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

ABSTRACT Contrary to historical episodes, the 2022–2023 tightening of US 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 US policy historically led to more adverse outcomes compared to advanced economies, where the 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 the 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 the lack of credible monetary policies and dollar-denominated debt. The improvement in monetary policy frameworks combined with reduced levels of dollar-denominated debt have helped emerging markets weather the recent Federal Reserve 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, "The Stunning Resilience of Emerging Markets"

In stark contrast to the 1980s and 1990s, emerging markets have demonstrated resilience in the face of monetary policy tightening in advanced economies, notably the United States, during the post-COVID-19 era. Historically, sharp increases in policy rates in the United States have led to falling currencies elsewhere combined with capital outflows—the so-called sudden stops—which often resulted in widespread financial stress and crises in emerging markets and developing economies. The 1982–1983 debt crisis in Latin America, following the Federal Reserve hikes during disinflation under Paul Volcker, remains the classic example, but there are also other instances such as the 1994 tightening of US monetary policy paving the way to Asian crisis and the infamous taper tantrum of 2013. However, the recent tightening cycle has unfolded differently. This time, the majority of emerging markets have effectively navigated the most significant tightening in the United States in several decades without much damage to their economies.

What explains this newfound resilience to the US 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 the dollar debt and local currency assets can force central banks to defend the currency to avoid local currency depreciations, which would otherwise increase the debt burden and defaults.[1] An inflation-targeting central bank can lose its credibility by responding to exchange rate fluctuations through policy rates without a clear framework, since such behavior could entail a deviation from the "do what you say, say what you do" rule that captures the essence

1. Since most of the foreign currency debt in emerging markets and developing economies is in US dollars, reducing the extent of foreign currency debt means they borrow less in dollars relative to the 1980s and 1990s (McCauley, McGuire, and Sushko 2015).

of monetary policy credibility.[2] Our new credibility index quantifies these types of deviations within an existing 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 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 data set based on a narrative approach from Unsal, Papageorgiou, and Garbers (2022) to quantify the monetary policy frameworks, and hence the credibility improvements in countries over time that are exogenous to both the US monetary policy shocks and other domestic policy changes within countries. This data set is hand-collected from thousands of central bank legal documents from fifty countries over 2007–2021, to characterize the monetary policymaking across three pillars of independence and accountability: policy, operational strategy, and communications. Even though the changes in domestic monetary policy rate could be endogenous to US monetary policy and other policy and institutional changes in the country, our measure is orthogonal to such changes since it is designed to capture policy design and implementation features that enable and guide the conduct of monetary policy, rather than specific endogenous monetary policy actions at any point in time.[3]

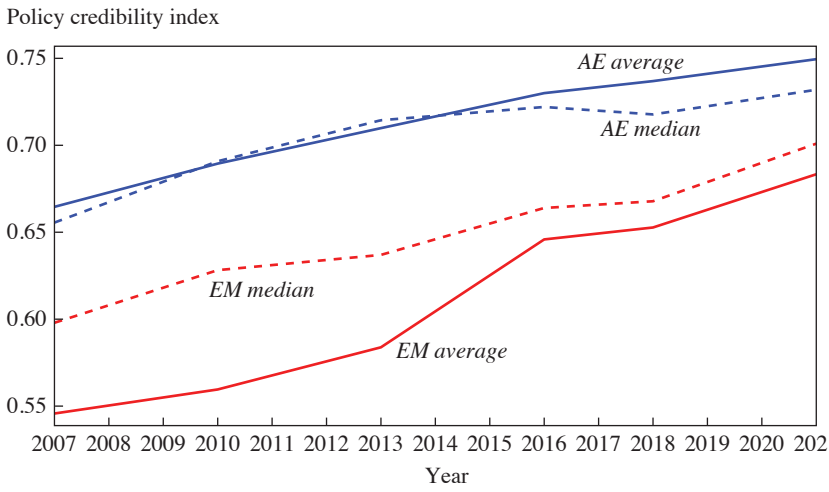
Empirical literature on the central bank independence focuses on the political independence by constructing cross-country measures and relating them to inflation and inflation expectations.[4] The theoretical underpinning of

2. There could be reasons to intervene in the exchange rate market. Our point is that, if not done correctly with a clear framework, monetary policy credibility could be jeopardized. An increasing number of emerging markets have moved toward approaches where multiple tools are employed in pursuit of multiple objectives related to financial stability, exchange rate stability, and capital flow management. See Basu and others (2020) on how an "integrated" approach helps provide macroeconomic and financial stability in the face of risk-off shocks.

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 online appendix A.1 for an illustration of how transparency, coherence, and consistency principles underpin our credibility metric, using the criteria on the numerical targets of monetary policy as an example.

4. See, for example, Alesina and Summers (1993) and Dincer and Eichengreen (2014).

Figure 1. Policy Credibility over Time



Source: IAPOC index from Unsal, Papageorgiou, and Garbers (2022)

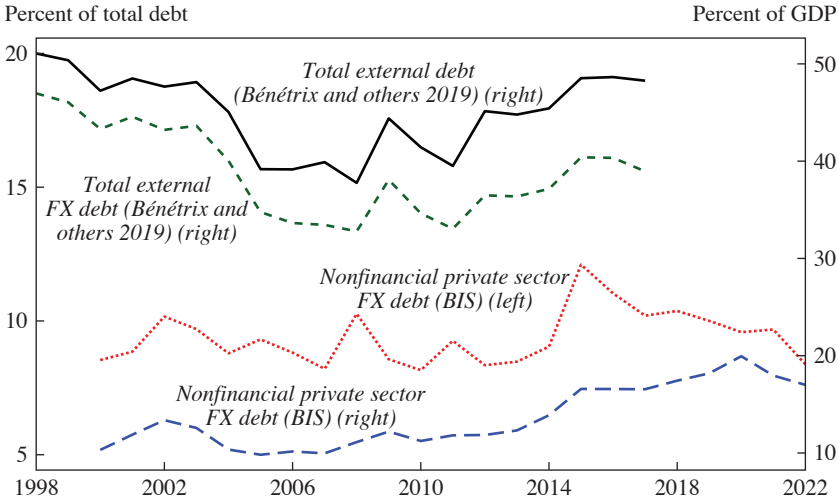
Note: The measure of policy credibility, on a scale of zero to one, is based on the monetary policy frameworks index (IAPOC index) from Unsal, Papageorgiou, and Garbers (2022). The graph shows the average and median policy credibility in advanced economies (AEs) and emerging markets (EMs) from 2007 to 2021.

this idea that delegating monetary policy to an independent body mitigates the inflationary bias comes from Rogoff (1985). Separately, there is a strand of literature starting 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 in both theoretical and empirical literature regarding how improvements in monetary policy credibility affect emerging markets over time, especially when they face external shocks with considerable impact on their exchange rates, such as the changes in US monetary policy.

The new credibility index is plotted in figure 1. The index is between zero and one, where a value of one indicates perfect credibility. It reveals that the monetary policy credibility substantially improved in emerging markets, for both the average and median countries. 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. Figure 2 plots the ratio of total external debt to gross domestic product (GDP) and the ratio of total external

Figure 2. Foreign Currency Debt in Emerging Markets



	FX debt/total debt 1995–2002, private sector
Argentina	0.61
Brazil	0.28
Chile	0.30
Colombia	0.25
Hungary	0.21
Mexico	0.60
Peru	0.50
Turkey	0.55

Source: Bank for International Settlements (nonfinancial private sector debt); and Bénétrix and others (2019) (total external debt and total external FX debt).

Note: Credit in US dollars to the nonfinancial private sector is estimated as the total credit in US dollars minus international debt securities for government and financial institutions, normalized by total debt and by annual GDP. We plot the averages for emerging markets and use a balanced panel in each series. The table shows the data from Di Giovanni and others (2022), Salomao and Varela (2022), Kamil (2004), Kalemli-Özcan, Kamil, and Villegas-Sanchez (2016), Aguiar (2005), and Kalemli-Özcan (2022), which are all based on confidential data from each central bank, as reported in these papers.

debt in FX to GDP. These series show some decline at first, from around 50 percent to 38 percent of GDP between 1998 and 2008, but both increased afterward during the quantitative easing in advanced economies following the global financial crisis that drove capital flows to emerging markets. As explained above, historically, what triggered central banks in emerging markets to defend their currencies in the face of Fed hikes was the FX debt-related vulnerabilities in their nonfinancial private sectors. Hence, we also

plot in figure 2 the FX debt of the nonfinancial private sector (household and corporate) both as a percentage of GDP and as a percentage of total debt. Unfortunately, the time series for these data is only available after 2000. What is remarkable is that the nonfinancial sector FX debt is below 20 percent of GDP and around 10 percent of total debt. This is a huge reduction given the historical values before the 2000s as shown in the table. There are some countries such as Turkey and Argentina, where the shares of corporate sector FX debt are still similar to the historical values, hovering around 50 percent of GDP or total debt (Di Giovanni and others 2022; Das and others 2020). But these countries would be outliers rather than the norm as of 2020. We do not analyze the FX debt of financial institutions since this debt is hedged by several regulatory restrictions. By now these ensure the FX mismatches on bank and financial intermediary balance sheets are fully hedged or minimal (IMF 2022).

There is extensive literature on the international transmission of US monetary policy, starting with Diaz-Alejandro (1983) and Calvo, Leiderman, and Reinhart (1993, 1996) that emphasize the impact of interest rate differentials between a given country and the United States on the demand for government bonds.[5] Consistent with this early literature's focus on the interest rate differentials, more recent literature on the US monetary policy spillovers to other countries has shifted attention to the financial channel of US policy transmission—switching demand of assets between the United States and the rest of the world—from the trade channel—switching demand for goods produced in the United States to those produced in the rest of the world (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 the changes in US monetary policy and the cross-border correlations of macro-financial conditions, that is, the global financial cycle proxied by global-level risk indicators, like the CBOE Volatility Index (VIX), the broad US dollar index, and the US excess bond premium (Bekaert, Hoerova, and Duca 2013; Rey 2013; Miranda-Agrippino and Rey 2020; Bruno and Shin 2015; Obstfeld and Zhou 2022). Hence, the underlying factors for the financial transmission channel of US 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)—

5. See also Eichengreen and Portes (1987), Reinhart and Reinhart (2009), and Reinhart and Rogoff (2009).

the country-level risk premia priced by international investors—which has been identified as crucial in understanding the deteriorating macro conditions in emerging markets with risk-sensitive capital flows (Kalemli-Özcan 2019; Di Giovanni and others 2022).[6] Based on this empirical literature, the recent theoretical works focusing on the optimal policies for emerging markets single out the UIP wedge as the key factor to be stabilized to maximize welfare (Basu and others 2020; Bianchi and Lorenzoni 2022; Itskhoki and Mukhin 2022).

The financial channel is more pronounced in distinguishing the impact of US 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 US monetary policy overlooked a key domestic vulnerability, that is, the role of monetary policy credibility, while focusing solely on the exchange rate or the monetary policy 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 US 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 US monetary policy on 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

6. See also quantitative models, where exogenous UIP deviations take center stage, such as Dedola, Rivolta, and Stracca (2017) and Akinci and Queralto (2023); see Gourinchas (2018) on the contractionary effects of US monetary policy on real outcomes of other countries. Kalemli-Özcan and Varela (2021) investigate the empirical determinants of endogenous UIP deviations, and Akinci, Kalemli-Özcan, and Queralto (2021) model such deviations in a global general equilibrium framework.

7. Dedola, Rivolta, and Stracca (2017) point out that one reason why they do not find a strong role for exchange rate regimes in driving the international spillovers of US monetary policy shocks is that none of the countries in their sample has been in a peg all the time. Iacoviello and Navarro (2019) also find exchange rate regimes inconsequential when considering higher US interest rates on economic activity.

debt. Therefore, our analysis differentiates countries not only by their monetary policy credibility, but also by their levels of dollar-denominated debt, following Kalemli-Özcan (2019).

Our broad analysis covers fifty-nine countries using quarterly data from 1990:Q1 to 2019:Q4. 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, and 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.[8] We show that the improvement in these two key domestic vulnerabilities has led to a minimal impact of the Fed hikes on emerging markets so far.

The paper is composed of five sections. Section I lays out the broader literature and shows descriptive evidence. Section II details the data. Section III undertakes an empirical analysis that shows the heterogeneous effects of US monetary policy. Section IV analyzes the recent post-pandemic inflation episode and the effects of Fed hikes during this period. Section V concludes.

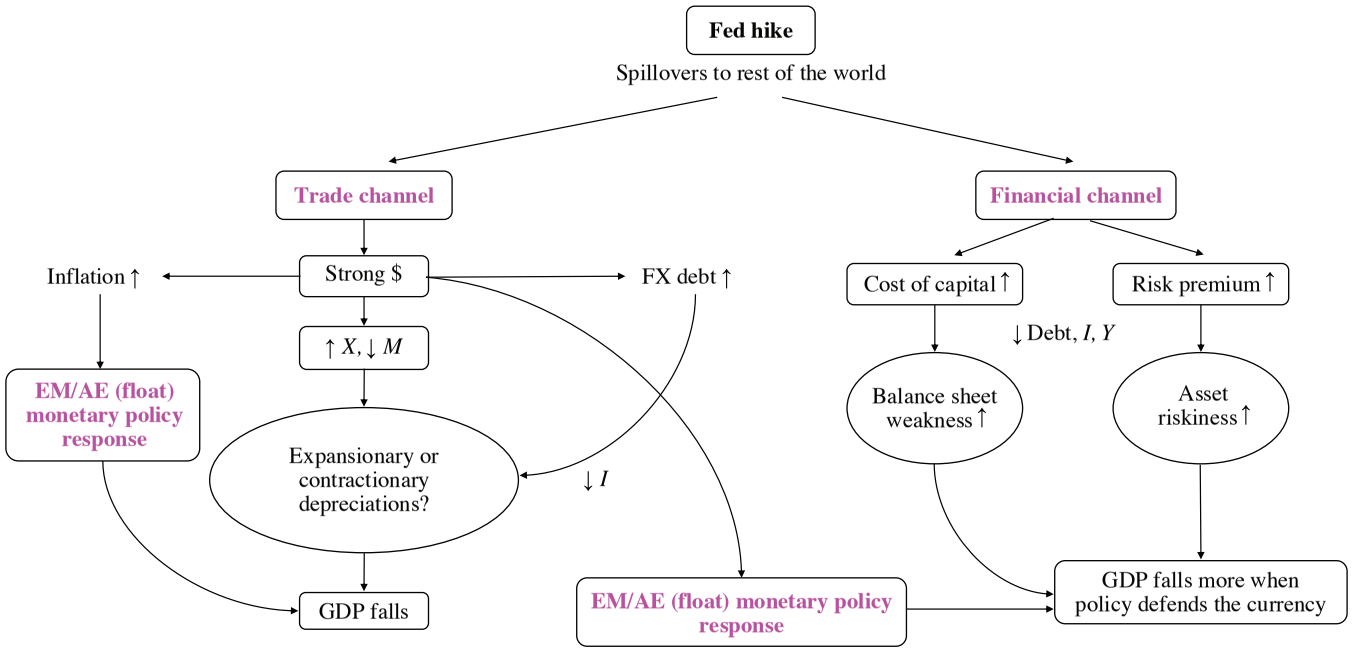
I. The Narrative within the Broader Literature

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

In the traditional models and empirical work, the focus was on the 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 the Federal Reserve hikes the federal funds rate and the US dollar appreciates, the demand for goods switches from the now expensive US goods to the goods from the rest of the world, which 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 when countries' currencies depreciate and capital flows out during Fed hikes.

8. Kalemli-Özcan (2019) shows similar results for the detrimental effects of US monetary policy and risk-off shocks in high FX debt countries.

Figure 3. Fed Hike



Source: Authors' elaboration.

Figure 3 shows this as the trade channel, depicted on the left side of the diagram. The failure to find an expansionary effect of currency depreciations has been justified by the models and evidence showing the dollar pricing of exports (Gopinath 2016) or negative balance sheet effects due to currency mismatch involving unhedged 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 flows out on net, such expenditure switching fails to initiate an expansion in output, leading to a contraction in GDP (Mendoza and Yue 2012; Gopinath and Neiman 2014) via lower investment. Consistently, Miranda-Agrippino and Rey (2020) and Obstfeld (2015) argue that the flexible exchange rates fail to fully absorb external shocks through expenditure switching. Hence, even though the 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.[9]

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

The financial channel is depicted on the right side of figure 3. The US interest rate increase not only results in higher safe rates globally, increasing the cost of capital, but also leads to higher risk premia toward inherently riskier assets such as emerging markets. As the balance sheets of US/global financial intermediaries weaken (Gertler and Kiyotaki 2010) with the Fed hikes—recently witnessed during the banking stress of 2023 (Jiang and others 2023)—they may not want to bear more risk by being exposed to

9. 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 US interest rates rather than flexible regimes, so flexible exchange rates must be doing some smoothing (Obstfeld and Zhou 2022). 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 US 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 to higher net exports, but rather through the financial channel, when the country experiences a boom financed with capital inflows, implying a lower UIP premium.

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 international financial intermediation (Gabaix and Maggiori 2015).

As discussed in the earlier literature starting 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 the Federal Reserve hikes the interest rates, emerging markets do not experience sudden stops or capital outflows; and if they do, resilience means that the extent is much smaller such that it does not affect their domestic economies. During the 1980s and 1990s, the main form of borrowing by other countries involved their sovereigns issuing dollar bonds. As shown by Alfaro, Kalemli-Özcan, and Volosovych (2014) and Kalemli-Özcan (2019), since the 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 dominates their capital flows (Avdjiev and others 2022). Also, the currency of borrowing has evolved, as shown by Du and Schreger (2016) and Hofmann, Patel, and Wu (2022), such that the emerging market sovereigns are increasingly borrowing in local currency, whereas the private sector, especially the nonfinancial corporations, can still only access foreign funding in US dollars as they cannot issue bonds in local currency, unlike their governments.[11] Thus, the transmission mechanism of US monetary policy might also have changed, as private capital flows are generally more sensitive to the global risk aversion. Forbes and Warnock (2012) study the total gross flows as the sum of private sector and government borrowing, and show the increasing importance of global risk factors after the mid-1990s. Avdjiev and others (2019, 2022) show that this risk sensitivity in gross flows is driven by private capital flows.

