Global Transmission of FED Hikes: The Role of Policy Credibility and Balance Sheets

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Global Transmission of FED Hikes: The Role of Policy Credibility and Balance Sheets*

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Abstract

Contrary to historical episodes, the recent rapid tightening of the U.S. monetary policy has not yet triggered financial crisis in the rest of the world, particularly in emerging markets and developing economies. Why is this time different? To answer this question, we analyze the current situation through the lens of historical evidence, during which international transmission of the U.S. monetary policy’s depended on trade and financial linkages. In emerging markets, the financial channel-based transmission often led to more adverse outcomes compared to trade channel and also compared to more benign impact of both channels for advanced economies. When the Federal Reserve increases interest rates, global investors tend to shed risky assets in response to tightening global financial conditions, affecting emerging markets more severely due to their lower credit ratings and higher risk profiles. We show that, this time around, the escape from emerging market assets and the increase in risk spreads were limited, due to credibility of their monetary policy and lower foreign-exchange vulnerabilities on their balance sheets. The improvement in monetary policy frameworks, especially in policy and operational strategy and communication, combined with reduced levels of dollar-denominated debt helped emerging markets to weather the 2021–2023 FED hikes.

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1 Introduction

In stark contrast to 1980s and 1990s, emerging markets and developing economies have demonstrated resilience in the face of monetary policy tightening in advanced economies, notably the U.S., during the post-COVID era. Historically, sharp increases in policy rates in the U.S. have led to falling currencies elsewhere, combined with capital outflows, often resulting in widespread financial stress and crises in emerging markets and developing economies. The 1982-83 debt crisis in Latin America, following the FED hikes during Volcker’s disinflation, remains the classic example, but there are also other instances such as the 1994 tightening of the U.S. monetary policy paving the way to Asian crisis and the infamous Taper Tantrum of 2013. The recent tightening cycle has unfolded differently, however. This time, the majority of emerging markets have effectively navigated the most significant tightening in the U.S. in several decades, without much damage to their economies.

What explains this new-found resilience to U.S. monetary policy shocks? We argue that, the resilience comes from their improved monetary policy credibility and a reduction in dollar borrowing. Starting early 2000s, almost all emerging markets and some developing economies have taken significant steps, which helped decrease the sensitivity of their economies to global monetary policy spillovers. First, they have improved their monetary policy credibility towards more transparent, consistent and coherent approaches, often with a strong focus on controlling inflation. The improvement in monetary policy credibility is plotted in Figure 1, using a brand new index of the IMF measuring credibility.\(^1\) Second, they have reduced their foreign currency-denominated borrowing, which typically leads to balance sheet vulnerabilities due to currency mismatches between local currency assets and foreign currency liabilities. Since, most of the foreign currency debt in emerging markets

\(^1\)This index was developed by Unsal, Papageorgiou and Garbers (2022) and characterizes monetary policy frameworks across three pillars (independence and accountability, policy and operational strategy and communications) for 50 countries between 2007–2021. It provides a tool to assess the soundness of monetary policy frameworks, and identify their drivers and changing properties—even within the same monetary policy or exchange rate regimes—over time. See Section 3 for more details.
and developing economies is in dollars, reducing the extent of foreign currency debt means they borrow less in the U.S. dollars relative to 1980s and 1990s (See McCauley, McGuire and Sushko (2015)). For financial institutions, regulatory restrictions on open FX positions or capital requirements by now largely ensure that FX mismatches on their balance sheets are hedged or minimal (IMF, 2022). Even the private (corporate/household) sector FX debt stayed around modest number when viewed in the context of the 1980s and 1990s. As shown in Figure 2, the extent of non-financial private sector FX debt in total debt remained constant around 8.5% since 2006 after the initial reduction in early 2000s, with some increase in 2012 and after,—given the quantitative easing policies of the FED that channeled capital flows towards emerging markets—falling back to a similar low share in 2018. The same figure also plots the share of FX debt in GDP, which was on a downward path until 2012 and then increased and stabilized around 12 percent at the end of our sample.2

Strengthened monetary policy credibility coupled with reduced dollar debt, lead to decreased inflation, credit and currency risks, and diminish the tendency of rapid global investor withdrawals as a result of global financial tightenings linked to FED hikes.

2There are still countries like Turkey, Argentina, Mexico, Peru where these shares can be as high as 50 percent (e.g. Das, Kalemli-Özcan, Damien and Varela (2020)). This is not the norm currently but was the case historically, see Kalemli-Özcan, Kamil and Villegas-Sanchez (2016) for these shares from 1990 to 2005. Note that we only show private sector FX debt. The public sector FX debt in emerging markets register even a sharper reduction as sovereigns’ have increased their local currency borrowing during the last decade. Currently, emerging market governments’ FX debt will be around 30 percent of their GDP at most (e.g. Arslanalp and Tsuda (2014)).
In this paper, first, we take a historical perspective in terms of the effects of and re-
responses to FED hikes separating advanced economies from emerging markets and developing economies. Our analysis covers 70 countries since 1990 using quarterly data. Second, we analyze the recent 2021–2023 period, focusing on resilience. Our focus is on two domestic factors that help us to tease out the heterogeneous effects of the U.S. monetary policy on other countries: Monetary policy credibility (proxied by a new measure constructed by Unsal, Papageorgiou and Garbers (2022)) and balance sheet weakness proxied by the extent of un-hedged FX debt on private non-financial sector balance sheets. The two factors are linked since weak private sector balance sheets due to dollar debt and local currency assets, forces the central banks to defend the currency in the face of local currency depreciations, which would otherwise increase the debt burden and defaults. An inflation targeting central bank can lose its credibility by targeting the exchange rate, since such behavior would entail a deviation from “do what you say, say what you do” rule, which has an important role in monetary policy credibility through its effect on perceived transparency, coherency and consistency. We show that historically emerging markets and developing economies are affected worse from global financial tightenings linked to FED hikes, due to lower credibility of their monetary policies and high levels of debt in foreign currency. Since these issues were largely remedied in the last decade, they have been more resilient to the 2021–2023 FED hikes.

There is a long and extensive literature on the international transmission of the U.S. monetary policy, starting with Alejandro (1983), Calvo, Leiderman and Reinhart (1993), Calvo, Leiderman and Reinhart (1996), who argued that the interest rate differentials between a given country and the U.S. affect the demand for government bonds (See also Eichengreen and Portes (1987), Reinhart and Reinhart (2009) and Reinhart and Rogoff (2009)). During 1980s and 1990s, the main form of borrowing of other countries involved their sovereigns issuing dollar bonds. As shown by Alfaro, Kalemli-Özcan and Volosovych (2014), and Kalemli-Özcan (2019), since early 2000s, there has been a compositional change from sovereign to private sector borrowing in emerging markets. The advanced economies went through this transition earlier, and developing economies are not quite there yet, where their
sovereigns’ borrowing still dominate their capital flows (Avdjiev, Hardy, Kalemli-Özcan and Servén (2022)). Also the currency of borrowing has changed as shown by Du and Schreger (2016) and Hofmann, Patel and Wu (2022), where emerging market sovereigns increasingly borrowed in local currency, whereas private sector, especially non-financial corporations increased their borrowing in foreign currency. These changes may indicate the end of the “original sin”, a term referring to the inability to issue external debt in domestic currency, coined by Eichengreen and Hausmann (1999), Eichengreen, Hausmann and Panizza (2005). Thus, the transmission mechanism of the U.S. monetary policy might also have changed, as private capital flows are generally more sensitive to global risk aversion (e.g. Avdjiev, Du, Koch and Shin (2019)). Forbes and Warnock (2012) studied total gross flows as sum of private sector and government borrowing (instead of net flows, aka current account) and show the increasing importance of global risk factors after mid-1990s. In addition, the VIX, a key global risk factor that captures changes in global risk aversion and uncertainty, has been shown to be related to monetary policy in the U.S. by Bekaert, Hoerova and Duca (2013), Miranda-Agrippino and Rey (2020), and Bruno and Shin (2015).

