly matter for emerging markets.

Finally, we turn to the aggregate quantity point. We test this using two measures of bank-intermediated exposures provided by the BIS: Locational Banking Statistics (*LBS*), which measure USD cross-border bank claims, and Consolidated Banking Statistics (*CBS*), which measure international bank claims. We construct each quantity state separately for EME exposures and for G10 exposures, and ask whether it changes the sensitivity of individual currencies to their group common factor. The results are reported in Table 3.

Consistent with the model, we find that when the intermediated quantity state is built from EME exposures, the common-factor sensitivity of EME currencies rises, while the sensitivity of G10 currencies does not. As a placebo, we also test the same hypothesis

Table 2: Currency comovement and intermediary capacity

	EME	G10
Common factor	0.793*** (51.18)	0.911*** (123.17)
Common factor $\times$ Intermediary tightness	0.138*** (5.21)	0.010 (1.14)
Common factor $\times$ VIX	-0.034** (-2.55)	-0.004 (-0.60)

Notes. The dependent variable is the monthly percent depreciation of each currency against the USD. The common factor is the leave-one-out mean monthly return of the other currencies in the relevant group. Each currency's return is regressed on the common factor, its interaction with lagged intermediary tightness, its interaction with lagged VIX, and the level of lagged tightness, with currency fixed effects. Intermediary tightness is minus the standardized He et al. (2017) intermediary capital ratio. *t*-statistics in parentheses use standard errors clustered by month. Sample 1997–2025 (1999–2025 for G10 currencies because of the Euro).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

using G10 exposures. In that case, there is no significant effect on either EME or G10 currencies. This pattern suggests that the relevant state variable is not simply exposure to advanced-economy currencies, but the quantity of EME exposure intermediated by global banks. This is consistent with the mechanism in Section 4: intermediary constraints price EME currencies because EME exposures load on a segmented balance-sheet capacity, and the aggregate quantity of those exposures determines the shadow cost of intermediation.

7 Extensions

7.1 Foreign Exchange Interventions

As mentioned above, the inefficiencies highlighted in Section 4 are fundamentally generated from the use of a single instrument (monetary policy) to control both employment and the exchange rate (Korinek 2017). This extension considers the optimal use of a sec-

Table 3: Aggregate quantity intermediated and currency pricing

	Quantity from EME exposures		Quantity from G10 exposures	
	LBS	CBS	LBS	CBS
EME currencies	0.022** (1.99)	0.047** (2.24)	0.006 (0.42)	-0.005 (-0.08)
G10 currencies	-0.004 (-0.79)	-0.003 (-0.34)	-0.001 (-0.16)	-0.013 (-0.96)

Notes. The dependent variable is the monthly percent depreciation of each currency against the USD. Each entry reports how the sensitivity of individual currency returns to the group common factor (computed as for Table 2) changes with the aggregate quantity proxy. The first two columns build the quantity state from EME exposures; the last two build the same state from G10 exposures. LBS is based on BIS Locational Banking Statistics: the trailing four-quarter sum of FX- and break-adjusted changes in USD cross-border bank claims on non-banks in the relevant country group. CBS is based on BIS Consolidated Banking Statistics: year-on-year growth in international bank claims on the relevant country group. Both quantity states are standardized using expanding means and standard deviations. The regressions also control for the common factor itself, its interactions with VIX and HKM intermediary tightness, the levels of the quantity state and tightness, and currency fixed effects. *t*-statistics in parentheses use standard errors clustered by month. Sample 1997–2025 (start in 1999 for G10 because of the Euro).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

ond instrument, FX interventions (FXIs). FX interventions are an attractive instrument in the setup studied here: they act on the exchange rate directly, thus allowing the interest rate to focus on aggregate demand management. By relaxing the trade-off faced by the central bank, FX interventions can intuitively improve welfare.

Appendix E provides an extension where the central bank has access to a pre-determined level of reserves to influence the equilibrium exchange rate. When reserves are ample enough, the central bank can target full employment while using FXI to target balance sheet effects, leading to a constrained efficient equilibrium for the continuum of SOEs. When reserves are constrained, however, the central bank still allows for some output gap, but less than in the case without access to FXIs. In particular, if implemented by all EMEs, FX interventions have *positive* spillovers across countries, leading to a lower i_2^* and more appreciated currencies, as well as higher output and employment in EMEs.

From an *ex-ante* perspective, however, the welfare results are ambiguous. This is because the amount of dollar-denominated liabilities is endogenous to policy at $t = 2$, from the optimal issuance strategy of private firms (Section 5). By expecting FX interventions, firms expect an appreciated currency, which feeds back into their private decisions and reinforces balance sheet effects. This can go as far as lowering welfare: not having access to reserves would incentivize firms to issue more in local currency, easing the trade-off faced by the central bank when choosing its domestic policy rate. This reinforces the need for macroprudential measures to address the resulting moral hazard, a point first made by Jeanne (2016) and Acharya and Krishnamurthy (2019) in different settings.

7.2 Intermediary Capacity and the Dollar

Although my model focuses on the interplay of dollar-denominated debt and US monetary policy shocks, recent empirical work has also demonstrated that dollar shocks are crucial for understanding fluctuations in global leverage (Shin 2016). Appendix F proposes a variation of the main framework to account for these forces. Two main insights emerge from this exercise. First, tighter financial conditions due to a dollar appreciation (or a US tightening) exacerbate the spillovers highlighted above. Second, the model points towards asymmetric effects of such shocks. When the continuum of EMEs is a net saver relative to the rest of the world, they benefit from tighter financial conditions, as this appreciates their currencies. The opposite happens when the continuum of EMEs is a net borrower. It is irrelevant whether one particular country is a net saver or borrower. Since the external interest rate it faces, i_2^* , depends on aggregate capital flows, what matters is the *aggregate* current account position of EMEs going through intermediaries.

7.3 Cyclicalities of Emerging Markets' Policy Rates

Recent work by [De Leo, Gopinath and Kalemli-Ozcan \(2024a\)](#) called into question the idea that emerging markets tighten their domestic policy rates in response to an increase in the Fed funds rate. Although the main model presented in the core of the paper does feature this synchronization of interest rates, it is not a necessary ingredient for the spillover and inefficiency results. Appendix [H](#) presents a simple extension that can account for the empirical results of [De Leo et al. \(2024a\)](#), while keeping all the other normative results unchanged.³¹

The additional ingredient in Appendix [H](#) is to assume that a Fed tightening shock also has an impact through a trade channel. Specifically, an increase in $i_2^{\$}$ is accompanied by an increase in the price of tradable goods. This depresses aggregate demand in emerging economies. All else being equal, this leads individual central banks to want to implement a lower interest rate. If the trade channel is strong enough, the optimal monetary response in the face of the shock is indeed to lower the domestic policy rate, but not enough to implement full employment because of the trade-off with balance sheet effects.

Importantly, the spillovers identified in Section [4](#) are still at work, for the precise reason that the trade-off is identical. Emerging markets' currencies are still excessively depreciated. A regional central bank acting for all emerging economies would prefer to ease the policy rate even more, which would result in less aggregate capital inflows. As before, this would reduce the bottleneck externality working through global intermediaries, easing the trade-off faced by each EME. What matters is thus not that EMEs tighten with the Fed, but that the GFC forces EMEs to be away from full employment and to also care about the absolute level of their exchange rate. This is for the same reason discussed in Section [4.5](#): when entrepreneurs are against their borrowing constraint, EME central banks always prefer to have a marginally more appreciated currency. Individu-

³¹[Pelin and Mendoza-Fernández \(2025\)](#) argue instead that EME central banks systematically move with the Fed, using a dataset of monetary policy meetings.

ally, they do not internalize that if everyone eases even more, that would lead to a lower premium on the dollar interest rate through the balance sheet of intermediaries, which would help the entrepreneurs as well as aggregate demand. The contractionary bias in domestic monetary policy is thus unchanged.

Finally, [De Leo et al. \(2024a\)](#) also document that, in spite of this monetary easing by EMEs, *market rates* tend to increase in response to a Fed tightening. This can also be understood through the extension presented in Appendix F. Building on the work of [Shin \(2016\)](#), an increase in $i_2^{\$}$ now has three effects: (i) a depreciation of EMEs' currencies ; (ii) an increase in the price of tradable goods through the trade channel ; and (iii) an increase in the global intermediation friction. This helps account for the fact that, while central banks in EMEs lower their domestic policy rates, the increase in the friction Γ results in a *higher* i_2^* , since intermediaries require a higher premium to intermediate capital flows. Importantly, not only are the inefficiencies highlighted in this paper still present, they are amplified by the increase in the friction Γ since this exacerbates the bottleneck externality.

8 Conclusion

This paper shows that intermediation frictions in global financial markets have profound normative implications for emerging markets. When multiple EMEs try to defend their currencies, global intermediaries must intermediate a larger quantity of flows, resulting in a higher premium on the dollar interest rate. This feeds back into further depreciation pressures in individual EMEs. It then leads to inefficiently high interest rates and inefficiently low levels of employment. Importantly, this effect goes through the balance sheet of global intermediaries. As such, it does not depend on whether the set of EMEs is large enough to influence the equilibrium determination of the world interest rate faced by all countries, but rather on the underlying frictions in the global financial system.

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A Proofs and Derivations

A.1 Equilibrium Setup and Useful Identities

The utility function of households in the SOE is given by:

$$U_2 = \frac{1}{1-\rho} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{1-\rho} + \beta (c_3^N + c_3^T) \quad (\text{A.1})$$

The budget constraints are:

$$p_2^T c_2^T + p_2^N c_2^N = p_2^T y_2^T + w_2 l_2 + \Pi_2 + \frac{1}{1+i_2} a_3 + \frac{1}{1+i_2^*} e_2 a_3^* \quad (\lambda_2) \quad (\text{A.2})$$

$$p_3^N c_3^N + p_3^T c_3^T + a_3 + e_3 a_3^* = p_3^T y_3^T + \bar{w} \bar{l} + \Pi_3 \quad (\lambda_3) \quad (\text{A.3})$$

with $p_t^T = e_t$ and $p_t^N = \bar{w} = 1$. We thus end up with the following first-order conditions for households:

$$\frac{\lambda_2}{1+i_2} = \beta \lambda_3 \quad (\text{A.4})$$

$$\frac{\lambda_2}{1+i_2^*} e_2 = \beta \lambda_3 e_3 \quad (\text{A.5})$$

$$\phi(c_2^T)^{-1} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{1-\rho} = \lambda_2 p_2^T \quad (\text{A.6})$$

$$(1-\phi)(c_2^N)^{-1} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{1-\rho} = \lambda_2 p_2^N \quad (\text{A.7})$$

$$1 = \lambda_3 p_3^N \quad (\text{A.8})$$

$$1 = \lambda_3 p_3^T \quad (\text{A.9})$$

By taking the ratio between the T and NT conditions, we can write non-tradable demand as:

$$c_2^N = \left(\frac{\phi}{1-\phi} \frac{p_2^N}{p_2^T} \right)^{-1} c_2^T = \left(\frac{\phi}{1-\phi} \frac{\bar{w}}{e_2} \right)^{-1} c_2^T \quad (\text{A.10})$$

The savings/borrowing decisions in peso and dollar also yield the standard UIP condition since there is no uncertainty:

$$1 + i_2 = (1 + i_2^*) \frac{e_3}{e_2} \quad (\text{A.11})$$

Using the fact that the price of tradables is equal to the exchange rate, and that the price of non-tradables is $\bar{w} = 1$ since firms are perfectly competitive, we have the following

demand function for non-tradable goods:

$$c_2^N = \frac{1-\phi}{\phi} e_2 c_2^T \quad (\text{A.12})$$

Plugging the UIP condition we have the familiar condition for expenditure switching:

$$c_2^N = \left(\frac{\phi}{1-\phi} \frac{(1+i_2)}{(1+i_2^*)} \right)^{-1} c_2^T \quad (\text{A.13})$$

We also have:

$$(1-\phi)(c_2^N)^{-1} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{1-\rho} = \beta(1+i_2) \quad (\text{A.14})$$

where the consumption composite is preventing us from having a simple expression only involving the interest rate and the consumption of non-tradables. This implies that the consumption levels can be expressed as:

$$(c_2^T)^{-1} = \frac{\beta(1+i_2^*)}{\phi} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{\rho-1} \quad (\text{A.15})$$

$$(c_2^N)^{-1} = \frac{\beta(1+i_2)}{1-\phi} \left((c_2^T)^\phi (c_2^N)^{1-\phi} \right)^{\rho-1} \quad (\text{A.16})$$

These two equations determine (implicitly) the consumption of tradables, as a function of the domestic and international interest rates. Use the first-order condition for tradable consumption to write:

$$(c_2^T)^{-1-\phi(\rho-1)} = \frac{\beta(1+i_2^*)}{\phi} (c_2^N)^{(1-\phi)(\rho-1)} \quad (\text{A.17})$$

$$\implies c_2^T = \left(\frac{\beta(1+i_2^*)}{\phi} \right)^{\frac{1}{\phi(1-\rho)-1}} (c_2^N)^{\frac{(1-\phi)(\rho-1)}{\phi(1-\rho)-1}} \quad (\text{A.18})$$

Which, when incorporated in the non-tradable consumption first-order condition, gives:

$$(1 - \phi)(c_2^N)^{-1+(1-\phi)(1-\rho)+\phi(1-\rho)\frac{(1-\phi)(\rho-1)}{\phi(1-\rho)-1}} \left(\frac{\beta(1+i_2^*)}{\phi} \right)^{\frac{\phi(1-\rho)}{\phi(1-\rho)-1}} = \beta(1+i_2) \quad (\text{A.19})$$

After some algebra:

$$(1 - \phi)(c_2^N)^{\frac{\rho}{\phi(1-\rho)-1}} \left(\frac{\beta(1+i_2^*)}{\phi} \right)^{\frac{\phi(1-\rho)}{\phi(1-\rho)-1}} = \beta(1+i_2) \quad (\text{A.20})$$

Full employment arises thus when:

$$(1 - \phi) \left(\bar{l} + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - \frac{1+i_2^*}{1+i_2^{full}} b_1^*}{s - r_0} \right)^{\frac{\rho}{\phi(1-\rho)-1}} \left(\frac{\beta(1+i_2^*)}{\phi} \right)^{\frac{\phi(1-\rho)}{\phi(1-\rho)-1}} = \beta(1+i_2^{full}) \quad (\text{A.21})$$

Finally, the gross capital flow from a country is:

$$\frac{1}{1+i_2^*} a_{3,j}^* = c_{2,j}^T + b_{1,j}^* - y_{2,j}^T \quad (\text{A.22})$$

and the net is:

$$\frac{1}{1+i_2^*} a_{3,j}^* - b_{1,j}^* = c_{2,j}^T - y_{2,j}^T \quad (\text{A.23})$$

A.2 Proof of Proposition 1

Deviation from Full Employment: This proof rests on two arguments: (i) keeping employment fixed at the full employment level, the benefits of appreciating the currency are unbounded above when b_1^* increases ; (ii) the costs of decreasing employment are getting arbitrarily close to 0 when b_1^* increases.