10. See models formalizing this financial channel endogenously in Jiang, Krishnamurthy, and Lustig (2021), Bianchi, Bigio, and Engel (2021), Akinci, Kalemli-Özcan, and Queralto (2021), and 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.

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

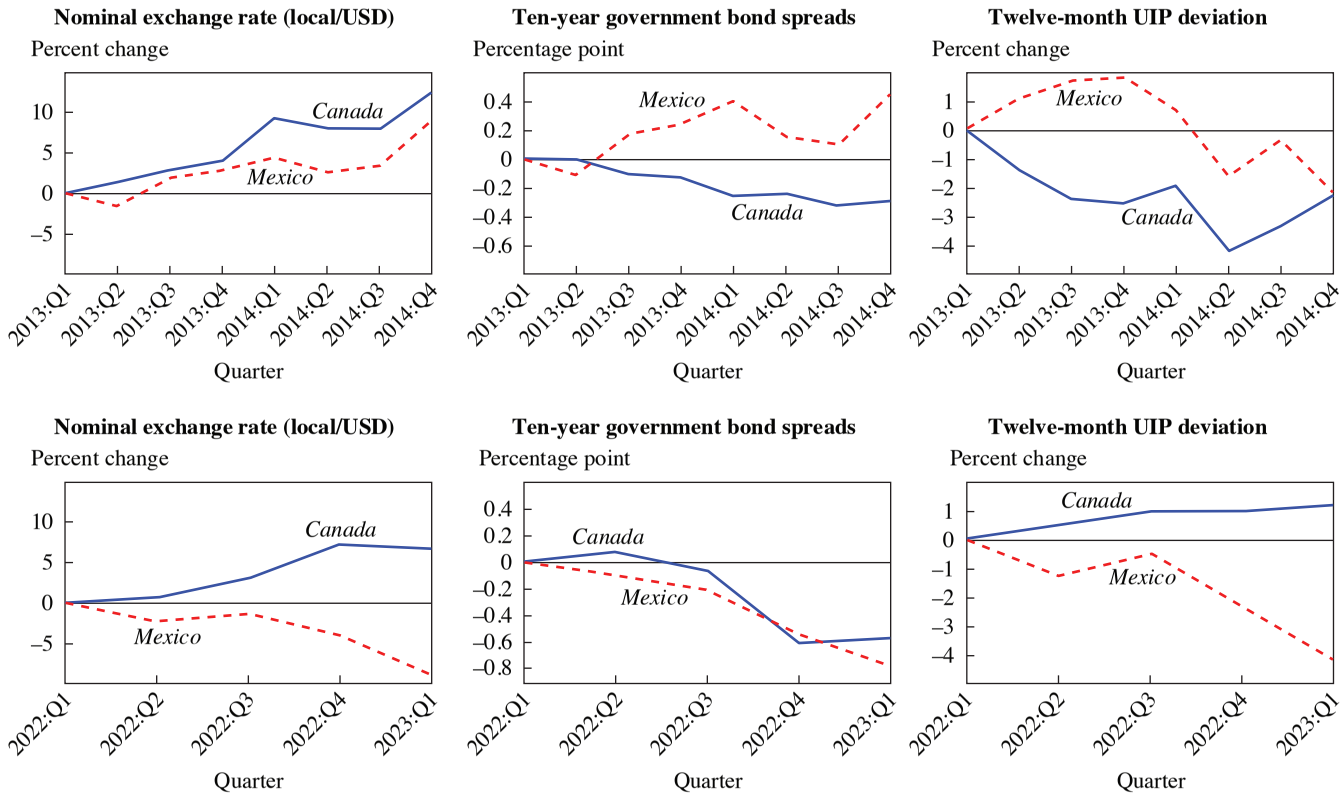
I.A. A Tale of Two Countries: Mexico and Canada

To illustrate, we use the two trading partners of the United States, Canada and Mexico, as case studies. These are both small open economies with important differences relevant to our analysis. From the perspective of the trade channel for US 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.

Figure 4 documents a specific US 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 United States under a trade agreement, should observe a similar impact through the trade channel given both of their currencies depreciate vis-à-vis the US dollar: the nominal exchange rate depreciations, 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 the ten-year government bond spreads. The short-term risk premium also rose sharply, captured by the twelve-month UIP premium. Both spreads remained mainly flat for Canada, with a slight decrease in the UIP premium. Notice that the long-term government bond spreads can capture the dollar premium via default risk if issued in dollars, or the term premium if issued in local currency. The short-term UIP premium captures the local currency premium, that is, the 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 United States uses the twelve-month government bond rates in local currency, and the second term is the expected change in the peso/dollar (or Canadian dollar to US dollar) exchange rate (s) in the next twelve months.

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 Federal Reserve's actions; (2) an increase in the interest rate differential above and beyond the movements in the expected exchange rate, driven by the possible response of the Mexican central bank hiking its own interest rates more than the Federal Reserve to defend the currency; or (3) a higher risk premium reflected in the interest rate differential demanded by global investors of risky Mexican assets. Kalemli-Özcan (2019), Kalemli-Özcan and Varela

Figure 4. Canada and Mexico after the Fed Hikes: Taper Tantrum versus COVID-19



Source: IMF International Financial Statistics; Bloomberg; Consensus Economics; and authors' calculations.

Note: The top row shows the evolution of variables relative to the taper tantrum (2013:Q1). The bottom row shows the evolution of variables relative to the recent Fed hikes (2022:Q1).

(2021), and 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 US monetary policy shocks and risk-off shocks.[12]

As shown in figure 4, for 2022:Q1–2023:Q1, the recent experiences of Canada and Mexico are very different from the earlier episode. Now both countries behave in a similar way in terms of risk spreads. The Mexican exchange rate appreciated during the recent Fed hikes, implying an expected depreciation in the future. Hence, the UIP premium fell in Mexico more than in Canada, implying a lower risk premium for Mexico by global investors to hold on to the Mexican assets. The long-term risk spreads fell for both countries.[13]

I.B. A Tale of Won and Weakened 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 plot the key macro variables together with inflation dynamics, risk spreads, and changes in our policy credibility measure. Turkey serves as an effective case study for understanding the exogeneity of our policy credibility measure and its time series changes being orthogonal to the domestic and US policy changes.

After the triple crises in 2001 (balance of payments, sovereign, and banking), Turkey successfully moved to a floating exchange rate regime within an inflation-targeting framework. This framework had been in place since 2002 and during the entire period we look at; however, the implementation of inflation targeting is what drives the time variation in our credibility measure.

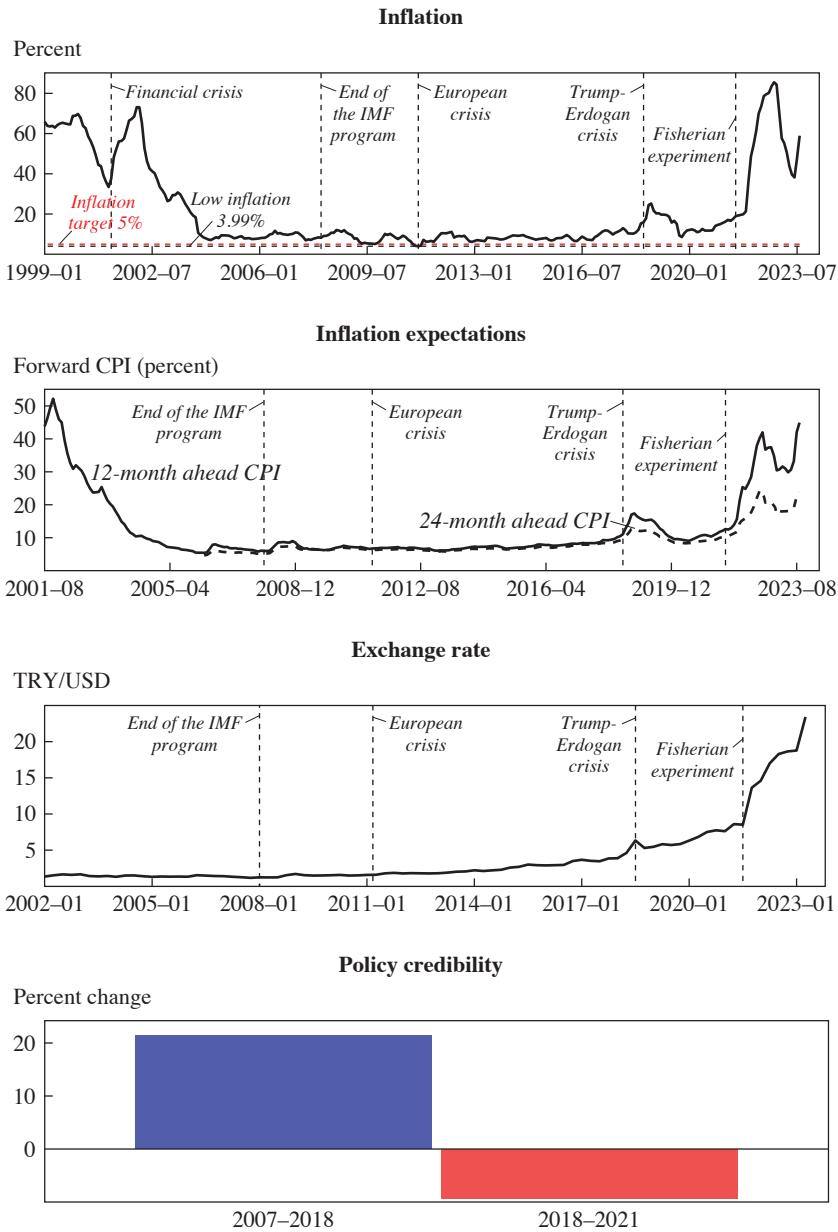
As shown in figure 5, the inflation and inflation expectations came down around 2004–2005 and stayed low (with inflation sometimes even below the target of 5 percent) until Turkey started an unorthodox monetary policy experiment, known as the Fisherian experiment, in late 2020.[14] This late period of 2018–2021 is when our credibility measure shows a deterioration

12. The UIP premium decline for Canada is explained by the fact that the interest rate differential term went down more than the expected appreciation since Canada did not change the policy rate at the time. Capital flows also showed different patterns: there were capital outflows from Mexico, whereas Canada received capital inflows (these results are available upon request).

13. Note that with a slight depreciation and an expected appreciation of the Canadian dollar, there is a slight increase in the UIP premium for Canada.

14. *Economist* (2020).

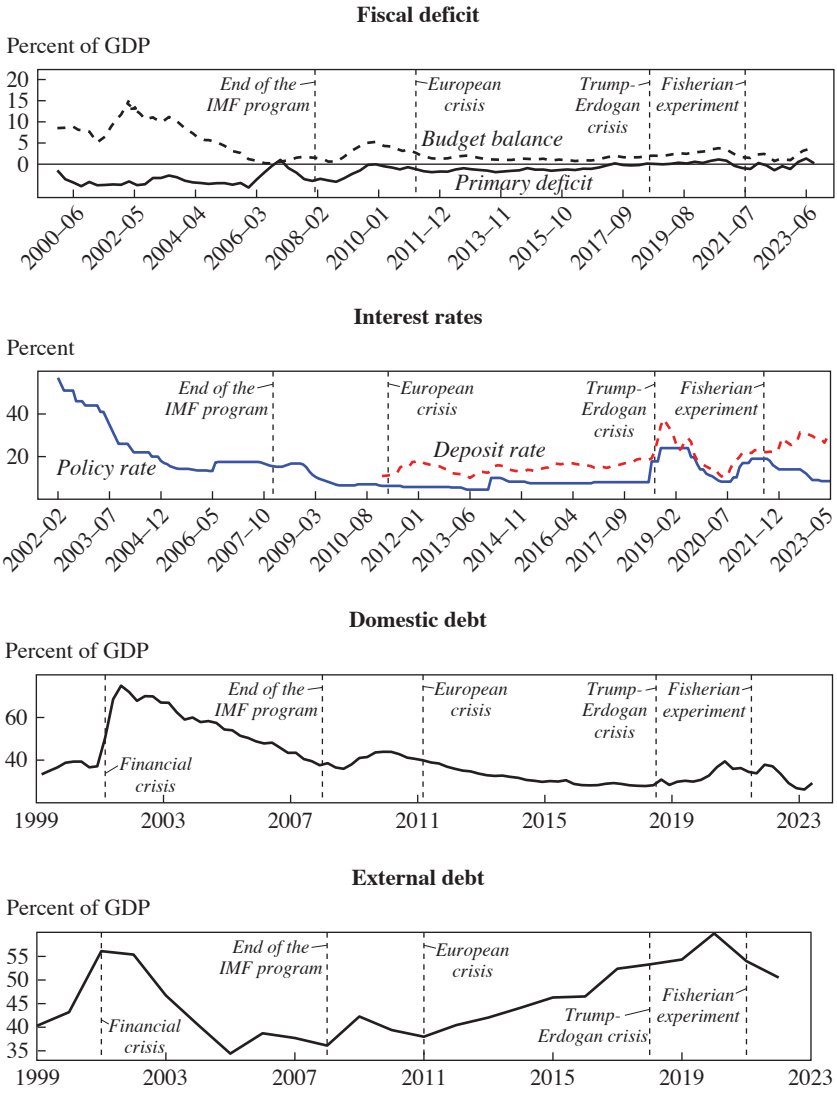
Figure 5. Case Study: Turkey I



Source: IMF International Financial Statistics (inflation and exchange rate); Central Bank of the Republic of Turkey Electronic Data Delivery System (EVDS) (inflation expectations); and IAPOC index (policy credibility).

Note: We plot exchange rates for the float regime starting in 2002.

Figure 6. Case Study: Turkey II



Source: Fiscal data come from Turkey's Ministry of Treasury and Finance; policy and deposit rate data are available from the Central Bank of the Republic of Turkey Electronic Data Delivery System (EVDS).

Note: The fiscal deficit is composed of primary deficit and budget balance—primary deficit data are the central government's last twelve-month ratio of primary balance to nominal GDP, and budget deficit data are calculated by adding the central government's last year ratio of interest expense share to primary deficit. Domestic debt as a percentage of GDP is the ratio of public sector net debt to GDP, 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 as a percentage of GDP is the ratio of gross external debt stock to GDP, covering short- and long-term debt stocks of the public sector, the Central Bank of the Republic of Turkey, and the private sector.

of almost 10 percent, whereas the early period of 2007–2018 picks up an improvement of 20 percent (recall that the credibility index is between zero and one). 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 2018 political crisis, further intensified in the later period, marked by a decline in policy credibility post-2020.[15]

Figure 6 shows the evolution of interest rates and domestic and external debt in Turkey. Again, the key insight here is not about the deteriorating fundamentals such as the current account deficit or external debt, as would typically be the case, but rather about how such deterioration priced in the risk spreads leads to different dynamics in market rates (short-term deposit rates) versus monetary policy rates, as shown to be the case in the latest episode.[16] Kalemli-Özcan (2019) calls this phenomenon "short-rate disconnect" and shows that emerging markets' domestic monetary policies have been ineffective in general since the 1990s as the policies' 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 after 2020 is an example, with the monetary policy credibility deteriorating and priced in by foreign investors as a risk premium, which is picked up both by the UIP premia and as the difference between domestic market rates and policy rates. The issue is not only the less than one-to-one pass-through of policy rates into market rates, but also having these rates go in totally opposite directions. De Leo, Gopinath, and Kalemli-Özcan (2022) study the short-rate disconnect in detail by writing down a model that delivers the wedge between market rates and policy rates as long as the domestic financial intermediaries borrow overseas at a dollar premium. They show that emerging markets pursue countercyclical monetary policy; however, the market rates they face go up in bad times and down in good times due to the risk premia inherent in market rates for emerging markets, even though the monetary policy is countercyclical in those countries akin to advanced economies.

15. Tensions between Turkey and the United States soared as President Trump ordered new sanctions in 2018, following the political dispute over Turkey's continued detention of an American pastor who was jailed after a failed coup in Turkey. Tariffs on imported Turkish steel and aluminum were doubled to 50 percent and 20 percent, respectively (Tankersley, Swanson, and Phillips 2018).