Consistent with this literature on capital flows, the recent literature on the U.S. monetary policy spillovers to other countries has been focusing on the financial channel of transmission of the U.S. policy rather than the trade channel (Rey (2013); Degasperi, Hong and Ricco (2023); Chari, Dilts Stedman and Lundblad (2021)). A prevailing finding in this body of research establishes a link between changes in the U.S. monetary policy and cross-border correlations of macro-financial conditions, mostly working through volatile external finance (Miranda-Agrippino and Rey (2020)), leading to time-varying deviations from the uncovered interest parity (UIP) and macroeconomic destabilization especially in emerging markets with risk-sensitive capital flows (Kalemli-Özcan (2019); Di Giovanni, Kalemli-Özcan, Ulu and Baskaya (2022)).

3 See also quantitative models such as Dedola, Rivolta and Stracca (2017); Akinci and Queralto (2018); Gourinchas (2018) for contractionary effects of the U.S. monetary policy on real outcomes of other countries.
Traditionally, the literature has more of a focus on the trade channel of the U.S. monetary policy transmission. A key issue here is the extent to which a weakening of the domestic currency vis-a-vis the U.S. dollar provides a boost to net exports, the so-called expenditure switching. Existing evidence on this issue goes against the notion of an expansionary effect when countries currencies depreciate since expenditure switching fails either due to dollar pricing of exports (Cavallo, Gopinath, Neiman and Tang (2021)) or the importance of expansive imported intermediate inputs, hindering investment and production (Mendoza and Yue (2012)). Miranda-Agrippino and Rey (2020) and Obstfeld (2015) also argue that flexible exchange rates fail to fully absorb external shocks through expenditure switching.

The financial channel is more salient than the trade channel in terms of discriminating between advanced economies and emerging markets in terms of worse effects as global investors shed risky assets as a response to tighter global financial conditions caused by a tighter U.S. monetary policy. Emerging markets and developing economies represent a risky asset class in any investor’s portfolio. This channel, as it is risk-based, highlights the importance of the endogenous responses of monetary policy and domestic vulnerabilities in these countries in understanding the international transmission of the U.S. monetary policy to these countries.\(^4\) Rey (2013) has argued that domestic monetary policy cannot be independent from international capital flows, even with flexible exchange rates and De Leo, Gopinath and Kalemli-Özcan (2022a) showed that, emerging markets’ domestic monetary policy is ineffective as its’ pass-through to domestic market rates is less than one in the light of capital flows that also have an effect on market rates. At the same time, countries with fixed exchange rate regimes are still shown to be more sensitive to global risk shocks and

\(^4\)Policies other than monetary policy, such as macroprudential policies, also shown to be important in dealing with the global financial cycle, which is linked to the U.S. monetary policy (Chari, Dilts-Stedman and Forbes (2022); Das, Gopinath and Kalemli-Özcan (2022)).
a strong dollar due to higher U.S. interest rates rather than flexible regimes (Obstfeld and Zhou (2023)). Kalemli-Özcan (2019) shows that this is due to the “risk-absorbing” properties of the floating exchange rates. Since the exchange rate depreciates, vis-a-vis the U.S. dollar, the risk premia, measured as the uncovered interest rate (UIP) premia, on emerging market assets do not have to go up as much, limiting capital outflows and contractionary effects. Similarly, Fukui, Nakamura and Steinsson (2023) show that exchange rate depreciations can be expansionary, not due to expenditure switching linked higher net exports, but rather through the financial channel, when the country experiences a boom financed with capital inflows, implying a lower UIP premium.

What has been missing in this literature covering the international transmission of the U.S. monetary policy and the effects of a strong U.S. dollar, is the role of policy credibility. Thus, we complement this literature by using a novel indicator of monetary policy credibility that shows large variations even across countries with the same exchange rate or monetary policy regime classifications, such as countries with free floating exchange rate or inflation-targeting regime. Hence, we do not define monetary policy credibility as the choice of the exchange rate regime: typically when a country lacks monetary policy credibility, it chooses to peg its currency to the U.S. dollar as it needs another nominal anchor. These extensive margin considerations on the exchange rate regime surely shed light on the role of monetary policymaking, however, they may not entirely explain the recent heterogeneity observed not only between emerging markets and advanced economies but also within emerging markets as most emerging markets already transitioned away from pegged exchange rate regimes since the end of the 1990s. Our new monetary policy credibility index works at the intensive margin and can explain such heterogeneity and the observed resilience to recent FED hikes.

5For example, Forbes and Klein (2015) show countries’ monetary policy choices, including how tightly they control the exchange rate, could drive differential responses.

6Dedola, Rivolta and Stracca (2017) point that one reason why they do not find a strong role for exchange rate regime in driving the international spillovers of U.S. monetary policy shocks is that none of the countries in their sample has been all the time in a peg. Iacoviello and Navarro (2019) also find the exchange rate regime inconsequential when considering higher U.S. interest rates on economic activity.
The paper is composed of seven sections. Section 2 lays out the broader literature and shows descriptive evidence on our narrative, focusing on the difference between a small open economy and an emerging market. Section 3 details the data and our benchmark measures of policy credibility and balance sheet weakness. Section 4 undertakes the empirical analysis that shows the heterogeneous effects of the U.S. monetary policy. Section 5 analyzes the recent post-pandemic inflation episode and the effects of FED hikes during this period. Section 6 runs robustness analysis. Section 7 concludes.

2 The Narrative from the Lens of the Broader Literature

For the transmission of the U.S monetary policy, trade and finance linkages represent two critical channels that have garnered significant attention among academic and policymakers. Figure 3 below illustrates these channels and the way the literature evolved in trying to understand these channels both theoretically and empirically.

Figure 3: Fed Hike

Notes: Own elaboration
In traditional models and empirical work, the focus was on currency depreciations of other countries vis-à-vis dollar appreciations, akin to the Mundell-Fleming model (IS-LM for an open economy). A currency depreciation has the potential to stimulate net exports, creating an expansionary effect, but it can also trigger inflation through exchange rate pass-through, (Burstein and Gopinath (2014); Forbes, Hjortsoe and Nenova (2018)), potentially requiring monetary tightening that might lead to a contraction. Figure 3 shows this as the “Trade Channel,” depicted on the left side of the figure. The empirical literature fails to find an expansionary effect of currency depreciations. This finding has been justified by models and evidence showing dollar-pricing of exports (Gopinath (2016)), and/or negative balance sheet effects due to currency mismatch involving un-hedged dollar debt and local currency assets (Krugman (1999), Schneider and Tornell (2004), Aghion, Bacchetta and Banerjee (2001), Cook (2004), Céspedes, Chang and Velasco (2004), Aguiar (2005), Kalemli-Özcan, Kamil and Villegas-Sanchez (2016)). A strong dollar leads to a deterioration of countries’ balance sheets as a result of depreciated currency and leads to lower investment and production when it is combined with expensive imported intermediate inputs (Mendoza and Yue (2012), Gopinath and Neiman (2014)), again leading to a contraction in GDP.

Currency mismatches in balance sheets as often pushed policymakers to have a tight control over the currency (Calvo and Reinhart (2002), Reinhart (2000), IMF (2022)), leading to a reaction by other central banks to mimic the FED hikes, which might intensify the contraction in their own economies. Kalemli-Özcan (2019) shows that countries who hike the policy rate to defend their currencies in the face of a strong dollar experience deeper recessions.

These actions of other central banks that are endogenous to the U.S. monetary policy, affect behavior of global investors as depicted on the right side of Figure 3, under the financial channel. When U.S. interest rates increase, it not only results in higher safe rates globally, increasing cost of capital, but it also leads to higher risk premia towards inherently riskier assets, such as emerging markets. Here, it can be the case that the balance sheets
of U.S./global financial intermediaries weaken (Gertler and Kiyotaki (2010)) as witnessed during the banking stress of 2023 linked to interest rate risk (Seru (2023)), and/or global investors want to dump risky assets given higher risk-aversion, inducing risk premia shocks for emerging markets combined with dollar appreciations.\(^7\) Given the extent of dollar debt on the balance sheets of financial intermediaries (in the U.S. and in other countries), asset riskiness and balance sheet weakness can go hand-in-hand in limiting the international financial intermediation (Gabaix and Maggiori (2015)). The overall quantitative impact of the U.S. tightening would then depend on the endogenous responses of other countries’ monetary policies which is a function of the relative potency of each transmission channel.

To illustrate the distinction between an advanced small open economy, and an emerging market—which is also a small open economy—we will go through some examples. This distinction is important in understanding how trade channel works in a similar way on all small open economies, whereas, the financial channel is salient to separate the worse impact of FED hikes on more risky vs less risky countries.

