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

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Abstract

Contrary to historical episodes, 2022–2023 tightening of the U.S. monetary policy has not yet triggered financial crisis in emerging markets. Why is this time different? To answer this question, we analyze the current situation through the lens of historical evidence. In emerging markets, the financial channel-based transmission of the U.S. policy often led to more adverse outcomes compared to advanced economies, where trade channel fails to smooth out these negative effects. 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. This time around, the escape from emerging market assets and the increase in risk spreads have been limited. We document that the historical experience of higher risk spreads and capital outflows can be largely explained by lack of credible monetary policies and dollar-denominated debt related weak balance sheets. The improvement in monetary policy frameworks combined with reduced levels of dollar-denominated debt helped emerging markets weather the recent FED hikes.

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Contrary to many analysts' expectations, emerging markets have not spiraled into a debt crisis. This can be partly attributed to central banks' decision to reject populist policy proposals in favor of a modern iteration of macroeconomic orthodoxy—Ken Rogoff (2023).

1 Introduction

In stark contrast to 1980s and 1990s, emerging markets 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—the so-called sudden stops, 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 of emerging markets comes largely from their improved monetary policy credibility, combined with a reduction in dollar borrowing. Monetary policy credibility and debt denominated in foreign currencies (FX), mostly dollars, are domestic vulnerabilities that are often linked. Weak private and public sector balance sheets due to dollar debt and local currency assets can force the central banks to defend the currency in the face of local currency depreciations, which would otherwise increase the debt burden and defaults.[1] An inflation targeting central bank can lose its credibility by responding systematically to exchange rate

[1]Since, most of the foreign currency debt in emerging markets 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 (e.g McCauley, McGuire and Sushko (2015)).

fluctuations, since such behavior would entail a deviation from "do what you say, say what you do" rule that captures the essence of monetary policy credibility. Our new credibility index quantifies these type of deviations within an existing monetary policy framework, where most of the frameworks are centered on inflation targeting. Thus, credibility is measured through transparency, coherency and consistency among policy tools and objectives.

While the benefits of central bank independence and/or inflation targeting frameworks have been extensively highlighted in the literature using cross-country data, it is rare to quantify the improvements in policy credibility for a given country over time. We use a brand-new dataset based on a narrative approach from Unsal, Papageorgiou and Garbers (2022) to quantify monetary policy credibility improvements within countries over time that are exogenous both to U.S. monetary policy shocks and to other domestic policy changes within countries.[2] Even though domestic monetary policy changes are endogenous to U.S. monetary policy and other policy and institutional changes in the country, our measure is orthogonal to such changes since it is designed to capture the implementation via operational, and communication features of monetary policy making, rather than specific endogenous monetary policy actions at any point in time.[3]

The empirical literature on central bank independence (e.g. Alesina and Summers (1993), Dincer and Eichengreen (2014)) focuses on political independence by constructing cross-country measures and relating them to inflation and inflation expectations. The theoretical underpinnings of this idea that delegating monetary policy to an independent body miti-

[2]The authors hand-collected data, part of a project at the IMF, is from thousands of legal central-bank documents from 50 countries over 2007–2021 in order to be able to characterize monetary policy frameworks across three pillars of independence and accountability, policy and operational strategy and communications. See Section 3 for more details.

[3]The policy credibility index goes far beyond classifying countries' monetary or exchange rate regimes. For example, in addition to checking whether a country has a numerical target (on inflation) or not, the assessment metric considers whether the numerical target is a viable nominal anchor, by encapsulating various key elements such as how the target is set and by who, the time-horizon, and whether objectives and the numerical target in Communications are consistent with the ones in Policy and Operational Strategy. See the Table in Appendix A1 for an illustration on how transparency, coherence, and consistency principles underpin the IAPOC metric, using the criteria on the numerical targets of monetary policy as an example.

gates the inflationary bias comes from Rogoff (1985). Separately, there is a strand of literature, started with the work of Sargent and Wallace (1981), that studies structural models of monetary-fiscal interactions. In this line of work, fiscal dominance is interpreted as low monetary policy credibility since politicians can get central banks to finance deficits through inflation. However, there remains a gap both in the theory and empirical literatures regarding how improvements in monetary policy credibility affects the emerging markets over time especially when they face external shocks with considerable impact on their exchange rates, such as changes in the U.S. monetary policy.

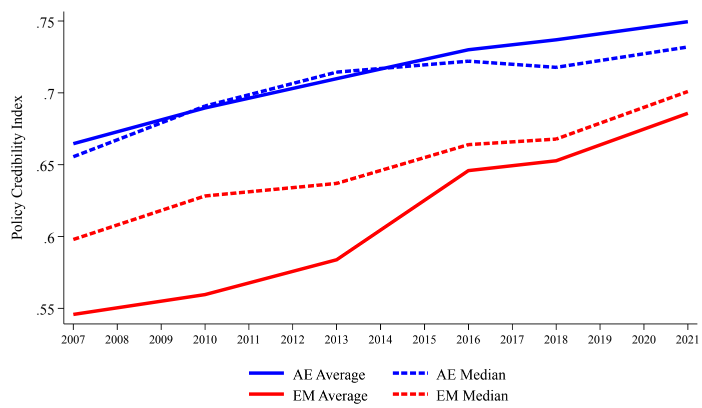
The new credibility index is plotted in Figure 1. The index is between 0 and 1, where a value of 1 indicates perfect credibility. It reveals that monetary policy credibility substantially improved in emerging markets, both for the mean and the median country. In contrast, advanced countries which already had high monetary policy credibility in 2007, showed only minimal improvement over time. This advancement in credibility among emerging markets is paralleled by a decrease in dollar-denominated debt, as illustrated in Figure 2. Notably, the total external debt to GDP ratio has seen a substantial decline since the late 1990s. However, total external debt is composed of both FX and local currency borrowing so we also plot non-financial private sector FX debt both as a percent of GDP and total debt.[4] Despite a slight uptick towards the end of the sample period, partly due to quantitative easing in advanced economies post-global financial crisis that drove capital flows to emerging markets, the FX debt levels are not even 15% which is very low in historical perspective.[5] We do not analyze the FX debt of financial institutions since this debt is entirely hedged as several regulatory restrictions have passed after each financial crisis in emerging markets on open

[4]Currently, emerging market governments' FX debt estimated to be around 30 percent of their GDP at most (e.g. Arslanalp and Tsuda (2014)), a lower number than where the line for total external debt settles in the Figure (42%) due to the fact that total external debt captures both FX and local currency debt.

[5]There are some countries such as Turkey, Argentina, Mexico, Peru where corporate sector FX debt shares can be as high as 50 percent of GDP and/or total debt (e.g. Di Giovanni, Kalemli-Özcan, Ulu and Baskaya (2022), Das, Kalemli-Özcan, Damien and Varela (2020)). This is not the norm currently but was historically, see Kalemli-Özcan, Kamil and Villegas-Sanchez (2016) who document the high FX debt shares of the corporate sectors from 1990 to 2005 for several Latin American countries.

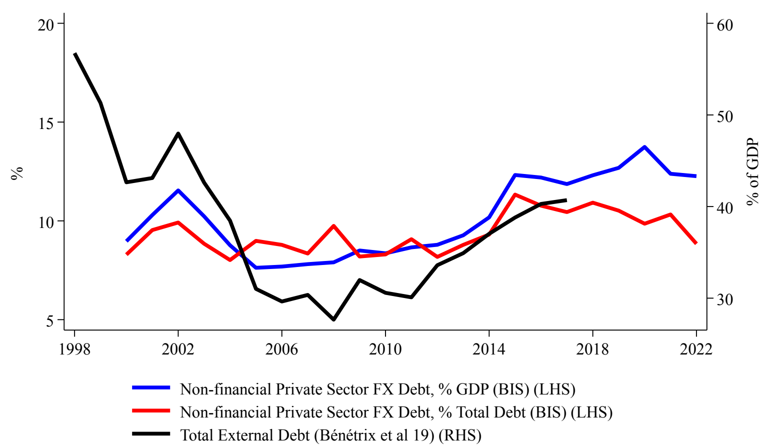
FX positions and/or capital requirements. By now they ensure FX mismatches on bank and financial intermediary balance sheets are hedged or minimal (IMF (2022)).

Figure 1: Policy Credibility over Time



Notes: Our measure of policy credibility is the monetary policy frameworks index (IAPOC, Unsal, Papageorgiou and Garbers (2022)). The graph shows the average and median policy credibility in advanced economies (AEs) and emerging market (EMs) from 2007–2021.

Figure 2: Corporate Foreign Exchange Debt in Emerging Markets



Notes: Credit in U.S. dollars to non financial private sector is estimated as the total credit in U.S. dollars minus international debt securities for government and financial institutions. We normalize by total debt and by annual GDP. This data is from BIS for 15 EMs, Bénétrix et al. (2019) data is total external debt as percent of GDP and it includes 25 EMs.

There is an extensive literature on the international transmission of the U.S. monetary policy, starting with Diaz-Alejandro (1983), Calvo, Leiderman and Reinhart (1993), Calvo, Leiderman and Reinhart (1996), who emphasized the impact of interest rate differentials between a given country and the U.S. on the demand for government bonds (see also Eichengreen and Portes (1987), Reinhart and Reinhart (2009) and Reinhart and Rogoff (2009)). Consistent with this early literature's focus on the interest rate differentials, more recent literature on the U.S. monetary policy spillovers to other countries has shifted attention to the financial channel of transmission of the U.S. policy (switching demand of assets between the U.S. and the rest of the world) rather than the trade channel (switching demand for goods produced in the U.S. vs in the rest of the world) (e.g. Rey (2013); Kalemli-Özcan (2019); Degasperi, Hong and Ricco (2023); Chari, Dilts Stedman and Lundblad (2021); Di Giovanni and Rogers (2023)).

A prevailing finding in this body of research is the link between changes in the U.S. monetary policy and cross-border correlations of macro-financial conditions, a.k.a global financial cycle, proxied by global-level risk indicators like the VIX, the broad USD index and the U.S. excess bond premium (e.g. Bekaert, Hoerova and Duca (2013), Rey (2013), Miranda-Agrippino and Rey (2020), Bruno and Shin (2015), and Obstfeld and Zhou (2023)). Hence, the underlying factors for the financial transmission channel of U.S. monetary policy are changes in risk-taking incentives and the associated risk premia. Central to this discussion is the role of time-varying deviations from the uncovered interest parity (UIP), a country-level risk premia priced by the international investors, which have been identified as crucial in understanding deteriorating macro conditions in emerging markets with risk-sensitive capital flows (Kalemli-Özcan (2019), Di Giovanni, Kalemli-Özcan, Ulu and Baskaya (2022)).[6]

[6]See also quantitative models, where exogenous UIP deviations take center stage, 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. Kalemli-Özcan and Varela (2021) investigates the empirical determinants of endogenous UIP deviations and Akinci, Kalemli-Özcan and Queralto (2021) model such deviations in a global general equilibrium framework.

Based on this empirical literature, recent theoretical works focusing on optimal policies for emerging markets single-out the UIP wedge as the key factor to be stabilized to maximize welfare (Basu, Boz, Gopinath, Roch and Unsal (2020), Bianchi and Lorenzoni (2022), Itskhoki and Mukhin (2022)).

The financial channel is more pronounced in distinguishing the impacts of U.S. monetary policy tightening on advanced economies versus emerging markets. This is primarily due to global investors moving away from risky assets in response to tighter global financial conditions. Emerging markets, typically considered riskier investments in any portfolio, are particularly affected by this shift. This risk-based channel underscores the significance of domestic vulnerabilities in emerging markets. We argue that the literature on the international transmission of the U.S. monetary policy overlooked a key domestic vulnerability, that is the role of monetary policy credibility, while focusing solely on the exchange rate regime. The choice of the exchange rate regime is endogenous to policy credibility; countries lacking monetary policy credibility often opt to peg their currency to the U.S. dollar as an alternative nominal anchor. In addition, since the late 1990s most emerging markets have moved away from pegged exchange rate regimes, comparing countries with fixed versus floating regimes over time will identify the impact of U.S. monetary policy from a select set of countries, suffering from a time-varying selection bias.[7]

There are other variables that are likely to be endogenous to improved monetary policy credibility such as capital flows, UIP premia, inflation, exchange rates and current accounts. We also investigate these outcomes, recognizing that many of them depend on the presence of dollar-denominated debt. Therefore, our analysis differentiates countries not only by their monetary policy credibility but also by their levels of USD-denominated debt.

Our broad analysis covers 59 countries since 1990q1 using quarterly data until 2019q4.

[7] Dedola, 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.

We analyze the recent 2021–2023 period separately. We show that historically the worse effects of the FED hikes, such as declining GDP, depreciating exchange rates, higher risk spreads, higher UIP premia combined with capital outflows, can be explained by lower monetary policy credibility and higher levels of FX debt in the corporate sector. We show that the improvement in these two key domestic vulnerabilities led to a minimal impact of the FED hikes on emerging markets so far.

The paper is composed of six sections. Section 2 lays out the broader literature and shows descriptive evidence. Section 3 details the data. 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 concludes.

2 The Narrative within 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.

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. 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. When FED hikes and the U.S. dollar appreciates, the demand for goods switches from now expensive U.S. goods to the rest of the world goods, who suffer from a local currency depreciation but can enjoy an increase in output thanks to higher net exports. Existing evidence on this issue goes against the notion of an expansionary effect

Figure 3: Fed Hike

Notes: Own elaboration

when countries currencies depreciate and capital flows out during FED hikes.

Figure 3 shows this as the "Trade Channel," depicted on the left side of the figure. The failure to find an expansionary effect of currency depreciations 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)). Even though there is an increase in net exports as capital is flowing out on net, such expenditure switching fails to initiate an expansion in output since due to dollar pricing of exports (Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020)) the increase in net exports is driven by a decline in imports, leading to a contraction in GDP (Mendoza and Yue (2012), Gopinath and Neiman (2014)), combined with lower investment due to negative balance sheet effects.

Consistently, Miranda-Agrippino and Rey (2020) and Obstfeld (2015) argue that flexible exchange rates fail to fully absorb external shocks through expenditure switching. Hence, even though trade channel is not responsible for the worse outcomes in emerging markets (falling output and capital outflows) resulting from FED hikes, it is not smoothing out these effects either.[8]

Currency mismatches in balance sheets have often pushed policymakers to defend the currency (Calvo and Reinhart (2002), Reinhart (2000), IMF (2022)), by mimicking the FED hikes, which might intensify the contraction in their own economies.[9] These actions of other central banks that are endogenous to the U.S. monetary policy, may also 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. As the balance sheets of U.S./global financial intermediaries weaken (Gertler and Kiyotaki (2010)) with the FED hikes—recently witnessed during the banking stress of 2023 (Jiang, Matvos, Piskorski and Seru (2023))—they may not want to bear more risk by being exposed to emerging market assets which are likely to depreciate. Thus global investors want to dump risky assets given higher risk-aversion and a risk-off sentiment, inducing risk premia shocks for emerging markets combined with dollar appreciations.[10] As a result, asset riskiness and balance sheet weakness can go hand-in-hand in limiting the inter-

[8]At the same time, countries with fixed exchange rate regimes are shown to be more sensitive to global risk shocks and a strong dollar due to higher U.S. interest rates rather than flexible regimes, so flexible exchange rates must be doing some smoothing (Obstfeld and Zhou (2023)). Kalemli-Özcan (2019) shows that this smoothing is from "risk-absorbing" properties of the floating exchange rates. Since the exchange rate depreciates, vis-à-vis the U.S. dollar, the risk premia, measured as the 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.