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

II. Data and Measurement

II.A. Monetary Policy Credibility

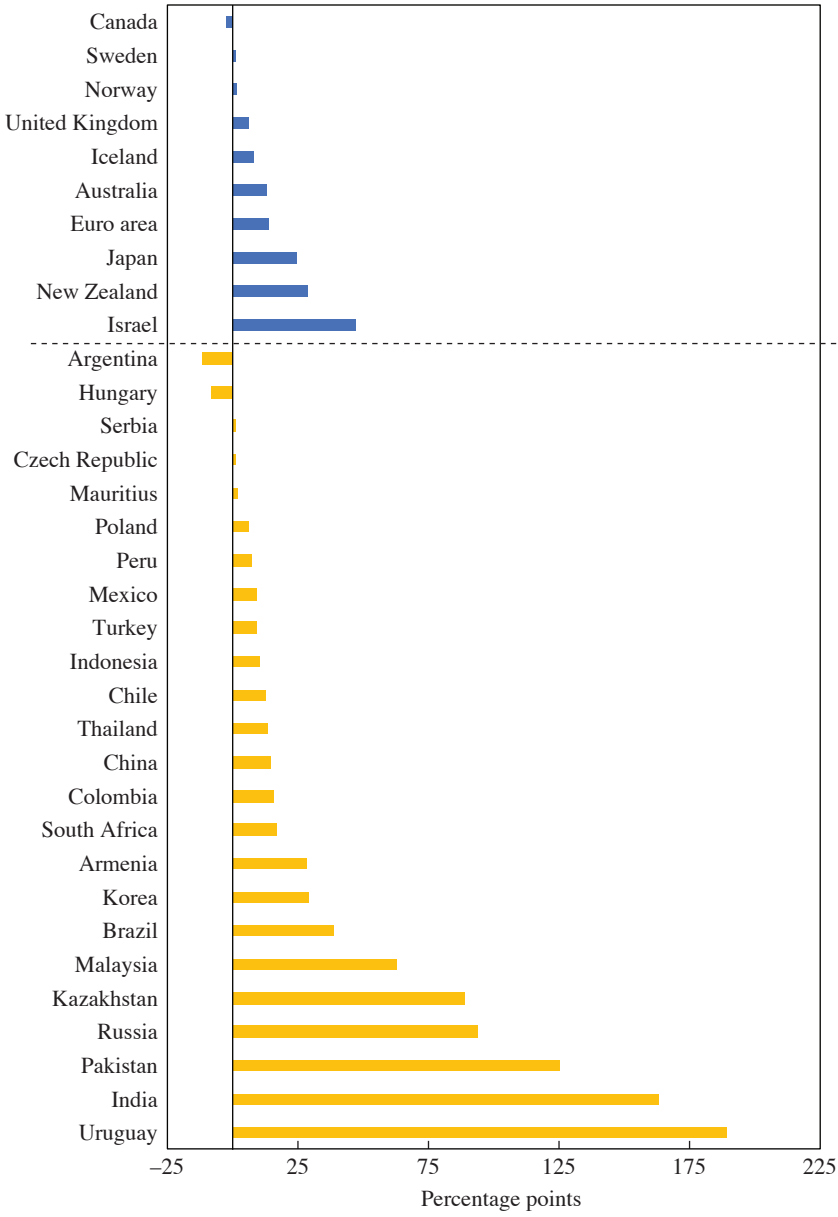
Our measure for monetary policy credibility is a new index developed by Unsal, Papageorgiou, and Garbers (2022) using a narrative approach similar to Romer and Romer (1989) for fifty countries between 2007 and 2021. This index characterizes monetary policy frameworks across three pillars: independence and accountability (IA), which provide the foundations of monetary policy; policy and operational strategy (PO), which guide the adjustments to policy stance given the objectives, as well as the adjustments to policy instruments to implement the policy stance; and communications (C), which conveys decisions about the policy stance and rationale to the public. To cover these pillars with sufficient clarity and comprehension, 225 criteria were used and assessed against the public information from countries' central banks. Figure 7 shows the detailed 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 distributions of the index for 2007 and 2021 in figure 8. The mass has shifted more to the right, keeping the extensive heterogeneity. Advanced economies have a narrower distribution. In particular, in 2007 for emerging markets, the lowest value is 0.194 and the highest is 0.759 (mean of 0.546). In the 2021 distributions, the highest value for emerging markets is 0.822, and the value for advanced economies is only 0.867; so the best monetary policy credibility in emerging markets is almost as good as the best among advanced economies.

The IAPOC index is negatively and significantly correlated with inflation and inflation expectations at different horizons (figure 9). The figure clearly shows that the 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 stand apart from a large number of existing studies that measure monetary policy credibility with realized inflation or inflation expectations, which are endogenous measures of policy credibility, since the inflation level and expectations might be driven by policy credibility as we show above.[17]

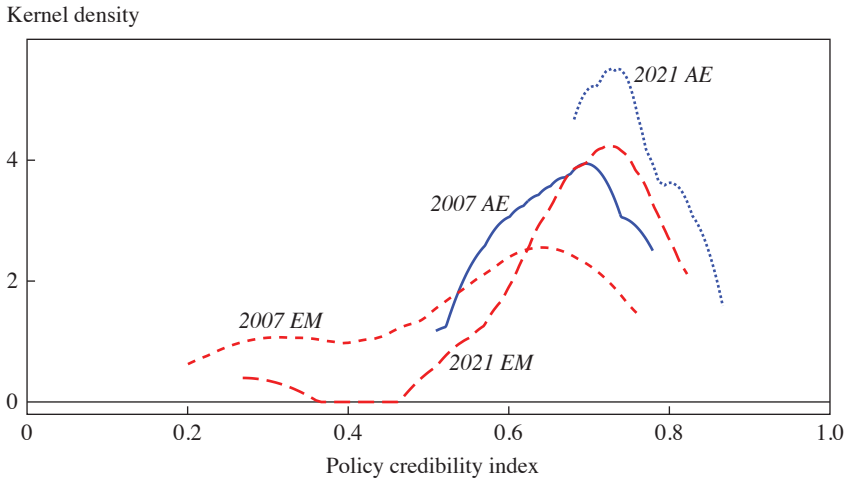
17. For example, Bems and others (2021) obtain policy credibility measure from inflation, relying on historical data.

Figure 7. Change in Monetary Policy Credibility, 2007–2021



Source: IAPOC index from Unsal, Papageorgiou, and Garbers (2022).
Note: Percentage point change in monetary policy credibility of advanced economies and emerging markets between 2007 and 2021.

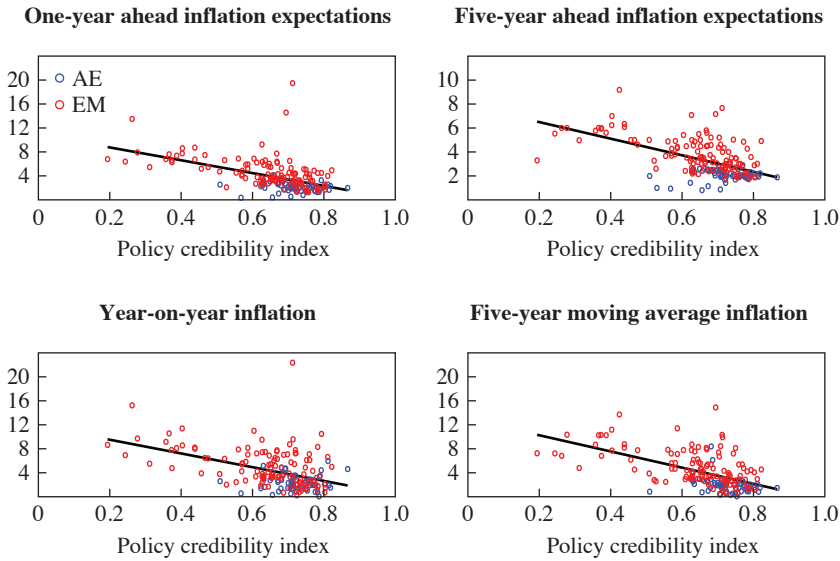
Figure 8. Policy Credibility Distributions



Source: IAPOC index from Unsal, Papageorgiou, and Garbers (2022).

Note: Distributions of policy credibility of advanced economies (AE) and emerging markets (EM) in 2007 and 2021.

Figure 9. Inflation and Expectations, 2007–2021



Source: IMF International Financial Statistics (inflation); IAPOC index from Unsal, Papageorgiou, and Garbers (2022); Consensus Forecasts and the *World Economic Outlook Projections* (April 2023 edition) (inflation expectations); and authors' calculations.

Note: Regression coefficients of one-year ahead inflation expectations, five-year ahead inflation expectations, year-on-year inflation, and five-year moving average inflation on policy credibility. Inflation is the headline CPI inflation and seasonally adjusted with ARIMA X-13.

II.B. Balance Sheet Weakness via FX Debt

To study the role of heterogeneity in terms of the balance sheet weakness of countries for the international transmission of US 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, and we follow the methodology in Kalemli-Özcan (2019). These data come from the Bank for International Settlements (BIS) global liquidity indicators (GLI) database, which provides FX debt exposures for both bonds and loans for the nonfinancial private sector (nonfinancial corporations and households) and for governments separately. FX bonds are defined as debt securities issued in the US dollar, euro, or Japanese yen, and issued in international markets by the residents in the nonfinancial sector of a given economy. FX loans are defined as bank loans extended to the nonbank sector of a given economy by both domestic banks and international banks located outside the economy, and denominated in the US dollar, euro, or Japanese yen.

We work with the ratio of FX debt to total credit for the nonfinancial sector. Total credit data come from the BIS total credit database, which provides data on total loans and debt securities used for borrowing by the residents in the nonfinancial 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 data set for the nonfinancial sector by the sum of total loans and bonds for the nonfinancial sector from the total credit database, we obtain the country-level nonfinancial private sector FX debt share. The data are available for the following fifteen 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 the extensive literature that documents how, in emerging markets, the financial sector (banks) is often required to hedge currency risk, while corporations, including exporters, tend not to match currency risk on their balance sheets (Di Giovanni and others 2022; Alfaro, Calani, and Varela 2023). 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, as reported in the online appendix figure A1.

The rationale for utilizing this data set, despite its limitations in terms of sample size, is its ability to focus exclusively on the 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 and others (2019) in the introduction, we do not use these data in our regressions as the FX dimension is a proxy in this data set. This is because it uses as input: the currency composition of the main international investment position (IIP) components from the International Monetary Fund (IMF); the IMF's Coordinated Portfolio Investment Survey (CPIS); the portfolio debt data reported to the European Central Bank; and banks' cross-border positions reported to the BIS, available through its locational banking statistics. Thus, corporate and government debt will be mixed, as those are mixed in the IIP and CPIS data sets, and hence the currency composition for the corporate sector cannot be precisely measured unlike our data from BIS.

II.C. Other Variables

Our panel data set includes other variables: GDP, Consumer Price Index (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 bureaus of statistics, and the International Financial Statistics (IFS). We use the CPI data from the IFS. For nominal exchange rates, we use the IFS as well. We also use total capital inflows, defined as the sum of bank, central bank, corporate, and government portfolio debt and other investment debt flows (loans) from BIS, originally constructed by Avdjiev and others (2022). These data are identical to the IMF balance of payments data at the annual level but with better quarterly coverage in emerging markets, which is why we prefer them over the standard IMF balance of payments data. The twelve-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 I. Log interest rate differentials are the short-term government bond rates vis-à-vis the United States, at twelve months. The log expected exchange rate is the twelve-month ahead expected exchange rate in a given month from the Consensus Economics, and the log exchange rate is the spot rate, both nominal and in terms of local currency per US dollar. From Bloomberg, we get the 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 are from the IFS. As for dollar shock,

Table 1. Country Sample

	Emerging markets	
Advanced economies		*Countries for which we have a direct measure of FX debt exposure of the private sector*
Australia	Albania*	Argentina
Canada	Armenia	Brazil
Denmark*	Azerbaijan*	Chile
Euro Area	Belarus*	China
Finland*	Bulgaria*	Colombia
Germany*	Costa Rica*	India
Iceland	Croatia*	Indonesia
Ireland*	Czech Republic	Malaysia
Israel	Ecuador*	Mexico
Italy*	Egypt Arab*	Peru
Japan	Guatemala*	Philippines
New Zealand	Hungary	Russia
Norway	Kazakhstan	South Africa
Spain*	Korea*	Thailand
Sweden	Latvia*	Turkey
Switzerland*	Malta*	
United Kingdom	Mauritius	
	Morocco*	
	Pakistan	
	Paraguay	
	Poland	
	Romania*	
	Serbia	
	Singapore*	
	Slovak Republic*	
	Tunisia*	
	Uruguay	

Source: Authors' compilation.
* Indicates no IAPOC index measure for this country.

we use the Nominal Major Currencies US Dollar Index from FRED, and we normalize it to 10 percent following Obstfeld and Zhou (2022). 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 fifty-nine countries in the big sample. These are all advanced economies and emerging markets that do not have hard pegs and dual markets exchange rates. Similarly, of the fifty countries that are in the IAPOC index sample, we work with thirty-four; we drop the low-income countries, those with hard pegs, dual

markets exchange rate countries, and the United States. In the FX debt exercise, we have only fifteen emerging economies, all floating or managed floating countries. The online appendix provides more details including descriptive statistics.

III. Empirical Analysis

III.A. Fed Hikes and Risk Premia in Financial Markets

We want to capture the exogenous component of US monetary policy that constitutes a surprise for the financial markets, which in turn has an impact on their risk sentiment, after a Federal Reserve announcement. Not every Fed hike needs to involve a change in the risk sentiments of investors, but if there are enough Fed hikes that do change the risk sentiments, then our identification of the risk channel of US monetary policy's international transmission is valid. We are also relying on the fact that a large body of literature shows a high correlation between the Fed hikes and common measures of risk sentiments (e.g., the VIX and the excess bond premium). We also use such measures for robustness in addition to our exogenous US monetary policy measures.[18]

The US monetary policy is endogenous to the US business cycle and financial markets since markets price in the expected actions of the Federal Reserve before the actual change in the policy rate. The common approach to dealing with the endogeneity of 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 the monetary policy is predetermined over the event window and hence not affected by the financial market reaction. Using such surprises, the macro finance literature estimates the causal effect of US monetary policy both on financial markets (Kuttner 2001; Gürkaynak, Sack, and Swanson 2004) and on macro variables (Stock and Watson 2018; Gertler and Karadi 2015).

Recently, this literature has been debating some puzzling effects. Forecasts respond in the wrong direction when a high-frequency monetary policy surprise indicates, say, a tightening of monetary policy. Not only do output, employment, and inflation respond positively to tightening (Nakamura and Steinsson 2018), but similar positive responses are observed

18. Results with the VIX, excess bond premium, and a new measure of risk-on-risk-off (RORO) sentiment from Chari, Dilts Stedman, and Lundblad (2020) are available upon request.

in the stock market as well (Miranda-Agrippino and Ricco 2023; Cieslak and Schrimpf 2019; Jarociński and Karadi 2020). The common explanation for these puzzling results is the "Federal Reserve information effect," that is, the Federal Reserve announcements convey private information about the economy and therefore directly affect the beliefs about economic fundamentals. If, for example, a tightening surprise is interpreted as a signal that the Federal Reserve thinks the economy is stronger, then the survey forecasters will revise their outlook upward and the stock market will boom. 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 surprises are small. In fact, Obstfeld and Zhou (2022) argue that the US dollar exchange rate is a better measure than the monetary policy shocks for tracing the risk-based international transmission from the United States 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 the excess bond premium. Consistently, others argue that the most important driver of the global financial cycle is not the US monetary policy per se, but rather the precise measures of risk sentiments such as the excess bond premium (Rogers, Sun, and Wu 2023) and volatility in macroeconomic news (Boehm and Kroner 2023). Unfortunately, all of these—the dollar exchange rate, VIX, excess bond premium, and macroeconomic news—are endogenous to the US monetary policy changes since they are all endogenous to financial markets' risk sentiment changes that depend largely on US monetary policy.

For example, when the Federal Reserve hikes the rates, the global financial conditions get tighter, which results in a higher excess bond premium, flight to safety, and an appreciation of the US dollar together with more macroeconomic news on higher earning volatility and uncertain outlook. For our purposes, we want the US monetary policy surprises that are exogenous to the US economy and financial markets but still relevant for financial markets, relevant enough that the surprises will change financial markets' risk sentiments. We do not want our policy surprises to be contaminated by the Federal Reserve or the financial markets' reaction to public news that is available before the Federal Reserve announcement. Rather, we want to measure the new information that financial markets learn from the Federal Reserve's announcement and changes their risk sentiments and international portfolios differentially across emerging markets versus advanced economies.

Table 2. Weak Instrument Test

	Cragg-Donald	*Wald* F *statistic*	*Kleibergen-Paap* rk	*Wald* F *statistic*
Depvar	*Emerging markets*	*Advanced economies*	*Emerging markets*	*Advanced economies*
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
Twelve-month UIP deviation	144.371	111.145	144.376	111.096

Source: Authors' calculations.

Note: Shown are the weak instrument test results for the baseline regression (specification one below) and for $h = 1$. They are all above the Stock-Yogo weak ID test critical values of 10 percent maximal IV size, which in this case is equal to 16.38.

Bauer and Swanson (2023) solve these types of endogeneity issues. They show that the key endogeneity problem lies in the omitted variable of economic news, where all—survey forecasters, markets, and the Federal Reserve policy—respond to macroeconomic news. Bauer and Swanson (2023) show that there is no information effect in the Federal Reserve's announcements, but rather that the predictability of the monetary policy surprises is due to learning about the Federal Reserve's policy during the announcements. Hence, the publicly observable macro data and the omitted news can help solve the endogeneity issue together with the relevance issue. Bauer and Swanson (2023) compute the 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 the prices of short maturity (three-month) federal funds futures contract in a thirty-minute window surrounding the Federal Open Market Committee announcement, as instruments for the policy rate (the twelve-month T-bill rate). We use Bauer and Swanson (2023) surprises in reduced form. Following Bauer, Bernanke, and Milstein (2023), we rescale the Bauer and Swanson (2023) surprises to gauge the effects of a 10 basis point surprise (the standard deviation of the original surprises is about 9 basis points).

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

III.B. Historical Evidence: The Impact of Fed Hikes on Emerging Markets versus Advanced Economies, 1990:Q1–2019:Q4

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 the vector autoregression (VAR) models. Above all, local projections are more robust to possible misspecifications, at least under a finite lag structure (Kilian and Lütkepohl 2017; Plagborg-Møller and Wolf 2021). They allow us to parsimoniously model the asymmetric effects of US monetary policy on emerging markets versus advanced economies, on countries with high versus low policy credibility, and also on countries with high versus low debt denominated in US dollars. The local projections estimation also saves degrees of freedom relative to a multivariate approach: even though we lose observations from adjusting for leads and lags, 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 $h = 1, 2, \ldots H$, conditional on an information set that consists of a set of control variables. In the linear case, the regression equation reads:

$$y_{t+h} = \alpha_h + \beta_h Shock_t + \gamma X_t + \varepsilon_{t+h},$$

where y_{t+h} is the variable of interest at horizon h and 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}, independent 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 (Rey 2013; Degasperi, Hong, and Ricco 2023; Miranda-Agrippino and Rey 2020; Kalemli-Özcan 2019):

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

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

There are two sets of controls, all of which enter lagged: X_{t-i} are lags of the global controls for the shock (lags of monetary policy rate, $\hat{\imath}_t^{US}$, 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 the past and anticipated US policy changes. These are inflation rate differentials and GDP growth differentials for the given country with the United States. These controls are essential since the inflation 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 the past or anticipated changes in US policy and other global shocks are captured directly by these variables.