Start from point (i). The benefits of appreciating the currency, in terms of marginal utility, are given by:

$$\frac{dc_3^N}{de_2} = -b_1^* \frac{r_1 \kappa}{s - r_0} \quad (\text{A.24})$$

This comes from a decrease in the consumption of non-tradable at $t = 2$ to finance investment, in proportion:

$$\frac{dc_2^N}{de_2} = b_1^* \frac{s \kappa}{s - r_0} \quad (\text{A.25})$$

where $r_1 > s$ (for investment to be profitable for entrepreneurs). But in terms of welfare, this change in the exchange rate (everything else being fixed) is beneficial if and only if:

$$U_{2,N} s < \beta r_1 \quad (\text{A.26})$$

With optimality, we also have that $U_{2,N} = \beta(1 + i_2^{full})$ so we only have to compare $s(1 + i_2^{full})$ to r_1 . Equation (A.21) however shows that, for b_1^* large enough, the full employment interest rate is negative. Since $r_1 > s$, for large enough b_1^* it implies that $s(1 + i_2^{full}) < r_0$. Since r_0 is fixed, the welfare benefits are growing towards $+\infty$ when i_2^{full} goes towards -1 .

Going to point (ii), we now factor in the costs of allowing for under-employment on the margin. We can rewrite the equivalent of equation (A.21) outside of full employment with some function g simply as:

$$l_2 + \frac{s \kappa (1 + i_2^*)}{s - r_0} \frac{b_1^*}{1 + i_2} = g(i_2) \quad (\text{A.27})$$

where g is a decreasing function that does not depend on b_1^* . Differentiating we get:

$$\frac{dl_2}{di_2} = \underbrace{g'(i_2)}_{<0} + b_1^* \frac{s \kappa (1 + i_2^*)}{(s - r_0)(1 + i_2)^2} \quad (\text{A.28})$$

We can thus always find a b_1^* high enough such that the decrease in employment, provoked by the increase in the interest rate, is close enough to 0 such that the overall welfare benefits are strictly positive.

Constrained Efficiency: The maximization program of the central bank is:

$$\begin{aligned} \max_{l_2, c_2^T, e_2} \frac{1}{1-\rho} & \left[(c_2^T)^\phi \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right)^{1-\phi} \right]^{1-\rho} \\ & + \beta \left(\bar{l} + r_1 \kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right) \\ & + \beta \left(y_3^T + (1 + i_2^*) (y_2^T - b_1^* - c_2^T) \right) \quad (\text{A.29}) \end{aligned}$$

with the constraints:

$$l_2 \leq \bar{l} \quad (\text{A.30})$$

$$e_2 c_2^T = \frac{\phi}{1-\phi} \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right) \quad (\text{A.31})$$

$$\beta \frac{1 + i_2^*}{e_2} = (1 - \phi) \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right)^{(1-\phi)(1-\rho)-1} (c_2^T)^{\phi(1-\rho)} \quad (\text{A.32})$$

where the second constraint is the expenditure switching condition (A.12), and the third is the Euler equation (A.18), where in both cases c_2^N is replaced by its value according to market clearing. Let us denote by ν the Lagrange multiplier associated with the slackness condition (A.30), m_T the Lagrange multiplier on (A.31), and ϵ the Lagrange multiplier on (A.32). We focus on the case where b_1^* is high enough that it is optimal to allow for under-employment, so that $\nu = 0$. Writing the first-order conditions for l_2 , c_2^T and e_2 , and using the optimality conditions (A.15) and (A.16) to substitute out the marginal utilities,

the constrained efficiency conditions simplify to:

$$\beta(1 + i_2) - m_T \frac{\phi}{1 - \phi} - \epsilon((1 - \phi)(1 - \rho) - 1) \frac{\beta(1 + i_2)}{c_2^N} = 0 \quad (\text{A.33})$$

$$m_T e_2 - \epsilon(1 - \phi)(1 - \rho) \frac{\beta(1 + i_2)}{c_2^T} = 0 \quad (\text{A.34})$$

and

$$\begin{aligned} s\kappa \frac{b_1^*}{s - r_0} \beta(1 + i_2) - \beta r_1 \kappa \frac{b_1^*}{s - r_0} + m_T \left(c_2^T - \frac{\phi}{1 - \phi} s\kappa \frac{b_1^*}{s - r_0} \right) \\ - \epsilon \beta \frac{1 + i_2}{e_2} - \epsilon((1 - \phi)(1 - \rho) - 1) s\kappa \frac{b_1^*}{s - r_0} \frac{\beta(1 + i_2)}{c_2^N} = 0 \end{aligned} \quad (\text{A.35})$$

The first two conditions pin down the multipliers. Combining (A.33) and (A.34) yields $\beta(1 + i_2) = m_T \Omega_M$ and $c_2^N = -\epsilon \Omega_\epsilon$, where

$$\Omega_M = \frac{\phi}{1 - \phi} \frac{1 + 2(1 - \phi)(\rho - 1)}{(1 - \phi)(\rho - 1)} > 0, \quad \Omega_\epsilon = 1 + 2(1 - \phi)(\rho - 1) > 0, \quad (\text{A.36})$$

which satisfy $\frac{\phi}{1 - \phi} \Omega_\epsilon = (1 - \phi)(\rho - 1) \Omega_M$. The third condition (A.35) then simplifies sharply: the terms proportional to $s\kappa \frac{b_1^*}{s - r_0}$ have as common coefficient exactly the left-hand side of (A.33), and therefore vanish. This leaves

$$m_T c_2^T - \epsilon \beta \frac{1 + i_2}{e_2} = \beta r_1 \kappa \frac{b_1^*}{s - r_0}. \quad (\text{A.37})$$

Substituting $\beta(1 + i_2) = m_T \Omega_M$, $c_2^N = -\epsilon \Omega_\epsilon$ and the expenditure-switching relation $c_2^N = \frac{1 - \phi}{\phi} e_2 c_2^T$, and using the link between Ω_M and Ω_ϵ , this becomes

$$(1 + i_2) c_2^T = \frac{\phi}{1 - \phi} \frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{A.38})$$

This tells us that an increase in b_1^* must be matched by an increase in $(1 + i_2)c_2^T$. Similarly, it also implies that an increase in i_2^* must leave $(1 + i_2)c_2^T$ constant. Now rewrite this equation in terms of non-tradable consumption, which has an easier intuition:

$$(1 + i_2)^2 c_2^N = (1 + i_2^*) \frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{A.39})$$

Now we simply need to use the aggregate demand condition, (A.20). This relation stipulates that:

$$(1 - \phi)(c_2^N)^{\frac{\rho}{\phi(1-\rho)-1}} \left(\frac{\beta(1 + i_2^*)}{\phi} \right)^{\frac{\phi(1-\rho)}{\phi(1-\rho)-1}} = \beta(1 + i_2) \quad (\text{A.40})$$

Which implies that:

$$(1 + i_2)^2 c_2^N = \left(\frac{1 - \phi}{\beta} \right)^2 \left(\frac{\beta(1 + i_2^*)}{\phi} \right)^{\frac{2\phi(1-\rho)}{\phi(1-\rho)-1}} (c_2^N)^{1 + \frac{2\rho}{\phi(1-\rho)-1}} \quad (\text{A.41})$$

The crucial point here is that the exponent on c_2^N is equal to:

$$1 + \frac{2\rho}{\phi(1-\rho)-1} = \frac{\phi(\rho-1) + 1 - 2\rho}{\phi(\rho-1) + 1} \quad (\text{A.42})$$

$$= \frac{(1-\rho) + \rho(\phi-1) - \phi}{\phi(\rho-1) + 1} < 0 \quad (\text{A.43})$$

This implies that, all else being equal, c_2^N is decreasing in b_1^* and thus that i_2 is increasing in b_1^* . Finally, we conclude with the comparative statics with respect to i_2^* (the Global Financial Cycle). Relation (A.38) demonstrates that the quantity $(1 + i_2)c_2^T$ must stay constant when i_2^* increases. But using the private expenditure switching condition:

$$c_2^N = \frac{1 - \phi}{\phi} \frac{(1 + i_2^*)}{(1 + i_2)} c_2^T \quad (\text{A.44})$$

$$\implies (1 + i_2)^2 c_2^N = \frac{1 - \phi}{\phi} (1 + i_2^*) (1 + i_2) c_2^T \quad (\text{A.45})$$

The right-hand side is thus constituted of a term that increases, $1 + i_2^*$, and a constant term $(1 + i_2)c_2^T$. Hence the left-hand side must also increase: $(1 + i_2)^2 c_2^N$ and we just showed that this means that c_2^N decreases and $1 + i_2$ increases.

A.3 Proof of Corollary 1

This can be seen by deriving the closed-form solution for the optimal interest rate. Start from:

$$(1 + i_2)^2 c_2^N = (1 + i_2^*) \frac{1 + 2(\rho - 1)(1 - \phi)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{A.46})$$

Then use (A.20) to replace the non-tradable consumption:

$$(1 + i_2)^2 \left(\frac{\beta(1 + i_2)}{1 - \phi} \right)^{-\frac{1 + \phi(\rho - 1)}{\rho}} \left(\frac{\beta(1 + i_2^*)}{\phi} \right)^{\frac{\phi(\rho - 1)}{\rho}} = (1 + i_2^*) \frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{A.47})$$

Collecting the $(1 + i_2)$ terms and raising both sides to the power ρ :

$$(1 + i_2)^{\rho - 1 + \rho(1 - \phi) + \phi} = (1 + i_2^*)^{\rho - \phi(\rho - 1)} \left(\frac{\phi}{1 - \phi} \right)^{\phi(\rho - 1)} \frac{\beta}{1 - \phi} \left(\frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \right)^{\rho} \quad (\text{A.48})$$

Define the following positive constant:

$$\Omega = \left[\left(\frac{\phi}{1 - \phi} \right)^{\phi(\rho - 1)} \frac{\beta}{1 - \phi} \left(\frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} \right)^{\rho} \right]^{\frac{1}{\rho - 1 + \rho(1 - \phi) + \phi}} \quad (\text{A.49})$$

such that we can express the optimal monetary policy as:

$$1 + i_2 = \Omega \left(r_1 \kappa \frac{b_1^*}{s - r_0} \right)^{\frac{\rho}{\rho - 1 + \rho(1 - \phi) + \phi}} (1 + i_2^*)^{\frac{\rho(1 - \phi) + \phi}{\rho - 1 + \rho(1 - \phi) + \phi}} \quad (\text{A.50})$$

Now plug in $\rho = 1$ to get a simpler expression:

$$1 + i_2^{opt} = \frac{\beta}{1 - \phi} \left(r_1 \kappa \frac{b_1^*}{s - r_0} \right) (1 + i_2^*) \quad (\text{A.51})$$

A.4 Proof of Corollary 2

Use the solution from (A.50):

$$1 + i_2 = \Omega \left(r_1 \kappa \frac{b_1^*}{s - r_0} \right)^{\frac{\rho}{\rho - 1 + \rho(1 - \phi) + \phi}} (1 + i_2^*)^{\frac{\rho(1 - \phi) + \phi}{\rho - 1 + \rho(1 - \phi) + \phi}} \quad (\text{A.52})$$

Which also directly gives the sensitivity of the interest rate with respect to the world interest rate:

$$\frac{d \ln(1 + i_2)}{d \ln(1 + i_2^*)} = \frac{\rho(1 - \phi) + \phi}{\rho - 1 + \rho(1 - \phi) + \phi} \quad (\text{A.53})$$

This yields after basic algebra:

$$\frac{di_2}{di_2^*} \propto (b_1^*)^{\frac{\rho}{\rho - 1 + \rho(1 - \phi) + \phi}} (1 + i_2^*)^{\frac{1 - \rho}{\rho - 1 + \rho(1 - \phi) + \phi}} \quad (\text{A.54})$$

leading to the expression in the text.