Think Canada and Mexico, both small open economies with important differences for our purposes. From the perspective of the trade channel of the U.S. monetary policy transmission, the distinction between Mexico and Canada is less important; however, from the perspective of the financial channel, failing to distinguish between a small open economy and an emerging market/developing economy is detrimental. To fix ideas, Figure 4 document a specific U.S. monetary policy tightening episode, known as the “Taper Tantrum” in May 2013, during which the Federal Reserve signaled the end of quantitative easing and an anticipated earlier increase in interest rates. Mexico and Canada, both neighboring the U.S. under a trade agreement, should observe a similar impact through trade channel, given both their currencies depreciate vis-a-vis the U.S. dollar.

\(^7\)See models formalizing this financial channel endogenously, Jiang, Krishnamurthy and Lustig (2021), Bianchi, Bigio and Engel (2021), Akinci, Kalemi-Özcan and Queralto (2021), Devereux, Engel and Wu (2023). Gourinchas and Rey (2022) modeled this story as a rise in risk aversion and Kekre and Lenel (2021) as flight to safety.
The figure plots the evolution of key macro-finance variables relative to the second quarter of 2013, together with Mexico and Canada nominal exchange rate depreciations (NER). In spite of the fact that, both countries have experienced similar depreciations, their other macro-finance variables show stark contrast. During this period, the long-term risk premium in Mexico experienced a sharp increase and remained elevated for a prolonged period, captured by 10 year government bond spreads. The short-term risk premium also rose sharply, captured by the 12-month UIP premium. Notice that the long-term government bond spreads capture dollar premium via default risk (or term premium together with default risk for local currency bonds) and the short-term UIP premium captures local currency premium, that is excess currency returns due to currency risk. The UIP premium is measured in logs as follows: \((i_{\text{mex}} - i_{\text{US}}) - (\Delta E(s))\), where the first interest rate differential term between Mexico and the U.S. uses 12-month government bond rates in local currency and the second term is the expected change in the peso/dollar exchange rate \((s)\) in 12-months.

The increase in the UIP premium can be driven by three different events: 1) An expected appreciation captured by a fall in the second term, \(\Delta E(s)\) as currency depreciated on impact with the FED’s actions, as shown, 2) an increase in the interest rate differential above and beyond the movement in the exchange rate, driven by possible response of Mexican central bank by hiking its own interest rates more than the FED to defend the currency, 3) a higher risk premium reflected in the interest rate differential demanded by global investors on risky Mexican assets. Kalemli-Özcan (2019), Kalemli-Özcan and Varela (2021), De Leo, Gopinath and Kalemli-Özcan (2022b) show that it is the 3) case that drives the higher UIP premium in response to the U.S. monetary policy shock and risk-off shocks.

These risk spreads moved in exact opposite direction in Canada. True, the exchange rate in Mexico depreciated more on impact, though Canadian exchange rate has also depreciated, even more so later on. The interesting part is that the similar depreciations in both countries are associated with opposite movements not only in risk spreads but also in capital flows; there were capital outflows from Mexico by foreigners, despite interventions in
the FX markets at the time (which might have limited depreciation), whereas Canada has received capital inflows. Inflation fell in Mexico in spite of the fact that peso is depreciating, reflecting the slowdown in output, as we document below in the empirical analysis. What is interesting is that Mexico monetary policy went in reverse compared to FED and tried to stimulate the economy, whereas Canada monetary policy did not respond at all.

As shown in Figure 5, the recent experiences of Canada and Mexico present a distinct narrative, particularly in how variables in Mexico have demonstrated improvement. The y-axis in both set of figures are the same for ease of comparison for a country across time. Furthermore, responses have exhibited more similarity between these two countries. Both Canada and Mexico witnessed a reduction in long-term risk premia and some capital outflows, albeit less pronounced compared to earlier episodes. The increase in inflation was comparable across both countries, and both countries employ the same monetary policy by hiking their rates since they were also experiencing a COVID-era inflation problem. Most importantly, Mexican exchange rate depreciated and Canada exchange rate appreciated vis-a-vis the U.S. dollar, when both country interest rates were increasing similar amounts and more than the U.S., and yet the UIP premium fell in Mexico more than Canada, implying a much lower risk premium on Mexico by global investors.8

This narrative underscores that the impact of U.S. policy shocks is heterogeneous both across countries and over time. Subsequently, we conduct a systematic econometric analysis, demonstrating that both policy credibility and FX-related vulnerabilities play pivotal roles in explaining such heterogeneity and evolution.

8For the UIP premium to fall, the expected depreciation of the Mexican peso must be higher than the interest rate differentials.
Figure 4: Canada and Mexico after Taper Tantrum: May 2013

Notes: The Figure shows the evolution of variables relative to Taper Tantrum (2013q2). 10 year government bond spreads are calculated with respect to the U.S., and the plot shows the percentage point difference relative to 2013q2. 12 month UIP deviations are calculated as explained in the data section and the plot shows the percentage change relative to 2013q2. Nominal exchange rate (NER) is defined as local currency per USD, and the plot shows the percentage change relative to 2013q2. Capital inflows to GDP are measured as bank and corporate capital inflows to GDP ratio, and the plot shows the percentage change relative to 2013q2. The policy rate plot shows the percentage point difference relative to 2013q2. The inflation plot shows the year-to-year growth rates.
Figure 5: Canada and Mexico after recent FED Hikes: 2021q4

Notes: The Figure shows the evolution of variables relative to the recent FED Hikes (2021q4). 10 year government bond spreads are calculated with respect to the U.S., and the plot shows the percentage point difference relative to 2021q4. 12 month UIP deviations are calculated as explained in the data section and the plot shows the percentage change relative to 2021q4. Nominal exchange rate (NER) is defined as local currency per USD, and the plot shows the percentage change relative to 2021q4. Capital inflows to GDP are measured as bank and corporate capital inflows to GDP ratio, and the plot shows the percentage change relative to 2021q4. The policy rate plot shows the percentage point difference relative to 2021q4. The inflation plot shows the year-to-year growth rates.

3 Data and Measurement

3.1 Monetary Policy Credibility

Our measure for monetary policy credibility is a new index developed by Unsal, Papageorgiou and Garbers (2022) using a narrative approach similar to Romer and Romer (1989) for 50 countries between 2007–2021. This index characterizes monetary policy frameworks
across three pillars: (i) (IA) Independence and Accountability, which provides the foundations of monetary policy; (ii) (PO) Policy and Operational Strategy, which guides adjustments to the policy stance given the objectives, as well as adjustments to the policy instruments to implement the policy stance; and (iii) (C) Communications, which convey decisions about the policy stance and rationale to the public. In order to cover these pillars at sufficient clarity and comprehension within the IAPOC index, Unsal, Papageorgiou and Garbers (2022) formulate 225 criteria, which are then assessed against the public information from countries’ central bank laws and websites.

By thoroughly characterizing all three pillars of the monetary policy frameworks, the resulting scope and granularity of the index enable detecting novel properties of and patterns across monetary policy frameworks. In particular, it provides a tool to assess the soundness of monetary policy frameworks, and identify their drivers and changing properties—even within the same monetary policy or exchange rate regimes—over time. As shown in the introduction, Figure 1 registers a more substantial increase for emerging markets and developing economies in their policy credibility compared to advanced economies since 2007. The median emerging market improved much more. Figure 6 shows the detailed cross-country heterogeneity behind Figure 1, where countries like Uruguay and India show the maximum improvement.

The improvement in monetary policy credibility across emerging markets and developing economies becomes even more evident when comparing the distribution of the index for 2007 and 2021 in Figure 7. The mass has shifted more to the right, still keeping the extensive heterogeneity. Advanced economies have a more narrow distribution. In particular, in the 2007 the min of emerging market distribution is 0.194 and it has a max of 0.759 (mean of 0.493), while for the advanced distribution, it has a mean of 0.509 and a max of 0.779 (with mean of 0.665). In the 2021 distributions, the min of emerging markets is 0.269 while 0.681 for advanced, but it gets as high as 0.822 for emerging and 0.867 for advanced, with average index value of 0.632 and 0.750, respectively.
Understandably, the enhancements in the monetary policy frameworks of rich countries have been relatively modest, given their already robust foundation in 2007. Conversely, many emerging markets have achieved substantial improvements, underscored by a remarkable increase of approximately 50 percent in their IAPOC index over the past 15 years, reflecting the progress made the way they both conduct and communicate their monetary policies. Indeed, within IAPOC, most of the improvements over time come from pillars associated with monetary policy practices, specifically PO and C. In contrast, IA pillar displays much less variation, reflecting the fact that legal foundations and administrative processes that define de jure part of the IA, such as the central bank law, are typically cannot be changed or rescinded quickly.