[9]Kalemli-Özcan (2019) shows that countries who hike the policy rate to defend their currencies experience deeper recessions.

[10]See models formalizing this financial channel endogenously, Jiang, Krishnamurthy and Lustig (2021), Bianchi, Bigio and Engel (2021), Akinci, Kalemli-Özcan and Queralto (2021), Devereux, Engel and Wu (2023). Gourinchas and Rey (2022) model this story as a rise in risk aversion and Kekre and Lenel (2021) as flight to safety.

national financial intermediation (Gabaix and Maggiori (2015)).

As in the earlier literature that started with the work of Diaz-Alejandro (1983), capital flows are central to both channels in the context of FED hikes. Any resiliency to these hikes has to come from the fact that, when FED hikes the interest rates, emerging markets do not experience sudden stops and capital outflows, and if they do, resilience means that the extent is much smaller that it does not affect their domestic economies. 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, while many developing economies still rely heavily on sovereign borrowing which dominate their capital flows (Avdjiev, Hardy, Kalemli-Özcan and Servén (2022)). Also the currency of borrowing has evolved as shown by Du and Schreger (2016) and Hofmann, Patel and Wu (2022), where emerging market sovereigns are increasingly borrowing in local currency, whereas private sector, especially non-financial corporations can still only access foreign funding in U.S. dollars as they cannot issue bonds in local currency unlike their governments.[11] 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.[12]

2.1 A Tale of Two Countries: Mexico and Canada

To illustrate, we use the two trading partners of the U.S., Canada and Mexico, as case studies. These are both small open economies with important differences relevant to our analysis.

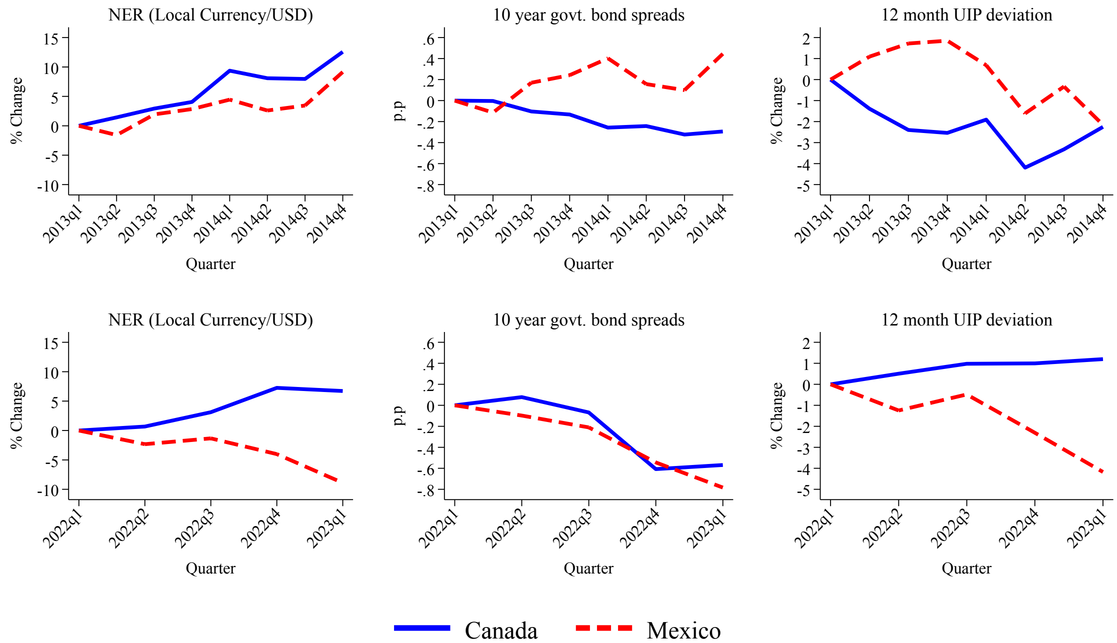
[11]These changes may indicate the shift of the "original sin", from sovereigns to corporates, a term referring to the inability to issue external debt in domestic currency, coined by Eichengreen and Hausmann (1999), Eichengreen, Hausmann and Panizza (2005).

[12]Forbes and Warnock (2012) study total gross flows as sum of private sector and government borrowing and show the increasing importance of global risk factors after mid-1990s. Avdjiev, Hardy, Kalemli-Özcan and Servén (2022), Avdjiev, Du, Koch and Shin (2019) show that this risk sensitivity in gross flows is driven by private capital flows.

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 documents 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-à-vis the U.S. dollar, as shown in top left figure. The nominal exchange rate depreciations (NER), shown for Mexico and Canada, are similar. However, the risk spreads 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 in mid-panel. The short-term risk premium also rose sharply, captured by the 12-month UIP premium for Mexico in the last panel. Both of these spreads remained mainly flat for Canada, with a slight decrease in the UIP premium. Notice that the long-term government bond spreads can capture dollar premium via default risk if issued in dollars or term premium if issued in local currency. 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: $(i_{mex/can} - i_{US}) - (\Delta E(s))$, where the interest rate differential term between Mexico/Canada 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 (or canadian dollar to USD) exchange rate (s) in the next 12-months.

Figure 4: Canada and Mexico after FED Hikes: Taper Tantrum vs COVID



Notes: The top row of the figure shows the evolution of variables relative to pre-Taper Tantrum (2013q1). The bottom row of the figure shows the evolution of variables relative to the recent FED Hikes (2022q1). 10 year government bond spreads are calculated with respect to the U.S., and the plot shows the percentage point difference. 12 month UIP deviations are calculated as explained above and the plot shows the percentage change. Nominal exchange rate (NER) is defined as local currency per U.S. dollar, and the plot shows the percentage change.

The increase in the UIP premium for Mexico can be driven by three different channels: 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 in NER figure, 2) an increase in the interest rate differential above and beyond the movements in the expected 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 (2022) show that it is the third channel that drives the higher UIP premium in emerging markets as a response to the U.S. monetary policy shocks and risk-off shocks.[13]

As shown in bottom panel of Figure 4, the recent experiences of Canada and Mexico are very different. Now both countries behave in a similar way in terms of risk spreads. The y-axis in both panels are the same for ease of comparison. Mexican exchange rate appreciated during recent FED hikes, implying an expected depreciation in the future. Hence, the UIP premium fell in Mexico more than Canada, implying a lower risk premium for Mexico by global investors to hold on to Mexican assets. The long-term risk spreads fell for both countries as shown in bottom mid-panel.[14]

2.2 A Tale of Won and Lost Credibility: The Case of Turkey

Next, we conduct a within-country analysis to understand the changes of monetary policy credibility over time and how this could relate to macroeconomic performance, with a specific focus on Turkey. Figures 5 and 6 below plot key macro variables together with inflation dynamics, risk spreads and changes in our policy credibility measure. Turkey serves as an effective case study in terms of understanding the exogeneity of our policy credibility measure based on the narrative approach.

After the triple crisis in 2002 (balance of payments, sovereign and banking), Turkey moved to a floating exchange rate regime within an inflation targeting framework. So these two regimes were always in place since 2002 during the entire period we look at, however the “implementation” of floating exchange rate and inflation targeting is what drives the time variation in our credibility measure.

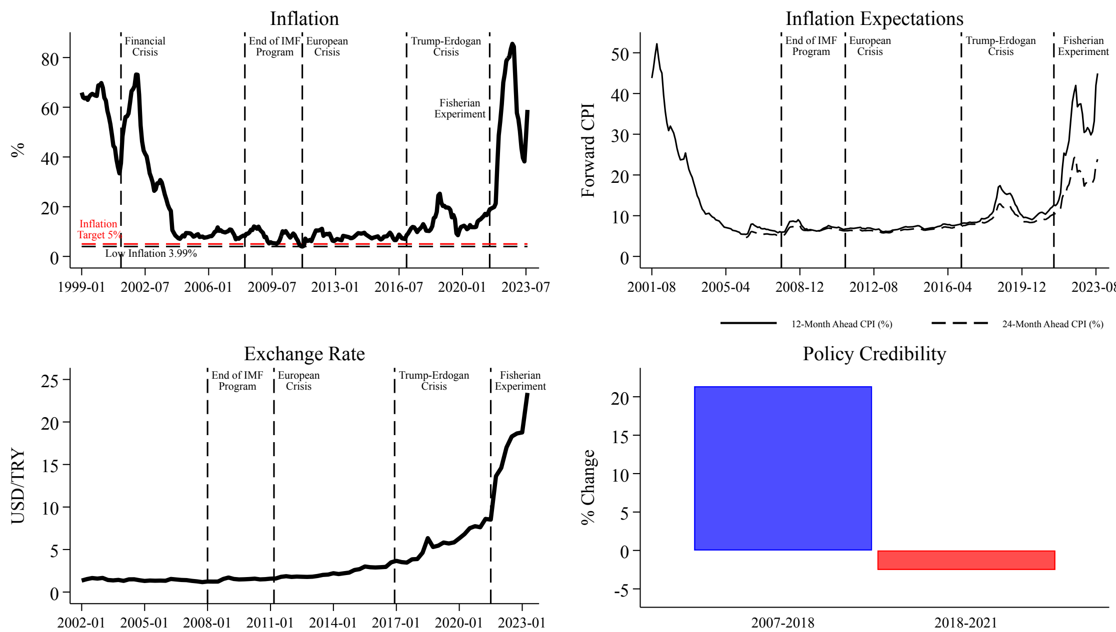
[13]The UIP premium decline for Canada is explained by the fact that interest rate differential term goes down more than the expected appreciation since Canada did not change the policy rate as shown in the Appendix Figure A6. This appendix figure also shows that similar NER depreciations in both countries are associated with opposite movements not only in risk spreads but also in capital flows; there were capital outflows from Mexico, whereas Canada has received capital inflows.

[14]Note that with slight depreciation and an expected appreciation of Canadian dollar, there is a slight increase in UIP premium for Canada, whereas capital flows and policy rates behave exactly the same in both countries as shown in the appendix figure.

As shown in Figure 5, inflation and inflation expectations came down around 2004-2005 and stayed low (with inflation sometimes being even below the target of 5%) until the unorthodox monetary policy experiment, known as the Fisherian experiment Turkey started in late 2020.[15] As can be seen this late period is when our credibility measure shows a deterioration of 3 percent, whereas early period picked up an improvement of 20 percent (recall that the credibility index is between 0 and 1). In Turkey's case, the fluctuations in monetary policy credibility correlate increasingly well with inflation and inflation expectations, which act as lagging variables due to their nature as endogenous outcomes to changes in monetary policy credibility. Additionally, the nominal exchange rate depreciation, which began during the 2017-2018 political crisis, further intensified in the later period, marked by a decline in policy credibility post-2020.

[15] The Economist article; Project Syndicate article

Figure 5: Case Study: Turkey I



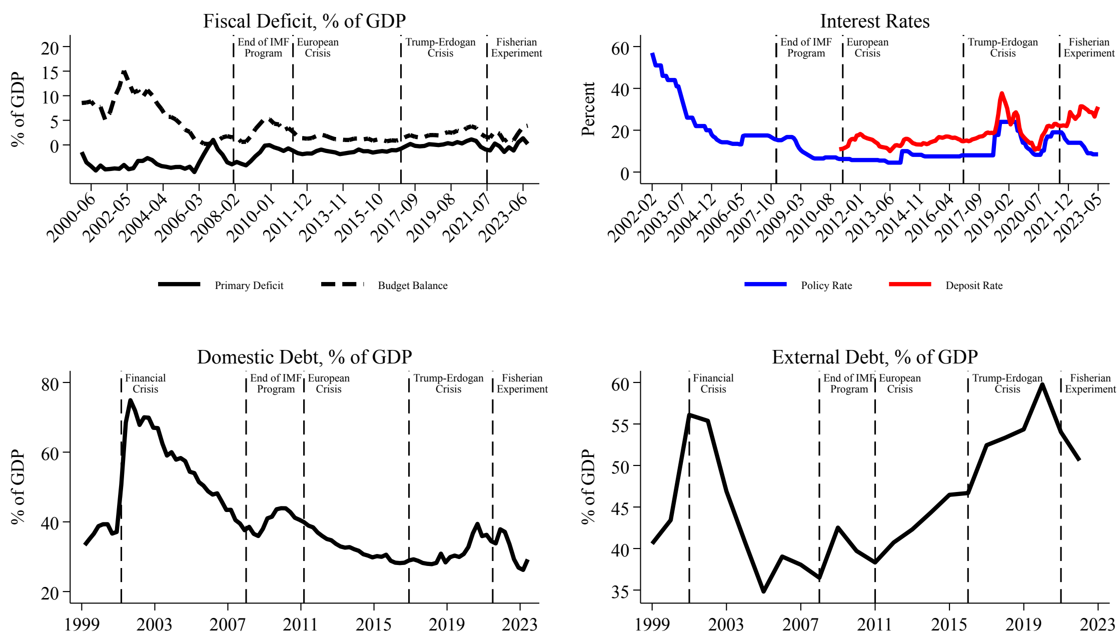
Note: We plot exchange rates for the float regime starting in 2002. Inflation and exchange rate data is from IFS, inflation expectations data is CBRT EVDS database and policy credibility is the IAPOC index.

Figure 6 shows the evolution of domestic and external debt together with interest rates in Turkey. Again the key insight here is not the deteriorating fundamentals such as current account deficit or external debt, as typical, but rather how such deterioration priced-in the risk spreads leading to the different dynamics in market rates (short term deposit rates) vs monetary policy rate, as shown to be the case in the latest episode.[16] De Leo, Gopinath and Kalemli-Özcan (2022) coined this phenomena as "short-rate disconnect" and showed that, emerging markets' domestic monetary policy is ineffective in general since 1990s on-wards as policy's pass-through to domestic market rates is always less than one-to-one with capital flows having an effect on market rates as a function of risk sentiments. The Turkish case here

[16]We only plot external debt to save space as increasing external debt also implies widening current account deficits.

after 2020 is an extreme example with monetary policy credibility deteriorated at a speed of light and priced-in by foreign investors as a risk premium which is both picked up by the UIP premia and as the difference between domestic market rates and policy rates.[17]

Figure 6: Case Study: Turkey II



Note: Primary Deficit data is Central Government's last 12-month primary balance to nominal GDP ratio, and budget deficit data is calculated by adding Central Government's last year interest expense share to primary deficit ratio. Domestic Debt to GDP ratio is Public Sector Net Debt to GDP ratio covering total public gross debt stock, unemployment insurance fund net assets, public sector assets, and central bank net assets to last year's GDP. External Debt to GDP ratio is the Gross External Debt Stock to GDP ratio covering short and long term debt stocks of public sector, CBRT, and private sector. Fiscal data comes from Turkey's Ministry of Treasury and Finance statistic webpage. Policy and Deposit Rate data are available from CBRT EVDS database.