A.5 Proof of Lemma 1

Net capital flows are defined by:

$$\frac{1}{1 + i_2^*} a_{3,j}^* - b_{1,j}^* = c_{2,j}^T - y_{2,j}^T \quad (\text{A.55})$$

With separable preferences, the consumption level of tradables is straightforward, simply using the private first-order condition:

$$c_{2,j}^T = \frac{\phi}{\beta(1+i_2^*)} \quad (\text{A.56})$$

Using the global intermediary condition and that all countries are identical:

$$i_2^* = i_2^S + \Gamma \left[\frac{\phi}{\beta(1+i_2^*)} - y_2^T \right] \quad (\text{A.57})$$

For a small i_2^* this can be approximated as (first-order to make it linear):

$$i_2^* = \frac{i_2^S + \Gamma \frac{\phi - \beta y_2^T}{\beta}}{1 + \frac{\Gamma \phi}{\beta}} \quad (\text{A.58})$$

A.6 Proof of Proposition 2

Net capital flows are defined by:

$$\frac{1}{1+i_2^*} a_{3,j}^* - b_{1,j}^* = c_{2,j}^T - y_{2,j}^T \quad (\text{A.59})$$

where only $c_{2,j}^T$ is endogenous from the point of view of period $t = 2$. And we also have the expenditure switching relation:

$$c_{2,j}^T = \frac{\phi}{1-\phi} \frac{(1+i_{2,j})}{(1+i_2^*)} c_{2,j}^N \implies \frac{d \ln c_{2,j}^T}{d \ln(1+i_{2,j})} = 1 + \frac{d \ln c_{2,j}^N}{d \ln(1+i_{2,j})} \quad (\text{A.60})$$

And the last term is coming from the aggregate demand condition (A.20):

$$\frac{d \ln c_{2,j}^T}{d \ln(1+i_{2,j})} = 1 + \frac{\phi(1-\rho) - 1}{\rho} = \frac{(\rho-1)(1-\phi)}{\rho} > 0 \quad (\text{A.61})$$

since $\rho > 1$. This leads to:

$$\frac{d(\frac{a_{3,j}^*}{1+i_2^*} - b_{1,j}^*)}{d \ln(1+i_{2,j})} = c_{2,j}^T \frac{(\rho-1)(1-\phi)}{\rho} \quad (\text{A.62})$$

And finally, differentiating the global intermediary condition yields the spillover result:

$$\frac{d \ln(1+i_2^*)}{d \ln(1+i_2)} = \Gamma(\rho-1) \frac{c_2^T}{1+i_2^*} \frac{1-\phi}{\rho} \quad (\text{A.63})$$

A.7 Proof of Proposition 3

Start from the log-relation between i_2 and i_2^* , coming from the optimal policy solution (A.50):

$$\ln(1+i_2) = \frac{\rho(1-\phi) + \phi}{\rho + (\rho-1)(1-\phi)} \ln(1+i_2^*) + \text{Constant} \quad (\text{A.64})$$

Then plug-in the equilibrium condition from the global arbitrageurs, which stipulates that (using A.61):

$$d \ln(1+i_2^*) = \frac{1}{1+i_2^*} \left[di_2^\$ + \Gamma(\rho-1) \frac{1-\phi}{\rho} c_2^T d \ln(1+i_2) \right] \quad (\text{A.65})$$

which gives by differentiating (A.64):

$$d \ln(1+i_2) = \frac{\rho(1-\phi) + \phi}{\rho + (\rho-1)(1-\phi)} \frac{1}{1+i_2^*} \left[di_2^\$ + \Gamma(\rho-1) \frac{1-\phi}{\rho} c_2^T d \ln(1+i_2) \right] \quad (\text{A.66})$$

and this implies equivalently:

$$\frac{d \ln(1+i_2)}{di_2^\$} = \frac{\frac{d \ln(1+i_2)}{di_2^*}}{1 - \Gamma(\rho-1) \frac{d \ln(1+i_2)}{di_2^*} \frac{1-\phi}{\rho} c_2^T} \quad (\text{A.67})$$

A.8 Issuance and Macprudential Policy: Derivations

Entrepreneurs' program at $t = 1$ is:

$$\min_{b_1, b_1^*} \quad b_1 + e_2 b_1^* \quad \text{s.t.} \quad \frac{b_1}{1 + \hat{i}_1} + \frac{e_1 b_1^*}{1 + \hat{i}_1^*} = K_1 \quad (\text{A.68})$$

An interior solution exists when a simple UIP condition using the equilibrium interest rates is verified: $e_2/e_1 = 1 + \hat{i}_1/1 + \hat{i}_1^*$. Since firms are raising K_1 in total, we can write:

$$K_1 = \frac{b_1}{1 + \hat{i}_1} + \frac{e_1 b_1^*}{1 + \hat{i}_1^*} = \omega(\hat{i}_1 - i_1) + e_1 \omega^*(\hat{i}_1^* - i_1^*) \quad (\text{A.69})$$

$$K_1 = (1 + \hat{i}_1)(\omega + e_1 \omega^* \frac{e_1}{e_2}) - [\omega(1 + i_1) + e_1 \omega^*(1 + i_1^*)] \quad (\text{A.70})$$

leading to the equilibrium interest rates of borrowing:

$$1 + \hat{i}_1 = \frac{K_1 + \omega(1 + i_1) + e_1 \omega^*(1 + i_1^*)}{\omega + e_1 \omega^* \frac{e_1}{e_2}}; 1 + \hat{i}_1^* = \frac{K_1 + e_1 \omega^*(1 + i_1^*) + \omega(1 + i_1)}{\omega \frac{e_2}{e_1} + e_1 \omega^*} \quad (\text{A.71})$$

From this, we get:

$$\hat{i}_1^* - i_1^* = \frac{K_1 + \omega \left(1 + i_1 - \frac{e_2}{e_1} (1 + i_1^*) \right)}{\omega \frac{e_2}{e_1} + e_1 \omega^*} \quad (\text{A.72})$$

which finally yields:

$$b_1^* = \omega^* \frac{K_1 + e_1 \omega^*(1 + i_1^*) + \omega(1 + i_1)}{\left(\omega \frac{e_2}{e_1} + e_1 \omega^* \right)^2} \left(K_1 + \omega \left(1 + i_1 - \frac{e_2}{e_1} (1 + i_1^*) \right) \right) \quad (\text{A.73})$$

Proof of Proposition 4 Using (A.50), the optimal exchange rate set by the central bank is given by (for $\Gamma = 0$, hence $i_2^* = i_2^\$$):

$$e_2^{opt} = \frac{1 + i_2^\$}{1 + i_2^{opt}} = \Omega^{-1} \left(r_1 \kappa \frac{b_1^*}{s - r_0} \right)^{\frac{-\rho}{\rho - 1 + \rho(1 - \phi) + \phi}} (1 + i_2^*)^{1 - \frac{\rho(1 - \phi) + \phi}{\rho - 1 + \rho(1 - \phi) + \phi}} \quad (\text{A.74})$$

We isolate the b_1^* component to understand the fixed-point problem: $e_2^{opt} = A (b_1^*)^{\frac{-\rho}{\rho+(\rho-1)(1-\phi)}}$ where $A > 0$ collects all the terms that do not depend on b_1^* (the constant Ω^{-1} , the level of i_2^* , and the structural parameters). The aggregate demand condition, as before, reads $(c_2^N)^{\frac{-\rho}{(\rho-1)\phi+1}} = Cste \times e_2^{-1}$. Substituting the optimal exchange rate:

$$(c_2^N)^{\frac{-\rho}{(\rho-1)\phi+1}} = Cste \times A(b_1^*)^{\frac{\rho}{\rho+(\rho-1)(1-\phi)}} \implies d \ln c_2^N = -\frac{(\rho-1)\phi+1}{\rho+(\rho-1)(1-\phi)} d \ln b_1^* \quad (\text{A.75})$$

Now plug in the optimal exchange rate on the budget constraint for NT and differentiate:

$$dc_2^N = dl_2 + \frac{(\rho-1)(1-\phi)}{\rho+(\rho-1)(1-\phi)} \frac{s\kappa}{s-r_0} e_2^{opt} db_1^* \quad (\text{A.76})$$

Merging the aggregate demand condition with the budget constraint condition gives the externality result:

$$\frac{dl_2}{db_1^*} = -\frac{1}{\rho+(\rho-1)(1-\phi)} \left((1+(\rho-1)\phi) \frac{c_2^N}{b_1^*} + (\rho-1)(1-\phi) \frac{s\kappa}{s-r_0} e_2^{opt} \right) < 0 \quad (\text{A.77})$$

We can directly express the welfare losses that come from an increase in b_1^* in a very concise manner when $\rho = 1$:

Corollary 3. *When $\rho = 1$, an increase in b_1^* yields welfare losses at $t = 2$ equal to:*

$$\frac{d\mathcal{W}}{db_1^*} = -\frac{1-\phi}{b_1^*} \quad (\text{A.78})$$

This comes from two useful features of the problem in that specific case: (i) the path of tradable goods consumption is independent of the nominal interest, and (ii) the optimal policy can be simply expressed as:

$$(1+i_2)c_2^T = \frac{\phi}{1-\phi} r_1 \kappa \frac{b_1^*}{s-r_0} \quad (\text{A.79})$$

But the usual private first-order conditions, when preferences are separable, also give us that:

$$c_2^T = \frac{\phi}{\beta(1+i_2^*)}; \quad \text{and} \quad c_2^N = \frac{1-\phi}{\beta(1+i_2)} \quad (\text{A.80})$$

In terms of optimal policy, this yields the following easy characterization:

$$\frac{\beta}{e_2^{opt}} = \frac{r_1 \kappa}{1-\phi} \frac{b_1^*}{s-r_0} \quad (\text{A.81})$$

which means that the product $e_2 b_1^*$ is constant on the optimal policy point. At the same time, welfare can be expressed as follows:

$$\mathcal{W} = (1-\phi) \ln c_2^N + \beta c_3^N \quad (\text{A.82})$$

$$= (1-\phi) \ln \left(e_2 \frac{1-\phi}{\beta(1+i_2^*)} \right) + \beta \left(\bar{l} + r_1 \kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s-r_0} \right) \quad (\text{A.83})$$

Staying on the optimal policy path, since $e_2 b_1^*$ is constant the derivative with respect to b_1^* is simply $\frac{d\mathcal{W}}{db_1^*} = (1-\phi) \frac{d \ln e_2^{opt}}{db_1^*}$, and using (A.81) this yields the stated result $\frac{d\mathcal{W}}{db_1^*} = -\frac{1-\phi}{b_1^*}$.

Proof of Proposition 5 With the framework of optimal debt structure of period $t = 1$, a reduction in b_1^* must be compensated by a corresponding increase in b_1 in order to finance capital expenditures K_1 . Specifically, since $\frac{b_1^*}{1+\hat{i}_1^*} = \omega^*(\hat{i}_1^* - i_1^*)$ holds, we can differentiate with respect to b_1^* to find the corresponding change in the interest rate on dollar debt:

$$db_1^* = \omega^* d\hat{i}_1^* (1 + 2\hat{i}_1^* - i_1^*); db_1 = \omega d\hat{i}_1 (1 + 2\hat{i}_1 - i_1) \quad (\text{A.84})$$

But since in equilibrium both sources of financing add up to K_1 , it has to be that $\omega d\hat{i}_1 = -\omega^* e_1 d\hat{i}_1^*$, implying that:

$$\frac{e_1 db_1}{1 + 2\hat{i}_1 - i_1} = -\frac{db_1^*}{1 + 2\hat{i}_1^* - i_1^*} \implies e_1 \frac{db_1}{db_1^*} = -\frac{1 + 2\hat{i}_1 - i_1}{1 + 2\hat{i}_1^* - i_1^*} \quad (\text{A.85})$$

Going back to the welfare analysis when $\rho = 1$, we can then find the optimal debt issuance in dollars simply by using:

$$\frac{d\mathcal{W}}{db_1^*} = -\frac{1-\phi}{b_1^*} - \beta \frac{r_1 \kappa}{s - r_0} \frac{db_1}{db_1^*} \quad (\text{A.86})$$

since $e_2 b_1^*$ is constant on the whole optimal policy path. Macroprudential policy is thus optimal when this is equal to 0.

Proof of Proposition 6 Recall that the dollar rate is determined by the intermediary equation, implying that $\frac{d(1+i_2^*)}{db_1^*} = \Gamma \frac{dc_2^T}{db_1^*}$. Using the optimal policy characterization (A.38) and the closed-form solution for the interest rate (A.50):

$$\frac{d \ln c_2^T}{d \ln b_1^*} = \frac{(\rho - 1)(1 - \phi)}{\rho + (\rho - 1)(1 - \phi)} \implies \frac{d(1 + i_2^*)}{db_1^*} = \Gamma(\rho - 1) \frac{(1 - \phi)}{\rho + (\rho - 1)(1 - \phi)} \frac{c_2^T}{b_1^*} \quad (\text{A.87})$$

Internet Appendix

B Micro-foundations for Global Intermediaries

This part offers explicit micro-foundations for the expressions postulated in (22). Since these setups all lead to the same expression, I do not take a stance on which precise foundations are more realistic. The crucial feature that generates the spillover results is that the dollar premium faces by EMEs depends on the *aggregate* flows intermediated. This is consistent with the recent empirical evidence of [Bräuning et al. \(2026\)](#): risk limits and trading activities at the bank-level are intertwined across desks. They rationalize this evidence with a model in which dealers face a fixed VaR budget that must be allocated across multiple asset markets, similarly to the micro-foundation that follows [Coimbra and Rey \(2024\)](#) in what follows, and which also leads to the reduced-form expression used in the paper.

Bianchi and Lorenzoni (2022): The authors postulate that the global arbitrageur has a quadratic cost function for intermediating all capital flows coming from the continuum of EMEs. Denote by $cf_{3,j}$ the net capital flow coming from EME j between period 2 and 3:

$$\Phi \left(\int_j cf_{3,j} dj \right) = \frac{\Gamma}{2} \left(\int_j cf_{3,j} dj \right)^2 \quad (\text{B.88})$$

The net profits of intermediaries are then given by:

$$\int_j (1 + i_2^*) cf_{3,j} dj - (1 + i_2^\$) \int_j cf_{3,j} dj - \Phi \left(\int_j cf_{3,j} dj \right) \quad (\text{B.89})$$

Profit maximization for the global arbitrageur thus leads to the same expression as in (22) under quadratic costs, using simply that $cf_{3,j} = c_{2,j}^T - y_{2,j}^T$.