What then remains to be captured by the identified US monetary policy shock is the transmission via the financial channel driven by endogenous changes in the risk premium affecting the current and future interest rate differentials. Policy transmission via the trade channel will be captured by the endogenous appreciation of the dollar affecting the current and future GDP growth differentials. We investigate the impact of identified US shocks on both risk premia and exchange rates. When $y_{c,t+h}$ is GDP and shows improvement, 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 the falling GDP and rising risk premia (UIP) can identify the financial channel dominating over the trade channel.

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

Although we believe that the parsimonious specification given in equation (1) is all that is needed to identify the asymmetric effects of US policy on emerging markets versus advanced economies, to ease the worries about robustness, we also run equation (2) to control for additional global variables contemporaneously. This exercise will show that we do not

need to control for additional variables as none of our results based on equation (1) will change qualitatively, and conditional on the equation (1) variables, additional variables from equation (2) will not have much explanatory power.

For this exercise, we follow Obstfeld and Zhou (2022) and run the following specification with additional global controls, allowing both contemporaneous and lagged relation between these variables and the identified US monetary policy shock:

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

The variable X_t is a vector of global controls including the US dollar shock from Obstfeld and Zhou (2022), defined as the appreciation of the US dollar vis-à-vis euro area, Canada, Japan, United Kingdom, Switzerland, Australia, and Sweden, the oil price index, and the median country trade balance. When we run regressions for emerging markets and advanced economies separately, we use the median trade balances specific to those aggregate groups. The variable X_{t-i} includes the lags of all these global controls.

III.C. Benchmark Results

Figure 10 displays the differential impact of the US monetary tightening on advanced economies and emerging markets, based on equation (1) where we run this in the two samples of countries. The US monetary policy shock results in a significant and persistent decline in output in emerging markets but not in advanced economies: a 1 percentage point increase in the US policy rate leads to a 2 percent decline in output by the third quarter and a 3 percent decline by the ninth quarter in emerging markets. The stark difference between the output results implies that the financial channel dominates the trade channel in emerging markets.

The dominance of the financial channel of US policy transmission for emerging markets can also be seen from the large nominal exchange rate depreciation observed in quarters two to four (whereas advanced economies' exchange rates do not respond significantly) combined with the large increase in UIP: 3.5 percentage points for a 1 percentage point shock by the third quarter. Given the mean UIP deviation for emerging markets, this implies a large change: moving from a country that is in the 25th percentile to a country 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.

Figure 10. International Transmission of the Fed Hikes: Emerging versus Advanced Economies (Gertler-Karadi Surprises)

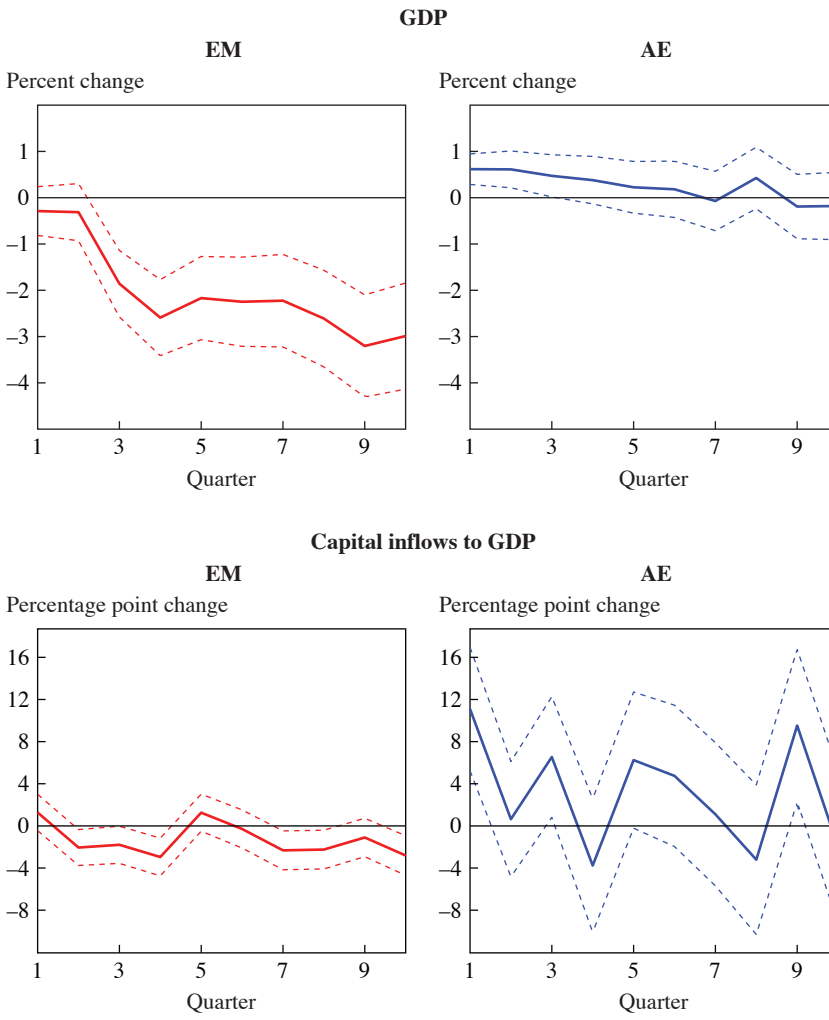
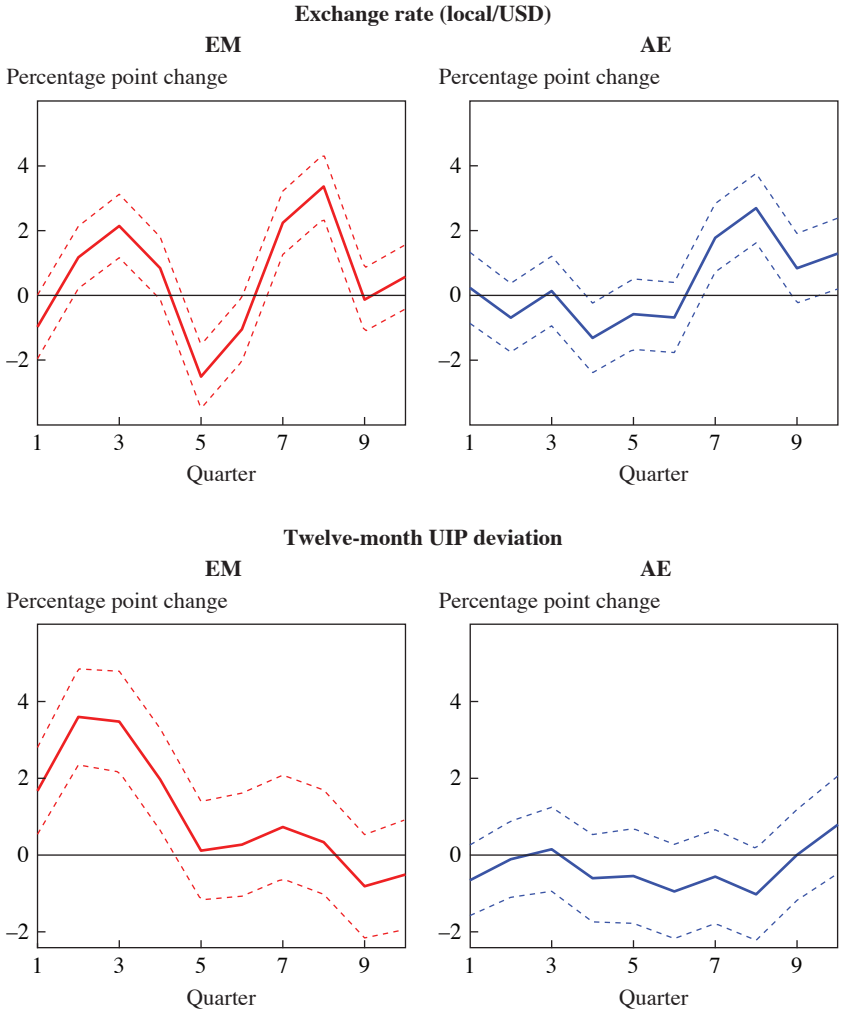


Figure 10. International Transmission of the Fed Hikes: Emerging versus Advanced Economies (Gertler-Karadi Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the twelve-month US Treasury rate, instrumented by monthly weighted raw surprises in the three-month federal funds futures from Gertler and Karadi (2015), are obtained from panel local projections. Confidence intervals at 90 percent (calculated using Newey-West standard errors) are indicated by the dashed lines. Controls include four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, and the instrument. See also figure A1 in the online appendix, where we add FX reserves to GDP as a control and where the advanced economies' exchange rates also show some depreciation. Dependent variables include real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), UIP deviations, which are defined as the twelve-month interest rate (government bond) differentials vis-à-vis the United States minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP. See also figure A2 in the online appendix, where we also run this specification for our smallest country sample (FX debt EM sample).

It can happen if investors expect the emerging market's currency to appreciate in the future since there is a depreciation on impact with the Fed hike, or the emerging market's interest rate differentials with the United States increase as a result of higher risk premium, or both.[19] Consistent with higher UIP premia, capital inflows go down (meaning international investors leave) by 2 percentage points around the third quarter before reverting back. All these variables are insignificant for advanced economies.

We next run equation (1) in reduced form, using the monetary policy surprises in Bauer and Swanson (2023). Figure 11 shows results that are similar for emerging markets with more significant capital outflows. In particular, a 10 basis point shock results in a 0.2 percent decline in output by the third quarter and 0.6 by the ninth quarter in emerging markets. Similarly, the dominance of the financial channel is shown by an increase in UIP of 0.8 percentage points by the third quarter for emerging markets, while there is no effect at all for advanced economies. What is interesting is that now we also have a decline in output for advanced economies combined with currency depreciation. Hence, even for advanced economies, the financial channel dominates the trade channel, but the impact is much milder on output since there is no response of UIP wedge and capital outflows to the US shocks in advanced economies.

In figure 12, we show the results of equation (2), which includes global controls that might be correlated with the US policy shocks. Results are consistent with our previous findings. In figure A3 in the online appendix, we rerun this exercise, dropping commodity exporters, and find that the results hold with the exception that now we also have some delayed depreciation in the advanced economies' exchange rates.

In figure 13, we show the results of running equation (2) in reduced form using the monetary policy shocks from Bauer and Swanson (2023). We do not find large differences relative to our findings in figure 11, which highlights the strength of the results. The only change is that now the previous, mild decline on advanced economies' 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 third quarter, when currency depreciates, the output effect becomes insignificant.

19. This result is not due to higher policy rates in emerging markets, as shown by De Leo, Gopinath, and Kalemli-Özcan (2022).

Figure 11. International Transmission of the Fed Hikes: Emerging versus Advanced Economies (Bauer-Swanson Surprises)

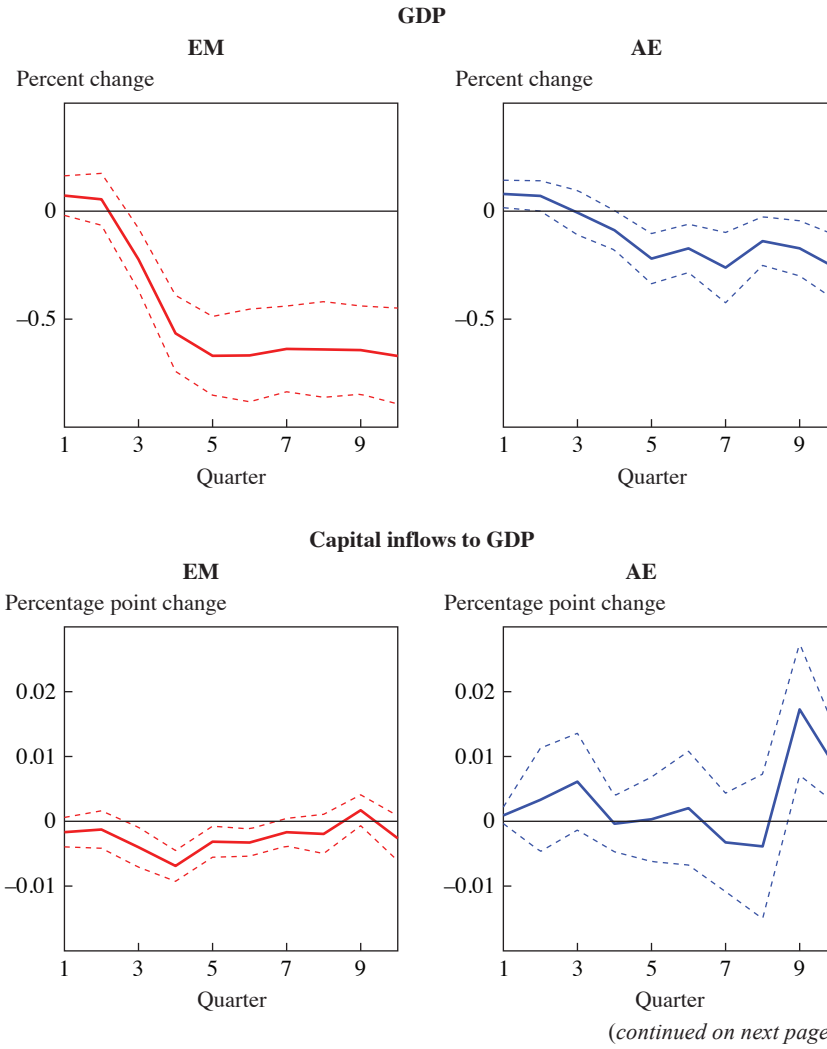


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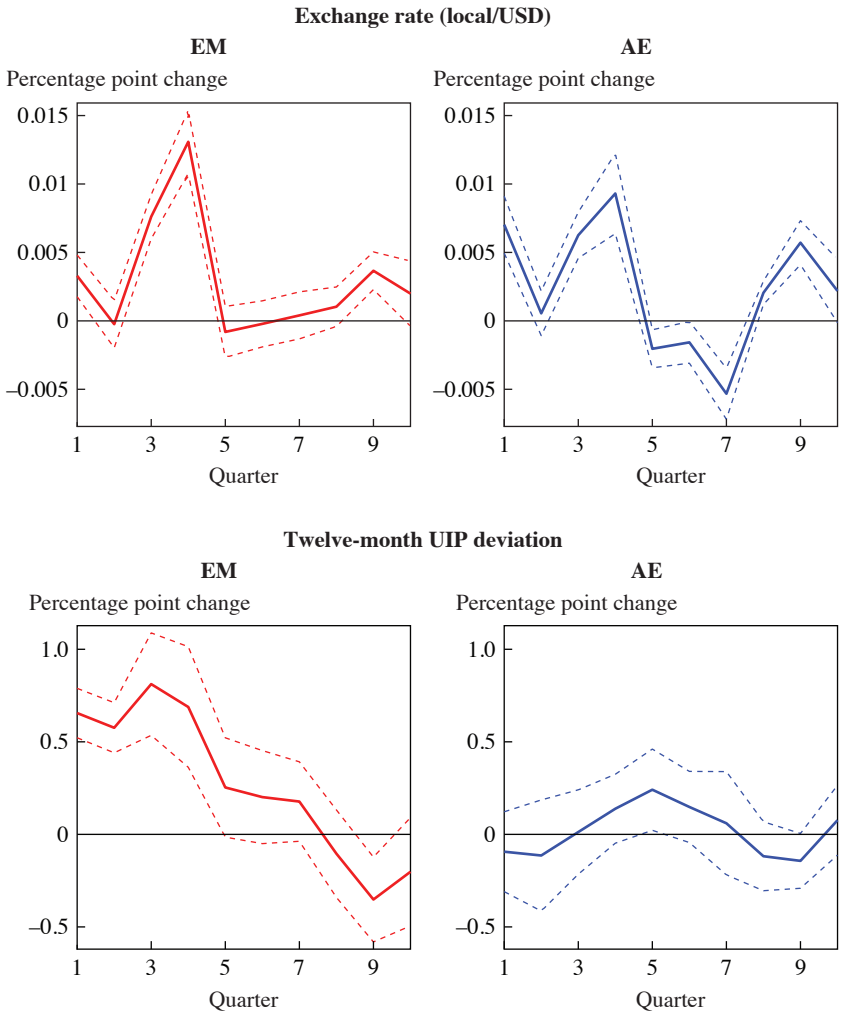
Figure 11. International Transmission of the Fed Hikes: Emerging versus Advanced Economies (Bauer-Swanson Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the US monetary policy surprises in Bauer and Swanson (2023), scaled to a 10 basis point surprise, are obtained from panel local projections. Confidence intervals of 90 percent (calculated using Newey-West standard errors) are indicated by the dashed lines. Controls include four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, and the shock. Dependent variables include real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), UIP deviations, which are defined as the twelve-month interest rate (government bond) differentials vis-à-vis the United States minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP.