[17]See the model and evidence in De Leo, Gopinath and Kalemli-Özcan (2022) where the short rate disconnect between market rates and policy rates also shows up in the UIP wedge.

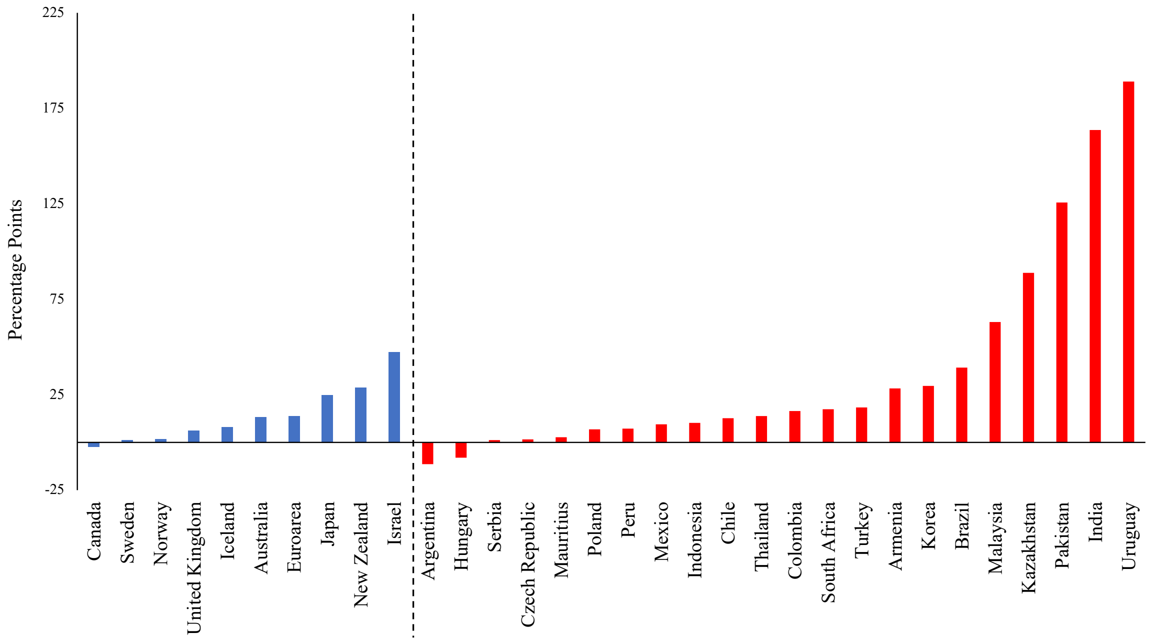
3 Data and Measurement

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 225 criteria were used and assessed against the public information from countries' central banks. Figure 7 shows the detailed within cross-country heterogeneity, where countries like Uruguay and India show the maximum improvement.

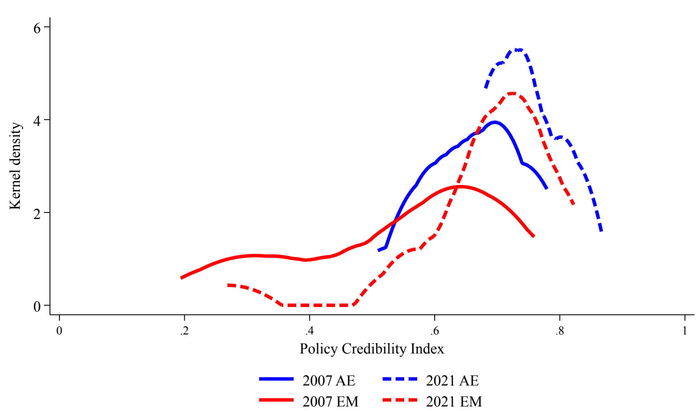
The improvement in monetary policy credibility becomes even more evident when comparing the distribution of the index for 2007 and 2021 in Figure 8. The mass has shifted more to the right, still keeping the extensive heterogeneity. Advanced economies have a more narrow distribution. In particular, in 2007 the min of emerging market distribution is 0.194 and it has a max of 0.759 (mean of 0.546). In the 2021 distributions, the max of emerging markets is 0.822 and it is only 0.867 for advanced; so best in emerging markets is almost as good as the best among the advanced countries.

Figure 7: Change in Monetary Policy Credibility, 2007-2021



Notes: Percentage change in monetary policy credibility (IAPOC index) of AEs and EMs between 2007 and 2021.

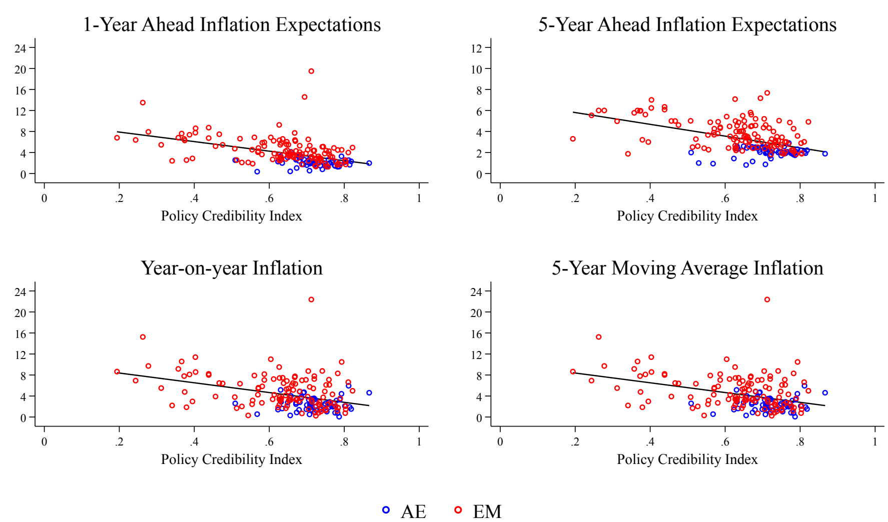
Figure 8: Policy Credibility Distributions



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

The IAPOC index is negatively and significantly correlated with inflation and inflation expectations at different horizons (Figure 9). The figure clearly shows that both downward slopes (higher policy credibility, lower inflation and lower inflation expectations) are mostly driven by emerging markets and not by advanced economies. In fact, this is what makes our policy credibility index to stand apart from a large body of existing studies that measure monetary policy credibility with realized inflation or inflation expectations. These are endogenous measures of policy credibility since inflation level and expectations might be driven by policy credibility as we show above.[18]

Figure 9: Inflation (2007-2021)



Notes: Regression coefficients of 1-year ahead inflation expectations, 5-year ahead inflation expectations, year-on-year inflation and 5-year moving average inflation, on IAPOC. Inflation is headline CPI inflation and seasonally adjusted with ARIMA X13. Inflation data is from IFS while inflation expectations data comes from Consensus Survey and WEO Projections.

[18] For example, Bems, Caselli, Grigoli and Gruss (2021) obtain policy credibility measure from inflation, relying on historical data.

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 15 emerging economies: Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, 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 run robustness exercises controlling FX reserves reported in Appendix Figure A1.

The 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. Even though we showed data from Bénétrix, Gautam, Juvenal and Schmitz (2019) dataset in the introduction, we do not use this data in our regressions as the FX dimension is a proxy in this dataset. This is because of the fact that it uses as input the currency composition of the main IIP components from the IMF, as well as IMF's Coordinated Portfolio Investment Survey (CPIS), portfolio debt data reported to the European Central Bank (ECB) and banks cross-border positions reported to the Bank of International Settlements (BIS) available through its Locational Banking Statistics (LBS). Thus, corporate and government debt will be mixed, as those are mixed in the IIP and CPIS datasets, and hence the currency composition for the corporate sector cannot be precisely measured, unlike our data from BIS, which will lead to classical measurement error.

3.3 Other Variables

Our panel data set includes other variables: GDP, CPI, exchange 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. 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). This data is identical to IMF, BOP data at the annual level but with better quarterly coverage in emerging markets, which is why we prefer it over the standard IMF, BOP data. 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 rates 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 in a given month from Consensus Economics and the log exchange rate is the spot rate, both nominal and in terms of local currency per U.S. dollar. From Bloomberg, we get nominal interest rate data.

Our panel data set also includes other variables that we use as controls: trade balance to GDP, dollar shock, oil price index and FX reserves to GDP. Data on trade balance to GDP is from the IFS. As dollar shock we use the Nominal Major Currencies U.S. Dollar Index from FRED, and we normalize it to 10% following Obstfeld and Zhou (2023). Oil prices and FX reserves to GDP data are from the IFS. In our analysis, we drop hard pegs and dual markets exchange rate countries (Ilzetzki, Reinhart and Rogoff (2022) classifications 1 and 6). Thus, we always work with an unbalanced panel composed of managed and pure floats at the time of their inclusion.

Table 1 lists our country sample. We have a total of 59 countries in the big sample. This is all AEs and EMs who are not hard pegs and dual market exchange rates. Similarly, from the 50 countries that are in the IAPOC sample, we work with 34 since we drop LICs, hard pegs, dual markets exchange rate countries and the United States. In the FX debt exercise we have only 15 EMs, all floating or managed floating countries. The data appendix provides more details including descriptive statistics.

Table 1: Country Sample

Albania	Costa Rica	India*$	Mexico*$	Singapore
Argentina*$	Croatia	Indonesia*$	Morocco	Slovak Republic
Armenia*	Czech Republic*	Ireland	New Zealand*	South Africa*$
Australia*	Denmark	Israel*	Norway*	Spain
Azerbaijan	Euro Area*	Italy	Pakistan*	Sweden*
Belarus	Ecuador	Japan*	Paraguay	Switzerland
Brazil*$	Egypt Arab	Kazakhstan*	Peru*$	Thailand*$
Bulgaria	Finland	Korea	Philippines*$	Tunisia
Canada*	Germany	Latvia	Poland*	Turkey*$
Chile*$	Guatemala	Malaysia*$	Romania	United Kingdom*
China*$	Hungary*	Malta	Russian Federation*$	Uruguay*
Colombia*$	Iceland*	Mauritius*	Serbia*	

Note: * 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

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, after the FED announcement. Not every FED hike needs to involve a change in the risk sentiments of investors but if there are enough of FED hikes that do change the risk sentiments then our identification of the risk channel of U.S. monetary policy's international transmission is valid. We are also relying on the fact that, a large literature shows a high correlation between the FED hikes and common measures of risk sentiments (e.g. VIX and Excess Bond Premium). We also use such measures for robustness in addition to our exogenous

U.S. monetary policy measures.[19]

The U.S. monetary policy is endogenous to U.S. business cycle and also to financial markets since markets price-in the expected actions of the FED before the actual change in the policy rate. The common approach to deal with the endogeneity of the monetary policy in the literature is to measure the "monetary policy surprises". These surprises are obtained from high frequency changes in interest rates around central bank policy announcements. The key identifying assumption is that monetary policy is predetermined over the event window and hence not affected by financial market reaction. Using such "suprises", macro-finance literature estimates the causal effect of the U.S. monetary policy, both on financial markets (e.g. Kuttner (2001), Gürkaynak, Sack and Swanson (2004)), and on macro variables (e.g Stock and Watson (2018), Gertler and Karadi (2015)).

Recently this literature has been debating some puzzling effects. Forecasts respond in the wrong direction when high-frequency monetary policy surprise indicates, say, a tightening of monetary policy. Not only output, employment and inflation responds positively to tightening (e.g. Nakamura and Steinsson (2018)), but also similar positive responses are observed in the stock market (e.g Miranda-Agrippino and Ricco (2023), Cieslak and Schrimpf (2019), Jarociński and Karadi (2020)). The common explanation for these puzzling results is the "FED information effect", that is the FED announcements convey private information about the economy and therefore directly affect beliefs about economic fundamentals. If, for example, a tightening surprise interpreted as a signal that FED thinks the economy is stronger, then survey forecasters will revise their outlook upwards and stock market booms. As a result, monetary policy surprises are not exogenous but contaminated with information that will prevent them from identifying the causal effects of monetary policy.

There is also the additional problem of "relevance." This problem is about the fact that the "suprises" are small. In fact, Obstfeld and Zhou (2023) argues that the U.S. dollar exchange

[19] Results with VIX, EBP and a new measure of risk-on-risk-off sentiment from Chari, Stedman and Lundblad (2020), RORO are available upon request.

rate is a better measure than the monetary policy shocks to trace the risk-based international transmission from the U.S. to the rest of the world, since the dollar exchange rate picks up much more variation in risk sentiment variables such as the VIX and Excess Bond Premium. Consistently, others argue that the most important driver of the global financial cycle is not the U.S. monetary policy per se but rather the precise measures of risk sentiments such as Excess Bond Premium (Rogers, Sun and Wu (2023)), and/or volatility in macroeconomic news (Boehm and Kroner (2023)). Unfortunately all of these, the dollar exchange rate, the VIX, Excess Bond Premium and the macroeconomic news are endogenous to the U.S. monetary policy changes since they are all endogenous to financial markets' risk sentiment changes that depend largely on the U.S. monetary policy.

For example, when FED hikes the rates, global financial conditions gets tighter, which results in higher Excess Bond Premium, flight to safety and an appreciation of the U.S. dollar together with more macroeconomic news on higher earnings volatility and uncertain outlook. For our purposes, we want U.S. monetary policy surprises that are exogenous to U.S. economy and financial markets but still relevant for financial markets enough that they will change their risk sentiments. We do not want our policy surprises to be contaminated by FED and/or financial markets reaction to public news that are available before the FED announcement. Rather, we want to measure the new information that financial markets learn from FED's announcement that changes their risk sentiments and their international portfolios differentially across emerging markets vs advanced countries.

Bauer and Swanson (2023) solves these type of endogeneity issues. They show that the key endogeneity problem lies in the omitted variable of economic news, where all, survey forecasters, markets and FED policy respond to macroeconomic news. These authors show that there is no information effect in FED's announcements but rather the predictability of monetary policy surprises is due to learning about FED's policy during announcements. So publicly observable macro data and omitted news can help to solve the endogeneity issue together with the relevance issue. These authors compute orthogonalized monetary surprises as residuals from regressing monetary surprises on six macro and financial variables. As a result, we use monetary policy surprises from both Gertler and Karadi (2015) and Bauer and Swanson (2023) in our analysis. We use Gertler and Karadi (2015) in a two-step IV approach using the "surprises" calculated as the movements in prices of short maturity (3-month) Fed Funds futures contract prices in 30 minute window surrounding the FOMC announcement, as instruments for the policy rate (12-month Tbill rate). Bauer and Swanson (2023) clean these surprises from the aforementioned endogeneity issues so we use them in reduced form not as IV.