Gabaix and Maggiori (2015): The authors assume that financiers are subject to a financial friction: after taking positions, the financiers can divert a portion of the funds they intermediate (see also **Maggiori (2022)** for a review). To stay close to the notation, denote by q the position taken by financiers. Financiers maximize the value of the firm:

$$V = (i_2^* - i_2^\$)q \quad (\text{B.90})$$

If they divert the funds, the household gets back only a fraction $1 - \Gamma|q|$ of their funds. This implies that the financiers are subject to the financial constraint:

$$V \geq |q|\Gamma|q| = \Gamma q^2 \quad (\text{B.91})$$

The maximization program is thus simply:

$$\max_q V \quad \text{such that} \quad V \geq \Gamma q^2 \quad (\text{B.92})$$

Since the financiers would like to borrow or lend as much as possible for any non-zero return ($i_2^* \neq i_2^\$$) the constraint binds:

$$(i_2^* - i_2^\$)q = \Gamma q^2 \quad (\text{B.93})$$

Substituting q by the equilibrium quantity of flows intermediated, $\int_j c_{2,j}^T - y_{2,j}^T dj$ yields expression (22) in the main text again.

Fanelli and Straub (2021): Global arbitrageurs can borrow directly on US financial markets at the rate set by the Fed, $i_2^\$$, but they are subject to a net open position limit $1/\Gamma > 0$, and face heterogeneous participation costs. In particular, intermediary g has costs of g per dollar invested. This implies that the intermediary g solves the following profit-

maximization program:

$$\max_{x_g \in [-1/\Gamma, 1/\Gamma]} x_g(i_2^* - i_2^\$) - g|x_g| \quad (\text{B.94})$$

Therefore, the marginal intermediary verifies:

$$\bar{g} = |i_2^* - i_2^\$| \quad (\text{B.95})$$

We denote by $\int_j (c_{2,j}^T - y_{2,j}^T) dj$ the aggregate net capital flow from the continuum of SOEs to the rest of the world. Since each intermediary is against the net position constraint, a total of $\bar{g}$ intermediaries have a position of $1/\Gamma$, which yields the equilibrium relationship between interest rates and aggregate flows:

$$i_2^* = i_2^\$ + \Gamma \cdot \int_j (c_{2,j}^T - y_{2,j}^T) dj \quad (\text{B.96})$$

Coimbra and Rey (2024): In this framework, intermediaries are subject to a VaR constraint. To adapt this to my model without adding risk on the side of individual countries, I assume the following. By investing in a quantity q in EMEs, global intermediaries face random compliance costs $q^2\zeta$. They are then required to maintain a position such that the probability that their investment loses money is less than some probability α . This means that intermediaries are required to ensure that:

$$\Pr \left(q(i_2^* - i_2^\$) - q^2\zeta \leq 0 \right) \leq \alpha \quad (\text{B.97})$$

Assuming that ζ follows a uniform distribution on $[0, \Xi]$, where Ξ is understood to be large enough such that a loss is a non-zero probability event, this yields:

$$1 - \frac{i_2^* - i_2^\$}{\Xi q} = \alpha \quad (\text{B.98})$$

One simply now needs to define $\Gamma = \Xi(1 - \alpha)$ to get:

$$i_2^* - i_2^\$ = \Gamma q \quad (\text{B.99})$$

And once again, substituting q by the equilibrium quantity of flows intermediated, $\int_j c_{2,j}^T - y_{2,j}^T dj$ yields expression (22) in the main text.

Itskhoki and Mukhin (2023): Again, some assumptions are necessary to adapt this model in a setting without risk. At the core of the influential theory of **Itskhoki and Mukhin (2023)** is that capital flows must be intermediated by risk-averse agents exposed to the nominal exchange rate risk coming from noise traders. As a result, the wedge between the two rates i_2^* and $i_2^\$$ will be driven by the compensation for risk required by the intermediary. To stay in the spirit of their framework, one can then assume that intermediaries' positions are subject to a noise shock ϵ , with variance σ_ϵ^2 . With mean-variance preferences, the maximization program of an intermediary with risk-aversion ω boils down to:

$$\max_q \left[(1 + i_2^*)q - (1 + i_2^\$)q \right] - \frac{\omega}{2} \text{Var}((1 + \epsilon)q) \quad (\text{B.100})$$

The usual optimal portfolio choice then yields:

$$q = \frac{i_2^* - i_2^\$}{\omega \sigma_\epsilon^2} \quad (\text{B.101})$$

And once again, substituting q by the equilibrium quantity of flows intermediated, $\int_j c_{2,j}^T - y_{2,j}^T dj$ we get:

$$i_2^* = i_2^\$ + \omega \sigma_\epsilon^2 \cdot \int_j (c_{2,j}^T - y_{2,j}^T) dj \quad (\text{B.102})$$

which is the main expression (22), but where Γ is endogenized by the risk-aversion level of intermediaries and the volatility of the noise shock.³²

C Monetary Policy Coordination

What does this externality result imply in terms of possible coordination of monetary policies across EMEs? Were all individual SOEs to delegate their monetary policy to a supra-national authority, the optimal monetary policy response would be different. This is because the coordinated planner would internalize the impact of its interest rate decision on Equation (27): tightening creates an upward pressure on the interest rate that these EMEs face, which feeds back in the form of depreciationary pressures hurting the balance sheet of entrepreneurs. The next proposition formally characterizes optimal monetary policy when countries can (and commit to) coordinate.

Proposition 7 (Coordinated Monetary Policy). *Around an equilibrium where $a_3^* = 0$, and to the first-order in Γ , optimal monetary policy with coordination implements a lower interest rate, and reacts less to US monetary policy shocks. The difference between the optimal interest rate with coordination, i_2^C , and the decentralized interest rate i_2^{unC} is equal to:*

$$i_2^{unC} - i_2^C \approx \frac{\Gamma}{e_2} \frac{c_2^T (1 - \phi)^2 (\rho - 1)^2}{(2(1 - \phi)(\rho - 1) - 1)^3} \quad (\text{C.103})$$

Employment and output are thus higher in each emerging country in the coordinated equilibrium than in the un-coordinated one.

Once again, the gap between the two solutions is quantified by Γ and $\rho - 1$. This proposition and its implications for the global equilibrium can be seen graphically in Fig-

³²In [Itskhoki and Mukhin \(2023\)](#), intermediaries are exposed to currency risk. By stabilizing the exchange rate, the central bank can thus act on the value of Γ , a force that is absent in my framework and yields rich policy implications in their model.

ure 1. This figure shows the best responses of central banks in the uncoordinated and coordinated equilibria. The difference between the two is the bottleneck externality highlighted above. The equilibrium is at the intersection of central banks' best response, and the "T locus" that traces the relation between the dollar premium faced by EMEs and the individual domestic rates in EMEs, given the intermediation friction given by equation (22). By internalizing how their capital inflow will create congestion and result in a higher dollar premium offered by intermediaries, central banks in the coordinated equilibrium raise rates by less (in proportion to the externality in Proposition 2) leading to less depreciation and an equilibrium with higher employment and output. The intuition can also be understood as follows. The level of interest rate that guarantees full employment is an *absolute* level, independent of the actions of other countries. The exchange rate that mutes balance sheet effects stemming from dollar debt is a *relative* level, that depends on the quantity of capital flows of other countries. Thus, these two are conflicting when countries are hit by a global shock such as a Fed tightening.

Although the coordinated solution increases the welfare of all EMEs, each country has an incentive to deviate. That deviation is exactly quantified by the expression (C.103) in Proposition 7: given the equilibrium dollar interest rate achieved by the regional central banker, the private solution requires a further appreciation of the currency *via* an interest rate increase. Coordination is thus hard to achieve and unrealistic in this setup.

Note finally that, once the continuum of EMEs are allowed to coordinate, the regional social planner acts as a monopolist on the external interest rate it faces: it takes into account equation (22). This creates an incentive to manipulate "dynamic terms-of-trade," as explained by Costinot et al. (2014) (see also Farhi and Werning 2014). In this two-period model, this is simply equivalent to limiting tradable consumption when there is a trade deficit at $t = 2$. The idea is that individual countries do not take into account that, by all running a trade deficit, they increase their borrowing costs. The regional planner takes this into account (and vice versa for running trade surpluses, which lowers the interest

rate on their savings). To highlight that my coordination result comes from the feedback effect of individual interest rate decisions on exchange rates and balance sheets, the next proposition looks at the equilibrium around $a_3^* = 0$, such that there is no incentive to manipulate interest rates for dynamic terms-of-trade motives. In general, both forces are present. The crucial difference is that the force that I highlight is always going in the same direction, to appreciate the currency.

C.1 Proof of Proposition 7

The central bank problem, when taking into account how aggregate capital flows impact the interest rate i_2^* , is:

$$\begin{aligned} \max_{l_2, c_2^T, e_2} \frac{1}{1-\rho} & \left[(c_2^T)^\phi \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right)^{1-\phi} \right]^{1-\rho} \\ & + \beta \left(\bar{l} + r_1 \kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right) \\ & + \beta \left(y_3^T + (1 + i_2^*) (y_2^T - b_1^* - c_2^T) \right) \end{aligned} \quad (\text{C.104})$$

with the constraints:

$$l_2 \leq \bar{l} \quad (\text{C.105})$$

$$e_2 c_2^T = \frac{\phi}{1-\phi} \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right) \quad (\text{C.106})$$

$$\beta \frac{1 + i_2^*}{e_2} = (1 - \phi) \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right)^{(1-\phi)(1-\rho)-1} (c_2^T)^{\phi(1-\rho)} \quad (\text{C.107})$$

$$i_2^* = i_2^\$ + \Gamma(c_2^T - y_2^T) \quad (\text{C.108})$$

Call ι the Lagrange multiplier on the new constraint. The first-order conditions are then given by (respectively for l_2 , c_2^T , e_2 , and i_2^* , assuming that we deviate from full-employment as before so $\nu = 0$):

$$\beta(1 + i_2) - m_T \frac{\phi}{1 - \phi} - \epsilon((1 - \phi)(1 - \rho) - 1) \frac{\beta(1 + i_2)}{c_2^N} = 0 \quad (\text{C.109})$$

$$m_T e_2 - \epsilon(1 - \phi)(1 - \rho) \frac{\beta(1 + i_2)}{c_2^T} - \Gamma \iota = 0 \quad (\text{C.110})$$

$$\begin{aligned} s\kappa \frac{b_1^*}{s - r_0} \beta(1 + i_2) - \beta r_1 \kappa \frac{b_1^*}{s - r_0} + m_T \left(c_2^T - \frac{\phi}{1 - \phi} s\kappa \frac{b_1^*}{s - r_0} \right) \\ - \epsilon \beta \frac{1 + i_2}{e_2} - \epsilon((1 - \phi)(1 - \rho) - 1) s\kappa \frac{b_1^*}{s - r_0} \frac{\beta(1 + i_2)}{c_2^N} = 0 \end{aligned} \quad (\text{C.111})$$

and

$$\beta(y_2^T - b_1^* - c_2^T) + \epsilon \frac{\beta}{e_2} + \iota = 0 \quad (\text{C.112})$$

As discussed in the text, the part $\beta(y_2^T - b_1^* - c_2^T)$ comes from terms-of-trade externality *à la* [Costinot et al. \(2014\)](#). To mute this effect, we look at the equilibrium around 0 borrowing ($a_3^* = 0$). This yields:

$$\iota = -\epsilon \frac{\beta}{e_2} \quad (\text{C.113})$$

We can combine (C.111) and (C.109) as in the SOE case to get:

$$m_T c_2^T - \epsilon \beta \frac{1 + i_2}{e_2} = \beta r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{C.114})$$

while combining (C.109) and (C.110) yields a similar expression as in the SOE case but with an extra term:

$$\beta(1 + i_2^*) \frac{1 - \phi}{\phi} - \epsilon(2(1 - \phi)(1 - \rho) - 1) \frac{\beta(1 + i_2)}{c_2^T} + \Gamma \epsilon \frac{\beta}{e_2} = 0 \quad (\text{C.115})$$

This makes clear that the value of the multiplier ϵ takes a similar form to without coordination, whose effect is through the Γ term:

$$\epsilon \left[(2(1-\phi)(1-\rho) - 1) \frac{\beta(1+i_2)}{c_2^T} - \Gamma \frac{\beta}{e_2} \right] = \beta(1+i_2^*) \frac{1-\phi}{\phi} \quad (\text{C.116})$$

To the first-order in Γ , we can thus write the deviation from the previous ϵ as:

$$\epsilon = \frac{e_2 c_2^T}{2(1-\phi)(1-\rho) - 1} \frac{1-\phi}{\phi} \left(1 + \frac{\Gamma}{e_2} \frac{c_2^T}{2(1-\phi)(1-\rho) - 1} \right) \quad (\text{C.117})$$

Then start again from (C.109):

$$m_T = \frac{1-\phi}{\phi} \beta(1+i_2) \left(1 - \frac{\epsilon}{c_2^N} ((1-\phi)(1-\rho) - 1) \right) \quad (\text{C.118})$$

Replace m_T with (C.114):

$$c_2^T \frac{1-\phi}{\phi} \beta(1+i_2) \left(1 - \frac{\epsilon}{c_2^N} ((1-\phi)(1-\rho) - 1) \right) - \epsilon \beta \frac{1+i_2}{e_2} = \beta r_1 \kappa \frac{b_1^*}{s-r_0} \quad (\text{C.119})$$