Figure 6: Change in Monetary Policy Credibility, 2007-2021

Notes: Percentage change in monetary policy credibility (IAPOC index) of AEs and EMDEs in 2007 (or the earliest starting year) and 2021.

A more sound monetary policy framework bolsters monetary policy credibility, assur-
ing the public that monetary actions are executed transparently, coherently, and consistently. This is embodied in our measure of policy credibility, the IAPOC index, reflecting the efficacy of monetary policy in maintaining price or inflation stability. The index is indeed negatively and significantly correlated with inflation and inflation expectations at different horizons (Figure 8). The color coding in the figure clearly shows that both downward slopes (higher policy credibility, lower inflation and lower inflation expectations) are mostly driven by emerging markets (red dots).

Our policy credibility index stands apart from a large body of existing studies that measure monetary policy credibility with realized inflation or inflation expectations. These will be endogenous measures since inflation level and expectations depend on policy credibility. For example, Bems, Caselli, Grigoli and Gruss (2021) drive policy credibility from inflation, relying on historical data. Our measure is a direct measure of policy credibility, based on narrative approach, and hence allows looking into how the underlying monetary policy credibility could affect macroeconomic and financial outcomes such as inflation expectations and risk spreads following a shock.

Figure 7: Policy Credibility Distributions

Notes: Distributions of policy credibility (IAPOC) index of AEs and EMDEs in 2007 and 2021.

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3.2 Balance Sheet Weakness via FX Debt

To study the role of heterogeneity in terms of balance sheet weakness of countries for the international transmission of the U.S. monetary policy, we rely on updated data from Fan and Kalemli-Özcan (2016) and Kalemli-Özcan, Liu and Shim (2021) on the ratio of FX debt to total debt, for the private sector, in a given country. This data comes from the BIS Global Liquidity Indicators (GLI) database which provides FX debt exposures for both bonds and loans for the non-financial private sector (non-financial corporations and households), and for governments separately. FX bonds are defined as debt securities issued in the U.S. dollar, euro and Japanese yen and issued in international markets by the residents in the non-financial sector of a given economy. FX loans are defined as bank loans extended to the non-bank sector of a given economy both by domestic banks and international banks located
outside the economy and denominated in the U.S. dollar, euro and Japanese yen.

We work with the ratio of FX debt to total credit to the non-financial sector. Total credit data comes from the BIS total credit database which provides data on total loans and debt securities used for borrowing by the residents in the non-financial sector of a given economy, in both domestic and foreign currencies and from both domestic and foreign lenders. By dividing the sum of loans and bonds in FX from the GLI dataset for the non-financial sector by the sum of total loans and bonds for the non-financial sector from the total credit database, we obtain the country-level non-financial private sector FX debt share. The data is available for the following 16 emerging economies: Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, Saudi Arabia, South Africa, Thailand and Turkey.

Of course, having FX debt alone does not necessarily indicate a weak balance sheet. To address this issue, we draw upon extensive literature that documents how, in emerging markets, the financial sector (banks) is often required to hedge currency risk, while corporates, including exporters, tend not to match currency risk on their balance sheets (Di Giovanni, Kalemli-Özcan, Ulu and Baskaya (2022), Alfaro, Calani and Varela (2021)). Governments can act as the lender of last resort for dollars through their reserves, effectively hedging this risk at the national level, and hence we control the FX reserves to GDP in these regressions. The primary rationale for utilizing this dataset, despite its limitations in terms of sample size, is the ability to focus exclusively on private sector FX exposure. This is crucial because, as we highlighted in the introduction, emerging market governments are increasingly borrowing in local currency, while the non-financial private sector continue to borrow in foreign currency, un-hedged, from international markets.
3.3 Other Variables

Our panel data set includes other variables: GDP, CPI, exchange rates, monetary policy rates, capital flows and UIP deviations. We use seasonally adjusted real GDP, from the World Economic Outlook and complement the missing series using data from central banks, national bureau of statistics and the IFS. We use CPI data from IFS. For nominal exchange rates we use IFS as well. From Bloomberg, we get nominal interest rate data. We also use total capital inflows, defined as the sum of banks, central banks, corporate and government portfolio debt and other investment debt flows (loans) from BIS, originally constructed by Avdjiev, Hardy, Kalemli-Özcan and Servén (2022). 12-month UIP deviations are calculated as the difference between log interest rate differentials and the gap between log expected and spot exchange rate, all at the same horizon, as shown in section 2. Log interest rate differentials are the short-term government bond vis-à-vis the United States, at or less than 12-months. The log expected exchange rate is the 12-month ahead expected exchange rate as of month t from Consensus Economics and the log exchange rate is the spot rate, both nominal and in terms of local currency per U.S. dollar. Thus, a positive UIP premium means, positive excess currency returns to local currency. As we argued before, an increase in the UIP premium in response to FED hikes over time can come from two sources: 1) An expected appreciation that is not enough to offset the lower interest rate differentials due to FED hike, 2) An endogenous response of local monetary policy to the FED hike by hiking more that drives up the interest rate differentials above and beyond the expected depreciation in the currency.

Our panel data set also includes two variables that we use as controls, namely the capital account openness index and FX reserves to GDP. The capital account openness index is measured as the degree of de jure capital account openness using measure from the IMF (Jahan and Wang, 2016), which is based on qualitative information from the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions. We use the overall openness
index in all asset categories. The FX reserves are from the IFS.

In our analysis, we drop hard pegs as our monetary policy credibility index captures the granular intensive margin and not the endogenous decision to peg or float as a result of lack of monetary policy credibility. We also do robustness by dropping dual markets exchange rate countries, such as Argentina (Ilzetzki, Reinhart and Rogoff (2022) classifications 1 and 6). Thus, we always work with an unbalanced panel composed of managed and pure floats. Given the time series nature of this classification, countries can come and go to the sample. For example we would not have Argentina during its currency board regime, but would include her after Argentina floats.

Below Table lists our country sample, indicting data availability. The data appendix provides the descriptive statistics table.

Table 1: Country Sample

<table>
<thead>
<tr>
<th>Albania</th>
<th>Czech Republic*</th>
<th>Israel*</th>
<th>Mongolia</th>
<th>Serbia*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina*</td>
<td>Denmark</td>
<td>Italy</td>
<td>Morocco</td>
<td>Singapore</td>
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<tr>
<td>Armenia*</td>
<td>Dominican Republic</td>
<td>Jamaica*</td>
<td>Mozambique*</td>
<td>Slovak Republic</td>
</tr>
<tr>
<td>Australia*</td>
<td>Euro Area*</td>
<td>Japan*</td>
<td>New Zealand*</td>
<td>South Africa*</td>
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<td>Ecuador</td>
<td>Kazakhstan*</td>
<td>Nigeria*</td>
<td>Sweden*</td>
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<td>Belarus</td>
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<td>Bolivia</td>
<td>Germany</td>
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<td>Brazil*</td>
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<td>Canada*</td>
<td>Hungary*</td>
<td>Malaysia*</td>
<td>Philippines*</td>
<td>Turkey*</td>
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<td>Chile*</td>
<td>Iceland*</td>
<td>Malta</td>
<td>Poland*</td>
<td>Uganda*</td>
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<tr>
<td>Colombia**</td>
<td>India*</td>
<td>Mauritius*</td>
<td>Romania</td>
<td>United Kingdom*</td>
</tr>
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<td>Costa Rica</td>
<td>Indonesia*</td>
<td>Mexico*</td>
<td>Russian Federation*</td>
<td>Uruguay*</td>
</tr>
<tr>
<td>Croatia</td>
<td>Ireland</td>
<td>Moldova*</td>
<td>Rwanda*</td>
<td>Zambia*</td>
</tr>
</tbody>
</table>

Note: We follow the IMF 2000 World Economic Outlook country groups classification. Because we measure U.S. monetary policy spillovers, we drop the U.S.
* indicates that we have the monetary policy credibility index (IAPOC) for this country
$ indicates that we have the direct measure of FX debt exposure of the private sector for this country
Red text indicates a country is an emerging market
Blue text indicates a country is a low income/developing country.
4 Empirical Analysis

4.1 FED Hikes and Risk Premia in Financial Markets

We want to capture the exogenous component of the U.S. monetary policy that constitutes a surprise for the financial markets, which in turn impacts their risk sentiment. The U.S. monetary policy reacts to U.S. business cycle and hence priced-in before the change in the federal funds rate. The macro literature has developed several approaches to deal with this endogeneity problem, one of which is known as the “high-frequency identification” approach of Gertler and Karadi (2015). This two-step approach uses fed funds rate or any short-term treasury rate as policy rate and instruments it with “surprises” calculated as the movements in future prices at the time of the FOMC announcement. The idea being, such moves in futures were not priced-in ex-ante. Following Gertler and Karadi (2015), we use the 12-month U.S. treasury rate as policy indicator, and instrument it with the averaged monthly weighted raw surprises in 3-month Fed Fund Futures (FF4).