The monetary policy shocks from Gertler and Karadi (2015) pass comfortably the weak instrument tests, and hence they are relevant in capturing exogenous changes in the U.S. monetary policy, as we show in Table 2 below (regressions of U.S. policy rate on policy surprises).

Table 2: Weak Instrument Test

	Cragg-Donald Wald F statistic		Kleibergen-Paap rk Wald F statistic	
Depvar	EM	AE	EM	AE
GDP	370.261	248.115	370.297	248.320
Capital inflows to GDP	175.319	74.783	175.251	74.716
Exchange Rate	440.293	257.478	440.532	257.772
12m UIP deviation	144.371	111.145	144.376	111.096

Note: We show the weak instrument test results, for the baseline regression (specification 1 below) and for $h = 1$. We show the Cragg-Donald Wald F statistic and the Kleibergen-Paap rk Wald F statistic. They are all above the Stock-Yogo weak ID test critical values of 10% maximal IV size, which in this case is equal to 16.38.

4.2 Historical Evidence: The Impact of FED Hikes on Emerging Markets vs Advanced Countries, 1990q1–2019q4

In order to uncover the asymmetric effects of FED hikes, we rely on local projections, as proposed by Jordà (2005). The local projection method provides a flexible framework and is easy to implement. Moreover, it is well documented that local projections have several advantages over VAR models. Above all, local projections are more robust to possible misspecifications, at least under a finite lag structure (e.g. Kilian and Lütkepohl (2017) and Plagborg-Møller and Wolf (2021)). They allow us to parsimoniously model asymmetric effects of the U.S. monetary policy on emerging markets vs advanced economies, on countries with high vs low policy credibility and also on countries with high vs low debt denominated in USD. Local projections estimation also saves degrees of freedom relative to a multivariate approach. That is, even though we lose observations from adjusting for leads and lags, we save degrees of freedom because our set of control variables on the right-hand side is relatively sparse as we do not need to describe the dynamics of the endogenous variables conditional on the shock.

Local projections regress the dependent variable at different horizons $t + h$ for $h = 1, 2, ..H$, conditional on an information set that consists of a set of control variables. In the linear case, the regression equation reads:

$$y_{t+h} = \alpha_h + \beta_h \, \text{Shock}_t + \gamma X_t + \varepsilon_{t+h}$$

where y_{t+h} is the variable of interest at horizon h, X_t is a vector of control variables, contemporaneous and lagged as long as they are supposed to have an effect on the endogenous variable y_{t+h}, independently from the identified structural shock, 'Shock$_t$'.

These control variables in X_t deserve discussion. The international transmission literature uses the specification below in general (e.g. Rey (2013), Degasperi, Hong and Ricco (2023), Miranda-Agrippino and Rey (2020), Kalemli-Özcan (2019), and others):

$$y_{c,t+h} = \alpha_c + \beta_h \hat{i}_t^{US} + \sum_{i=1}^{i=4} \omega_i X_{t-i} + \sum_{i=1}^{i=4} \eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{1}$$

where $y_{c,t+h}$ is a vector of macro and financial variables of country c at horizon h, α_c are country fixed effects that absorb institutional differences across countries including slow-moving fundamentals.

There are two sets of controls, all enter lagged. X_{t-i} are lags of the global controls for the shock (lags of monetary policy rate, i_t^{US}, and lags of monetary policy surprises that instrument the policy rate); and $x_{c,t-i}$ are lags of dependent variable and lags of country specific controls that have an independent effect but are correlated with past and anticipated U.S. policy changes. These are interest rate differentials and GDP growth differentials for the given country with the U.S. These controls are essential since the interest rate differentials are key for the financial channel of policy transmission and GDP growth differentials are key for the trade channel. Investors switching demand for assets or consumers switching demand for goods between countries, as a result of past and/or anticipated changes in the U.S. policy and other global shocks are captured directly by these variables.

What then remains to be captured by the identified U.S. monetary policy shock is the transmission via financial channel driven by endogenous changes in risk premium affecting current and future interest rate differentials. Policy transmission via trade channel will be captured by the endogenous appreciation of the dollar affecting current and future GDP growth differentials. We investigate the impact of identified U.S. shocks on both risk premia and exchange rates. When $y_{c,t+h}$ is GDP and it shows improvement then the trade channel should be dominant, whereas if GDP deteriorates then the financial channel is the dominant channel of international transmission. Notice that two of the other endogenous outcomes we focus on, capital flows and exchange rates, cannot separate the channels of transmission since both channels will imply capital flows out on net (or net exports increase) and exchange rate depreciates vis-à-vis the dollar. But falling GDP and rising risk premia (UIP) can identify financial channel dominating over the trade channel.

Last but not least, $\hat{i}_t^{US}$ denotes the instrumented 12-month U.S. treasury rate, where the first stage regresses the treasury rate on monetary policy surprises from 3-month Fed Funds futures contract prices as we explained in the previous section following Gertler and Karadi (2015). As we also showed before, instrument passes the relevance test, meaning the Gertler-Karadi shocks we use are not weak instruments for the U.S. monetary policy changes.

Although we believe that the parsimonious specification given in equation (1) is all what is needed to identify the asymmetric effects of the U.S. policy on emerging markets vs advanced countries, to ease worries about robustness, we also run specification (2) below to control for additional global variables, contemporaneously. This exercise actually will show that we do not need to control for additional variables as none of our results based on specification (1) will change qualitatively and conditional on specification (1) variables, additional variables from specification (2) will not have much explanatory power.

For this exercise, we follow Obstfeld and Zhou (2023) and run the following specification with additional global controls, allowing both contemporaneous and lagged relation between these variables and the identified U.S. monetary policy shock:

$$y_{c,t+h} = \alpha_c + \beta_h \hat{i}_t^{US} + \gamma X_t + \sum_{i=1}^{i=4} \omega_i X_{t-i} + \sum_{i=1}^{i=4} \eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{2}$$

X_t is a vector of global controls including U.S. dollar shock from Obstfeld and Zhou (2023) defined as the appreciation of the U.S. dollar vis-à-vis G7 countries, oil price index, and median country trade balance. When we run regressions for emerging markets and advanced countries separately we use median trade balances specific to those aggregate groups. X_{t-i} includes the lags of all these global controls.

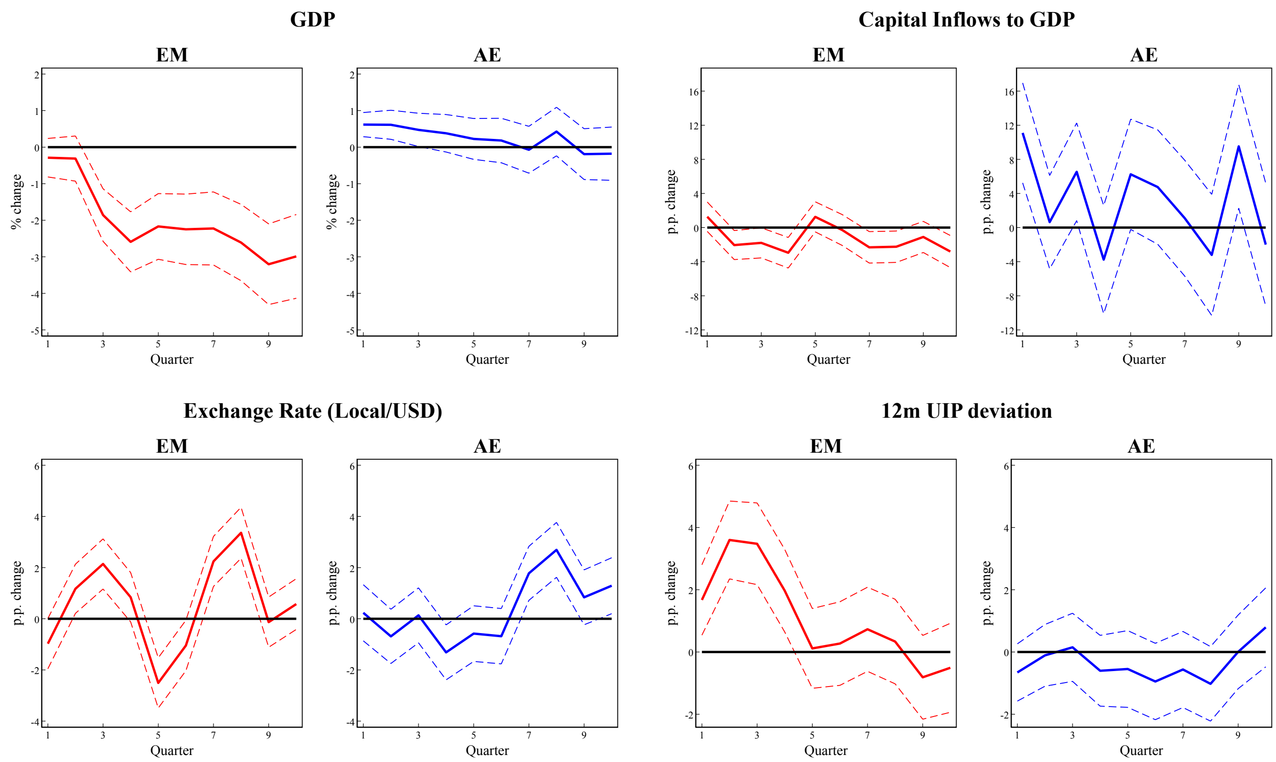
4.3 Benchmark Results

Figure 10 displays the differential impact of the U.S. monetary tightening on AEs and EMs, based on equation (1), where we run this in the two samples of countries. The U.S. monetary policy shock results in a significant and persistent decline in output in EMs 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 9th quarter in EMs. The stark difference between output results implies that financial channel dominates the trade channel.

The dominance of the financial channel of the U.S. policy transmission, for EMs, can also be seen from the large nominal exchange rate depreciation (whereas AEs exchange rates do not respond significantly) combined with the large increase in UIP; 3.5 percentage point for a 1 percentage point shock by 3rd quarter. Given the mean UIP deviation for EMs, 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-à-vis the dollar. It can happen if investors expect the EM currency to appreciate in the future since there is a depreciation on impact with the FED hike, or the EMs interest rate differentials with the U.S. increase as a result of higher risk premium or both.[20] Consistent with a higher UIP premia, capital inflows go down (meaning international investors leave) by 2 percentage points around 3rd quarter before reverting back. All these variables are insignificant for AEs.

[20]This result is not due to higher policy rates in EMs as shown by De Leo, Gopinath and Kalemli-Özcan (2022).

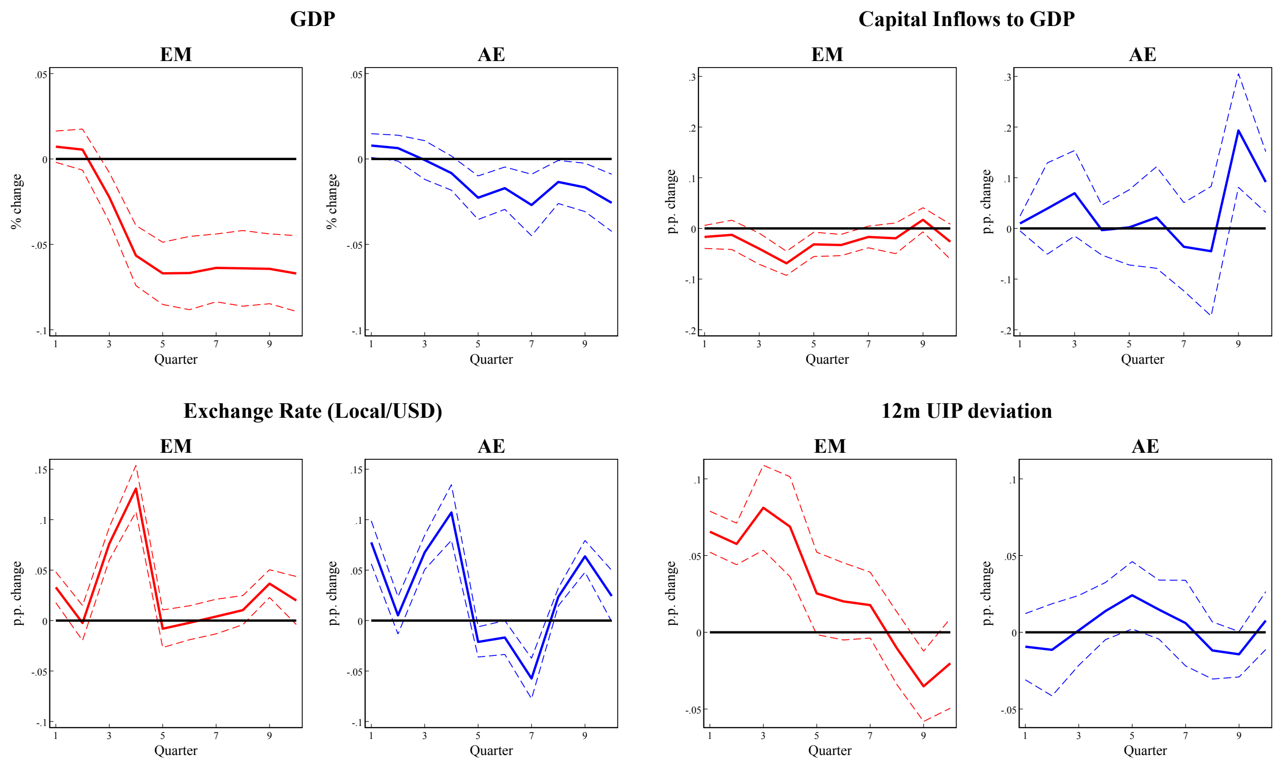
Figure 10: International Transmission of FED Hikes: Emerging vs. Advanced Economies (GK surprises)



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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. We also add FX reserves to GDP as control in Figure A1, where AEs' exchange rates also show some depreciation. Dependent variables include: real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), UIP deviations which are defined as 12m interest rate (government bond) differentials vis-à-vis the U.S. minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP. We also run this specification for our smallest country sample (FX debt EM sample) in Figure A2.

We next run the same specification (1) in reduced form, using Bauer and Swanson (2023) monetary policy surprises. Figure 11 shows results, which are similar for EMs with more significant capital outflows. What is interesting is now we also have a decline in output for AEs combined with currency depreciation. Hence, even for AEs financial channel dominate the trade channel but the impact is much milder on output since there is no response of UIP wedge and capital outflows to U.S. shocks in AEs.