Figure 12. International Transmission of the Fed Hikes: Emerging versus Advanced Economies with Global Controls (Gertler-Karadi Surprises)

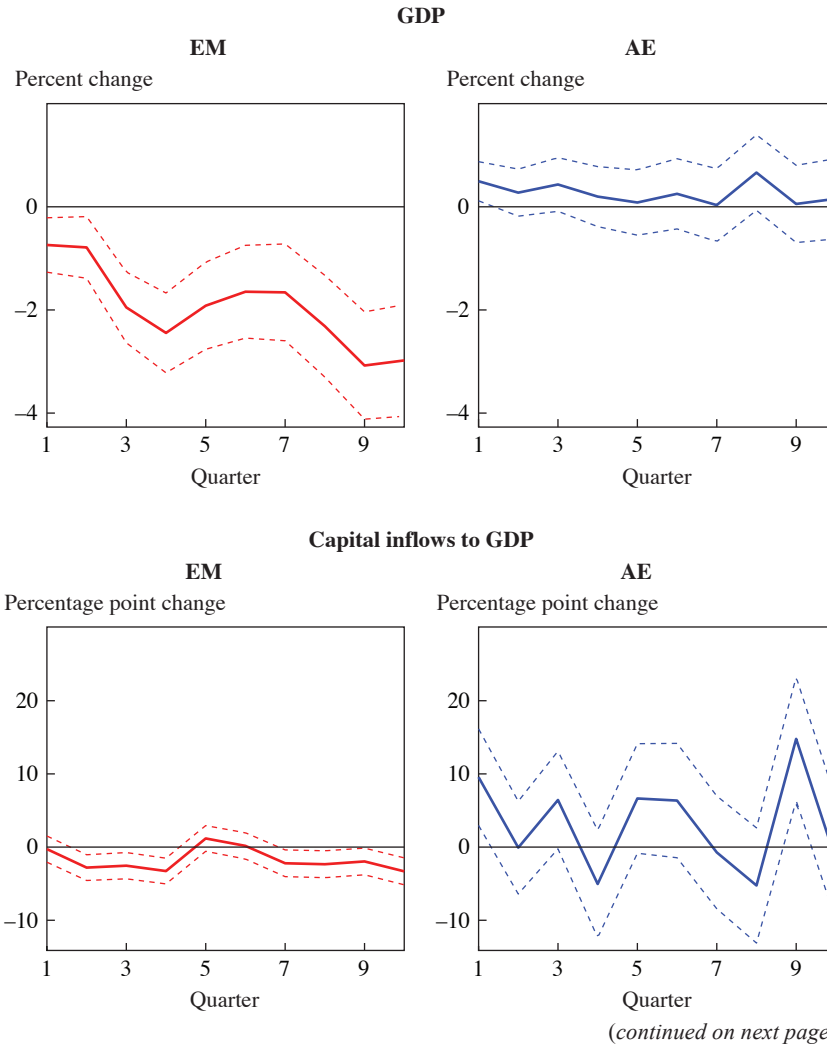


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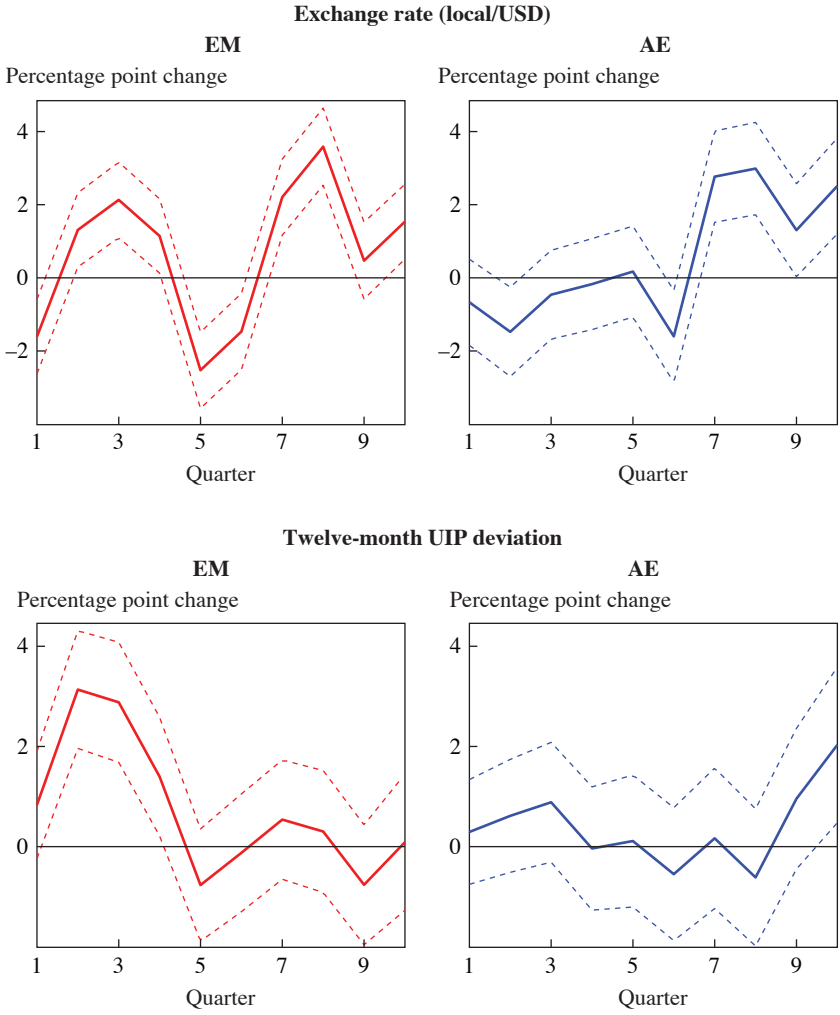
Figure 12. International Transmission of the Fed Hikes: Emerging versus Advanced Economies with Global Controls (Gertler-Karadi Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the twelve-month US Treasury rate, instrumented by monthly weighted raw surprises in the three-month federal funds futures from Gertler and Karadi (2015), are obtained from panel local projections. Confidence intervals at 90 percent (calculated using Newey-West standard errors) are indicated by the dashed lines. Controls include four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, the instrument, dollar shock, average oil price index, and median trade balance. Global controls (the last three) also enter contemporaneously. Dependent variables include real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), UIP deviations, which are defined as the twelve-month interest rate (government bond) differentials vis-à-vis the United States minus the expected changes in the exchange rate; and the ratio of total capital inflows to GDP.

Figure 13. International Transmission of the Fed Hikes: Emerging versus Advanced Economies with Global Controls (Bauer-Swanson Surprises)

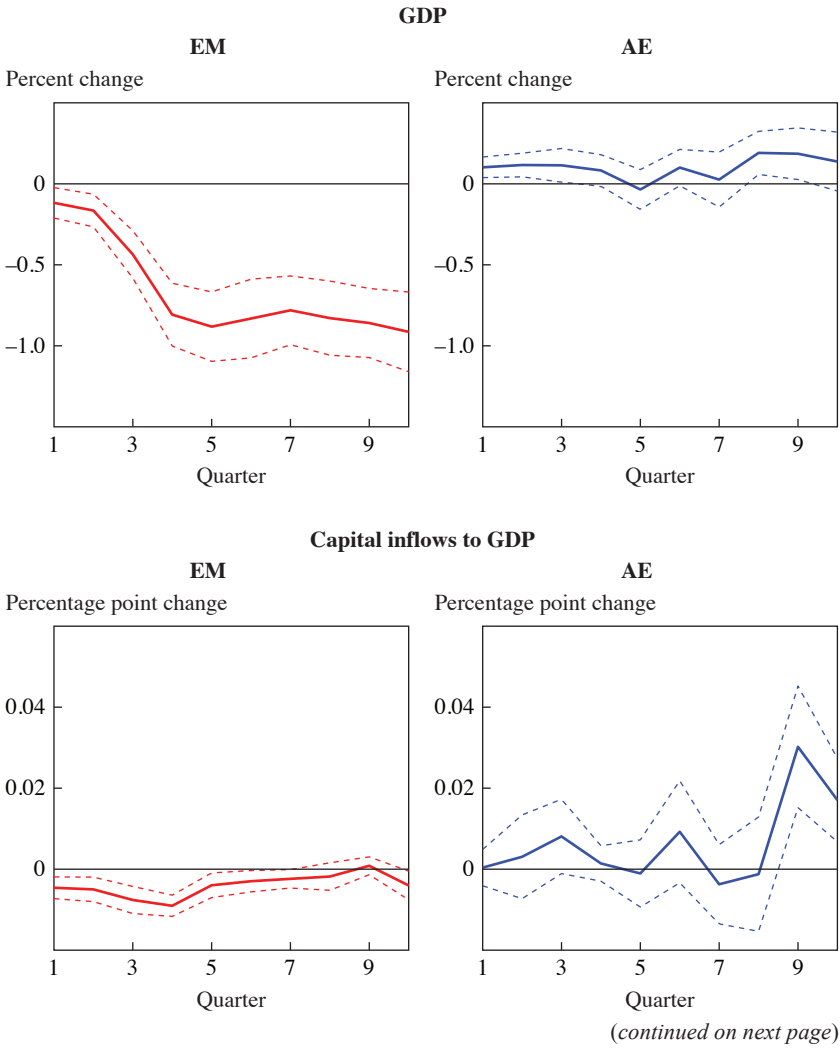


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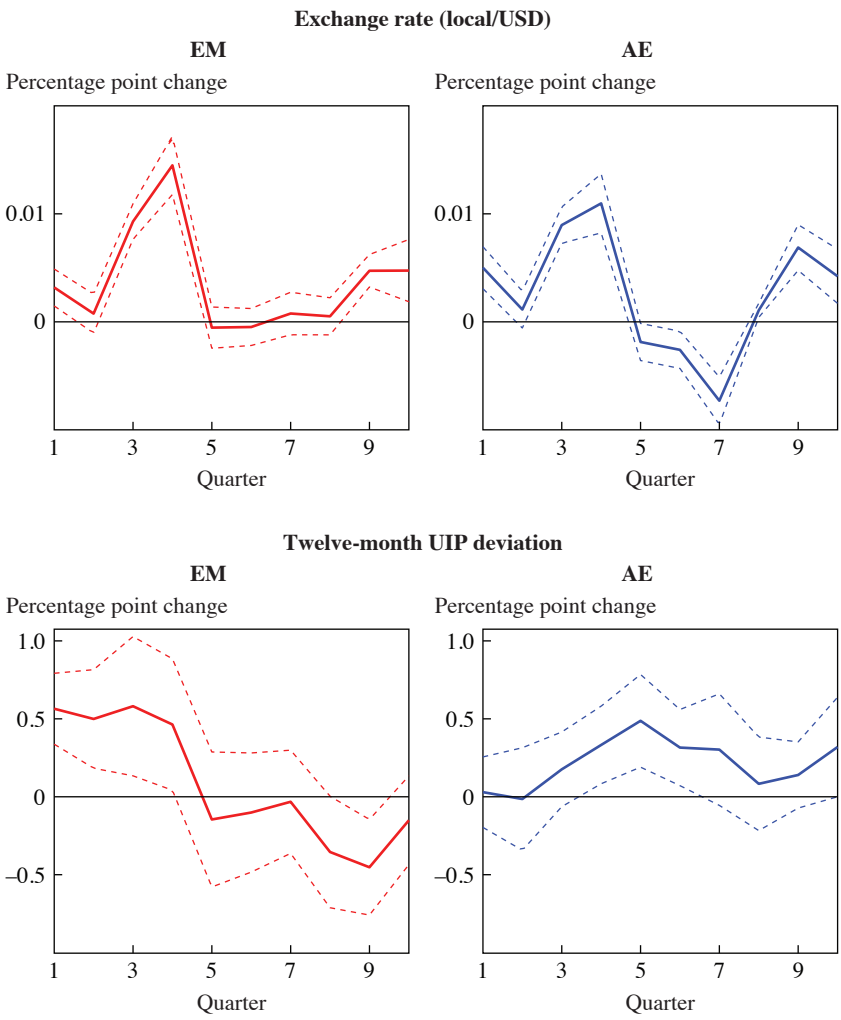
Figure 13. International Transmission of the Fed Hikes: Emerging versus Advanced Economies with Global Controls (Bauer-Swanson Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the US monetary policy surprises in Bauer and Swanson (2023), scaled to a 10 basis point surprise, are obtained from panel local projections. Confidence intervals of 90 percent (calculated using Newey-West standard errors) are indicated by the dashed lines. Controls include four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, monetary policy shocks, dollar shock, average oil price index, and median trade balance. Global controls (the last three) also enter contemporaneously. Dependent variables include real GDP in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), UIP deviations, which are defined as twelve-month interest rate (government bond) differentials vis-à-vis the United States minus the expected changes in the exchange rate, and the ratio of total capital inflows to GDP.

III.D. The Role of Policy Credibility

Why are emerging markets affected worse from Fed hikes (at least historically, during the period we study: 1990:Q1–2019:Q4)? To shed light on this question, we extend our local projections framework to analyze the differential impact of the US monetary policy shocks depending on the monetary policy credibility of countries, where we rely on the IAPOC index by Unsal, Papageorgiou, and Garbers (2022). In particular, we augment equation (2) in the following way:

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

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

To calculate the effect of the US monetary policy shock on countries with high versus low policy credibility, we calculate the marginal effect of a US monetary policy shock as:

$$\frac{\partial_y}{\partial_{\hat{\imath}}} = \beta_{1,h} + \beta_{2,h} * IAPOC_{2007}, \tag{4}$$

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

Figure 14 shows the impulse response functions, 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 is similar among low and high credibility countries. We also plot inflation response where, interestingly, the low 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 credibility, it can be that the 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 lowering interest rates after the shock.

III.E. The Role of Balance Sheet FX Vulnerabilities

Another reason why emerging markets were affected worse from Fed hikes historically can be their sizable external debt that is financed with

Figure 14. International Transmission of the Fed Hikes: The Role of Policy Credibility with Global Controls (Gertler-Karadi Surprises)

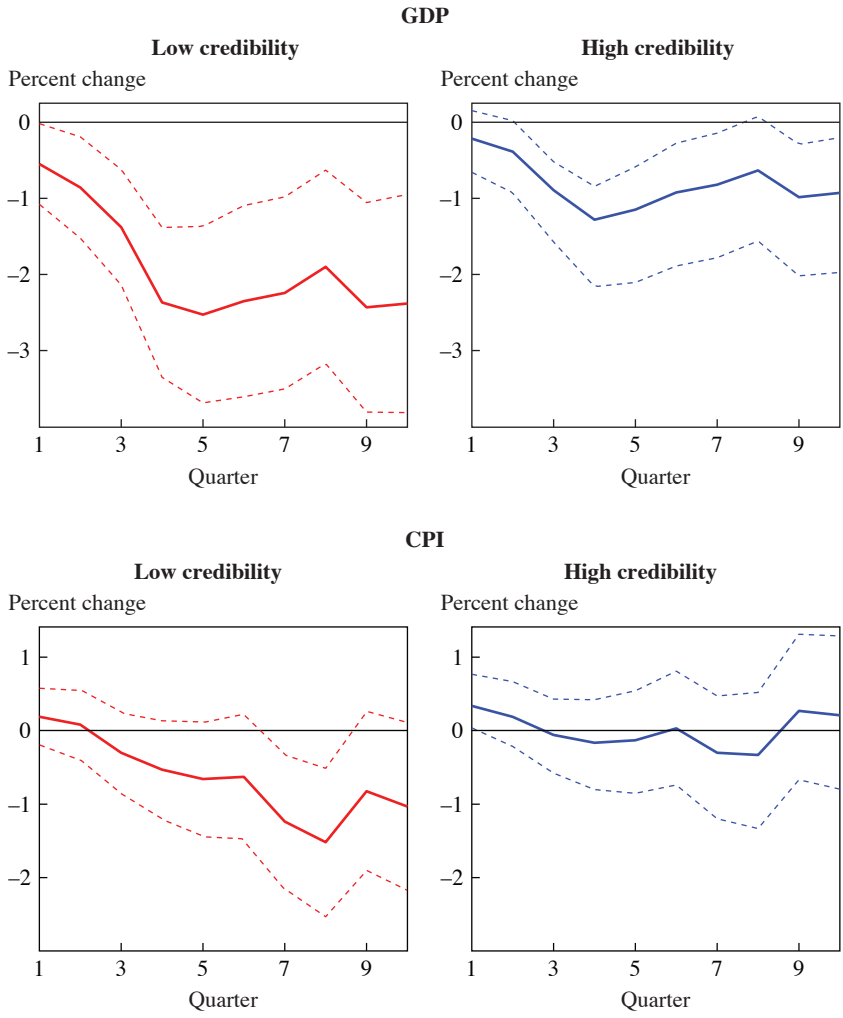
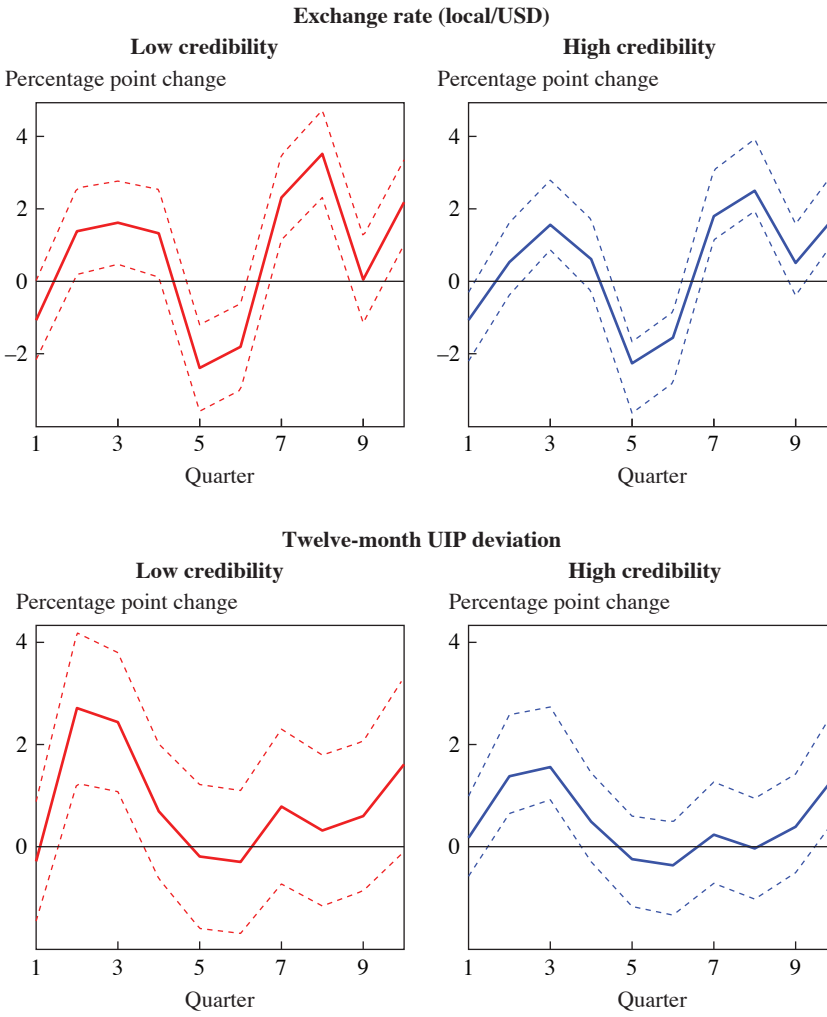


Figure 14. International Transmission of the Fed Hikes: The Role of Policy Credibility with Global Controls (Gertler-Karadi Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the twelve-month US Treasury rate, instrumented by monthly weighted raw surprises in the three-month federal funds futures from Gertler and Karadi (2015), are obtained from panel local projections. Confidence intervals at 90 percent (calculated using Newey-West standard errors) are indicated by the dashed lines. Controls include four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, the instrument, dollar shock, average oil price index, and median trade balance. Global controls (the last three) also enter contemporaneously. Dependent variables include real GDP in logs, CPI in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), and UIP deviations, which are defined as the twelve-month interest rate (government bond) differentials vis-à-vis the United States minus the expected changes in the exchange rate. See text for the definitions of high and low credibility countries.

persistent current account deficits and largely denominated in US dollars. Such debt creates balance sheet vulnerabilities hindering investment and growth, especially when the cost of servicing this debt goes up with Fed hikes where assets on balance sheets are largely in local currency, as shown by Kalemli-Özcan (2019).