Group together the nominal domestic rate:

$$(1+i_2) \left[\frac{1-\phi}{\phi} c_2^T - \frac{\epsilon}{e_2} ((1-\phi)(1-\rho)) \right] = r_1 \kappa \frac{b_1^*}{s-r_0} \quad (\text{C.120})$$

where one can see that plugging $\rho = 1$ delivers the solution found in (A.51). Using the expression in (C.117), we get:

$$(1+i_2) c_2^T \frac{1-\phi}{\phi} \frac{1+2(1-\phi)(\rho-1)}{1+(1-\phi)(\rho-1)}$$

$$+ \underbrace{\frac{\Gamma}{e_2} \frac{1-\phi}{\phi} \frac{(c_2^T)^2(1-\phi)(\rho-1)}{(2(1-\phi)(1-\rho)-1)^2}}_{>0} = r_1 \kappa \frac{b_1^*}{s-r_0} \quad (\text{C.121})$$

The first and last term are the optimality condition in the SOE case. The middle term comes from internalizing Γ , which immediately indicates that the coordinated central bank implements a lower interest rate as long as $\Gamma > 0$ and $\rho > 1$ (using again the fact that $(1+i_2)c_2^T$ is increasing in i_2). To the first-order, the two solutions are evaluated at the same c_2^T which gives:

$$i_2^C + \frac{\Gamma}{e_2} \frac{c_2^T(1-\phi)^2(\rho-1)^2}{(2(1-\phi)(\rho-1)-1)^3} = i_2^{Unc} \quad (\text{C.122})$$

which gives:

$$i_2^{Unc} - i_2^C = \frac{\Gamma}{e_2} \frac{c_2^T(1-\phi)^2(\rho-1)^2}{(2(1-\phi)(\rho-1)-1)^3} \quad (\text{C.123})$$

D Minor Extensions

D.1 Full Employment and Aggregate Demand Externalities

In the case where $\rho = 1$, the aggregate demand condition is simply:

$$(c_2^N)^{-1} = \frac{\beta(1+i_2)}{1-\phi} \quad (\text{D.1})$$

We can rewrite this condition in the case where we are at the margin of full employment ($l_2 = \bar{l}^-$) while the central bank implements the optimal interest rate:

$$\frac{1}{\bar{l} + \eta_2 K_1 - s \kappa \frac{\eta_2 K_1 - b_1 - e_2^{opt} b_1^*}{s-r_0}} = \left(\frac{\beta}{1-\phi} \right)^2 \left(r_1 \kappa \frac{b_1^*}{s-r_0} \right) (1+i_2^*) \quad (\text{D.2})$$

Using again the optimal interest rate, as well as the UIP condition, we also have:

$$e_2^{opt} b_1^* = \frac{1 - \phi}{\beta} \frac{s - r_0}{r_1 \kappa} \quad (D.3)$$

And putting everything together, this defines the threshold $\tilde{b}_1^*$ for full employment:

$$\tilde{b}_1^* = \left(\frac{1 - \phi}{\beta} \right)^2 \frac{s - r_0}{r_1 \kappa} \frac{1}{1 + i_2^*} \frac{1}{\bar{l} + \eta_2 K_1 - s \kappa \frac{\eta_2 K_1 - b_1 - \frac{1 - \phi}{\beta} \frac{s - r_0}{r_1 \kappa}}{s - r_0}} \quad (D.4)$$

This expression directly implies that $\tilde{b}_1^*$ is decreasing in b_1 , the level of domestic debt (in peso) issued by entrepreneurs at $t = 1$. Since i_2^{opt} is also increasing in b_1^* , this implies that the interest rate necessary to achieve full employment is also decreasing in b_1 (leading to aggregate demand externalities when i_2 is constrained below, see [Farhi and Werning 2016](#) and [Korinek and Simsek 2016](#))).

In the aggregate demand externalities literature, it is generally assumed that a zero lower bound constraint (ZLB) binds at period 2. In such a case, a higher debt in $t = 1$ translates into weaker aggregate demand at $t = 2$, and the policymaker is unable to stimulate the economy enough, resulting in unemployment and inefficiently low output. The effect is absent here, since I do not assume a ZLB constraint. In my paper, the problem faced by the central bank is rather the opposite: the presence of foreign debt makes the policymaker more likely to *hike* interest rates, not to restore full employment but to counter financial frictions.

D.2 General Currency Mismatch

The assumption in the main framework is an extreme form of currency mismatch, where entrepreneurs' production at $t = 2$ is in non-tradable goods only. This implies that their

net worth is given by:

$$n_2 = \eta_2 K_1 - b_1 - e_2 b_1^* \quad (\text{D.5})$$

Meaning that the exchange rate moves only costs, not the revenues, of entrepreneurs. We can easily extend this framework and work with a general currency mismatch, by assuming that entrepreneurs' capital at $t = 2$ yields a quantity η_2 of non-tradable goods, and a quantity $\iota\eta_2$ of tradable goods, per unit of capital. In this case, their net worth becomes:

$$n_2 = \eta_2 K_1 + e_2 \iota \eta_2 K_1 - b_1 - e_2 b_1^* \quad (\text{D.6})$$

and the exchange rate moves income and as well as costs. The net worth multiplier (assume constrained entrepreneurs as before) that governs balance sheet effects is then similar but simply weakened by the presence of tradable goods:

$$\frac{dK_2}{di_2} = (1 - \iota) \frac{e_2 \kappa b_1^*}{s - r_0} \quad (\text{D.7})$$

D.3 Cost of Interest for Firms

Because of the micro-foundation for the financial friction ([Tirole 2010](#)), the equivalent of (3) is now:

$$b_2(1 + i_2) \leq r_0 k_2 \quad (\text{D.8})$$

We write instead this constraint as:

$$b_2(1 + \zeta i_2) \leq r_0 k_2 \quad (\text{D.9})$$

with $\zeta = 1$. This is simply to make sure that when $\zeta = 0$, we are back to the baseline model.

Assuming again that productive firms are constrained, their budget constraint yields:

$$n_2 + b_2 = sk_2 \implies n_2 + \frac{r_0 k_2}{1 + \zeta i_2} = sk_2 \quad (\text{D.10})$$

which gives the equilibrium level of re-investment at $t = 2$:

$$k_2 = \frac{n_2}{s - \frac{r_0}{1 + \zeta i_2}} \quad (\text{D.11})$$

We linearize this expression for small i_2 in order to preserve tractability:

$$k_2 \approx \frac{n_2}{s - r_0} - \frac{n_2 r_0}{(s - r_0)^2} \zeta i_2 \quad (\text{D.12})$$

How does this change the optimal policy problem? The central bank now also has to factor in that a higher interest rate tightens financial frictions, and hence indirectly lowers the amount of non-tradable production (and consumption) at $t = 3$. For simplicity, the optimal policy analysis is done with $\rho = 1$ for this extension. The maximization program of the central bank is:

$$\max_{l_2, i_2, e_2, k_2} (1 - \phi) \ln (l_2 + \eta_2 K_1 - s \kappa k_2) + \beta (\bar{l} + r_1 \kappa k_2) \quad (\text{D.13})$$

with the constraints:

$$l_2 \leq \bar{l} \quad (\text{D.14})$$

$$\beta(1 + i_2^*) \left(l_2 + \eta_2 K_1 - s \kappa k_2 - \frac{b_1}{\bar{w}} \right) = (1 - \phi) e_2 \quad (\text{D.15})$$

$$k_2 = \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{\eta_2 - b_1 - e_2 b_1^*}{(s - r_0)^2} r_0 \zeta i_2 \quad (\text{D.16})$$

$$i_2 = 1 + i_2^* - e_2 \quad (\text{D.17})$$

with the respective multipliers: $\nu, \epsilon, \lambda, \mu$. The first-order conditions are then:

$$\frac{1-\phi}{c_2^N} - \nu - \epsilon\beta(1+i_2^*) = 0 \quad (\text{D.18})$$

$$\lambda \frac{\eta_2 - b_1 - e_2 b_1^*}{(s-r_0)^2} r_0 \zeta + \mu = 0 \quad (\text{D.19})$$

$$\epsilon(1-\phi) + \lambda \frac{b_1^*}{s-r_0} - \lambda \frac{b_1^*}{(s-r_0)^2} r_0 \zeta i_2 + \mu = 0 \quad (\text{D.20})$$

$$-(1-\phi) \frac{s\kappa}{c_2^N} + \beta r_1 \kappa + \epsilon\beta(1+i_2^*)s\kappa + \lambda = 0 \quad (\text{D.21})$$

The first condition directly leads to $\epsilon = 1/e_2$, when $\nu = 0$ (the central bank has to allow for under-employment). The last condition simplifies to $\lambda = -\beta r_1 \kappa$ thanks to the first one. The last Lagrange multiplier is then given by the second condition:

$$\mu = \beta r_1 \kappa \frac{n_2}{(s-r_0)^2} r_0 \zeta \quad (\text{D.22})$$

Putting everything together yields:

$$\frac{1}{e_2}(1-\phi) = \beta r_1 \kappa \frac{b_1^*}{s-r_0} + \frac{b_1^*}{(s-r_0)^2} \zeta i_2 - \beta r_1 \kappa \frac{n_2}{(s-r_0)^2} r_0 \zeta \quad (\text{D.23})$$

Which can be rewritten to isolate the optimal baseline solution when $\zeta = 0$, using once again the UIP condition:

$$1+i_2 = \frac{\beta r_1 \kappa}{1-\phi} \frac{b_1^*(1+i_2^*)}{s-r_0} - \frac{r_0 \zeta}{(s-r_0)^2} (\beta r_1 \kappa n_2 - b_1^* i_2) \quad (\text{D.24})$$

We are thus left with the previous solution, minus a positive term, highlighting that the central bank implements a lower interest rate than in the baseline case to avoid tightening the financial friction by too much.

D.4 A Version Without Aggregate Demand

This extension presents a version of the model without aggregate demand forces: wages are fully flexible so there is always full employment. All effects instead go through investment. The trade-off of the central bank is the following: by increasing the interest rate, it appreciates the currency which helps financially constrained firms. On the other hand, it raises the cost of investment for unconstrained firms, leading them to invest less. The point of this section is to show that the same forces are at play: the optimal monetary policy of the central bank depends (positively) on b_1^* and i_2^* , leading to the same spillovers through intermediaries.³³

A fraction κ of firms are constrained, subject to the same friction:

$$b_2 \leq r_0 k_2^\kappa \quad (\text{D.25})$$

The remaining fraction $1 - \kappa$ of firms are unconstrained, but face quadratic costs of adjusting their capital stock. They thus maximize:

$$r_1 k_2^{1-\kappa} - (1 + i_2)(k_2^{1-\kappa} - n_2) - \frac{\chi}{2} (k_2^{1-\kappa})^2 \quad (\text{D.26})$$

For a given policy rate i_2 , each unconstrained firm thus invests:

$$k_2^{1-\kappa} = \frac{r_1 - i_2}{\chi} \quad (\text{D.27})$$

The total capital stock for production in period $t = 3$ is then given by:

$$K_2 = \kappa \frac{n_2}{s - r_0} + (1 - \kappa) \frac{r_1 - i_2}{\chi} \quad (\text{D.28})$$

³³I thank Arvind Krishnamurthy for this suggestion.

Replacing the exchange rate in the net worth:

$$K_2 = \kappa \frac{\eta_2 K_1 - b_1 - \frac{1+i_2^*}{1+i_2} b_1^*}{s - r_0} + (1 - \kappa) \frac{r_1 - i_2}{\chi} \quad (\text{D.29})$$

Maximizing this capital stock with respect to i_2 delivers the aforementioned trade-off:

$$\kappa \frac{b_1^*}{s - r_0} \frac{1 + i_2^*}{(1 + i_2)^2} = \frac{(1 - \kappa)}{\chi} \quad (\text{D.30})$$

Optimal monetary policy is thus given by the following rule:

$$1 + i_2 = \sqrt{\chi \frac{\kappa}{1 - \kappa} \frac{b_1^*}{s - r_0} (1 + i_2^*)} \quad (\text{D.31})$$

Which has the same forces as Proposition 1 and a very similar form than Equation (20).

All other insights follow intuitively.

E FX Interventions

E.1 Setup

For FX interventions to have an effect on the exchange rate, we must add a layer of intermediation (otherwise, FX interventions by just one country are negligible for the global intermediary and thus do not affect the equilibrium exchange rate). We adopt the following notation: i_2^* is the interest rate offered by the global intermediary, while $\tilde{i}_{2,j}$ is the interest offered by country- j specific intermediary. We then have, using the same micro-foundations in Appendix B, that:

$$\tilde{i}_{2,j} = i_2^* + \gamma_j \left(c_{2,j}^T - y_{2,j}^T \right) \quad (\text{E.1})$$

and:

$$i_2^* = i_2^\$ + \Gamma \int_j \left(c_{2,j}^T - y_{2,j}^T \right) dj \quad (\text{E.2})$$

The previous framework of Section 4 is nested by taking $\gamma_j = 0$ for all j . We also allow the central bank to implement FX interventions. To this end, we assume that the central bank has access to a fixed quantity of foreign reserves, denoted by $\bar{f}$. Therefore, the country j can intervene in the FX markets by selling $f_{2,j} \in [0, \bar{f}]$, which changes capital flows according to the following:

$$\frac{1}{1 + i_2^*} a_{3,j}^* - b_1^* = c_{2,j}^T - y_{2,j}^T - f_{2,j} \quad (\text{E.3})$$

By doing this, the central bank effectively reduces capital outflows, which supports the currency. Indeed, by reducing outflows the central bank decreases $\tilde{i}_{2,j}$, and thanks to the UIP condition for households:

$$e_2 = \frac{1 + \tilde{i}_{2,j}}{1 + i_2} \quad (\text{E.4})$$

which simply means that decreasing $\tilde{i}_{2,j}$ appreciates the currency.