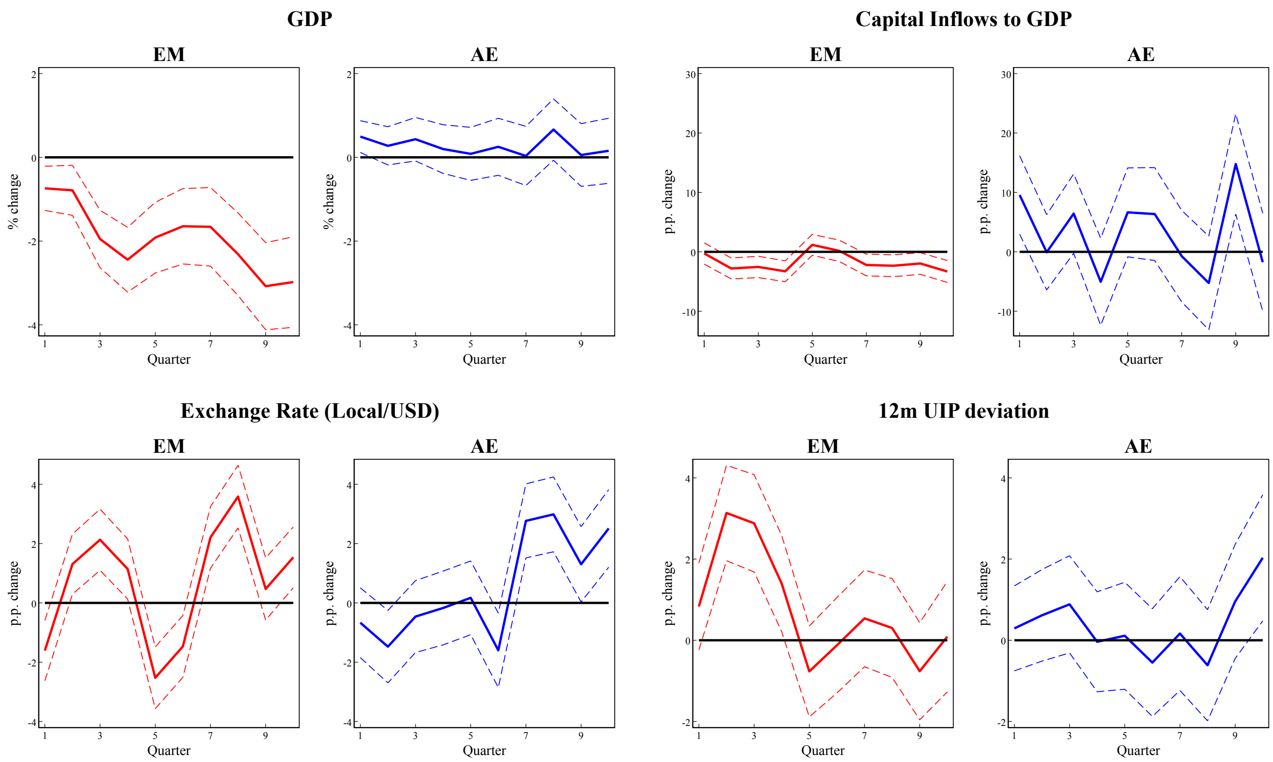
Figure 11: International Transmission of FED Hikes: Emerging vs. Advanced Economies (BS surprises)



Notes: Impulse responses of Bauer and Swanson (2023) US monetary policy shocks 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 shock. Dependent variables include: real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), UIP deviations which are defined as 12m interest rate (government bond) differentials vis-à-vis the U.S. minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP.

In Figure 12 we show results of specification (2), which includes global controls that might be correlated with the U.S. policy shocks. Results are consistent with our previous findings. In Figure A3 we re-run this exercise dropping commodity exporters and find that results hold with the exception that now we also have some delayed depreciation in the AEs exchange rates.

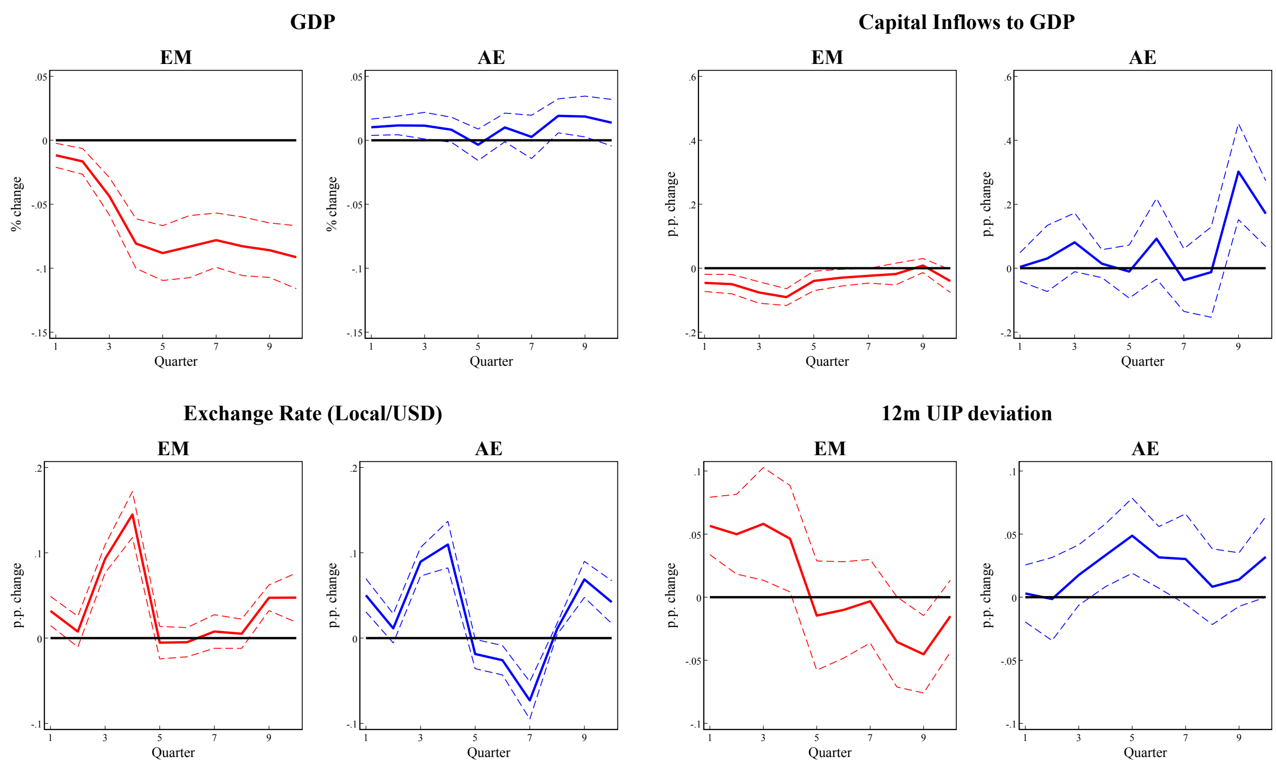
Figure 12: International Transmission of FED Hikes: Emerging vs. Advanced Economies with Global Controls (GK surprises)



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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., the instrument, dollar shock, average oil price index, and median trade balance. Dependent variables include: real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), UIP deviations which are defined as 12m interest rate (government bond) differentials vis-à-vis the U.S. minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP.

In Figure 13 we show results of running specification (2) in reduced form using Bauer and Swanson (2023) monetary policy shocks. We do not find large differences relative to our findings in Figure 11, which highlights the strength of the results. The only change is now the previous mild decline on AEs GDP goes away and in fact there is a weak small increase in GDP together with currency depreciation, which would support the trade channel via expenditure switching. The problem is that by the 3rd quarter when currency depreciates the output effect becomes insignificant.

Figure 13: International Transmission of FED Hikes: Emerging vs. Advanced Economies with Global Controls (BS surprises)



Notes: Impulse responses of Bauer and Swanson (2023) US monetary policy shocks 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., monetary policy shocks, dollar shock, average oil price index, and median trade balance. Dependent variables include: real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), UIP deviations which are defined as 12m interest rate (government bond) differentials vis-à-vis the U.S. minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP.

4.4 The Role of Policy Credibility

Why are EMs affected worse from FED hikes? At least historically, during the period we study: 1990q1–2019q4. To shed light on this question, we extend our Local Projections framework to analyze the differential impact of the U.S. monetary policy shocks depending on the monetary policy credibility of countries, where we rely on the IAPOC index of Unsal, Papageorgiou and Garbers (2022). In particular, we augment our specification (2) in the following way:

$$y_{c,t+h} = \alpha_c + \beta_{1,h}\hat{i}_t^{US} + \beta_{2,h}\hat{i}_t^{US} * IAPOC_{c,2007} + \gamma X_t + \sum_{i=1}^{i=4} \omega_i X_{t-i} + \sum_{i=1}^{i=4} \eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{3}$$

where $IAPOC_{c,2007}$ is time in-varying and takes the 2007 initial value for each country.

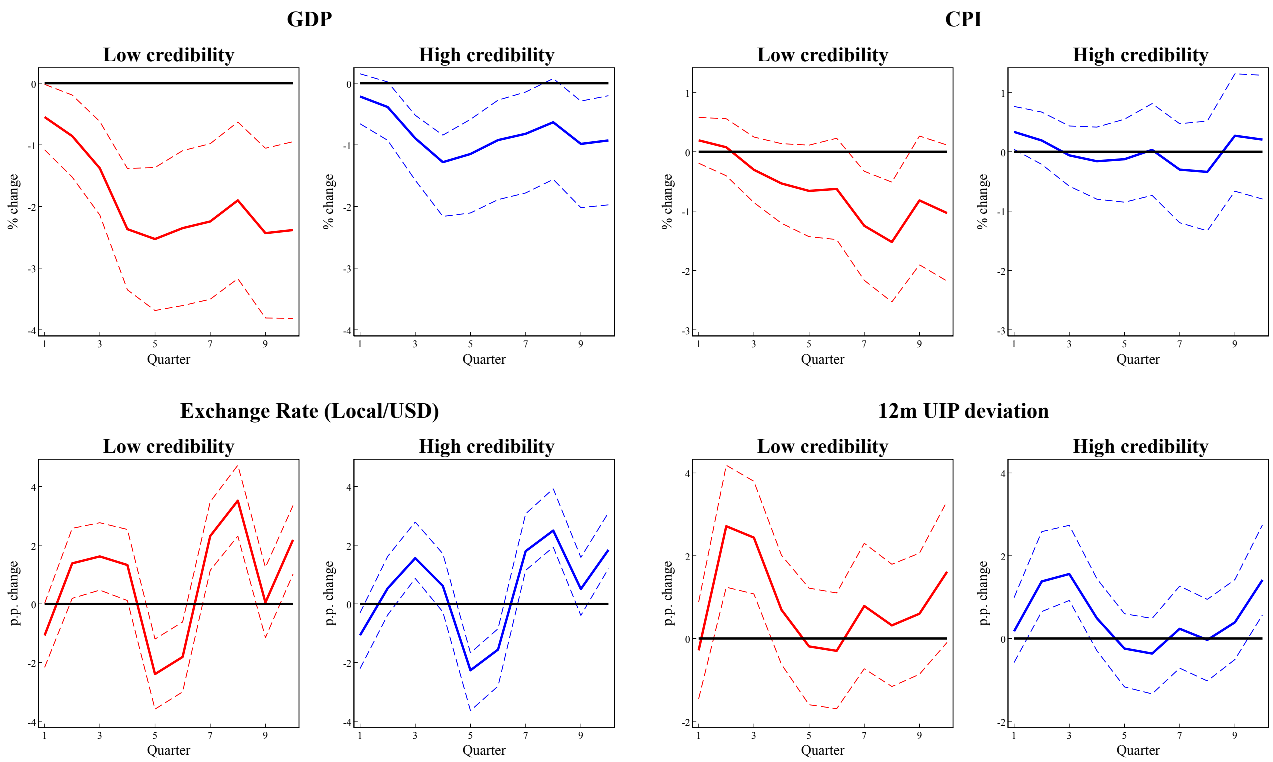
To calculate the effect of the U.S. monetary policy shock on countries with high vs low policy credibility, we calculate the marginal effect of a U.S monetary policy shock as:

$$\frac{\partial y}{\partial \hat{i}} = \beta_{1,h} + \beta_{2,h} * IAPOC_{2007} \tag{4}$$

and we evaluate equation (4) at the 25th percentile of the 2007 IAPOC distribution for the low credibility country and at the 75th percentile of the 2007 IAPOC distribution for the high credibility country.

Figure 14 shows the IRFs, which are striking. As shown, countries with low monetary policy credibility experience sharper contractions in output and higher UIP deviations even though the extent of nominal exchange rate depreciations are similar among low and high credibility countries. We also plot inflation response where interestingly, low monetary policy credibility countries have declining inflation, reflecting the severe contraction of the economy. In fact, given the high exchange rate pass through in countries with low monetary policy credibility, it can be that central banks increase interest rates, which would further slow down growth, and increase the UIP wedge. Instead, central banks with high credibility can afford to support the economy by lower interest rates after the shock.

Figure 14: International Transmission of FED Hikes: The Role of Policy Credibility with Global Controls (GK Surprises)



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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., instrument, dollar shock, average oil price index, and median trade balance. Dependent variables include: real GDP in logs, CPI in logs, a quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), and 12m UIP deviations which are defined as before. See text for the definition of high and low credibility countries.

4.5 The Role of Balance Sheet FX Vulnerabilities

Another reason why EMs were affected worse from the FED hikes historically can be their sizeable external debt that is financed with persistent current account deficits and largely denominated in USD. Such debt creates balance sheet vulnerabilities hindering investment and growth especially when cost of servicing this debt goes up with FED hikes where assets on balance sheets are largely in local currency.

We extend our Local Projections framework to allow the impact of the U.S. monetary policy shocks to differ based on FX (USD) debt of the private non-financial sector. We augment our specification (2) in the following way:

$$y_{c,t+h} = \alpha_c + \beta_{1,h}\hat{i}_t^{US} + \beta_{2,h}\hat{i}_t^{US} * FXdebt_{c,2000} + \gamma X_t + \sum_{i=1}^{i=4}\omega_i X_{t-1} + \sum_{i=1}^{i=4}\eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{5}$$

where $FXdebt_{c,2000}$ is a time-invariant variable equal to the initial 2000 value of FX debt.