For robustness, we have used several alternatives. One approach that became popular during the ZLB period with fed funds rate at zero is to use the surprises directly in reduced form as opposed to instrumenting the policy rate. The recent literature also argued that the information effect of the FED can contaminate the surprises. Hence we used the monetary policy shocks of Jarociński and Karadi (2020) that cleans out the FED information effect using the stock market reactions. We have also used Bauer and Swanson (2023) who compute orthogonalized monetary surprises as residuals from regressing monetary surprises on six macro and financial variables, and Nakamura and Steinsson (2018) policy shocks, measured as the first component of the policy news shock. These all yield similar results so we do not report given space considerations but these are available upon request.

What we do report instead are the results of other robustness checks, where we use direct measures of changes in risk sentiments, such as the VIX, a volatility index for the U.S. stock
market, the excess bond premium (EBP) of *Gilchrist and Zakrajšek (2012)*, that captures financial market risk sentiments free of default risk, and the risk-on-risk-off (RORO) index of *Chari, Stedman and Lundblad (2020)*, which reflects changes in the global risk appetite based on the first principle component of daily data from both the U.S. and the Euro area, combined with a structural model since first principle component may confound information about variation in price of risk (or risk aversion) and the quantity of risk. All these measures directly measure risk premia/risk sentiment shocks and risk-on-off behavior of financial markets.

Figure 9 shows that, even though not every FED hike since 1990s is associated with a risk-on-off shock, the key ones are, as highlighted with grey bars, such as 1994-1995, 2004, 2015-2018 and especially for our purposes the recent 2021-2022 hikes.
Figure 9: Monetary Policy Shocks and Risk Premia Shocks

Notes: This figure plots the U.S. monetary policy shock from Gertler and Karadi (2015), the Excess Bond Premium (EBP) of Gilchrist and Zakrajšek (2012) and VIX, all in percentage points. We use 4 quarter moving averages. The U.S. monetary policy shock is lagged one quarter, EBP is in deltas and VIX is in logs. Gray lines show important hikes when both the Fed and risk shocks co-move.

4.2 The International Impact of FED Hikes

We start by documenting how policy tightening in the U.S. affects monetary policy responses and macroeconomic outcomes. Specifically, we look at the relative effects of an identified U.S. monetary policy shock on advanced economies and emerging markets separately. The U.S. monetary policy shocks are exogenous from the viewpoint of these ‘other’ economies.

We use panel local projections with instrumental variables (LP-IV) (Jordà (2005), Stock and Watson (2018), Gertler and Karadi (2015)) to delineate the impact of the U.S. monetary policy shocks on policy rates as well as other macroeconomic aggregates. The alternative is to do a VAR, but as shown by Kilian and Lütkepohl (2017) and Plagborg-Møller and Wolf...
(2021), from an identification and estimation perspective, local projections and VARs are practically the same.

Following the specification in levels/log levels in the international transmission literature of Rey (2013), Degasperi, Hong and Ricco (2023), Miranda-Agrippino and Rey (2020), Kalemli-Özcan (2019), we estimate for each country group, as the second stage of our IV:

\[ y_{c,t+h} = \alpha_c + \beta_h \tilde{t}_{US}^c + \gamma W_{c,t} + \omega \sum_{i=1}^{4} \eta_i y_{c,t-i} + \epsilon_{c,t+h} \]  

where \( y_{c,t+h} \) is a vector of macro and financial variables of country \( c \) at time \( t+h \), \( \alpha_c \) are country fixed effects. \( \tilde{t}_{US}^c \) denotes the instrumented 12-month U.S. treasury rate, where the first stage regresses this treasury rate on Fed Fund Futures as explained above. \( W_{c,t} \) are controls that include the capital account openness index, and four lags of the 12-month U.S. treasury rate, the instrument and output growth and inflation differentials with the U.S.. We also include four lags of the dependent variable, as shown by \( \sum_{i=1}^{4} \eta_i y_{c,t-i} \). Note that controlling capital account openness also controls the trade channel of the U.S. monetary policy transmission since trade channel will work via exports minus imports (a.k.a current account) and capital account is simply current account with a reverse sign.

As an alternative, we estimated cumulative changes relative to pre-shock level of the dependent variable, as opposed to controlling four lags of it on the RHS, as in Obstfeld and Zhou (2023) and Fukui, Nakamura and Steinsson (2023):

\[ y_{c,t+h} - y_{c,t-1} = \alpha_c + \beta_h \tilde{t}_{US}^c + \gamma W_{c,t} + \epsilon_{c,t+h} \]  

This specification is similar to the first specification, where the first lag of the dependent variable is moved to LHS, which changes the interpretation of \( \beta \). The \( \beta \) in the first specification is the effect of the shock at each horizon, whereas the \( \beta \) in the second specification is the effect of the shock at each horizon relative to the previous horizon. In the second
specification, we additionally include as controls quarter to quarter GDP growth, and quarter to quarter growth rate of dependent variable, following earlier papers. $W_{c,t}$ still includes the capital account openness index, and four lags of the 12-month U.S. treasury rate, the instrument and output growth and inflation differentials with the U.S. As we show results from both specifications will be similar, consistent with the findings of Montiel Olea and Plagborg-Møller (2021), where local projection inference with lag-augmentation is robust to two common features of macroeconomic applications that our controls are trying to get at: highly persistent data and the estimation at long horizon. Hence it does not matter where we account for the lags of the dependent variable in the estimation.

Figure 10 displays the differential impact of the U.S. monetary tightening on AEs and EMDEs, based on equation 1, where we run this in two different samples of countries. The U.S. monetary policy shock results in a significant and persistent decline in output in EMDEs but not in AEs: A 1 percentage point increase in the U.S. policy rate, leads to 2 percent decline in output by the 3rd quarter and a 3 percent decline by the 8th quarter in EMDEs.

What is interesting is that such a decline happens even though EMDEs reduce their own policy rate, as also shown by De Leo, Gopinath and Kalemli-Özcan (2022a), by half a percentage point on impact and a full percentage point by 3rd quarter. Inflation in EMDEs goes down though less precisely estimated, possibly due to two opposing effects: Lower inflation due to a contraction and higher inflation due to the depreciation of the local currency of EMDEs vis-a-vis the dollar, which is almost 3 percent by 3rd quarter, as shown.

The dominance of the financial channel of the U.S. policy transmission, for EMDEs, is clearly shown by the large increase in UIP; 3 percentage point for a 1 percentage point shock by 3rd quarter. Given the mean UIP deviation for EMDEs, this implies a large change: moving from a country that is in the 25th percentile to a country that is in the 75th percentile of the UIP wedge distribution, which would be moving from Chile to Argentina.

Recall that a higher UIP premium means higher expected excess returns to local currency vis-a-vis the dollar. It can happen either investors expect the EMDE currency to appreciate
in the future since there is a depreciation on impact with the FED hike, or the EMDE interest rate differential with the U.S. can increase. Since EMDEs lower the policy rate on average, as a response to the U.S. monetary policy shock, the only way UIP premium can be higher is via a large expected appreciation 12 months ahead given the large current depreciation. Consistent with a higher UIP premia, capital inflows go down (meaning international investors leave) by 2 percentage point around 3rd quarter before reverting back. All the effects for AEs are either insignificant or economically smaller. Note that AEs currencies also depreciate on impact vis-a-vis the dollar, with a similar magnitude to EMDEs. Hence, these results generalize our earlier narrative on Mexico and Canada, where exchange rate movements are similar as a response to FED hike, however, risk spreads were quite different affecting real outcomes also differentially.
Figure 10: International Transmission of FED Hikes: Emerging vs. Advanced Economies

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the capital account openness index of the IMF and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: real GDP in logs, CPI in logs, the monetary policy rate, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), 12m UIP deviations which are defined as explained above, and the ratio of total inflows to GDP.
4.3 The Role of Policy Credibility

Why are EMDEs affected worse from FED hikes? At least historically, during the period we study: 1990–2020.