E.2 Optimal Use of FX Interventions

The first result in this section confirms that the insight of [Itskhoki and Mukhin \(2023\)](#) also applies to my setup: unconstrained access to FX interventions allows the central bank to achieve full employment.

Proposition 8 (Unconstrained FX Interventions). *When $\bar{f}$ is large enough, the central bank uses FX interventions while choosing an interest rate i_2 that implements full-employment: $l_2 = \bar{l}$.*

This is simply a manifestation of the Tinbergen Principle ([Tinbergen 1952](#)). As a result, there are no spillovers between EMEs, as explained in [Korinek \(2017\)](#). The more interesting insights come from the case where $\bar{f}$ is low enough, such that central banks

are constrained in their use of reserves. When this is the case, selling reserves is still valuable, because it relaxes the trade-off embedded in choosing the domestic interest rate.

Proposition 9 (Constrained FX Interventions). *When $f_{2,j} = \bar{f}$:*

1. *Country j still allows for under-employment: $l_{2,j} < \bar{l}$;*
2. *The domestic optimal interest $i_{2,j}$ is lower than without FX interventions ;*
3. *The currency is more appreciated than without FX interventions ;*
4. *If implemented by all EMEs, FX interventions have positive spillovers across countries, and i_2^* is lower than without FX interventions.*

Reserves will thus always be used at $t = 2$, and will deliver an appreciated currency (i.e. a lower e_2).³⁴ From the perspective of period $t = 1$, however, the welfare effects are less obvious.

Proposition 10 (Moral Hazard Consequences of FX Interventions). *Expected FX interventions raise ex-ante dollar debt issuance, b_1^* . Around an approximation point where Γ is large and $\bar{f}/\Gamma$ stays first-order, the possibility of FX interventions reduces welfare absent macroprudential policy when:*

$$\rho \frac{\left(2 + \frac{1+i_1^*}{i_1^* - i_1^*}\right) w}{e_1^2 \omega^* + \omega e_2^{opt}} > \rho(1 - \phi) + \phi \quad (\text{E.5})$$

Proposition 10 highlights an under-appreciated feature of FX interventions. By leaning against depreciations in the future, private debt issuers are incentivized to switch more of their liabilities into dollars. This in turn worsens the stabilization trade-off faced by the central bank. The reason it can go as far as to lower welfare is more subtle. Moral hazard

³⁴The fact that the use of reserves involves positive spillovers across currencies might seem surprising in light of the currency war literature (Eichengreen 2013, Jeanne 2021, Caballero, Farhi and Gourinchas 2021). This is because all the EMEs considered are on the *same side* of the global intermediary.

forces are always present in this model, with or without FX interventions. When it comes to interest rate policy, however, this force is muted by the costs of impairing aggregate demand. In other words, private firms realize that the central bank will appreciate the currency to avoid strong balance sheet effects, but also realize that the central bank will put some weight on its employment mandate, and thus will only appreciate the currency so much. The costs of using the interest rate to manage the currency are thus giving some sort of commitment power to the central bank. This is not the case for FX interventions in my model, which are modeled to be costless. Moral hazard concerns are then greater when considering FX interventions, and can result in lower levels of welfare. As a result, macroprudential policy is even more needed to curb dollar-denominated debt issuance.³⁵

E.3 Proofs

E.3.1 Optimal Policy: Unconstrained Reserves (Proposition 8)

Assume that the central bank has $\bar{f}$ of reserves available. The central bank's problem is now (omitting the subscript j for legibility):

$$\begin{aligned} \max_{l_2, c_2^T, e_2, f_2} \frac{1}{1-\rho} & \left[(c_2^T)^\phi \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right)^{1-\phi} \right]^{1-\rho} \\ & + \beta \left(\bar{l} + r_1 \kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right) \\ & + \beta \left(y_3^T + (1 + \tilde{i}_2) (y_2^T - b_1^* - c_2^T) \right) \quad (\text{E.6}) \end{aligned}$$

with the constraints:

$$l_2 \leq \bar{l} \quad (\text{E.7})$$

³⁵ Additionally, Das et al. (2024) highlight a novel externality: central banks accumulate reserves ex-ante, which lowers dollar interest rates and thus encourage even more issuance in dollars.

$$e_2 c_2^T = \frac{\phi}{1-\phi} (l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}}) \quad (\text{E.8})$$

$$\beta \frac{1 + \tilde{i}_2}{e_2} = (1 - \phi) \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right)^{(1-\phi)(1-\rho)-1} (c_2^T)^{\phi(1-\rho)} \quad (\text{E.9})$$

$$\tilde{i}_2 = i_2^* + \gamma_j (c_2^T - y_2^T - f_2) \quad (\text{E.10})$$

$$f_2 \leq \bar{f} \quad (\varphi) \quad (\text{E.11})$$

where φ is the Lagrange multiplier on the FX intervention constraint. This maximization problem is formally equivalent to the coordination one, since the individual central bank now understands that changing the interest rate has an impact on $\tilde{i}$, since there is a layer of country-specific intermediation. The maximization conditions are then similar:

$$v + \beta(1 + i_2) - m_T \frac{\phi}{1-\phi} - \epsilon((1-\phi)(1-\rho) - 1) \frac{\beta(1 + i_2)}{c_2^N} = 0 \quad (\text{E.12})$$

$$m_T e_2 - \epsilon(1-\phi)(1-\rho) \frac{\beta(1 + i_2)}{c_2^T} - \gamma_j \iota = 0 \quad (\text{E.13})$$

$$\begin{aligned} s\kappa \frac{b_1^*}{s - r_0} \beta(1 + i_2) - \beta r_1 \kappa \frac{b_1^*}{s - r_0} + m_T \left(c_2^T - \frac{\phi}{1-\phi} s\kappa \frac{b_1^*}{s - r_0} \right) \\ - \epsilon \beta \frac{1 + i_2}{e_2} - \epsilon((1-\phi)(1-\rho) - 1) s\kappa \frac{b_1^*}{s - r_0} \frac{\beta(1 + i_2)}{c_2^N} = 0 \end{aligned} \quad (\text{E.14})$$

and

$$\beta (y_2^T - b_1^* - c_2^T) + \epsilon \frac{\beta}{e_2} + \iota = 0 \quad (\text{E.15})$$

to which we also add the first-order condition on f_2 :

$$\gamma_j \iota = \varphi \quad (\text{E.16})$$

If the optimal amount of FX intervention is strictly less than $\bar{f}$, the amount of available reserves, then $\varphi = 0$. This implies $\iota = 0$, which means that:

$$\beta \left(y_2^T - b_1^* - c_2^T \right) + \epsilon \frac{\beta}{e_2} = 0 \quad (\text{E.17})$$

This directly implies that $\nu \neq 0$. Indeed, were ν to be equal to 0, the first three equations would be formally similar to the case in Proposition 1, but this solution is inconsistent with an ϵ value of $e_2 (c_2^T - y_2^T + b_1^*)$. Therefore, the central bank achieves full employment whenever it has access to unconstrained reserves.³⁶

E.3.2 Optimal Policy: Constrained Reserves (Proposition 9)

For $\bar{f}$ small enough, the central bank is then constrained and $\varphi \neq 0$, which means that the central bank fully uses $\bar{f}$ to appreciate the currency. This means that we can simply rewrite the maximization problem as before, taking $\bar{f}$ as fixed, and derive the optimal interest rate given that reserve policy. But we also showed that i_2 was increasing in i_2^* , and since implementing $\bar{f}$ decreases i_2^* , the resulting optimal interest rate is lower with FX interventions.

Individual central banks then do not internalize the effect this has on other countries, through:

$$i_2^* = i_2^{\$} + \Gamma \int_j (c_{2,j}^T - y_{2,j}^T) dj \quad (\text{E.18})$$

The use of FX interventions thus lowers i_2^* , resulting in *positive spillovers*, and dampens the Global Financial Cycle.

³⁶This is simply a formal proof of the Tinbergen principle (Tinbergen 1952).

E.3.3 Moral Hazard and FX Interventions (Proposition 10)

To generate analytical insights for this part, we assume that γ_j is small enough, while $\bar{f}$ is also large enough to prevent $\bar{f}\gamma_j$ from being second order.³⁷ This substantially simplifies the analysis, since it is equivalent to having the central bank not internalize the effect of its interest rate policy on $\tilde{i}_2$, while still having an impact on the exchange rate through $\bar{f}$. As a result, for a change in $\bar{f}$ the implied change in the exchange rate comes from:

$$d \ln(1 + i_2) = \frac{\rho(1 - \phi) + \phi}{\rho - 1 + \rho(1 - \phi) + \phi} d \ln(1 + \tilde{i}_2) \quad (\text{E.19})$$

$$\implies de_2 = \frac{\rho - 1}{\rho - 1 + \rho(1 - \phi) + \phi} d \ln(1 + \tilde{i}_2) \quad (\text{E.20})$$

$$\implies de_2 \approx -\frac{\rho - 1}{\rho - 1 + \rho(1 - \phi) + \phi} \gamma_j \bar{f} \quad (\text{E.21})$$

Which means that a use of reserves to intervene in the exchange rate market yields, in equilibrium, a lower e_2 , i.e. an appreciated currency. Using the equilibrium choice of dollar issuance (Appendix A.8), we also have the following:

$$db_1^* = - \left(\frac{2wb_1^*}{e_1^2 w^* + we_2^{opt}} + \frac{1}{e_1} \frac{w^*(1 + \hat{i}_1^*)(1 + i_1^*)}{e_1 w^* + w \frac{e_2^{opt}}{e_1}} \right) \omega de_2 \quad (\text{E.22})$$

or the simpler:

$$db_1^* = - (2b_1^* + w^*(1 + \hat{i}_1^*)(1 + i_1^*)) \frac{\omega de_2}{e_1^2 w^* + we_2^{opt}} \quad (\text{E.23})$$

This expression has two components, simply because a change in the exchange rate e_2 has an impact on the quantity issued and the interest rate paid for that issuance (as can be seen from the w^* in the second part). In a first-order approximation, these two effects

³⁷This tactic comes from [Itskhoki and Mukhin \(2023\)](#), who use it to derive first-order approximations in a setting with risk.

are additive. At the same time, the UIP condition stipulates that:

$$de_2 = d\tilde{i}_2 - di_2 = -\gamma_j \bar{f} - di_2 \quad (\text{E.24})$$

and the optimal policy at $t = 2$ gives:

$$di_2 = \frac{\rho}{\rho + (\rho - 1)(1 - \phi)} d \ln b_1^* + \frac{\rho(1 - \phi) + \phi}{\rho + (\rho - 1)(1 - \phi)} d\tilde{i}_2 \quad (\text{E.25})$$

Equation (E.23) in logarithm form is:

$$d \ln b_1^* = - \left(2 + \frac{w^*(1 + \hat{i}_1^*)(1 + i_1^*)}{b_1^*} \right) \frac{\omega de_2}{e_1^2 w^* + we_2^{opt}} \quad (\text{E.26})$$

$$= - \left(2 + \frac{1 + i_1^*}{\hat{i}_1^* - i_1^*} \right) \frac{\omega de_2}{e_1^2 w^* + we_2^{opt}} \quad (\text{E.27})$$

which gives, combined with the differential UIP condition:

$$d \ln b_1^* = \frac{\left(2 + \frac{1 + i_1^*}{\hat{i}_1^* - i_1^*} \right) w}{e_1^2 w^* + we_2^{opt}} (\gamma_j \bar{f} + di_2) \quad (\text{E.28})$$

And using this inside the optimal policy condition:

$$di_2 = \frac{\rho}{\rho + (\rho - 1)(1 - \phi)} \frac{\left(2 + \frac{1 + i_1^*}{\hat{i}_1^* - i_1^*} \right) w}{e_1^2 w^* + we_2^{opt}} (\gamma_j \bar{f} + di_2) - \frac{\rho(1 - \phi) + \phi}{\rho + (\rho - 1)(1 - \phi)} \gamma_j \bar{f} \quad (\text{E.29})$$

Which leads the final expression for the optimal domestic rate at $t = 2$ with FX intervention and moral hazard:

$$\begin{aligned}
di_2 & \left(1 - \underbrace{\frac{\rho}{\rho + (\rho - 1)(1 - \phi)} \frac{\left(2 + \frac{1+i_1^*}{\hat{i}_1^* - i_1^*}\right) w}{e_1^2 w^* + w e_2^{opt}}}_{\text{Feedback effect from moral hazard}} \right) \\
& = \frac{\gamma_j \bar{f}}{(\rho + (\rho - 1)(1 - \phi))} \left(\underbrace{\frac{\rho}{e_1^2 w^* + w e_2^{opt}} \frac{\left(2 + \frac{1+i_1^*}{\hat{i}_1^* - i_1^*}\right) w}{}}_{\text{Backfire from moral hazard}} - \underbrace{(\rho(1 - \phi) + \phi)}_{\text{Relaxation of constraints with FX}} \right) \quad (\text{E.30})
\end{aligned}$$

The total effect is then positive when:

$$\rho \frac{\left(2 + \frac{1+i_1^*}{\hat{i}_1^* - i_1^*}\right) w}{e_1^2 w^* + w e_2^{opt}} > \rho(1 - \phi) + \phi \quad (\text{E.31})$$

When this condition is satisfied, the anticipation of FX interventions has such a strong effect on dollar debt issuance, that the resulting equilibrium interest rate in $t = 2$ is even higher than without FX interventions, hurting aggregate demand.