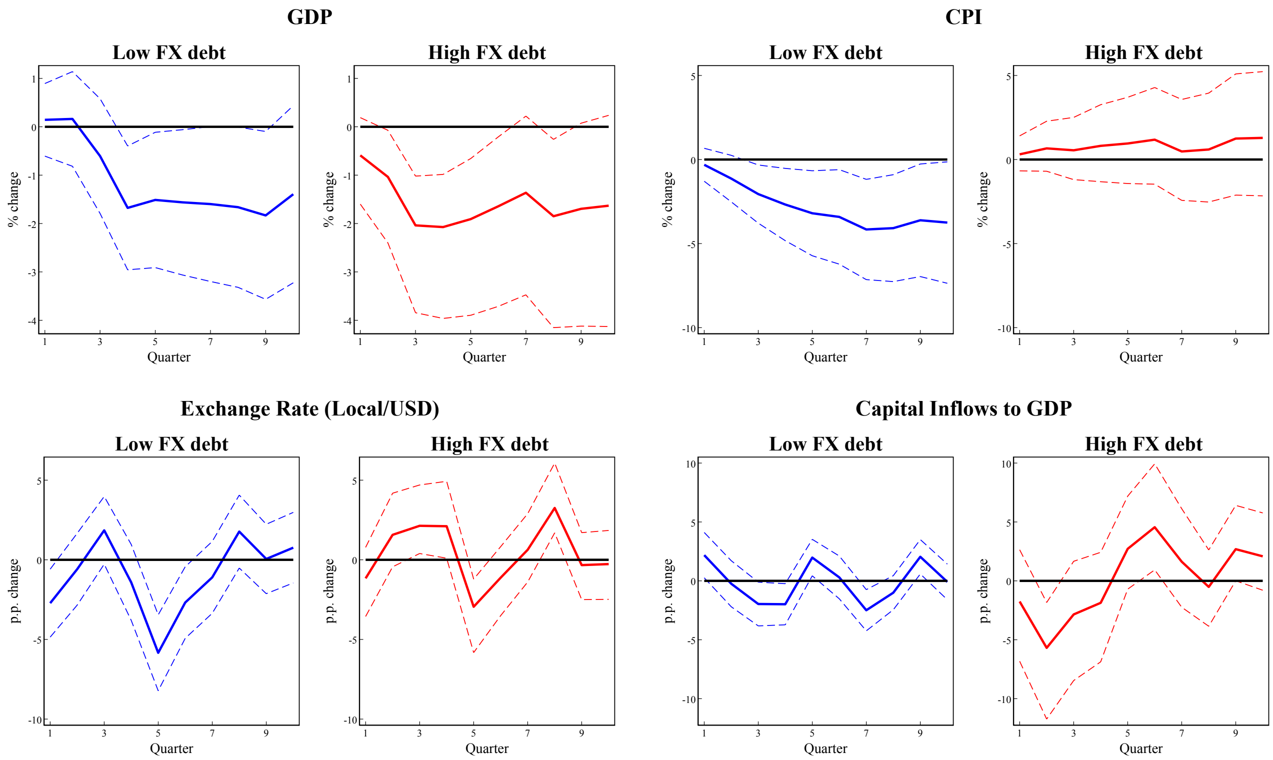
To calculate the effect of the U.S. monetary policy shock on high vs low FX debt countries, we calculate the marginal effect of a U.S monetary policy shock as:

$$\frac{\partial y}{\partial \hat{i}} = \beta_{1,h} + \beta_{2,h} * FXdebt_{2000} \tag{6}$$

For the low FX debt country, we evaluate equation (6) using the minimum value of 2000 FX debt distribution, and for the high FX debt country, we evaluate the same equation using the maximum value of that initial distribution.

We summarize IRFs in Figure 15. It is clear that countries with high FX debt, go through sharper contractions in output together with larger depreciations, higher inflation, and capital outflows though given the small sample size the statistical significance is lower for these variables compared to strong drop in output. In appendix A4, we use time-varying variables for IAPOC and FX debt getting similar results.

Figure 15: International Transmission of FED Hikes: The Role of Balance Sheet FX Vulnerabilities with Global Controls (GK Surprises)



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include dollar shock, average oil price index, and median trade balance and four lags of the: dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials with the U.S., and instrument. In this case we did not add 4 lags of dollar shock, average oil price index, and median trade balance because of the limited sample. Dependent variables include: real GDP in logs, CPI in logs, a quarter-to-quarter nominal exchange rate growth (domestic currency/U.S. dollar), and capital inflows to GDP ratio. See text for the definition of high and low FX debt countries.

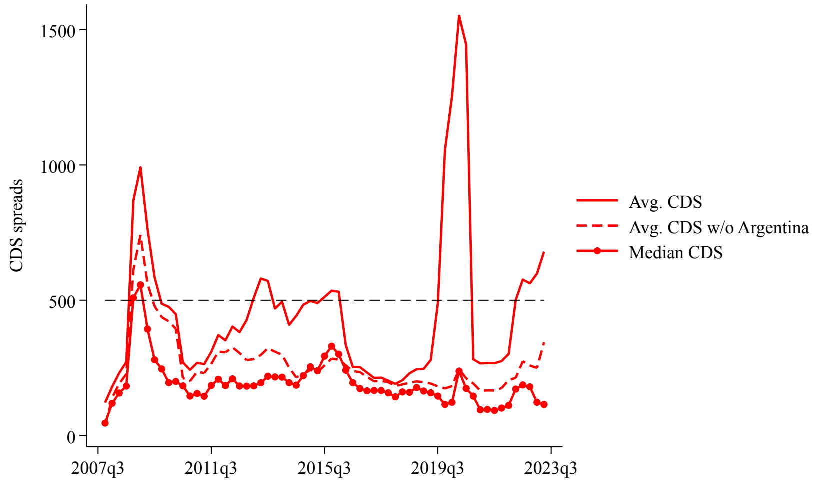
5 The Recent Episode: 2022–2023 FED Hikes

"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 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 EMs, and impressively, the top 25 EMs all surpassed their 2022 forecasts (IMF, 2023).

As it's widely acknowledged, and we confirm in this paper, rising U.S. interest rates historically created challenges for EMs. This time is different as most EMs managed to establish monetary and financial discipline, marked by credible monetary policies and reduced FX debt shown in Figures 1 and 2, respectively. In the recent period, they began raising rates ahead of AEs as soon as COVID inflation hit their economies. This shows improved monetary policy credibility since monetary policy is responding to their own inflation rather than to U.S. policy or to exchange rate developments. Their statements were clear on why they were raising interest rates: not to mimic the U.S. policy for currency defense, but rather to re-anchor the rising inflation expectations (e.g. Carvalho and Nechio (2023)).

The first piece of evidence on this time being different is the main risk spread, CDS, did not move at all for EMs as shown in Figure 16 below. Compared to 2008, where CDS spreads spiked both for average and median EM, this time around they actually went down for the median EM. For the average EM there was a huge spike totally driven by Argentina in 2020 when the pandemic started. In 2022 when FED started hiking, the median EM spread went down and average EM spread (w/o Argentina) went up very little, less than what happened in Taper Tantrum. The CDS spread captures the default risk of government on dollar denominated bonds. Clearly this risk was very low.

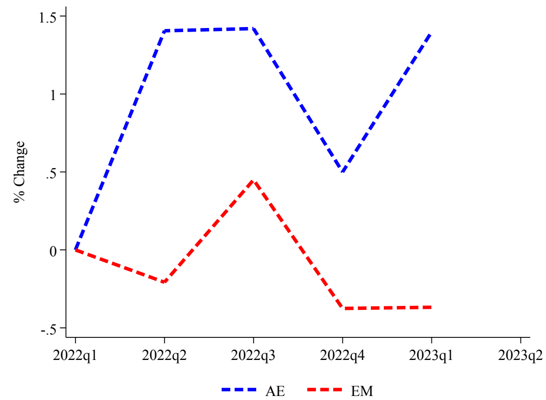
Figure 16: CDS in the recent episode



Notes: This figure plot Credit Default Swaps (CDS) for 15 EMs: Argentina, Egypt, Guatemala, India, Kazakhstan, Korea, Malta, Mexico, Morocco, Pakistan, Serbia, Singapore, Slovak Republic, Thailand and Uruguay. The solid line shows the simple average in each quarter, the dashed line excludes Argentina. The dotted line shows the median. Source: Refinitiv Datastream.

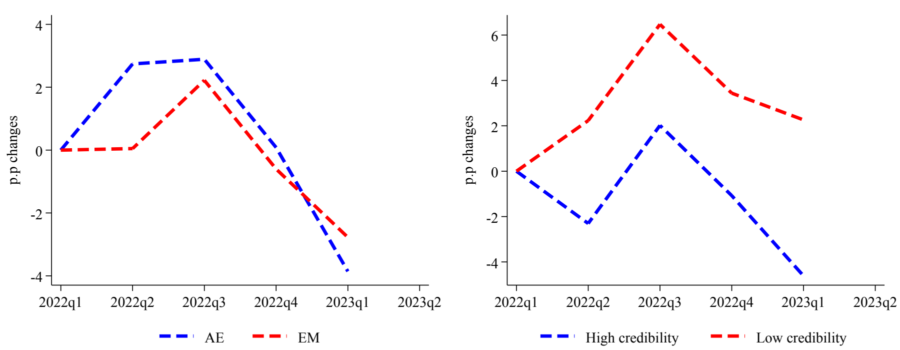
Figure 17 shows, relative to the first quarter in 2022, the change on 12 month UIP deviations for AEs and EMs. Investigating UIP spread on top of the CDS spread is useful since UIP risk spread captures the risk premium due to currency depreciations, and passes through the domestic lending rates one-to-one. Relative to our findings in previous sections, changes in the UIP premia are much smaller for EMs and less than AEs. Consistently, Figure 18 shows similar exchange rate movements in AEs and EMs and also on high and low credibility countries. This is because there is not much difference now between these countries given the improvement in monetary policy credibility, where low value is 0.51 and high value is 0.6.

Figure 17: UIP During 2022–2023 FED Hikes



Notes: This figure shows the percentage change in 12 month UIP deviations relative to 2022q1, for AEs and EMs. UIP deviations are calculated as explained in the data section.

Figure 18: Exchange Rates During 2022–2023 FED Hikes



Notes: This figure shows the growth rates of nominal exchange rate (domestic currency/U.S. dollar) with respect 2022q1.

We do not have enough observations to run Local Projections with U.S. monetary policy shocks starting in 2022q1. However if we run them starting 2021q4, we find results (available upon request) where the historical difference between EM and AE in terms of the UIP wedge, output and capital flows disappears during recent period. When we run these regressions with the latest values of IAPOC and FX debt as of 2019, we find no statistical difference between high-low credibility and high-low FX debt countries since high-low values are very similar as distributions of these variables narrowed considerably as we have shown before.

We have run an alternative panel regression to nail down this point that EMs became resilient to sudden stops related to FED hikes, as follows:

$$y_{ct} = \alpha_c + \delta_{year} + \gamma_1 Q_1 + \gamma_2 Q_2 + \gamma_3 Q_3 + \gamma_4 Q_4 + \varepsilon_{ct} \tag{7}$$

where y_{ct} is the dependent variable and includes exchange rate depreciation (year-on-year), real GDP growth (year-to-year), real investment growth (year-to year) and trade balance/GDP. All variables are in percentage. Controls include country fixed effects (α_c), year fixed effects (δ_{year}) and four dummies. The first dummy takes value one when quarter 0 is the sudden stop and so on ($\{Q_i\}_{i=1}^{4}$). We run equation (7) in two recent time periods in Panels B and C of Table 3, and show historical results for the same regression in Panel A from Eichengreen and Gupta (2017). Panel A covers 46 sudden stops during the period 1991-2015 for 20 EMs in 1991, 28 in 1995, and 34 from 2000 onwards. Panel B covers the only sudden stop in March 2020 for our EMs. Panel C covers the Fed Signal of Hikes as of December 2021 also for our EMs. Panels B) and C) don't include year fixed effects.

As Table 3 clearly shows, sudden stop of March 2020 and signal of FED hike in December 2021 markedly differ from previous sudden stop episodes. Notably, there was a much lower currency depreciation, a less persistent drop in GDP and investment, and negligible impact on the trade balance. Historically, sudden stops are linked with current account reversals, typically evident by the third quarter. However, even in the fourth quarter following the Fed's rate hike signal, while there was a reversal, it did not significantly affect output and investment, indicating a newfound resilience to such shocks which may plausibly be ascribed to enhanced monetary policy credibility and reduced foreign exchange debt.

Table 3: Sudden Stops in EMs

	(1) ER depreciation	(2) GDP growth (yoy)	(3) Investment growth (yoy)	(4) Trade balance/GDP
Panel A: 1991-2015 (46 Sudden Stops)				
Quarter 1	10.126***	–2.270***	-6.019**	-0.662
	(4.37)	(3.09)	(2.75)	(1.12)
Quarter 2	12.853***	-5.521***	-9.038**	1.045
	(3.40)	(4.97)	(2.17)	(1.14)
Quarter 3	3.514**	-5.845***	-16.643***	2.506*
	(2.39)	(4.51)	(3.83)	(2.32)
Quarter 4	5.621	-5.193***	-14.447**	3.272***
	(1.67)	(2.95)	(2.46)	(2.84)
N	2,658	2,236	2,031	2,076
Adj. R-sq.	0.027	0.07	0.03	0.01
Panel B: 2020-2021 (Sudden Stop of March 2020)				
Quarter 1	3.389***	-11.478***	-19.971***	-1.084
	(3.59)	(8.62)	(5.05)	(1.18)
Quarter 2	-3.608***	-3.702***	-6.291	0.618
	(3.82)	(2.74)	(1.59)	(0.67)
Quarter 3	-2.941***	-1.124	-0.693	-1.412
	(3.11)	(0.83)	(0.18)	(1.53)
Quarter 4	-3.361***	2.053	5.554	-1.142
	(3.56)	(1.52)	(1.40)	(1.24)
N	130	127	110	120
Adj. R-sq.	0.463	0.549	0.409	-0.131
Panel C: 2021-2022 (Fed Signal of 2020 Hikes of December 2021)				
Quarter 1	-0.643	-0.286	-0.521	0.537
	(0.44)	(0.44)	(0.37)	(0.59)
Quarter 2	-1.271	-1.355**	0.339	0.914
	(0.86)	(2.06)	(0.24)	(1.00)
Quarter 3	2.201	-1.406**	0.778	-0.281
	(1.50)	(2.08)	(0.52)	(0.30)
Quarter 4	-0.506	-3.135***	-0.307	2.890***
	(0.34)	(4.64)	(0.2)	(2.84)
N	130	121	104	107
Adj. R-sq.	0.258	0.567	0.371	-0.086

Notes: This table summarizes the panel regression estimates of $y_{ct} = \alpha_c + \delta_{year} + \sum_{k=1}^{4} \gamma_k Q_k + \varepsilon_{it}$, where y_{ct} is the outcome for country c in quarter t, α and δ are country and year fixed effects. Panels B and C don't include year fixed effects. Q_k is a dummy variable that takes value one when t is k quarters after the sudden stop period. Dependent variables include: exchange rate depreciation, real GDP growth (year-to-year), real investment growth (year-to year) and trade balance/GDP. All variables are in percentage. t statistics are in parentheses. *, **, or *** indicate the coefficients are significant at 10, 5 or 1% level of significance. Panel A) is from Eichengreen and Gupta (2017) and it covers 46 sudden stops during the period 1991-2015 for 20 EMs in 1991, 28 in 1995, and 34 from 2000 onward. Panel B) covers the sudden stop in March 2020 for the EMs studied in this analysis (summarized in Table 1). Panel C) covers the Fed Signal of 2020 Hikes of December 2021 also for the EMs studied in this paper. Data is quarterly.