To shed light on this question, we extend our LP-IV framework to analyze the differential impact of the U.S. monetary policy shocks depending on the monetary policy credibility of countries, using the full sample, where we rely on the IAPOC index of Unsal, Papageorgiou and Garbers (2022). In particular, we augment our specification 1 in the following way:

\[ y_{c,t+h} = \alpha_c + \beta_1 h_t^US + \beta_2 h_t^US \times IAPOC_c + \gamma W_{c,t} + \sum_{i=1}^{i=4} \eta_i y_{c,t-i} + \varepsilon_{c,t+h} \]  (3)

The marginal effect of a U.S monetary policy shock is now given by the value of the monetary credibility index IAPOC:

\[ \frac{\partial y}{\partial h} = \beta_1 h + \beta_2 h \times IAPOC \]  (4)

The Figure 11 show the IRFs evaluated at the minimum and maximum values of IAPOC using the first value observed for every country. As clearly shown, countries with low monetary policy credibility experience sharper contractions in output, higher inflation (in spite of a slowdown in their economies), larger depreciations and higher UIP premia, as opposed to countries with higher policy credibility. Countries with high policy credibility enjoy a sustained decrease in inflation, with a mild slowdown.

The responses also capture more pronounced trade-offs that central banks face when monetary policy credibility is low. In these cases, exchange rate pass-through is generally stronger such that exchange rate depreciations are more inflationary. In order to keep inflation under control, central banks often use interventions in the foreign exchange market to avoid the need to choose between sharp policy tightening, which would further slow down growth, and adopting a looser policy stance at the cost of much higher inflation. However,
central banks with such approaches tend to suffer from less transparent and inconsistent monetary policy, frequently deviating from ‘what they say they do’ in practice, which in turn erodes the policy credibility further. In fact, although imprecisely estimated, we see low credibility countries raising the policy rate and high credibility countries lowering the policy rate as a response to a FED hike.
Figure 11: International Transmission of FED Hikes: The Role of Policy Credibility

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: real GDP in logs, CPI in logs, the monetary policy rate, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), 12m UIP deviations which are defined as explained above, and the ratio of total inflows to GDP. We evaluate the marginal effect of a U.S. monetary policy shock given by equation 4 in the minimum and maximum values of first value of IAPOC observed (0.19 and 0.77, respectively). Low (high) credibility countries correspond to the minimum (maximum) value.
4.4 The Role of Balance Sheet FX Vulnerabilities

In this section, we extend our LP-IV framework to allow the impact of the U.S. monetary policy shocks to differ based on the weakness of the private sector balance sheets, where we measure the weakness with the extent of currency mismatch between liabilities and assets. To do so, we use FX debt of the private non-financial sector that we assume un-hedged given the extensive evidence in the literature, as we argued above. To guard against the possibility that the government can insure the currency mismatch, we control dollar assets of the government that is we control for reserves to GDP ratio.

Using the FX debt variable we have, we divide countries into two groups: countries with high FX debt (countries above the median on average) and countries with low FX debt (countries below the median on average) and we run our good-old specification 1 for each country group separately, with the same shocks and controls as before:

\[
y_{c,t+h} = \alpha_c + \beta_h i^{US}_t + \gamma W_{c,t} + \sum_{i=1}^{i=4} \eta_i y_{c,t-i} + \varepsilon_{c,t+h}
\]  

(5)

We summarize results in Figure 12. It is clear that countries with high FX debt, go through sharper contractions in output together with larger depreciations and higher UIP premia. Interestingly inflation is lower and policy rate is also reduced. These reflect the fact that due to tightened economic and financial conditions, inflation goes down in these countries, and policy rate is lowered. Most of these countries also use FX interventions to manage financial stability risks, which leads to a lower degree of pass-through of depreciation into inflation, but still cannot avoid a higher UIP premium. In fact this is why the response of capital inflows is limited, that is the possible use of other policies such as FX interventions and macroprudential regulation combined with capital flows management tools might be limiting the response of capital inflows in high FX debt countries.

The challenges faced by many EMDEs in securing loans denominated in their domestic
currency captured by the higher UIP premia, can be attributed to issues surrounding monetary policy credibility, bridging our findings from this and the preceding section. A vicious cycle appears to emerge, wherein diminished policy credibility leads to an increase in foreign currency-denominated debt. Consequently, these EMDEs becomes more susceptible to U.S. monetary policy shocks, often compelling central banks to adopt policy responses misaligned with their domestic conditions or engage in FXIs to safeguard macroeconomic or financial stability. However, these interventions, often executed without a structured and systematic monetary policy framework, often undermine policy credibility and increase currency risk such that countries borrowing in their own currency remain limited.
Figure 12: International Transmission of FED Hikes: The Role of Balance Sheet Weakness via Currency Mismatch

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the ratio of reserves to GDP and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: real GDP in logs, CPI in logs, the monetary policy rate, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), 12m UIP deviations which are defined as explained above, and the ratio of total inflows to GDP. High (low) FX debt countries are defined as those above (below) the median of the average FX debt over time.
Figure 13 below shows a strong negative relation between FX debt and credibility; countries with lower credibility accumulated higher levels of FX debt, or countries with high levels of FX debt have low policy credibility because of their policy actions. The relationship can be endogenous where each variable feeds-into each other, pointing to negative side effects of commonly employed FX interventions and capital controls on monetary policy credibility.

Figure 13: FX debt and Policy Credibility

\[ \text{Coef.} = -1.26, \quad \text{R-squared} = 0.43 \]

Notes: This figure shows the correlation between the policy credibility index (x-axis) and the FX debt (y-axis). Coefficient $\beta$, significant at 5%, and $R^2$ from OLS estimates $FX_{debt,c} = \alpha + \beta IAPOC_c + \epsilon_c$ are reported.

5 The Recent Episode: 2021–2023 FED Hikes

“Resilience” is the buzz word for 2022–2023. While it’s often used in the context of the U.S. economy, which has avoided a recession despite experiencing some of the steepest interest
rate hikes in decades, the story of emerging markets is even more remarkable. Projections for
global growth in 2023 are primarily fueled by EMDEs, and impressively, the top 25 EMDEs
all surpassed their 2022 forecasts (IMF, 2023)

As it’s widely acknowledged, and our documentation confirms, rising U.S. interest rates
created challenges for EMDEs during the 1980s and 1990s. This time is different as most
EMDEs managed to establish monetary and financial discipline, marked by credible mone-
tary policies and reduced FX debt. In the 2021–2023 period, they began raising rates ahead
of AEs as soon as COVID-related inflation started rising in their economies. With their
sound inflation targeting frameworks in place, they took action when they observed inflation
expectations being de-anchored with rising inflation (e.g. Carvalho and Nechio (2023)).

We ran both specification 1 and 2 in reduced form for the recent time span of 2021q1 to
2022q4. We opted to start in 2021q1, despite the FED not start hiking until the last quarter
of 2021, to ensure we had a sufficient number of observations for running the LPs. We
summarize results in Figure 14.

We highlight the historical financial channel of transmission, for EMDEs, (re-printed
from previos Figures) in the first column, focusing on the UIP premia and the exchange rate
movements. In stark contrast, the second and third columns display impulse responses of
UIP premia and exchange rates to recent FED hikes, using both LP specifications, equations
1 and 2 respectively. It becomes evident that the changes in exchange rates and UIP premia
are either insignificant or minimal, this time around.
Figure 14: International Transmission of FED Hikes to EMDEs during 2021–2022

Notes: Impulse responses of Gertler and Karadi (2015) shock are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the IMF capital account openness index one lag of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: nominal exchange rate growth (domestic currency/U.S. dollar) and 12m UIP deviations which are defined as explained above. Historical Episode is the 1990q1-2019q4 period. Recent Episode I covers the 2021q1-2022q4 period. Both of these use specification 1 in reduced form. Recent Episode II is also for the 2021q1-2022q4 period but uses specification 2 in reduced form.  