F Intermediary Capacity and the Dollar

[Bruno and Shin \(2015a\)](#) show that a US tightening shock leads to a fall in global banks' leverage. [Bruno and Shin \(2015b\)](#) build a model with local and global banks, where a dollar appreciation tightens financial conditions. [Avdjiev, Du, Koch and Shin \(2019\)](#) show that an appreciated dollar is associated with larger CIP deviations. This last fact is particularly interesting to my mechanism, since these deviations are the transmission mechanism of spillovers across EMEs.

To think about the link between the Dollar and global bank leverage in this framework, it is useful to go back to the microfoundations, in particular from [Fanelli and Straub](#)

(2021) and Coimbra and Rey (2024). In Fanelli and Straub (2021), it is assumed that the intermediaries are subject to a net open position limit $1/\Gamma > 0$ and face heterogeneous participation costs. This yields the equilibrium relationship between interest rates and aggregate flows:

$$i_2^* = i_2^\$ + \Gamma \cdot \int_j (c_{2,j}^T - y_{2,j}^T) dj \quad (\text{F.1})$$

In this setup, it seems natural to think of a tightening of financial conditions as a *fall* in $1/\Gamma$: each intermediary is restricted to a smaller net open position when the dollar is relatively more appreciated. In the microfoundations adapted from Coimbra and Rey (2024), Γ is a direct function of the value at risk banks are permitted to have. In a risk-off shock, banks become stricter and thus permit less value at risk, which translates directly into a higher Γ (through a lower α in the details of Appendix B).

In terms of comparative statics, recall that the spillover expression from Proposition 2 was:

$$\mathcal{C}(i_2, i_2^*) = \frac{d \ln(1 + i_2^*)}{d \ln(1 + i_2)} = \Gamma(\rho - 1) \frac{c_2^T}{1 + i_2^*} \frac{1 - \phi}{\rho} \quad (\text{F.2})$$

which makes it clear that spillovers are stronger when Γ is higher, i.e. when financial conditions are tighter. The Global Financial Cycle is then even more exacerbated (see Proposition 3), in the sense that all EMEs react even more to US monetary policy shocks. Similarly (see Proposition 6), the positive spillovers of macroprudential policies are enhanced.

Additionally, equation (F.1) points towards possible asymmetric effects of such dollar shocks. The sign of the wedge between the Fed interest rate, $i_2^\$$, and the interest rate at which EMEs can finance themselves, i_2^* , depends on whether these countries run a current account surplus or deficit. When the continuum of EMEs is a net saver, their i_2^* is *lower* than the US interest rate (the difference being the markup taken by global intermediaries).³⁸ This reasoning implies that shocks to Γ have asymmetric consequences. When

³⁸The sign of this wedge has no bearing on the spillover results: even if all EMEs are net savers, they still

EMEs are net borrowers, they face an interest rate $i_2^* > i_2^\$$. If suddenly Γ increases, the wedge between the two interest rates increases even more, which means that individual countries face a higher i_2^* . This depreciates their currencies, triggering negative balance sheet effects and monetary policy responses:

$$\frac{d \ln(1 + i_2)}{d \ln(1 + i_2^*)} = \frac{\rho(1 - \phi) + \phi}{\rho + (\rho - 1)(1 - \phi)} \quad (\text{F.3})$$

But the case of EMEs being net savers is going in the opposite direction. They then face an interest rate $i_2^* < i_2^\$$. If suddenly Γ increases, the wedge between the two interest rates increases even more, which means that individual countries face a *lower* i_2^* . This, in turn, appreciates their currency and relaxes the trade-off faced by the central bank. Finally, notice that in this model it is irrelevant whether one particular country is a net saver or borrower. Since the interest rate that it faces, i_2^* , depends on aggregate capital flows, what matters is only the aggregate current account position.

G Tradable Price Inflation

The main framework of the paper considers that the price of tradables in dollars was fixed at 1. This is the result of the assumption that the continuum of EMEs considered is small relative to the rest of the world. This extension relaxes this assumption.

To do so in a flexible and tractable manner, I assume that the rest of the world has the following linear demand for tradables:

$$D_2^T = D_2 - \delta P_2^T \quad (\text{G.1})$$

all tighten to appreciate their currency more, which increases capital inflow and raises i_2^* , depreciating other currencies. This is an important difference from the theory of dynamic terms-of-trade manipulation (Costinot et al. 2014).

where P_2^T is the price in dollars, now an equilibrium object. There is a fixed supply of tradables Y_2^T from the rest of the world at $t = 2$, so that the market clearing condition is:

$$\int_j (c_{2,j}^T - y_{2,j}^T dj) + D_2 - \delta P_2^T = Y_2^T \quad (\text{G.2})$$

From the perspective of a single EME, the optimal policy problem is entirely unchanged: an atomistic country does not take into account the effect of its domestic policies on the world price of tradable goods. The only difference from the proof in Appendix A is that we cannot normalize the price to 1 anymore, so the expenditure switching condition is now:

$$c_2^N = \left(\frac{\phi}{1-\phi} \frac{p_2^N}{p_2^T} \right)^{-1} c_2^T = \left(\frac{\phi}{1-\phi} \frac{1}{e_2 P_2^T} \right)^{-1} c_2^T \quad (\text{G.3})$$

and net capital flows are:

$$\frac{1}{1+i_2^*} a_{3,j}^* - b_1^* = P_2^T (c_2^T - y_2^T) \quad (\text{G.4})$$

G.1 Optimal Policy

The maximization program of the central bank is thus:

$$\begin{aligned} \max_{l_2, c_2^T, e_2} \frac{1}{1-\rho} & \left[(c_2^T)^\phi \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right)^{1-\phi} \right]^{1-\rho} \\ & + \beta \left(\bar{l} + r_1 \kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} \right) \\ & + \beta \left(y_3^T + (1+i_2^*) \left(P_2^T (y_2^T - c_2^T) - b_1^* \right) \right) \end{aligned} \quad (\text{G.5})$$

with the constraints:

$$l_2 \leq \bar{l} \quad (\text{G.6})$$

$$e_2 P_2^T c_2^T = \frac{\phi}{1-\phi} (l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}}) \quad (\text{G.7})$$

$$\beta \frac{1+i_2^*}{e_2 P_2^T} = (1-\phi) \left(l_2 + \eta_2 K_1 - s\kappa \frac{\eta_2 K_1 - b_1 - e_2 b_1^*}{s - r_0} - \frac{b_1}{\bar{w}} \right)^{(1-\phi)(1-\rho)-1} (c_2^T)^{\phi(1-\rho)} \quad (\text{G.8})$$

Solving this through the exact same algebraic steps of Appendix A.2 yields the optimal policy solution:

$$(1+i_2)P_2^T c_2^T = \frac{\phi}{1-\phi} \frac{1+2(1-\phi)(\rho-1)}{1+(1-\phi)(\rho-1)} r_1 \kappa \frac{b_1^*}{s-r_0} \quad (\text{G.9})$$

G.2 Spillovers

There is now a new source of spillovers across EMEs: the change in the demand for tradable goods impacts the equilibrium price of tradables. To see this, invert the market clearing condition (G.2):

$$P_2^T = \frac{c_2^T - y_2^T + D_2 - Y_2^T}{\delta} \quad (\text{G.10})$$

so that capital flows, in equilibrium, are:

$$\frac{1}{1+i_2^*} a_{3,j}^* - b_1^* = \frac{c_2^T - y_2^T + D_2 - Y_2^T}{\delta} (c_2^T - y_2^T) \quad (\text{G.11})$$

The change in the equilibrium price (in dollars) of the tradable good is:

$$dP_2^T = \frac{1}{\delta} dc_2^T \quad (\text{G.12})$$

Using the expenditure switching relation, as well as the aggregate demand condition:

$$d \ln c_2^T = \frac{(\rho-1)(1-\phi)}{\rho} d \ln(1+i_2) - \left(1 + \frac{(\rho-1)\phi}{\rho} \right) d \ln P_2^T \quad (\text{G.13})$$

which gives:

$$d \ln c_2^T = \frac{(\rho - 1)(1 - \phi)}{\rho} d \ln(1 + i_2) - \left(1 + \frac{(\rho - 1)\phi}{\rho}\right) \frac{1}{\delta} d \ln c_2^T \frac{c_2^T}{P_2^T} \quad (\text{G.14})$$

and putting the consumption parts together:

$$d \ln c_2^T \left(1 + \left(1 + \frac{(\rho - 1)\phi}{\rho}\right) \frac{c_2^T}{\delta P_2^T}\right) = \frac{(\rho - 1)(1 - \phi)}{\rho} d \ln(1 + i_2) \quad (\text{G.15})$$

For the interest rate i_2^* , what matters is total spending on tradable goods (capital flows), which we get through:

$$d \ln(P_2^T c_2^T) = d \ln P_2^T + d \ln c_2^T \quad (\text{G.16})$$

$$= \frac{1}{\delta P_2^T} d c_2^T + d \ln c_2^T \quad (\text{G.17})$$

$$= \frac{1}{\delta} \frac{c_2^T}{P_2^T} d \ln c_2^T + d \ln c_2^T \quad (\text{G.18})$$

$$= \left(1 + \frac{1}{\delta} \frac{c_2^T}{P_2^T}\right) \frac{\frac{(\rho - 1)(1 - \phi)}{\rho}}{1 + \left(1 + \frac{(\rho - 1)\phi}{\rho}\right) \frac{c_2^T}{\delta P_2^T}} d \ln(1 + i_2) \quad (\text{G.19})$$

$$= \frac{1 + \frac{1}{\delta} \frac{c_2^T}{P_2^T}}{1 + \left(1 + \frac{(\rho - 1)\phi}{\rho}\right) \frac{c_2^T}{\delta P_2^T}} \frac{(\rho - 1)(1 - \phi)}{\rho} d \ln(1 + i_2) \quad (\text{G.20})$$

Since $\rho \geq 1$, the first fraction is smaller than 1, meaning that total spending on tradable goods is *lower* after a coordinated interest rate shock, than in the case with a fixed tradable good price. This is simply because of the price effect: by raising tradable demand, the tradable price also increases, which makes it less attractive to consume, reversing some of the expenditure switching induced by increasing the domestic interest rate. As a result,

spillovers on i_2^* are also reduced, since:

$$di_2^* = \Gamma d(P_2^T c_2^T) \quad (\text{G.21})$$

hence by the same dampening coefficient:

$$\frac{1 + \frac{1}{\delta} \frac{c_2^T}{P_2^T}}{1 + \left(1 + \frac{(\rho-1)\phi}{\rho}\right) \frac{c_2^T}{\delta P_2^T}} \quad (\text{G.22})$$

Notice that when $\delta \rightarrow +\infty$, this dampening coefficient goes to 1: this is the case where the price of the tradable good is fixed. The other extreme scenario is when δ approaches 0, which corresponds to a world where the equilibrium price of the tradable good is extremely sensitive to changes in demand from the group of EMEs considered. When that is the case, the dampening coefficient becomes in the limit:

$$\frac{1 + \frac{1}{\delta} \frac{c_2^T}{P_2^T}}{1 + \left(1 + \frac{(\rho-1)\phi}{\rho}\right) \frac{c_2^T}{\delta P_2^T}} \xrightarrow{\delta \rightarrow 0} \left(1 + \frac{(\rho-1)\phi}{\rho}\right)^{-1} \in \left(\frac{1}{1+\phi}, 1\right) \quad (\text{G.23})$$

The intuition for this dampening is as follows. The source of the spillovers in the main framework is the rebalancing of demand away from non-tradable goods: by raising interest rates, central banks in EMEs are seeking to increase their demand for tradable goods in order to attract capital flows and appreciate their currency. When all central banks in EMEs act in this way, this creates pressure on the global market for tradable goods, raising its equilibrium price. This price effect naturally rebalances demand away from tradable goods, lowering the total amount spent. But the total amount spent is exactly what matters for the spillovers through the global intermediary. As a result, tradable price inflation

dampens these spillovers by reducing capital flows.³⁹

H Cyclicalities and the Short Rate Disconnect

The basic building block of the main framework presented in Section 2 is the presence of dollar debt, which induces monetary policy synchronization in emerging markets. This last fact has been recently questioned by De Leo et al. (2024a), who empirically show that emerging market central banks lower their policy rate in response to a US tightening. This section shows that this result is actually not needed to generate my spillover results: what matters ultimately is that emerging markets implement policy rates that are *higher than what would generate full employment*.

Setup To qualitatively match the findings of De Leo et al. (2024a), I assume that a US tightening is also causing a negative aggregate demand shock in emerging markets. The most parsimonious way to achieve this is to consider a negative shock through a trade channel: the price of tradable goods increases following an increase in $i_2^{\$}$ (Ozhan 2020, Camara, Christiano and Dalgic 2024). We can then use the extension in Appendix G, where the price of tradable goods is endogenous, and where the optimal interest rate was shown to verify:

$$(1 + i_2)P_2^T c_2^T = \frac{\phi}{1 - \phi} \frac{1 + 2(1 - \phi)(\rho - 1)}{1 + (1 - \phi)(\rho - 1)} r_1 \kappa \frac{b_1^*}{s - r_0} \quad (\text{H.24})$$

which is similar to the result in Proposition 1 in the main framework, but incorporating P_2^T (the price of tradable goods in dollars). We also showed in Appendix A.2 that $(1 + i_2)c_2^T$ is an increasing function of i_2 , which directly implies that, all else being equal, the optimal

³⁹One way to see this result is to recall that the exchange rate is coming from the UIP condition: $e_2 = (1 + i_2^*)/(1 + i_2)$. With tradable price inflation, an increase in i_2 generates a smaller increase in i_2^* , so that central banks can hike relatively less to appreciate their currency.

interest rate i_2 (from the point of view of SOE) is strictly *decreasing* in P_2^T . This means that if the shock to P_2^T caused by the increase in $i_2^\$$ is large enough, the optimal policy followed by emerging economies is to ease their policy rate, consistent with the results of [De Leo et al. \(2024a\)](#).