6 Conclusion

We ask why emerging markets showed resilience in the face of the sharp and quick FED hikes during last two years. In the 1980s and 1990s, the global transmission of FED hikes rooted in financial channels often resulted in adverse repercussions for emerging markets, characterized by sudden stops, increased UIP premia, capital outflows, and sharp recessions. In the post-COVID era, however, none of these events were observed. We argue that this is due to improved monetary policy credibility and lower dollar denominated debt in emerging markets this time around compared to historical episodes.

Historically, emerging markets have grappled with challenging trade-offs in response to Federal Reserve tightening, involving either raising their policy rates to match the U.S. and curb currency depreciation and capital outflows, or lowering them to alleviate recessionary pressures. Such trade-offs typically stemmed from the substantial external FX debts of these countries, compelling central banks, often lacking independence and sound policy frameworks, to protect their currencies against depreciation to prevent escalating FX debt burdens. Improved monetary policy credibility helped to mitigate these challenges both by bringing down the country risk premia. It has contributed to a reduction in FX debt, as investors became more confident that independent central banks with policy credibility would maintain inflation control and provide macroeconomic stability, which, in turn, helps to lower the FX debt in favor of local currency debt.

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 that are associated with FED hikes. 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.

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A Appendix

A.1 Policy credibility (IAPOC) Criteria

Table A1 below demonstrates how the three principles underpin the IAPOC metric, transparency, coherency, and consistency are systematically reflected in the design of the criteria, using the numerical targets of monetary policy as an example. The criteria that capture the availability of information (e.g., whether the body responsible for setting the numerical targets is stated) are related to the transparency principle (T). In turn, the ones that capture desirable policy practices (e.g., the medium-term nature of the numerical target) are related to the coherence principle (CH). Finally, the criteria that capture whether the numerical targets featured in Communications coincide with those identified in Policy and Operational Strategy are related to the consistency principle (CS). For the full set of criteria in the IAPOC metric, see Unsal, Papageorgiou and Garbers (2022).

Table A1: Criteria Related to the Numerical Targets

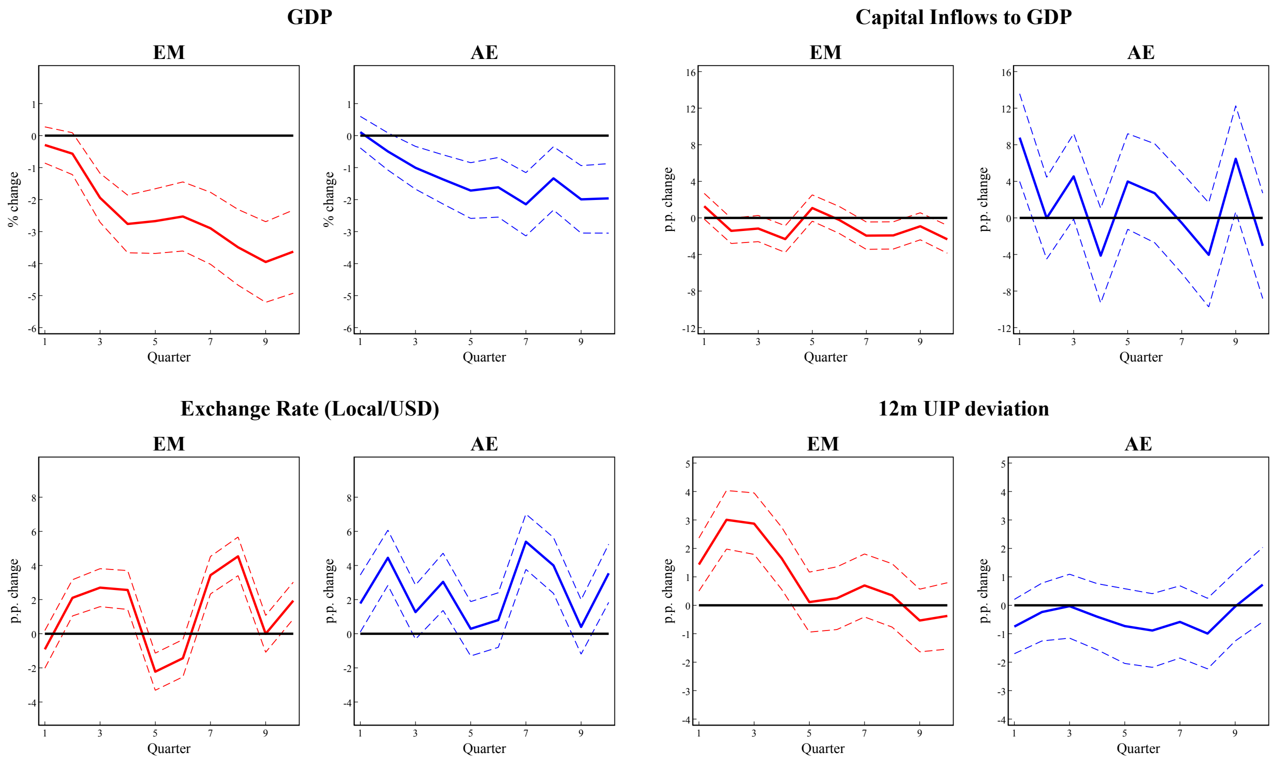
Criterion	Principle	Options and Scoring
INDEPENDENCE AND ACCOUNTABILITY		
2. Mandated Goals and Numerical targets		
2.2. By law, is it stated that there is a numerical monetary policy target?	**T**	Yes—1 No—0
2.2.1. By law, is it stated which body(s) is responsible for setting the numerical monetary policy target(s)?	**T**	Yes—1 No—0
2.2.1.1. By law, who sets the numerical monetary policy target(s)?	**CH**	The central bank and the government through joint consultations—1 The central bank or government alone—0.5 An individual—0
2.2.2. By law, is it stated how frequently the target(s) may be revised?	**T**	Yes—1 No—0
2.2.2.1. By law, how frequently may the target(s) be revised?	**CH**	At a fixed, low frequency, once every five or more years— 1 More Often—0
POLICY AND OPERATIONAL STRATEGY		
2. Numerical Targets		
2.1. Is it stated what the numerical targets are?	**T**	Yes—1 No—0
2.1.1. Does this include an inflation target?	**CH**	Yes—1 No—0
2.1.1.1. Is it stated which indices/data series define these targets?	**T**	Yes—1 No—0
2.1.1.2. Is it stated over which time horizon these targets should be met?	**T**	Yes—1 No—0
2.1.1.2.1. Is the time horizon for the inflation target the medium-term?	**CH**	Yes— 1 No—0
2.1.1.3. Is it stated under which conditions these targets may be revised?	**T**	Yes—1 No—0
2.1.1.3.1. Under which conditions may these targets be revised?	**CH**	Comprehensive review at a fixed frequency—1 Other—0
2.1.1.4. Have any of these targets been revised?	**CH**	No; or through a comprehensive review—1 Not through a comprehensive review—0
2.1.1.5. Is it explained how the objectives map into these targets?	**CH**	Yes—1 No—0
4. Policy Formulation		
4.2. Is it stated which objectives and numerical targets guide policy formulation?	**T**	Yes—1 No—0
4.2.1. Does policy formulation center around the outlook for the objectives and numerical targets, including an inflation target?	**CH**	Yes—1 No—0
4.2.2. If there are multiple objectives and numerical targets guiding policy formulation, is it explained how these, including an inflation target, are balanced?	**CH**	Yes—1 No—0
COMMUNICATIONS		
2. Announcing and Explaining the Policy Stance		
2.1. Is there a statement of monetary policy decisions?	**T**	Yes—1 No—0
2.1.3. Is there a statement explaining policy decisions?	**T**	Yes—1 No, or only when tools are changed—0
2.1.3.1. Are the objectives and numerical targets in the explanation consistent with Policy and Operational Strategy?	**CS**	Yes—1 No—0
2.1.3.1.1. Is there a discussion of the outlook for the objectives and numerical targets, including an inflation target?	**CH**	Yes—1 No—0
2.1.3.1.2. Is there a discussion of the risks to the outlook for the objectives and numerical targets, including an inflation target?	**CH**	Yes—1 No—0

Note: See Unsal, Papageorgiou and Garbers (2022) for the full set of criteria in the IAPOC metric. T, CH, and CS indicate whether the criterion is related to the transparency, coherence, and consistency principle, respectively. “Inflation target” refers to an inflation or price-level target.

A.2 Robustness of Figure 10

We re-run specification (1) and control for FX reserves to GDP. We show results in Figure A1. Results are very close to those in Figure 10, with the exception that now, there is also depreciation in AEs.

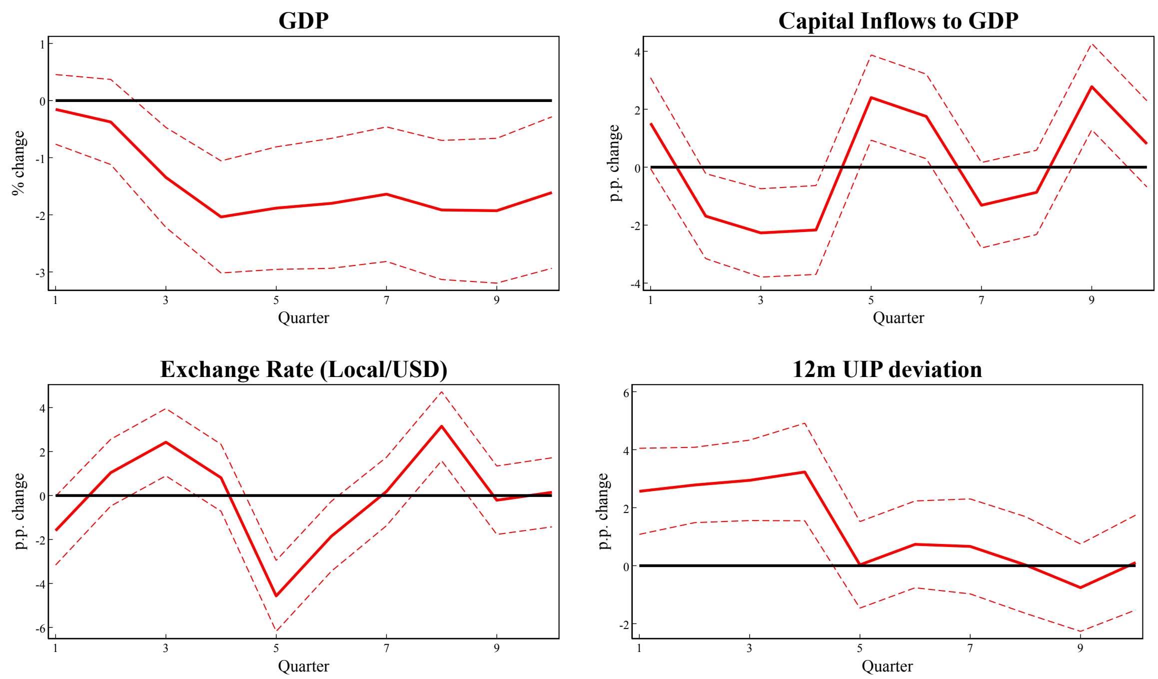
Figure A1: International Transmission of FED Hikes: Emerging vs. Advanced Economies (GK surprises), controlling for FX reserves



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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., the instrument and FX reserves to GDP. Dependent variables include: real GDP in logs, 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 also re-run specification (1) for the smallest sample (only for the 15 countries in the FX debt sample) as a robustness. We show results in Figure A2. Results are very close to those in Figure 10.

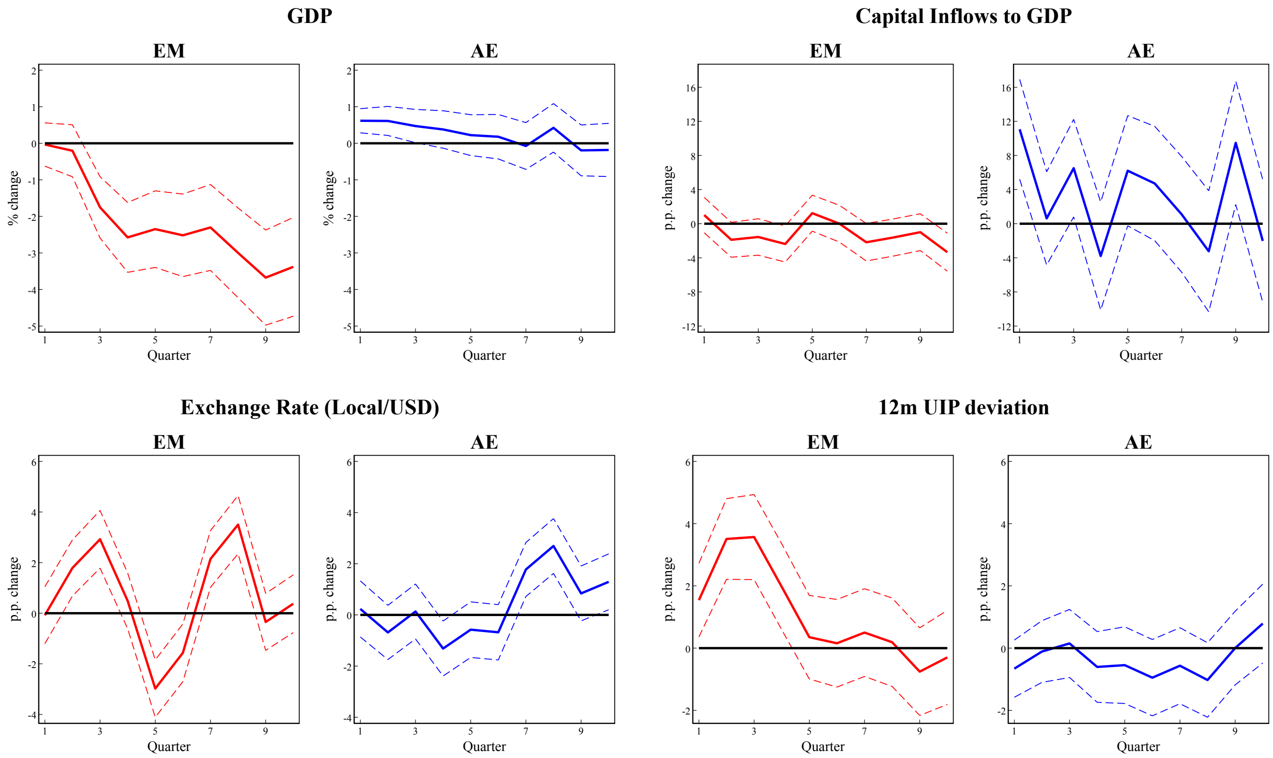
Figure A2: International Transmission of FED Hikes: Emerging Economies (GK surprises), Smallest Sample



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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, 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 run this for the 15 countries in the smallest sample, which all are EMs.

In Figure A3 we run specification (2) where we drop commodity exporters.