We extend our local projections framework to allow the impact of the US monetary policy shocks to differ based on FX (US dollar) debt of the private nonfinancial sector. We augment our equation (2) in the following way:

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

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

To calculate the effect of the US monetary policy shock on high versus low FX debt countries, we calculate the marginal effect of a US monetary policy shock as:

$$\frac{\partial_y}{\partial_{\hat{\imath}}} = \beta_{1,h} + \beta_{2,h} * FXdebt_{2000}. \tag{6}$$

For the low FX debt country, we evaluate equation (6) using the minimum value of the 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 the impulse response functions in figure 15. Countries with high FX debt go through sharper contractions in output on impact together with longer depreciations, higher inflation, and capital outflows, though given the small sample size, the statistical significance is lower for these variables compared to the strong drop in output on impact. The cumulative effect on output is similar between high and low FX debt countries. In online appendix A5, we use time-varying variables for IAPOC index and FX debt, getting similar results.

IV. The Recent Episode: 2022–2023 Fed Hikes

"Resilience" is the buzz word for 2022–2023. While it is often used in the context of the US economy, which has avoided a recession despite experiencing the steepest interest rate hikes in decades, the story of emerging

Figure 15. International Transmission of the Fed Hikes: The Role of Balance Sheet FX Vulnerabilities with Global Controls (Gertler-Karadi Surprises)

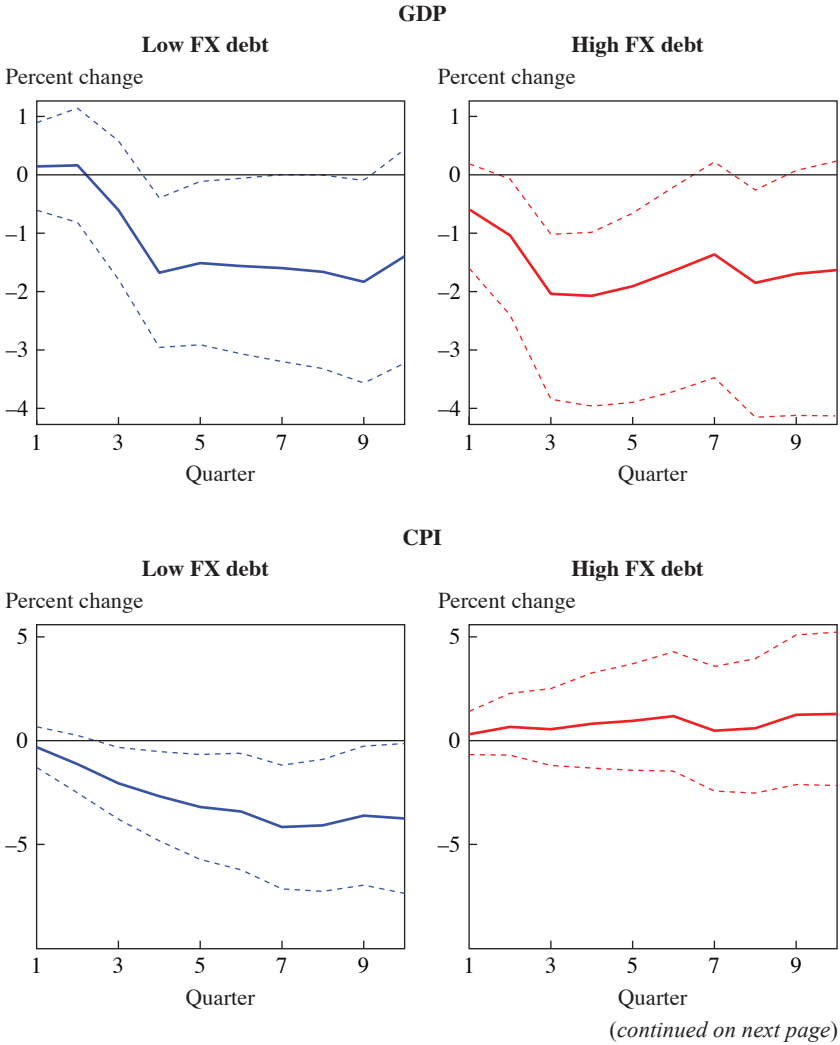


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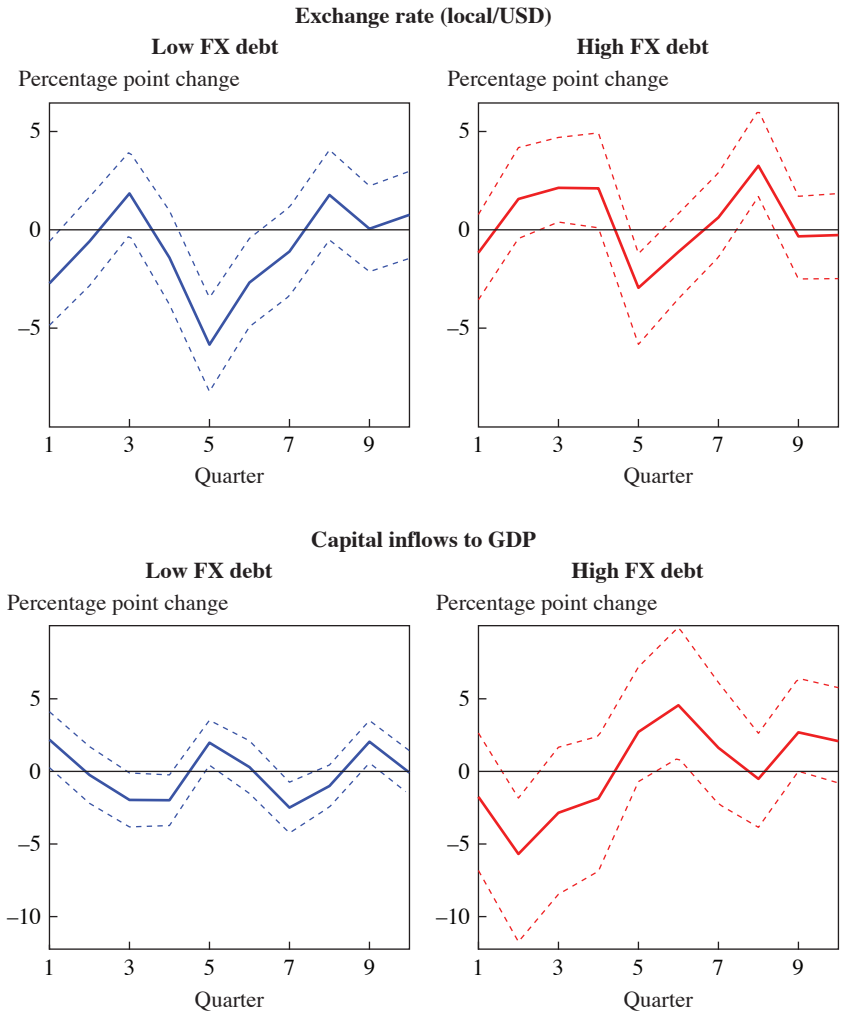
Figure 15. International Transmission of the Fed Hikes: The Role of Balance Sheet FX Vulnerabilities with Global Controls (Gertler-Karadi Surprises) (*Continued*)



Source: Authors' calculations.

Note: Impulse responses of the twelve-month US Treasury rate, instrumented by monthly weighted raw surprises in three-month federal funds futures from Gertler and Karadi (2015), are obtained from panel local projections. Confidence intervals at 90 percent (calculated using Newey-West standard errors) are shown by the dashed lines. Controls include dollar shock, average oil price index, and median trade balance, and four lags of the dependent variable, twelve-month US Treasury rate, output growth and inflation differentials with the United States, and the instrument. In this case, we did not add four lags of dollar shock, average oil price index, and median trade balance because of the limited sample. Global controls enter contemporaneously. Dependent variables include real GDP in logs, CPI in logs, quarter-to-quarter nominal exchange rate growth (domestic currency/US dollar), and capital inflows to GDP ratio. See text for the definitions of high and low FX debt countries.

markets is even more remarkable. Projections for global growth in 2023 are primarily fueled by emerging markets, and impressively, the top twenty-five emerging markets all surpassed their 2022 forecasts (IMF 2023).

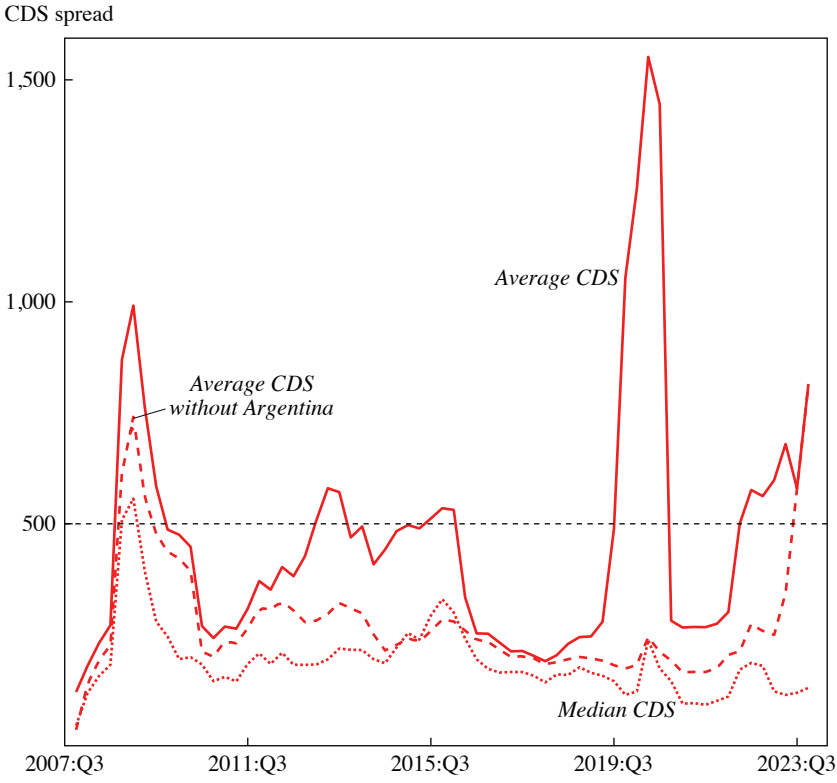
As is widely acknowledged, and as we confirm in this paper, rising US interest rates historically created challenges for emerging markets. This time is different as most emerging markets managed to establish monetary and financial discipline, marked by credible monetary policies and reduced FX debt, as shown in figures 1 and 2 respectively. In the recent period, they began raising rates ahead of advanced economies as soon as the COVID-19 inflation hit their economies. This shows improved monetary policy credibility since the monetary policy is responding to their own inflation rather than to the US policy or the exchange rate developments. Their statements were clear on why they were raising interest rates: not to mimic the US policy for currency defense, but rather to re-anchor the rising inflation expectations (Carvalho and Nechio 2023).

The first piece of evidence for this time being different is that the main risk spread—the credit default swaps (CDS)—did not move at all for emerging markets, as shown in figure 16. Compared to 2008 when the CDS spreads spiked for both average and median emerging markets, this time around they actually went down for the median emerging market. For the average emerging market, there was a huge spike totally driven by Argentina in 2020 when the pandemic started. In 2022 when the Federal Reserve started hiking, the median emerging market spread went down and the average emerging market spread (without Argentina) went up very little, less than what happened in the taper tantrum. The CDS spread captures the default risk of governments on dollar-denominated bonds. Clearly this risk was very low.

Figure 17 shows, relative to the first quarter of 2022, the change in the twelve-month UIP deviations for advanced economies and emerging markets. Investigating UIP spread on top of the CDS spread is useful since the 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 emerging markets than advanced economies. Consistently, figure 18 shows similar exchange rate movements in advanced economies and emerging markets and in 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 the low value is 0.51 and the high value is 0.6.

We do not have enough observations to run local projections with the US monetary policy shocks starting in 2022:Q1. We have run an alternative

Figure 16. Credit Default Swaps (CDS) in the Recent Episode



Source: Refinitiv Datastream.

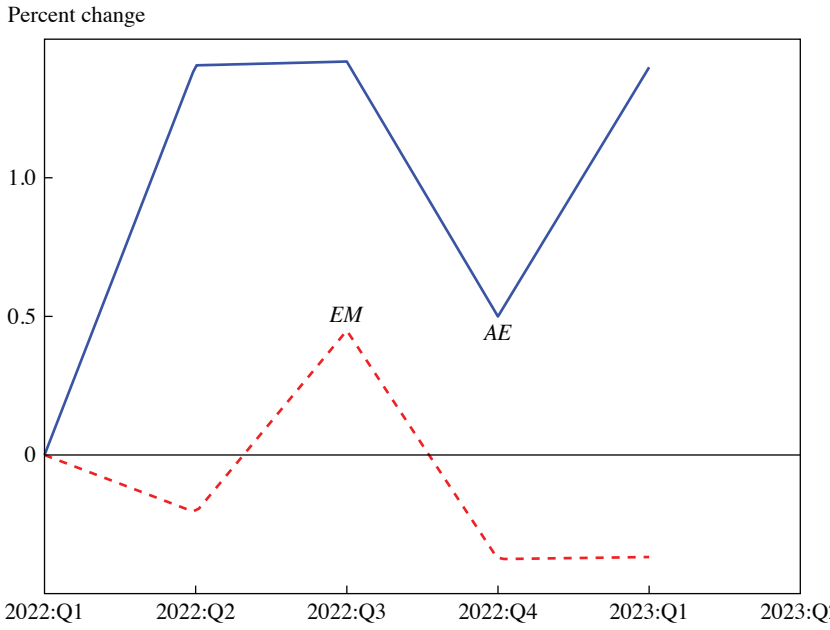
Note: CDS for fifteen emerging markets: Argentina, Egypt, Guatemala, India, Kazakhstan, Korea, Malta, Mexico, Morocco, Pakistan, Serbia, Singapore, Slovak Republic, Thailand, and Uruguay.

panel regression to nail down this point that emerging markets became resilient to sudden stops related to Fed hikes, as follows:

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

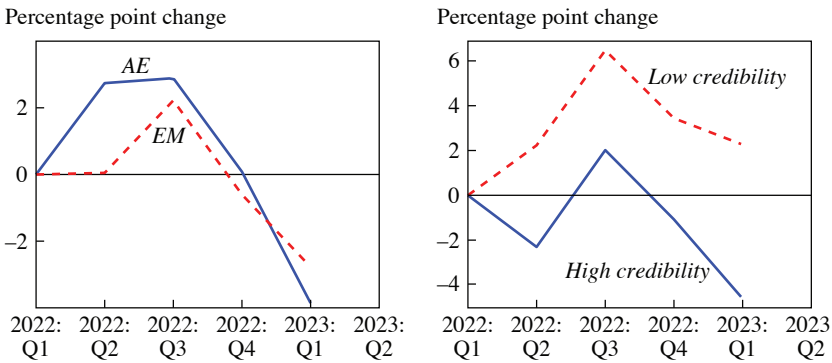
where y_{ct} is the dependent variable and includes exchange rate depreciation (year-on-year), real GDP growth (year-to-year), real investment growth (year-to-year), and trade balance/GDP. All variables are in percentages. Controls include country fixed effects (α_c), year fixed effects (δ_{year}), and four dummies. The first dummy takes the value one when quarter zero is the sudden stop and so on ($\{Q_i\}_{i=1}^{4}$). We run equation (7) in two recent time

Figure 17. UIP during the 2022–2023 Fed Hikes



Source: IMF International Financial Statistics; Consensus Economics; and authors' calculations.
Note: This figure shows the percentage change in the twelve-month UIP deviations relative to 2022:Q1 for advanced economies (AEs) and emerging markets (EMs). UIP deviations are calculated as explained in the data section.