Inefficient GFC The identified spillovers of Proposition 7, however, are still present. This is because, even though emerging markets lower their policy rate in response to the Fed, they still implement an interest rate higher than what guarantees full employment because of balance sheet effects: the trade-off between aggregate demand and the exchange rate is still there. As such, the bottleneck externality is the same as in the main framework: engineering a coordinated easing across emerging markets would result in more appreciated currencies, easing the trade-off for individual central banks:

$$\frac{d \ln(1 + i_2^*)}{d \ln(1 + i_2)} = \Gamma(\rho - 1) \frac{c_2^T}{1 + i_2^*} \frac{1 - \phi}{\rho} > 0 \quad (\text{H.25})$$

Short rate disconnect [De Leo et al. \(2024a\)](#) also document that, while policy rates tend to decrease in response to a US tightening, *market rates* tend to increase. Interestingly, this can also be rationalized in the framework of Appendix F. Conceptually, a US tightening is then accompanied by (i) an increase in P_2^T , and (ii) an increase in Γ reflecting the dollar shock on global intermediaries. While the first effect causes a lower i_2 , the second effect causes an increase in i_2^* (which here is the market rate: the interest rate at which the banks in emerging markets can finance themselves) when EMEs are on aggregate net borrowers (see Appendix F for details).

I Empirical Exercises

I.1 Data description and sources

Daily bilateral FX series are obtained from FRED, where the available data for EMEs cover Brazil, Mexico, India, South Korea, South Africa, Thailand, Malaysia, and Taiwan. The G10 comparison sample contains the euro area, Japan, the United Kingdom, Switzerland, Canada, Australia, New Zealand, Norway, and Sweden. Monetary surprises are monthly US monetary-policy shocks from [Bauer and Swanson \(2023\)](#), using the orthogonalized series, and the pure-monetary component from [Jarociński and Karadi \(2020\)](#). Intermediary tightness is minus the standardized [He et al. \(2017\)](#) intermediary capital ratio. VIX is the monthly average of daily VIX observations from FRED. For the common currency factor, I use the contemporaneous leave-one-out mean return of the other currencies in the same group. The BIS quantity states are quarterly series converted to monthly frequency by assigning each quarter to its quarter-end month, carrying the value forward, and lagged one month; the regressions use an additional one-month lag of this state. The LBS state is the expanding z-score of the trailing four-quarter sum of BIS Locational Banking Statistics FX- and break-adjusted changes in US-dollar cross-border claims of all reporting banks on non-banks in the relevant counterparty group. The CBS state is the expanding z-score of the year-on-year log growth of BIS Consolidated Banking Statistics international claims of all reporting countries' domestic banks on the relevant counterparty group, on an immediate-counterparty basis. The baseline BIS quantity state uses a broader EME counterparty set, namely Argentina, Brazil, Chile, China, Colombia, Czechia, Hungary, Indonesia, India, South Korea, Mexico, Malaysia, Peru, the Philippines, Poland, Romania, Thailand, Turkey, and South Africa. In the following robustness check, I re-aggregate the EME quantity state over only the eight countries in the FX panel, and obtain essentially the same point estimates; the EME-specific quantity channel is unchanged in magnitude,

with t -statistics only marginally lower given the smaller country aggregate (Table 7).

I.2 Robustness checks

We report here the results for a battery of robustness checks for the empirical exercises of Section 6: three different ways of computing standard errors, and an alternative construction for the common factor. Our baseline specifications cluster standard errors by month, which accommodates the cross-sectional correlation induced by common shocks across currencies but not serial correlation over time. We therefore re-report each coefficient using Driscoll–Kraay standard errors with a Newey–West lag length of four, which are more robust to both cross-sectional and serial correlation; using within-currency Newey–West standard errors with four lags, which instead correct for serial correlation while treating currencies as independent; and using a wild cluster restricted bootstrap that clusters on currency, which corrects for the limited number of currencies at our disposal. In the fourth check, in place of the leave-one-out group mean used in the core specifications, we recompute the factor as the first principal component of the group’s currency returns, estimated in real time on an expanding window so that the PC loading at each date uses only past information.

Table 4: Fed shock amplification: robustness

	Coef.	Cluster (month)	Driscoll– Kraay(4)	Newey– West(4)	Wild boot. <i>p</i> -value
<i>Column (1): Bauer–Swanson surprise</i>					
Fed shock	10.2	4.26***	4.33***	5.23***	0.004***
Fed shock $\times$ Intermediary tightness	5.5	3.24***	3.01***	3.83***	0.015**
<i>Column (2): Jarociński–Karadi pure-monetary</i>					
Fed shock	10.4	3.40***	3.50***	5.74***	0.007***
Fed shock $\times$ Intermediary tightness	4.2	2.45**	2.47**	3.92***	0.014**

Notes. Each row re-reports a coefficient from Table 1 under alternative inference, holding the point estimate (“Coef.”) fixed. The Cluster, Driscoll–Kraay, and Newey–West columns report *t*-statistics; the last column reports the *p*-value from a wild cluster restricted bootstrap clustering on currency (1,999 replications, Webb six-point weights, null imposed). Driscoll–Kraay uses a lag length of 4 and is robust to both cross-sectional and serial correlation; within-currency Newey–West uses 4 lags. The Driscoll–Kraay *t*-statistics are stable across lag lengths from 1 to 12. Sample 1997–2023 for the Bauer–Swanson surprise and 1997–2025 for the Jarociński–Karadi pure-monetary component.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Currency comovement and intermediary capacity: robustness

	Leave-one-out factor					PC
	Coef.	Cluster	DK(4)	NW(4)	Wild <i>p</i>	coef (<i>t</i>)
EME currencies	0.138	5.21***	5.20***	3.96***	0.093*	0.285*** (6.29)
G10 currencies (placebo)	0.010	1.14	1.20	0.34	0.819	-0.036** (-2.39)

Notes. Each row re-reports the coefficient on the common factor interacted with lagged intermediary tightness from Table 2 under alternative inference, for EME currencies and for the G10 placebo. The first five columns use the leave-one-out common factor of the core table: “Coef.” is the point estimate, and the Cluster (by month), Driscoll–Kraay (DK, 4 lags), and within-currency Newey–West (NW, 4 lags) columns report *t*-statistics, while “Wild *p*” is the *p*-value from a wild cluster restricted bootstrap clustering on currency (1,999 replications, Webb six-point weights, null imposed). The final column (PC) re-estimates the same specification using an expanding-window first principal component in place of the leave-one-out factor, reporting its coefficient with the clustered-by-month *t*-statistic in parentheses. Sample 1997–2025, starting in 1999 for G10 because of the Euro.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Coordinated and Uncoordinated Equilibria. The black line is the individual best response of an individual central bank for a given dollar interest rate i_2^* . The dashed green line is the best response of central banks taking into account the effect of their rate setting on aggregate capital flows and the resulting premium $i_2^* - i_2^S$. The blue line depicts the dollar interest rate determination for a given $\Gamma > 0$.

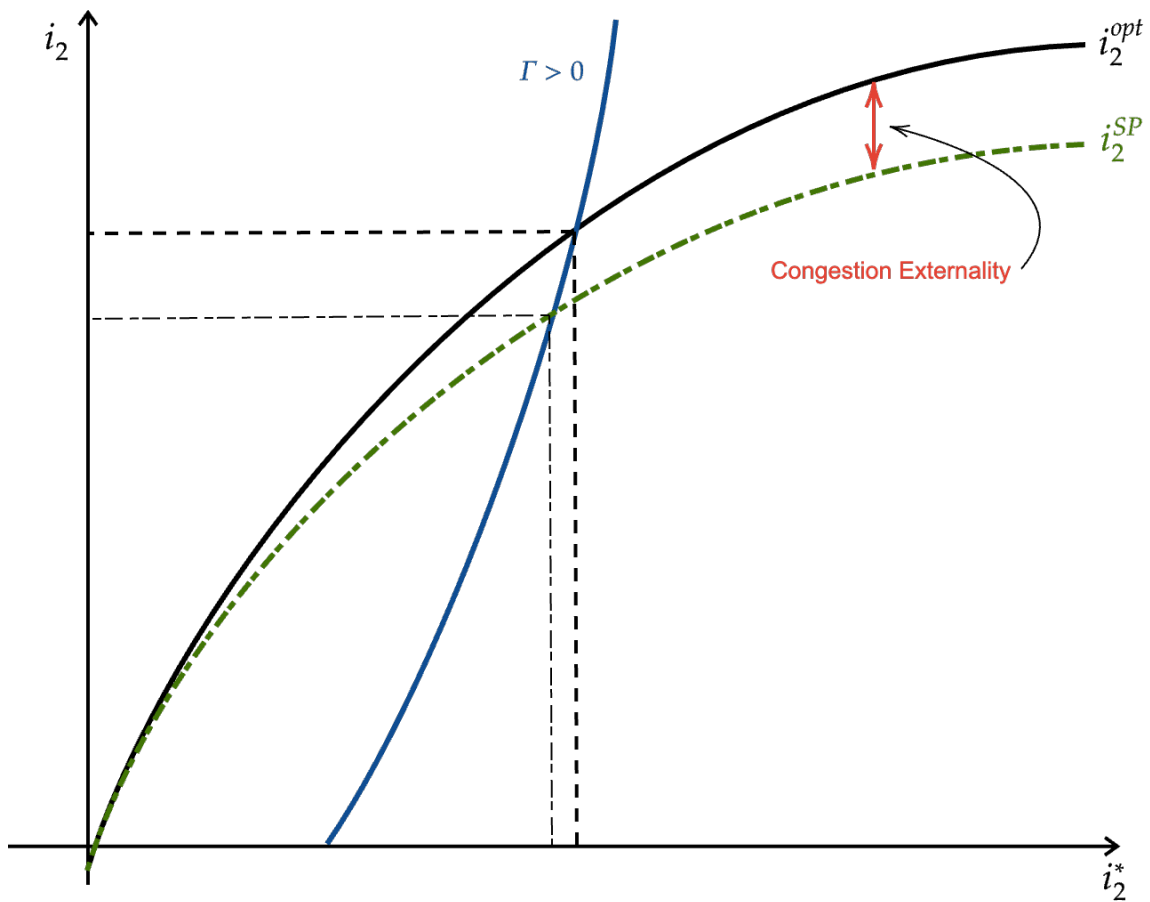


Table 6: Aggregate quantity intermediated: robustness

	Leave-one-out factor					PC
	Coef.	Cluster	DK(4)	NW(4)	Wild p	coef (t)
<i>Panel A: LBS quantity state (EME exposures)</i>						
EME currencies	0.022	1.99**	1.96*	0.97	0.180	0.024 (1.37)
G10 currencies	-0.004	-0.79	-0.98	-0.17	0.962	-0.014*** (-3.49)
EME – G10 (pooled)	0.006	0.80	0.84	0.19	0.882	0.036** (2.17)
<i>Panel B: CBS quantity state (EME exposures)</i>						
EME currencies	0.047	2.24**	1.91*	1.15	0.094*	0.065** (2.06)
G10 currencies	-0.003	-0.34	-0.40	-0.08	0.929	-0.020** (-2.42)
EME – G10 (pooled)	0.018	1.09	0.95	0.32	0.702	0.083** (2.55)

Notes. Each row re-reports the coefficient on the common factor interacted with the lagged EME-exposure quantity state from Table 3 under alternative inference. The first five columns use the leave-one-out common factor of the core table: “Coef.” is the point estimate, and the Cluster (by month), Driscoll–Kraay (DK, 4 lags), and within-currency Newey–West (NW, 4 lags) columns report t -statistics, while “Wild p ” is the p -value from a wild cluster restricted bootstrap clustering on currency (1,999 replications, Webb six-point weights, null imposed). The final column (PC) re-estimates the same specification using an expanding-window first principal component in place of the leave-one-out factor, reporting its coefficient with the clustered-by-month t -statistic in parentheses. The EME–G10 rows report the coefficient on the common factor $\times$ quantity state $\times$ EME indicator interaction in a pooled regression starting in January 1999. Factor loadings and their interactions with quantity, VIX, and intermediary tightness vary by group, while coefficients on the quantity and tightness levels are common across groups. Sample 1997–2025, starting in 1999 for G10 because of the Euro.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Aggregate quantity and currency pricing: EME quantity state on the baseline EME set vs. the currency-sample countries

	Quantity from baseline 19 EMEs		Quantity from 8 FX countries	
	LBS	CBS	LBS	CBS
EME currencies	0.022** (1.99)	0.047** (2.24)	0.027* (1.77)	0.043* (1.94)
G10 currencies	-0.004 (-0.79)	-0.003 (-0.34)	-0.002 (-0.39)	0.006 (0.60)

Notes. Robustness of Table 3 to the mismatch between the currency panel (eight EMEs with FRED FX series) and the baseline BIS aggregate quantity state (19 EMEs). The first two columns aggregate the EME-exposure quantity state over the baseline 19-country EME counterparty set used in Table 3; the last two re-aggregate the same LBS and CBS states over only the eight countries whose currencies enter the comovement factor (Brazil, Mexico, India, South Korea, South Africa, Thailand, Malaysia, and Taiwan; the BIS bank-claims counterparty set includes Taiwan). Specification, controls, currency fixed effects, sample (1997–2025, starting in 1999 for G10 because of the Euro), and month-clustered standard errors are exactly as in Table 3.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.