Figure A3: International Transmission of FED Hikes: Emerging vs. Advanced Economies with Global Controls and Dropping Commodity Exporters



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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., instrument, dollar shock, average oil price index, and median trade balance. Dependent variables include: real GDP in logs, 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 commodity exporters, following the World Economic Outlook's classification

A.3 Robustness of Policy Credibility and Balance Sheet FX Vulnerabilities

As a robustness of our exercise of policy credibility, we run the following specification:

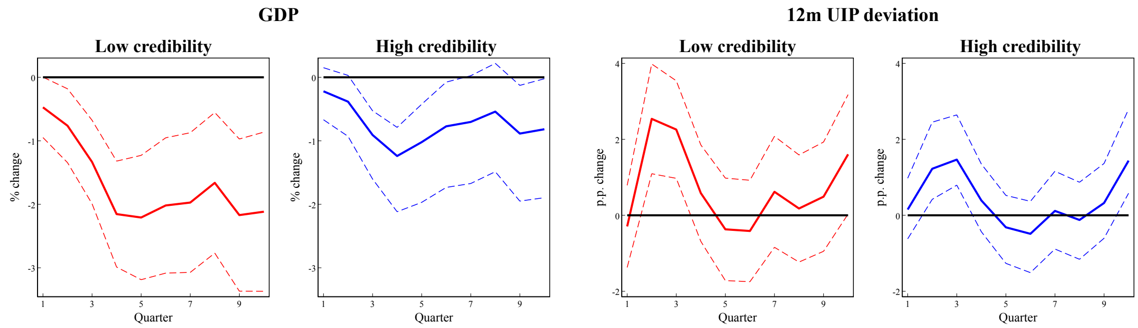
$$y_{c,t+h} = \alpha_c + \beta_{1,h}\hat{i}_t^{US} + \beta_{2,h}\hat{i}_t^{US} * IAPOC_{c,t-1} + \gamma X_t + \theta IAPOC_{c,t-1} + \sum_{i=1}^{i=4}\omega_i X_{t-i} + \sum_{i=1}^{i=4}\eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{8}$$

Relative to specification (3), in (8) we use the time varying IAPOC variable, lagged one period. To calculate the effect of the U.S. monetary policy shock on countries with high vs low policy credibility, we calculate the marginal effect of a U.S monetary policy shock as follows:

$$\frac{\partial y}{\partial \hat{i}} = \beta_{1,h} + \beta_{2,h} * IAPOC_{t-1} \tag{9}$$

and we evaluate equation (9) at the p25 of the $IAPOC$ distribution for the low credibility country and at the p75 of the $IAPOC$ distribution for the high credibility country. We show results in Figure A4. Results are robust to what we found in Figure 14.

Figure A4: International Transmission of FED Hikes: The Role of Policy Credibility with Global Controls (GK Surprises), Alternative Specification



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) 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., instrument, dollar shock, average oil price index, and median trade balance. Dependent variables include: real GDP in logs and 12m UIP deviations which are defined as before. See text above for the definition of high and low credibility countries.

We do a similar exercise for the balance sheet FX vulnerabilities by running:

$$y_{c,t+h} = \alpha_c + \beta_{1,h}\hat{i}_t^{US} + \beta_{2,h}\hat{i}_t^{US} * FX_{c,t-1} + \gamma X_t + \theta FX_{c,t-1} + \sum_{i=1}^{i=4}\omega_i X_{t-i} + \sum_{i=1}^{i=4}\eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{10}$$

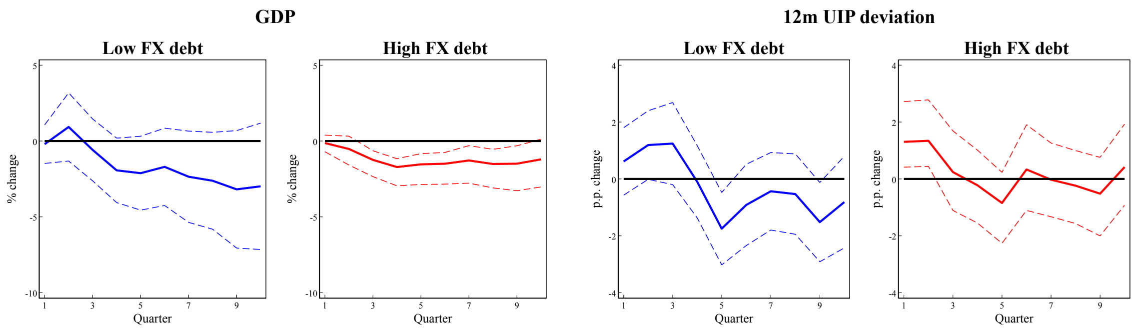
Relative to specification (5), we now use a time varying measure of FX debt, lagged. In particular, we use Bénétrix, Gautam, Juvenal and Schmitz (2019) measure of total external debt to GDP as measure of FX debt in this case.

To calculate the effect of the U.S. monetary policy shock on countries with high vs low FX debt, we calculate the marginal effect of a U.S monetary policy shock as follows:

$$\frac{\partial y}{\partial \hat{i}} = \beta_{1,h} + \beta_{2,h} * FX_{t-1} \tag{11}$$

and we evaluate equation (11) at the p25 of the FX distribution for the low FX debt country and at the p75 of the FX distribution for the high FX debt country. We show results in Figure A5.

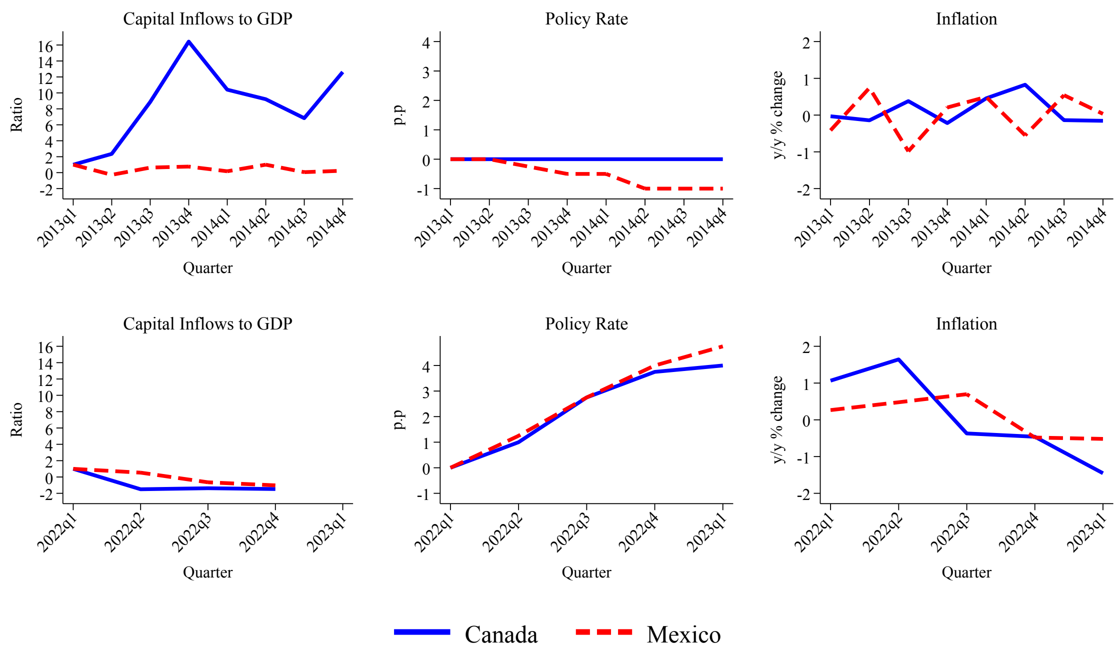
Figure A5: International Transmission of FED Hikes: The Role of Balance Sheet FX Vulnerabilities with Global Controls (GK Surprises), Alternative Specification



Notes: Impulse responses of 12-month US treasury rate instrumented by monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015) are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. Controls include the dollar shock, average oil price index, and median trade balance 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. In this case we did not add 4 lags of dollar shock, average oil price index, and median trade balance because of the limited sample. Dependent variables include: real GDP in logs and 12m UIP deviations which are defined as before. See text above for the definition of high and low FX debt countries.

A.4 Additional Variables for Figure 4

Figure A6: Canada and Mexico after Fed Hikes



Notes: The top row of the figure shows the evolution of variables relative to pre-Taper Tantrum (2013q1). The bottom row of the figure shows the evolution of variables relative to the recent FED Hikes (2022q1). Capital inflows to GDP are measured as bank and corporate capital inflows to GDP ratio, and the plot shows the ratio relative to 2013q1. The policy rate plot shows the percentage point difference relative to 2013q1. The inflation plot shows the year-to-year growth rates.

A.5 Variables

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

Local projections. The dependent variables we use are as follows:

1. GDP: real seasonally adjusted

2. CPI: period average

3. Nominal exchange rate: defined as domestic currency/U.S. dollar, period average

4. Capital inflows to GDP: defined as the sum of bank, central bank, corporate and government portfolio debt and other investment debt flows (loans) to GDP ratio

5. 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.

The global and country specific controls we use:

1. Median trade balance to GDP: within quarter median trade balance to GDP for each group of countries (EM and AEs).

2. Dollar shock: nominal major currencies U.S. dollar index

3. Oil price index: crude oil (petroleum) simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh

4. FX reserves to GDP

The shocks used are:

1. US 12m treasury bill

2. Gertler and Karadi (2015) shock: averaged monthly weighted raw surprises in 3-month Fed Fund Futures (FF4) from Gertler and Karadi (2015)

3. Monetary policy surprise from Bauer and Swanson (2023): the first principal component of the changes in the first four quarterly Eurodollar futures contracts (ED1–ED4) around FOMC announcements, which is re-scaled so that a one-unit change in the principal component corresponds to a 1 percentage point change in the ED4 rate.

Two key variables in our analysis are the monetary policy credibility index (IAPOC) and the FX debt to total credit to the non-financial sector:

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.

Below we present key descriptive statistics of the variables used in the cross country analysis:

Table A2: Descriptive Statistics (1990q1-2019q4)

	mean	sd	min	max
ln(GDP)	7.583	3.466	0.377	19.034
ln(CPI)	4.121	1.202	-9.602	6.243
12m UIP deviation	0.023	0.042	-0.114	0.158
Exchange rate (% change, q/q)	0.020	0.101	-0.438	2.550
Capital inflows to GDP	0.036	0.093	-0.170	0.690
12m US treasury rate	0.032	0.023	0.001	0.083
GK(15) shock	-0.011	0.030	-0.179	0.056
BS(23) surprise	-0.008	0.091	-0.342	0.214
Dollar shock	-0.005	0.334	-0.850	0.868
Median trade balance	-0.008	0.019	-0.060	0.042
ln(oil price index)	4.435	0.650	3.312	5.478
IAPOC index	0.603	0.147	0.194	0.818
FX debt to total credit to the NFS	0.145	0.146	0.013	0.794
Total external debt to GDP (Bénétrix et al, 2019)	0.730	0.775	0.138	5.268
FX reserves to GDP	15.988	14.865	0.194	113.472
Investment growth (yoy)	3.652	10.164	-83.475	61.967
Trade balance/GDP change	0.021	4.086	-69.465	73.246

Note: this table summarizes the descriptive statistics of the variables used in the cross-country analysis for the period 1990q1-2019q4. Variables are as explained above.

Additional variables used. As an auxiliary variable on FX debt, we rely on the total external FX debt from Bénétrix, Gautam, Juvenal and Schmitz (2019) dataset that uses as input the currency composition of the main IIP components from the IMF, as well as IMF's Coordinated Portfolio Investment Survey (CPIS), portfolio debt data reported to the European Central Bank (ECB) and banks cross-border positions reported to the Bank of International Settlements (BIS) available through its Locational Banking Statistics (LBS).

Primary Deficit data is Central Government's last 12-month primary balance to nominal GDP ratio, and budget deficit data is calculated by adding Central Government's last year interest expense share to primary deficit ratio. Domestic Debt to GDP ratio is Public Sector Net Debt to GDP ratio covering total public gross debt stock, unemployment insurance fund net assets, public sector assets, and central bank net assets to last year's GDP. External Debt to GDP ratio is the Gross External Debt Stock to GDP ratio covering short and long term debt stocks of public sector, CBRT, and private sector.

For Figures 5 and 6 we use fiscal deficit (primary and budget deficits) to GDP, domestic debt to GDP measured as Public Sector Net Debt to GDP ratio covering total public gross debt stock, unemployment insurance fund net assets, public sector assets, and central bank net assets to last year's GDP. External Debt to GDP ratio is the Gross External Debt Stock to GDP ratio covering short and long term debt stocks of public sector, CBRT, and private sector. Monetary policy rates, deposit rates, CPI inflation, nominal exchange rate (Turkish lira/U.S. dollar), 12 month and 24 month ahead inflation expectations, and the change of the IAPOC index for Turkey.

In the following table we summarize the data sources:

Table A3: Data sources

Variable	Source
GDP	WEO, IFS and national bureau of statistics
CPI	IFS
Nominal exchange rate	IFS
Capital inflows to GDP	Avdjiev et al. (2022)
12m UIP deviation	Bloomberg and Consensus Forecast
US 12m treasury bill	Bloomberg
Gertler and Karadi (2015) shock	Updated version of Gertler and Karadi (2015)
Bauer and Swanson (2023) surprise	Bauer and Swanson (2023)
IAPOC	Unsal et al. (2022)
FX debt	BIS, Fan and Kalemli-Özcan (2016) and Kalemli-Özcan et al. (2021)
External FX debt	Bénétrix, Gautam, Juvenal and Schmitz (2019)
Trade balance to GDP	IFS
Dollar shock	FRED
Oil price index	IMF
FX reserves to GDP	IFS
Turkey's fiscal deficit	IMF and Turkey's MoF
Turkey's domestic debt	Turkey's MoF and TURKSTAT
Turkey's external debt	Turkey's MoF
Inflation expectations	CBRT EVDS database, Survey of Market Participants

A.6 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. We work with an unbalanced panel composed of managed and pure floats.

We have a total of 59 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 work with 34 since we drop LICs+, hard pegs, free falling regimes and the United States. 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.

Table A4: Country Sample

Albania	Costa Rica	India*$	Mexico*$	Singapore
Argentina*$	Croatia	Indonesia*$	Morocco	Slovak Republic
Armenia*	Czech Republic*	Ireland	New Zealand*	South Africa*$
Australia*	Denmark	Israel*	Norway*	Spain
Azerbaijan	Euro Area*	Italy	Pakistan*	Sweden*
Belarus	Ecuador	Japan*	Paraguay	Switzerland
Brazil*$	Egypt Arab	Kazakhstan*	Peru*$	Thailand*$
Bulgaria	Finland	Korea	Philippines*$	Tunisia
Canada*	Germany	Latvia	Poland*	Turkey*$
Chile*$	Guatemala	Malaysia*$	Romania	United Kingdom*
China*$	Hungary*	Malta	Russian Federation*$	Uruguay*
Colombia*$	Iceland*	Mauritius*	Serbia*	

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