Figure 18. Exchange Rates during the 2022–2023 Fed Hikes



Source: IMF International Financial Statistics; Consensus Economics; and authors' calculations.
Note: The growth rate of nominal exchange rate (domestic currency/US dollar) with respect to 2022:Q1.

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 forty-six sudden stops during the period 1991–2015 for twenty emerging markets in 1991, twenty-eight in 1995, and thirty-four from 2000 onward. Panel B covers the only sudden stop in March 2020 for our emerging markets. Panel C covers the Federal Reserve's signal of hikes as of December 2021, also for our emerging markets. Panels B and C don't include year fixed effects.

As table 3 clearly shows, the sudden stops of March 2020 and the Federal Reserve signaling a 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, which are typically evident by the third quarter. However, even in the fourth quarter following the Federal Reserve's rate hike signal, while there was a reversal, it did not significantly affect investment, indicating a newfound resilience to such shocks, which may plausibly be ascribed to enhanced monetary policy credibility and reduced foreign exchange debt.

V. Conclusion

We ask why emerging markets showed resilience in the face of sharp and quick Fed hikes during the 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-19 era, however, none of these events were observed. We argue that this is due to the improved monetary policy credibility and lower dollar-denominated debt in emerging markets this time around compared to historical episodes.

With diminished risk sensitivity and reduced volatility of capital flows, emerging markets seem to be better insulated against the shifts in global investor sentiment and the risk-aversion shocks, which are associated with the Fed hikes. During the last two years, despite the sharply rising US interest rates, emerging market spreads have stayed stable with no major financial crises. Although inflation also rose quite dramatically in emerging markets, inflation expectations have remained largely anchored thanks to their improved monetary policy credibility.

Table 3. Sudden Stops in Emerging Markets

	(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
Adjusted R^2	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
Adjusted R^2	0.463	0.549	0.409	–0.131
Panel C: 2021–2022 (Federal Reserve 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
Adjusted R^2	0.258	0.567	0.371	–0.086

Source: Panel A is reproduced from Eichengreen and Gupta (2017), copyright *Economía Chilena*; panels B and C are based on authors' calculations.

Note: 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, and α and δ are country and year fixed effects. Panels B and C don't include the year fixed effects. Q_k is a dummy variable that takes the value of 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 percentages; t statistics are in parentheses. Panel A covers sudden stops for twenty emerging markets (EMs) in 1991, twenty-eight in 1995, and thirty-four 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 Federal Reserve's signal of 2020 hikes in December 2021, also for the EMs studied in this paper. Data are quarterly.

Coefficient level of significance: *10 percent, **5 percent, ***1 percent.

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Comments and Discussion

COMMENT BY

KRISTIN FORBES Kalemli-Özcan and Unsal ask an important question: why have many emerging markets been so resilient to the sharp tightening in US monetary policy over 2022–2023? The authors propose two answers: increased monetary policy credibility and lower levels of FX-denominated debt. This topic is timely and provides insights on what policies emerging markets should prioritize to reduce their vulnerability in the future.[1]

I will divide my comments into three parts: a quick summary of the main sections of the paper (with a few editorial comments), the broader context of how emerging market resilience has changed over a longer period, and some concerns about the data and omitted variables.

QUICK PAPER SUMMARY This paper covers a lot of ground. It begins with an overview of recent literature on how US monetary policy is transmitted to other countries. It focuses on financial channels of transmission, such as through risk premia, the cost of capital, and exchange rate effects. This discussion helps motivate the choice of variables included later in the empirical analysis. It also includes a case study of the impact of US interest rates on Canada and Mexico—which is a useful example to make the channels concrete. It also provides a description of the key variables for Turkey—an example that highlights the challenges of sorting out the multiple

1. It is worth noting that the authors' focus on the recent resilience of emerging markets describes many middle-income emerging markets, but not all. A number of emerging markets, and many developing economies, are struggling with slow growth, high inflation, and an inability to repay debt—problems aggravated by the recent increases in global interest rates. Other major emerging markets (such as Argentina) are on the verge of default. These situations—and particularly the current challenges of highly indebted, low-income countries—are not the focus of the paper.

Brookings Papers on Economic Activity, Fall 2023: 226–248

interrelationships between the key variables of interest in this paper.[2] This motivational section does not discuss the role of commodity markets and argues that the trade channel of transmission was not important during this period. While much of the recent literature (including that cited in the paper) highlights how shocks that affect the exchange rate may not generate the standard Mundell-Fleming effects through trade, I worry that ignoring commodity markets and trade may miss factors that were important during the 2021–2023 episode that motivates this paper. For example, early in this period, commodity prices spiked as countries reopened and after the invasion of Ukraine, boosting revenues, FX earnings, and exchange rates for many of the commodity-exporting emerging markets that are central to the analysis. These changes in commodity prices—which have heterogenous effects in different countries and therefore cannot be captured in time dummies—could be an important factor contributing to the recent resilience in many emerging markets in the sample.

In the next section of their paper, Kalemli-Özcan and Unsal discuss the main data sources used for the empirical analysis, highlighting a new measure of monetary policy credibility from Unsal, Papageorgiou, and Garbers (2022) and a measure of FX exposure from Fan and Kalemli-Özcan (2016) and Kalemli-Özcan, Liu, and Shim (2021). These variables are central to the paper and could be an important contribution to the literature—especially the measure of monetary policy credibility. I will discuss these data sources in more detail below, but I hope that the authors will be able to share these data in the future as they could be an important resource.

The authors then estimate their baseline model of the impact of US monetary tightening using a local projections method. They focus on the impact of the "surprise" component of US monetary policy—and since there are several different approaches to estimating this—provide an extensive set of sensitivity tests using different proxies for monetary policy shocks. They estimate the impact of these shocks on GDP, the exchange rate, CPI, UIP deviations, and capital inflows (although they only report a subset of results for each main test), and focus on the impact based on three different country characteristics: advanced economies versus emerging markets, emerging markets with more and less central bank credibility, and emerging markets with more and less FX exposure. Many of the results

2. More specifically, Turkey has recently experienced very high inflation and a sharp currency depreciation, combined with high FX debt and a large improvement in policy credibility since 2007 (which incorporates a sizable improvement from 2007 to 2018 combined with a small deterioration from 2018 to 2021).

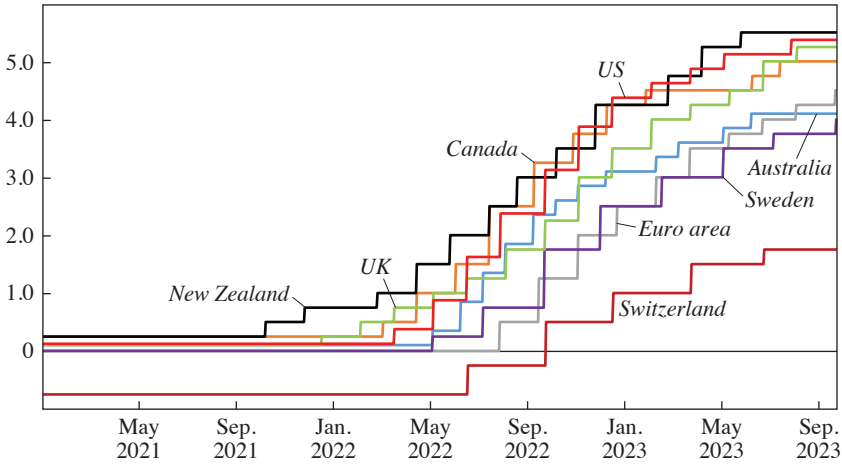
move in the expected direction and support the arguments outlined at the start of the paper—particularly a more negative impact on GDP and the UIP premium in emerging markets and countries with weaker central bank credibility. Some of the results, however, show some odd patterns and are not what I expected—such as the patterns for capital inflows and relative resilience of countries with more FX debt (particularly for GDP).

The last section of the paper contains the punchline: do improvements in central bank credibility and reduced FX exposure explain the recent resilience of emerging markets to the rapid tightening in US monetary policy? Unfortunately this section of the paper cannot yet be completed given the lags in obtaining key data and the fact that not enough time has passed to use the authors' methodology. The authors are aware of these limitations and show some regression results using a different framework that confirms emerging markets have been more resilient during this period (based on criteria such as their exchange rates, GDP growth, investment growth, and the trade balance). Unfortunately, they are not able to test the key hypothesis of the paper: did this resilience result from improved central bank credibility and lower levels of FX debt? I hope the authors will return to this analysis in the future when additional quarters of data are available to extend their analysis for this important case study.

IMPROVED RESILIENCE IN EMERGING MARKETS: THE BROADER CONTEXT The paper is motivated by the question of why many emerging markets have been fairly resilient to the sharp tightening in US monetary policy over 2022–2023. This is a timely and important question. Figure 1 shows that the United States is not the only major economy to raise its policy interest rate sharply—and this does not even incorporate the other ways in which monetary policy has been tightened (such as through unwinding central bank asset holdings). The tightening in monetary policy has been widespread and has occurred much faster and with rates increasing to a much higher level than forecasters were expecting at earlier stages in this cycle. For example, on January 1, 2021, the US terminal rate (i.e., the peak of the policy rate during this tightening cycle) was expected to be 85 basis points; on January 1, 2022, it was expected to be 1.72 percent; and at the start of June 2022 (even after the Federal Reserve had raised its policy rate by 50 basis points in one meeting), the expected terminal rate was only 3.0 percent.[3] This is well below the current band for the federal funds rate of 5.25–5.50 percent (in December 2023)—highlighting how much of this tightening in US monetary policy

3. The terminal rate data are from Morgan Stanley and available at Bloomberg, "Rates and Bonds," https://www.bloomberg.com/markets/rates-bonds.

Figure 1. Policy Interest Rates in Eight Advanced Economies



Source: Bloomberg.

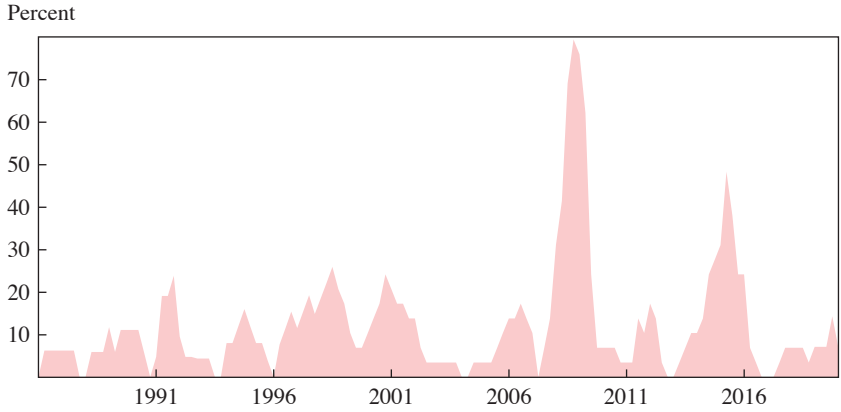
Note: US policy rate is the average of the range set by the Federal Reserve. Euro area is the interest rate on the European Central Bank's main refinancing operations. Data from January 1, 2021, through September 22, 2023.

was unexpected when countries were accumulating debt and making other financing decisions.[4] This also highlights the extent of surprise over a longer period than the short windows around monetary policy announcements that are often the focus of empirical analysis. Given that the surprise component of US monetary policy tends to have large spillover effects, this makes it even more noteworthy that the impact of this recent tightening in monetary policy on emerging markets has been muted.

This improved resilience of emerging markets, however, is not a new phenomenon and started well before the 2022 tightening in US monetary policy. For example, in 2020 when COVID-19 evolved into a global pandemic, risk spreads spiked, financial markets froze up, and emerging markets managed to avoid a series of financial crises and contagion (as was widely predicted by a number of economists). Granted, many emerging markets suffered sharp contractions in activity and major health challenges, as did most of the world, but many emerging markets were also much more resilient than expected. Let me provide two examples.

4. Federal Reserve Bank of New York, "Effective Federal Funds Rate," https://www.newyorkfed.org/markets/reference-rates/effr.

Figure 2. Share of Emerging Markets Experiencing a Sudden Stop



Source: Reproduced from Forbes and Warnock (2021) with permission from Elsevier.

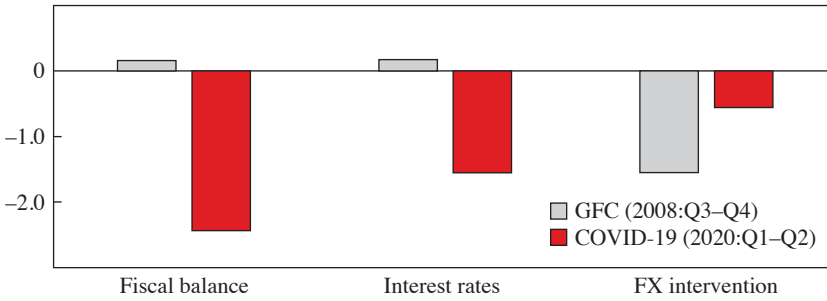
Note: Data from 1985:Q4 through 2020:Q2. A sudden stop is defined as a sharp decrease in gross capital inflows by foreigners relative to a country-specific historic average. See Forbes and Warnock (2012, 2021) for details on the methodology.

First, as the pandemic spread and global risk measures spiked (with some even higher than during the 2008 global financial crisis), emerging markets did not experience a wave of sudden stops in capital flows. Figure 2 replicates a graph from Forbes and Warnock (2021) showing the share of emerging markets experiencing a sudden stop in capital flows from foreigners from 1985 through the middle of 2020.[5] Only about 10 percent of emerging markets experienced a sudden stop in the first two quarters of 2020, well below the approximately 80 percent during the 2008 crisis. Forbes and Warnock (2021) describe the pattern of global capital flows after 2008 as more "ripples" than "waves." Their empirical analysis shows that capital flows became less sensitive to changes in global shocks (including risk measures, global growth, and US interest rates) after 2008.[6] They suggest that changes in the global financial system (e.g., tighter macroprudential regulation and reduced cross-border bank flows) have likely contributed to this improved resilience of emerging market capital flows for well over a decade.

5. More specifically, a sudden stop is defined as a sharp decrease in gross capital inflows by foreigners relative to a country-specific historic average. See Forbes and Warnock (2012, 2021) for details on the methodology.

6. Goldberg and Krogstrup (2018) and Avdjiev and others (2020) also find a reduced sensitivity of capital flows to global shocks in the 2010s relative to earlier periods.

Figure 3. Initial Policy Responses to COVID-19 in Emerging Markets



Source: Based on data compiled for Bergant and Forbes (2023).

Note: Initial policy response during the global financial crisis (GFC) is defined as 2008:Q3–Q4 and for COVID-19 as 2020:Q1–Q2. Fiscal balance is the change in the primary fiscal balance relative to GDP. Interest rates are the change in the policy interest rate. FX intervention is the change in FX reserves relative to per capita GDP. See Bergant and Forbes (2023) for a discussion of data sources and methodology.

A second, and related, example of this increased resilience from before the 2022 US monetary tightening is the greater ability of emerging markets to use countercyclical tools to support their economies in the face of global shocks—such as lowering interest rates and increasing government spending. This is in sharp contrast to many historical risk-off shocks (including increases in US interest rates) when emerging markets had to raise their domestic policy interest rate and reduce government spending in order to stabilize the exchange rate and capital flows. Figure 3 provides an example of this increased policy flexibility from Bergant and Forbes (2023).[7] During the initial phase of the COVID-19 pandemic (from 2020:Q1–Q2), emerging markets were able to lower interest rates and increase fiscal deficits to support their economies, a sharp contrast to what occurred during the initial phase of the 2008 global financial crisis (2008:Q3–Q4). Emerging markets also relied less on using reserves to support their exchange rates during the 2020 episode, a sharp contrast to the much larger reserve outflows during the 2008 crisis. In fact, by the end of 2020, even as COVID-19 still raged around the globe, many emerging markets began accumulating reserves as capital flows returned and began to worry about exchange rate appreciations that could damage competitiveness—a sharp reversal from the usual concerns about depreciations that traditionally occurred during risk-off shocks.

7. The fiscal response is measured as the change in the primary fiscal balance relative to GDP, and the monetary response is the change in the policy interest rate. The change in reserves is the change in FX reserves for exchange rate management relative to GDP per capita. Responses are for the first two quarters of each episode.

What explains this improved resilience of emerging markets since 2008—whether assessed by the reduced occurrence of sudden stops in capital flows, emerging markets' greater ability to use countercyclical policy tools, or their reduced vulnerability to the 2022–2023 US interest rate hikes? There are a number of possible explanations that could have played a role in at least a subset of major emerging markets.

- Reduced current account deficits—a vulnerability that received substantial attention during the taper tantrum as investors focused on the vulnerabilities related to large current account deficits in the Fragile Five.[8]
- Smaller aggregate volumes of gross capital inflows—especially of the more volatile types of flows, which could reduce vulnerability to risk shocks that affect global capital flows.
- Larger reserve stockpiles—which could be used to reduce exchange rate volatility (and the corresponding amplification effects through FX mismatches) as well as build investor confidence in the country's ability to manage shocks.
- More flexible exchange rates—which facilitate the adjustment to shocks and tend to increase the use of FX hedging so that entities can better withstand exchange rate movements.
- Stronger macroprudential regulations that have bolstered reserves and liquidity management in banks, making them more resilient to shocks and less likely to amplify shocks across the broader economy.[9]
- Improved credibility of monetary policy—which has allowed central banks to use monetary policy countercyclically to stabilize output and employment without increasing fears of price instability.
- Reduced exposure to FX debt, so that countries are less vulnerable to exchange rate movements.

I could make a strong case for why all of these changes (and others) have contributed to the greater resilience of many emerging markets to a range of shocks. Many of these changes are interrelated. This paper analyzes the last two potential explanations.