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Of course, these results can also be due to imprecise estimation given the low number of observations. While some of this might be going on, we have enough significant variables (all will be reported in Appendix) that we trust the finding of insignificance and small effects are true effects. For example, the UIP premia goes up by 3 percentage points historically, but less than 1 percentage points during the recent episode, for the same set of EMDEs.

6 Robustness Analysis

In this section we revisit our results using alternative country samples, specifications and measures for the risk sentiment shocks.

6.1 Dropping Low Income Developing Countries

In this subsection we re-run our same specifications for a reduced set of countries, excluding those we categorize as developing and low income economies+: Bolivia, Dominican Republic, Ghana, Jamaica, Kenya, Kyrgyz Republic, Moldova, Mongolia, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia. We present results below in Figure 15 for the EM vs. AE exercise and in Figure 16 for the IAPOC exercise. Some of these countries have less developed financial markets which are not well integrated to global capital markets and dependent on natural resources, making some of the financial transmission mechanisms we highlight for U.S. monetary policy spillovers potentially less applicable.

In the reduced sample, the results continue to hold and becomes stronger. Notably, but as anticipated, when these low income countries are omitted, the high credibility countries persistently lower policy rates in spite of depreciation which fails to pass-through to inflation. By the same taken, low credibility countries have less precisely estimated responses as we drop high inflation-high pass-through developing countries.
Figure 15: Robustness for Emerging Markets: Reduced Sample of Countries

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the capital account openness index of the IMF and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: real GDP in logs, CPI in logs, the monetary policy rate, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), 12m UIP deviations which are defined as explained above, and the ratio of total inflows to GDP. We drop Bolivia, Dominican Republic, Ghana, Jamaica, Kenya, Kyrgyz Republic, Moldova, Mongolia, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia.
Figure 16: Robustness for Policy Credibility: Reduced Sample of Countries

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: real GDP in logs, CPI in logs, the monetary policy rate, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), 12m UIP deviations which are defined as explained above, and the ratio of total inflows to GDP. We drop Bolivia, Dominican Republic, Ghana, Jamaica, Kenya, Kyrgyz Republic, Moldova, Mongolia, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia. We evaluate the marginal effect of a U.S. monetary policy shock given by equation 4 in the minimum and maximum values of first value of IAPOC observed. Low (high) credibility countries correspond to the minimum (maximum) value.
6.2 Alternative Measures for Risk Sentiment Shocks

In this section, we run local projections using our previous specifications but using direct measures of changes in risk sentiments instead of monetary policy shocks. Thus, we focus on outcomes that will pick risk premia, namely UIP deviations and capital inflows to GDP ratio. We also plot IRFs for GDP to show the importance of risk-based financial channel on real outcomes.

We run specification 1 in reduced form, in the full sample, using VIX, EBP and RORO as risk sentiment shocks:

\[
y_{c,t+h} = \alpha_c + \beta_h \text{Risk shock}_t + \gamma W_{c,t} + \sum_{i=1}^{i=1} \eta_i y_{c,t-i} + \varepsilon_{c,t+h} \tag{6}
\]

In particular, we express VIX and RORO in standard deviations from the mean, and for EBP we employ a 2.5\% increase, following Obstfeld and Zhou (2023). We summarize results in Figure 17. Responses are more persistent in this case and more precisely estimated, since VIX captures all risk-on and off shocks, small and large and there are many at high frequency, whereas the U.S. monetary policy shocks capture only some of these risk shocks since it is harder to extract the surprise part of the U.S. monetary policy shocks that were not priced-in before by the financial markets. The magnitudes are of similar sizes though and also comparable to what has been found in the international financial transmission literature mentioned above. One standard deviation in the VIX, which is above the 90 percentile of quarter to quarter changes in the VIX distribution, increase UIP premia almost 1 percentage points, with a similar reduction in capital inflows and GDP, as we have found before. Note that if we use a shock to VIX that was experienced during 2008 and/or COVID, then we record a much higher response of UIP premia, consistent with data during these extreme risk-off events.
Notes: Impulse responses of a one standard deviation increase in the VIX are obtained from panel local projections for equation 1 in reduced form. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the capital account openness index of the IMF and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the shock. Dependent variables include: 12 month UIP deviations, which are defined as explained above, the ratio of total inflows to GDP, and real GDP in logs.

Zooming in on the response of capital inflows and running the same regression in two samples—high and low FX debt countries, and using two other measures for risk sentiment shocks, EBP and RORO, gives us larger effects for the drop in capital inflows in high FX debt countries relative to low FX debt countries. As in Obstfeld and Zhou (2023), a 2.5% increase in EBP is associated with a 10% depreciation of the local currency, while a one standard deviation of RORO is above the 75 percentile of quarter to quarter changes in the index distribution.

Consistent with these effects on capital outflows and depreciation of local currency, the impact of risk-off shocks, measured by EBP and RORO, are also larger on inflation and monetary policy in low credibility countries. We show this in Figure 19 only for low credibility countries, where risk-off shocks led to higher inflation and tighter monetary policy, whereas the same effects were absent (insignificant) in high credibility countries.
Figure 18: International Transmission of Risk-Off Shocks to Capital Flows: The Role of FX Debt

Notes: Impulse responses of one standard deviation of RORO and delta EBP shocks are obtained from panel local projections for equation 1 in reduced form. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the ratio of reserves to GDP and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the shock. Dependent variable is the ratio of total inflows to GDP. High (low) FX debt countries are defined as those above (below) the median of the average FX debt over time.
Figure 19: International Transmission of Risk-Off Shocks to Inflation: The Role of Policy Credibility

**Risk Sentiment Measure: EBP**

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**Risk Sentiment Measure: RORO**

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</table>

Notes: Impulse responses of delta EBP and RORO shocks are obtained from panel local projections of equation 1 in reduced form. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the ratio of reserves to GDP and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the shock. Dependent variables are log CPI and monetary policy rates. We evaluate the marginal effect of a U.S. monetary policy shock given by equation 4 in the minimum and maximum values of first value of IAPOC observed. Low (high) credibility countries correspond to the minimum (maximum) value.
7 Conclusion

We ask why emerging markets showed resilience in the face of the sharp and quick FED hikes during 2021–2023 that coincided with the highest inflation since 1980s in the U.S. In the 1980s and 1990s, the global transmission of FED hikes rooted in financial channels often resulted in adverse repercussions for these countries, characterized by increased UIP premia, capital outflow spikes, and heightened inflation, credit, and currency risks. In the post-COVID era, however, most of these countries have showed remarkable resilience against the backdrop of U.S. monetary policy shifts.

When faced with FED tightening, emerging markets confront difficult trade-offs, which involve either increasing the policy rate to mirror the U.S. response to limit currency depreciations or by decreasing it to mitigate output losses. These trade-offs are amplified when monetary policy lacks credibility as inflation becomes more responsive to exchange rate changes and the policy effectiveness in driving the market interest rates decreases. The trade-offs are even more complex when financial sector debt is in FX which intensifies domestic financial conditions’ sensitivity to currency fluctuations. The two weaknesses may also mutually reinforce each other. If the policy rate or FXI is used to defend the currency without a well-defined framework, as it was the case in the past, it may further undermine monetary policy credibility. As currency risk rises, the ability of EMs to borrow in their own currency may decline (or the cost of domestic currency borrowing picked up by the UIP premium may increase), which in turn encourages more foreign currency borrowing and can set off a vicious cycle in response to the policy hikes in the U.S.

We have demonstrated that the resilience of EMs to the aggressive policy hikes by the FED between 2021 and 2023 can largely be ascribed to much enhanced monetary policy frameworks and the sharp decrease in FX vulnerabilities on balance sheets. With diminished risk sensitivity and reduced volatility of capital flows, EMs seem to be better insulated against shifts in global investor sentiment and risk-aversion shocks. Although the interna-
tional financial systems remain deeply interconnected, EMs with credible monetary policies and reduced foreign currency debt might have entered a newfound era of stability and resilience. During the last two years, despite sharply rising U.S. interest rates, EM spreads have stayed stable with no major financial crises. Although inflation also rose quite dramatically in EMS, inflation expectations remain largely anchored, thanks to their improved credibility.
References


Gourinchas, Pierre-Olivier and Helene Rey, “Exorbitant privilege and exorbitant duty,” 2022.


, World Economic Outlook 2023.


Jahan, Mrs Sarwat and Daili Wang, Capital account openness in low-income developing countries: Evidence from a new database, International Monetary Fund, 2016.


A Appendix

A.1 Variables

In this section we describe the variables used in the paper, how they are constructed, and their sources.

The dependent variables we use are:

1. GDP: real seasonally adjusted
2. CPI: period average
3. Monetary policy rates: period average
4. Nominal exchange rate: defined as domestic currency/U.S. dollar, period average
5. Capital inflows to GDP: defined as the sum of bank, central bank, corporate and government portfolio debt and other investment debt flows (loans)
6. 12m UIP deviation: calculated as the difference between log interest rate differentials and the gap between log expected and spot exchange rate, all at the same horizon. Log interest rate differentials are the short-term government bond or policy rate differentials vis-à-vis the United States. The log expected exchange rate is the 12-month ahead expected exchange rate as of month t and the log exchange rate is the spot rate, both nominal and in terms of local currency per U.S. dollar.

We present below descriptive statistics of the dependent variables:
Table 2: Descriptive Statistics of Dependent Variables (1990-2022)

<table>
<thead>
<tr>
<th>Variable</th>
<th>mean</th>
<th>sd</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth (q/q)</td>
<td>0.009</td>
<td>0.030</td>
<td>-0.947</td>
<td>0.676</td>
</tr>
<tr>
<td>Policy rate</td>
<td>0.082</td>
<td>0.092</td>
<td>0.000</td>
<td>0.784</td>
</tr>
<tr>
<td>CPI Inflation (q/q)</td>
<td>0.021</td>
<td>0.028</td>
<td>-0.006</td>
<td>0.117</td>
</tr>
<tr>
<td>12m UIP deviation</td>
<td>0.023</td>
<td>0.042</td>
<td>-0.114</td>
<td>0.158</td>
</tr>
<tr>
<td>Exchange rate (% change, q/q)</td>
<td>0.021</td>
<td>0.095</td>
<td>-0.438</td>
<td>2.550</td>
</tr>
<tr>
<td>Capital inflows to GDP</td>
<td>0.061</td>
<td>0.327</td>
<td>-0.628</td>
<td>4.505</td>
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</tbody>
</table>

Note: this table summarizes the descriptive statistics of the dependent variables used. Variables are as explained above.

The controls we use (excluding lags) are:

1. IMF capital openness index. Since this index goes through 2016, we extend the last data point until 2023.

2. FX reserves to GDP

The shocks used are:

1. US 12m treasury bill


3. VIX

4. EBP from Gilchrist and Zakrajšek (2012)

5. RORO index from Chari, Stedman and Lundblad (2020)
Two key variables in our analysis are the monetary policy credibility index (IAPOC) and the FX debt data:

1. IAPOC: new index that proxies monetary policy credibility developed by Unsal, Papageorgiou and Garbers (2022) using a narrative approach similar to Romer and Romer (1989) for 50 countries between 2007-2021. This index characterizes monetary policy frameworks across three pillars: (i) (IA) Independence and Accountability, which provides the foundations of monetary policy; (ii) (PO) Policy and Operational Strategy, which guides adjustments to the policy stance given the objectives, as well as adjustments to the policy instruments to implement the policy stance; and (iii) (C) Communications, which convey decisions about the policy stance and rationale to the public. In order to cover these pillars at sufficient clarity and comprehension within the IAPOC index, Unsal, Papageorgiou and Garbers (2022) formulate 225 criteria, which are then assessed against the public information from countries’ central bank laws and websites.

2. FX debt to total credit to the non-financial sector. Total credit data includes total loans and debt securities used for borrowing by the residents in the non-financial sector of a given economy, in both domestic and foreign currencies and from both domestic and foreign lenders. By dividing the sum of loans and bonds in FX for the non-financial sector by the sum of total loans and bonds for the non-financial sector from the total credit database, we obtain the country-level non-financial sector FX debt share.

In the following table we summarize the data sources of key variables:
### A.2 Countries and time coverage

Our data is of quarter frequency, and covers the period 1990q1-2023q1. In our analysis, we drop hard pegs and dual markets exchange rate countries, i.e. classifications 1 and 6 from Ilzetzki, Reinhart and Rogoff (2022). Since this classification goes through 2019, we use the 2019 through 2023. To sum up, we work with an unbalanced panel composed of managed and pure floats.

We have a total of 70 countries in the big sample which we use to run the EM vs AE exercises. From the 50 countries that are in the IAPOC sample, we only work with 45. In particular, we drop the U.S. due to the nature of the analysis, as well as Georgia, Malawai, Ukraine due to data availability and China because it is a hard peg. In the FX debt exercise we run it for 15 countries, due to data availability.

The countries in our sample, and the ones we use in each exercise are summarized in the table below.

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**Table 3: Data sources**

<table>
<thead>
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<td>IFS</td>
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<td>Monetary policy rates</td>
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<td>Nominal exchange rate</td>
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<td>Capital inflows to GDP</td>
<td>Avdjiev et al. (2022)</td>
</tr>
<tr>
<td>12m UIP deviation</td>
<td>Bloomberg and Consensus Forecast</td>
</tr>
<tr>
<td>US 12m treasury bill</td>
<td>Bloomberg</td>
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<tr>
<td>VIX</td>
<td>Federal Reserve Bank of St. Louis</td>
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<tr>
<td>EBP</td>
<td>Gilchrist and Zakrakov (2012)</td>
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<tr>
<td>RORO</td>
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<td>IAPOC</td>
<td>Unsal et al. (2022)</td>
</tr>
<tr>
<td>FX debt</td>
<td>BIS, Fan and Kalemli-Özcan (2016) and Kalemli-Özcan et al. (2021)</td>
</tr>
<tr>
<td>FX reserves</td>
<td>IFS</td>
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<td>Capital account openness index</td>
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Table 4: Country Sample

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Note: We follow the IMF 2000 World Economic Outlook country groups classification. Because we measure U.S. monetary policy spillovers, we drop the U.S.

* indicates that we have the monetary policy credibility index (IAPOC) for this country

$ indicates that we have the direct measure of FX debt exposure of the private sector for this country

Red text indicates a country is an emerging market

Blue text indicates a country is a low income/developing country.

A.3 Alternative Specification for the Historical Episode

We run the specification given in equation 2, reported below also, to study cumulative effects of monetary policy shocks relative to previous quarter:

\[ y_{c,t+h} - y_{c,t-1} = \alpha_c + \beta_{h}^US + \gamma W_{c,t} + \varepsilon_{c,t+h} \]  

(7)

where \( y_{c,t+h} \) is a vector of macro and financial variables of country \( c \) at time \( t + h \), \( \alpha_c \) are country fixed effects, and \( W_{c,t} \) are controls that include the capital account openness index, and four lags of: quarter to quarter GDP growth, quarter to quarter growth rate of the dependent variable, U.S. 12-month treasury rate, instrument, and output growth and inflation
differentials with the U.S. \( \hat{i}_t^{US} \) denotes the instrumented 12-month U.S. treasury rate. The instrument is the averaged monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015). We run this exercise for EMDE vs AE exercise, which we summarize results in Figure 20, and for the IAPOC exercise which we summarize in Figure 21.

We report two key variables, UIP premia and GDP, since we already reported the recent episode of FED hikes using this specification.
Figure 20: International Transmission of FED Hikes for EMDEs vs AEs: Historical Episode for Growth Rates

**12m UIP deviation**

**EM**

**AE**

**GDP**

**EM**

**AE**

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the capital account openness index of the IMF and four lags of the: quarter to quarter GDP growth rate, quarter to quarter growth rate of the dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: 12m UIP deviations and real GDP in logs.
Figure 21: International Transmission of FED Hikes by Policy Credibility: Historical Episode for Growth Rates

12m UIP deviation

Low credibility

High credibility

Exchange Rate (Local/USD)

Low credibility

High credibility

Notes: Impulse responses of 12-month US treasury rate are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the capital account openness index of the IMF and four lags of the: quarter to quarter GDP growth rate, quarter to quarter growth rate of the dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and the instrument. Dependent variables include: 12m UIP deviations and exchange rate (domestic currency/U.S. dollars).