CONCERNS: DATA LIMITATIONS AND OMITTED VARIABLES In order to test whether improved monetary policy credibility and reduced FX borrowing have bolstered emerging market resilience, the authors focus on two data

8. The so-called Fragile Five were Brazil, India, Indonesia, Turkey, and South Africa.

9. See Forbes (2021) for evidence of the tightening in macroprudential regulations in emerging markets and how this has increased resilience to shocks.

sets. The first—on credibility—is a new measure constructed by Unsal, Papageorgiou, and Garbers (2022). It covers about fifty countries—which is very good country coverage—and the aggregate statistics summarizing key aspects of the data look logical. The data set is currently confidential, however, so it is difficult to get a good sense of the strengths and weaknesses of the data. Hopefully the authors will be able to share the data set at some point in the future as it looks promising and could be used for a range of applications.

The data used to analyze the second key variable of interest—FX exposure of the nonfinancial corporate sector from Kalemli-Özcan, Liu, and Shim (2021)—are also a logical start for capturing the vulnerability of one sector of a country to exchange rate movements and changes in risk premia. But I also would have liked to see the analysis repeated with other measures of FX exposure for several reasons. First, the current measure has very limited sample coverage, which presents challenges for the empirical methodology. Second, the current measure could miss important aspects of country vulnerability, as it does not include FX exposure of the nonbank financial sector (which has increased sharply and is a major focus of concern in the international financial institutions), exposure to FX other than US dollars, or the FX exposure of the banking sector.[10] Finally, it would also be useful to analyze FX exposure relative to the size of the economy and to its overall financial sector, rather than just as a share of outstanding credit, as countries with low debt levels may not be vulnerable even if a high share of these low debt levels are in FX. The bottom line—several alternate measures of FX exposure are available (albeit each has its advantages and disadvantages), and it should be straightforward to extend the analysis using other FX measures to see if the results are robust. This is particularly important as the FX results currently reported with the small sample do not appear to be robust across sensitivity tests (such as countries with more FX debt having better GDP performance in figure A5 in the online appendix).

This limited country coverage also raises a number of additional questions. How important are the outliers in driving the results—especially as two of the limited set of countries with FX data are Argentina and Turkey, countries that have had extremely volatile macroeconomic performance? And with such a limited sample, is there any way to control for other factors affecting

10. Although macroprudential regulations in most countries require banks to be hedged against FX exposure (as argued in the paper), banks can still be exposed through gross positions and through loans to entities that are not hedged, including nonbank financial institutions. See Forbes, Friedrich, and Reinhardt (2023) for evidence that banks were still vulnerable to FX exposure in 2020.

resilience to identify the individual contributions of the variables discussed above that also could be driving the increased resilience of emerging markets? For example, what is the role of tighter macroprudential regulations, changes to the nature of global capital flows, reduced current account deficits, more flexible exchange rates, and so on? In addition to these widely shared improvements, countries with more monetary policy credibility also likely have stronger institutional frameworks, higher income levels, stronger social safety nets, stronger macroprudential regulations, more stable inflation expectations, and more. Granted, many of these variables are endogenous (e.g., more credibility likely stabilized inflation expectations), but it is difficult to disentangle cause and effect in the current framework and with such a limited sample.

Put slightly differently, there is a strong negative correlation between monetary policy credibility and FX exposure (as the authors point out and as shown in an earlier draft). These variables are also correlated with other variables that could be important in bolstering resilience. For example, consider Chile—a country with strong monetary policy credibility and low share of FX debt. Chile has also been fairly resilient to higher US rates. But what explains this resilience? Is it the credibility of Banco Central de Chile? Or Chile's low share of FX debt? Or its low overall external borrowing and strong net foreign asset position (with its foreign asset positions often buffering shocks to foreign capital flows)? Or its strong institutions and rule of law? Or is it Chile's heavy exposure to copper and mining—for which the price has rebounded since 2021 around the same time the United States raised interest rates? Emerging market resilience after the COVID-19 pandemic could be driven by a number of factors—and sorting out the different influences will require an econometric approach that can better identify the different influences (and likely require some combination of a larger sample size and more time having passed to understand the 2021–2022 period).

FINAL THOUGHTS The question posed in this paper is important: why have emerging markets been fairly resilient (albeit with some prominent exceptions) as the United States raised interest rates much faster and to much higher levels than anyone expected even a year after the pandemic began? The authors focus on two potential explanations—improved monetary policy credibility and reduced FX exposure. I agree with their conclusions that both of these are key parts of the story. But there is also probably more to the story. Emerging market resilience has improved over a number of years and in response to a range of shocks. Using the 2022–2023 period of sharp increases in US interest rates to better understand which factors are

behind this resilience is worthwhile, but also challenging today due to the short time period combined with limited data for one of the key variables. This makes it impossible to control for omitted variables and to disentangle the many forces at play. I look forward to further iterations of this paper and more work on this topic to better understand these issues. The answer is critically important to provide guidance for how countries can best improve their resilience in the future—especially if we are entering an era of higher interest rates for an extended period.

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COMMENT BY

GIAN MARIA MILESI-FERRETTI This is a timely and interesting paper, which complements the excellent contribution to the Fall 2022 *BPEA* Conference by Obstfeld and Zhou (2022). Obstfeld and Zhou focused on

episodes of dollar appreciation and their impact on emerging market economies, while this paper by Kalemli-Özcan and Unsal focuses on the impact of US monetary policy tightening on the same set of countries. Rapidly rising US interest rates have in the past generated financial stress in the rest of the world, particularly in emerging and developing economies. The classic example remains the 1982 debt crisis, when the high US interest rates under the Volcker disinflation contributed to many external crises in emerging market economies, accompanied by severe GDP contractions. Many of these countries effectively regained access to global capital markets only in the early 1990s. Between February 1994 and February 1995, the Federal Reserve raised short-term interest rates by roughly 3 percentage points, and long-term interest rates went up by 1.5 percentage points.[1] The tightening led to a collapse of the Mexican peso—the country needed an international bailout to stave off default. The shock reverberated in Argentina as well, but this time there was no wider wave of emerging market crises. There also have been US monetary policy tightening episodes not associated with macroeconomic distress in emerging market economies—notably when the Federal Reserve raised interest rates from 1 percent to 5.25 percent between 2004 and 2006, as the United States and the global economy were staging a strong recovery.[2] The very rapid tightening of US monetary policy in 2022–2023 is an excellent moment to revisit the evidence.

One natural question is whether dollar appreciation and US monetary policy tightening are two faces of the same coin. In fact, they are correlated but not one and the same. The dollar appreciates during periods of rising global risk aversion, which can be periods of monetary policy easing (think of the global financial crisis). In contrast, there can be periods of substantial US monetary policy tightening (for instance 2004–2006) during which the dollar does not appreciate, as strong global demand and risk-taking reduce the importance of safe-haven factors.

Kalemli-Özcan and Unsal highlight two channels through which US monetary policy tightening can have repercussions in other countries. The first is the trade channel: to the extent that US monetary policy tightening is associated with currency depreciation vis-à-vis the US dollar, it could provide a boost to net exports. The authors argue that the existing evidence goes against the notion of an expansionary effect of exchange rate depreciations, in light of US dollar pricing and other factors. The second channel,

1. Board of Governors of the Federal Reserve System, "Selected Interest Rates (Daily)—H.15," https://www.federalreserve.gov/releases/h15/.

2. FRED, "Federal Funds Effective Rate," https://fred.stlouisfed.org/series/FEDFUNDS.

and the more salient one in discriminating between advanced economies and emerging markets, is the financial channel. Here the shedding of risky assets by global investors in response to tighter global financial conditions affects emerging markets more severely than advanced economies, as their credit ratings are generally lower and their risk profile higher.

But which factors are associated with the vulnerability to US monetary policy surprises? The authors focus on two key factors: monetary policy credibility and debt liabilities denominated in foreign currency. Their hypothesis is that rising monetary policy credibility and reduced foreign exchange exposures have increased the resilience of emerging market economies to spillovers from US monetary policy tightening. With regard to the challenging issue of measuring monetary policy credibility, a valuable innovation of the paper is the use of a very detailed index of monetary policy frameworks presented in Unsal, Papageorgiou, and Garbers (2022). This index is constructed by analyzing central banks' laws and websites for fifty advanced economies, emerging markets, and low-income developing countries, from 2007 to 2018, and focuses in particular on independence and accountability, policy and operational strategy, and communications. Once made public the data will be widely used in the profession.

The authors' findings for the period 1990–2019 are generally sensible. They underscore how emerging market economies are more severely affected by US monetary tightening than advanced economies; how, among emerging market economies, those with more credible monetary policy institutions are better able to cushion the impact of tightening global financial conditions on the domestic economy; and how US monetary policy tightening affects more severely those emerging market economies with balance sheet vulnerabilities in the form of high foreign exchange exposures.

Overall, the authors argue, emerging markets are in a better position now to deal with tighter global financial conditions than they were in previous decades, as they have strengthened their monetary policy institutions and policy frameworks and reduced their foreign exchange exposures. While the resilience to the post-COVID-19 US monetary policy tightening episode is consistent with this thesis, the shortness of the sample period complicates the task of distinguishing among different hypotheses.

I agree with the authors' general assessment, as I view the strengthening of monetary policy frameworks and the reduction of foreign exchange exposures as essential in explaining increased resilience to external shocks in emerging market economies. But there are other important aspects of emerging market policies and institutions that have contributed to increased resilience: more flexible exchange rates, stronger fiscal frameworks, improved

net external positions, and macroprudential regulation and supervision come to mind. On the investor side, with increased financial integration there was arguably an increase in investors' ability and willingness to differentiate across countries with different vulnerabilities. Given the correlation across many of these indicators, a formal pecking order is difficult to establish, but the variables the authors consider are certainly very important.

My discussion of the paper focuses primarily on three broad themes. The first is when did emerging markets become more resilient—I will argue that this has been an ongoing process within the first sample period the authors use (1990–2019), which was already bearing fruit well before the current episode. The second theme is the difficulty in drawing general inferences given the use of a changing mix of countries in the empirical analysis. The third is the strength of the empirical evidence presented on the role of foreign exchange exposures. I also discuss briefly the interpretation of the resilience to the latest monetary policy tightening episode and the measurement of such tightening in the empirical analysis.

WHEN DID EMERGING MARKETS BECOME MORE RESILIENT? The main focus of the paper is on the comparison between the response to monetary policy shocks in the period 1990–2019 and in the tightening episode occurring after the COVID-19 shock. The authors show how countries with different average characteristics in terms of central bank credibility and foreign exchange exposure responded to monetary policy shocks during the entire pre-COVID-19 period, with stable coefficients throughout (implying a similar response of all variables to US monetary policy shocks during these three decades).

However, the strengthening of emerging market balance sheets and monetary policy frameworks has been a gradual process that was already bearing fruit long before the COVID-19 shock. And indeed the paper highlights a process of rising resilience, starting in the 1990s: the monetary policy credibility index—which increases notably for emerging market economies between 2007 and 2021—corroborates this view. Emerging market crises have declined substantially in frequency since the early 2000s. During the global financial crisis, a few economies in Central and Eastern Europe (notably Hungary, Latvia, and Romania) had to rely on IMF programs, but elsewhere the incidence of crises was limited, especially when considering the depth of that global downturn. To be sure, external shocks—including at times US monetary policy tightening—had an impact on these economies, but such impact has been increasingly tempered by more resilient policy frameworks. The taper tantrum starting in May 2013—which the paper uses to illustrate the different responses to US monetary policy shocks between

Canada and Mexico—provides a good example of this. The shock generated sharp currency depreciations and large portfolio outflows from a number of emerging economies, including in particular a group called, at the time, the Fragile Five (Brazil, India, Indonesia, South Africa, and Turkey). However, the impact faded later in the year, and none of the affected countries experienced even a single quarter of negative growth in 2013—a big contrast with the deep recessions of the 1980s, the Tequila Crisis in Mexico, and the Asian crisis of 1997.

For these reasons it would be interesting to explore whether this process of increased resilience is supported by evidence on the response of emerging market economies to US monetary policy shocks between the earlier and the latter part of the sample.[3] This would also strengthen the case for the role of improvements in monetary policy frameworks within countries, since the evidence presented in the text relies on cross-sectional differences and the robustness check in the online appendix combines cross-sectional differences with time series evidence.

COUNTRY GROUPS The baseline results highlighting differences between advanced economies and emerging markets rely on a sample of fifty-nine countries. The breadth of the sample shows the thoroughness of the authors in establishing important stylized facts. At the same time, however, a number of countries in this specific sample have characteristics that differ to an important extent from those of the main emerging markets. Specifically, there are some countries with lower incomes or limited integration to global financial markets for a good part of the sample (for instance Albania, Armenia, Azerbaijan, and Belarus), current euro area members (Latvia, Malta, and the Slovak Republic), and hard pegs such as Bulgaria (after a high inflation period in the early 1990s). These countries are not part of the subsequent analysis, which explores differences in the reactions of emerging market economies to US monetary policy shocks depending on their monetary policy credibility and foreign exchange exposures.

While the authors have commendably undertaken a vast array of robustness exercises, I would have found it useful to establish the key stylized facts on the basis of a sample which is consistent across the paper, since data on the monetary policy credibility index are available for all the main emerging markets in terms of size and global importance. One important reason is that the assumption of a common coefficient across countries in the response of macroeconomic and financial variables to US interest rate

3. Ideally the sample would start a decade earlier, so as to encompass the debt crisis, but data challenges would be daunting.

shocks becomes harder to defend as heterogeneity as the level of GDP, financial development, and institutional frameworks increases. The US monetary policy tightening during the post-COVID-19 period provides a very useful illustration. While the largest and most developed emerging market economies fared well, a number of countries with weaker policy frameworks, such as Egypt, Pakistan, Sri Lanka, and Tunisia, have experienced severe market pressures or, in the case of Sri Lanka, a painful default.

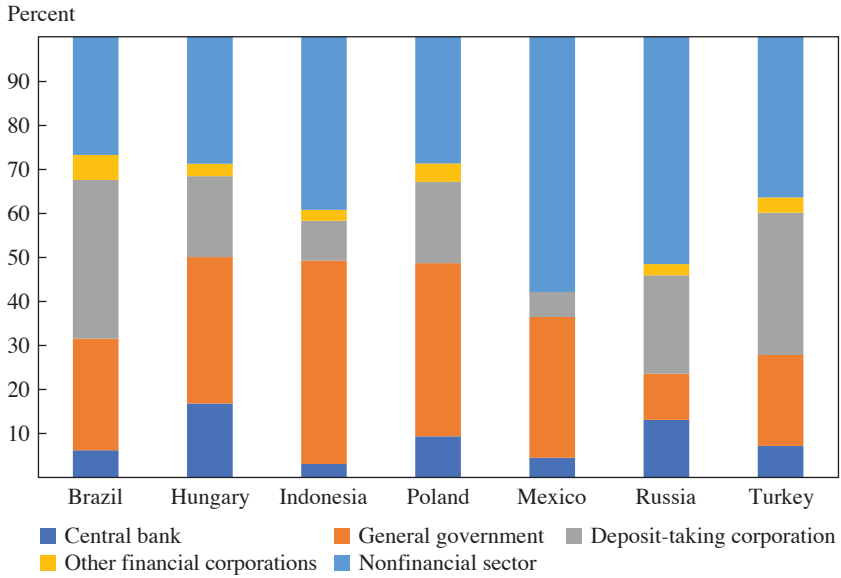
The most severe limitation in terms of data availability comes from the analysis of foreign exchange exposures. The Bank for International Settlements data used for this exercise on credit in foreign currency to the nonfinancial sector are available for only fifteen countries. These do not include countries in Central and Eastern Europe (with the exception of Russia) in which foreign exchange exposures were particularly important around the time of the global financial crisis—for instance in Hungary and Poland through mortgages denominated in currencies such as Swiss francs (Dizikes 2022; Minder 2022). The limited sample complicates the task of exploring differences in emerging market reactions to shocks depending on such exposures. Also, the strong negative correlation between the measure of foreign exchange exposure and the monetary policy credibility index (documented in the paper) raises questions as to whether the results for foreign exchange exposures could be capturing differences across countries due to the strength of monetary policy frameworks.

MEASURING FOREIGN EXCHANGE EXPOSURES Changes in foreign exchange exposures have been a crucial element in strengthening the resilience of emerging market economies. Since the early 1990s, their foreign exchange reserves have been rising, the composition of external liabilities in emerging market economies has shifted away from external debt toward foreign direct investment, and during the past two decades holdings by foreign investors of domestic currency government bonds have increased.[4] As a result, in the main emerging market economies, currency depreciations, while still costly, now improve the net external position, since the domestic economy is a net creditor in foreign exchange instruments.

Unfortunately there are many definitions of foreign exchange exposures (gross versus net, hedged versus unhedged, total versus vis-à-vis nonresidents) and no perfect comprehensive data set robustly based on microeconomic data. The variable chosen in the paper is a comprehensive measure of total foreign exchange exposure for the nonfinancial corporate sector, but that specific sectoral coverage and its reduced cross-country

4. See, for instance, Lane and Milesi-Ferretti (2007, 2018) and Arslanalp and Tsuda (2014).

Figure 1. External Debt in Foreign Currency (excluding Intercompany Lending): Sectoral Shares, 2021



Source: IMF Balance of Payments Statistics.

availability are important limitations. The authors argue that the currency exposure of banks is hedged. This may be the case in recent years for the largest emerging markets, but it is unlikely to be the case across the board for a protracted period of the thirty-year sample under consideration. But importantly, the definition also omits borrowing in foreign currency by the government, which is still important in most emerging market economies in the sample.

Figure 1 illustrates this point by making use of official data on the currency composition of external debt liabilities for the year 2021, published in the IMF Balance of Payments Statistics.[5] Furthermore, the relevance of borrowing by the nonfinancial corporate sector is higher for the more developed emerging markets (such as those shown here). For others, the role of government is even larger. What are the alternatives? The authors are reluctant to use data on the currency composition of external debt liabilities by Bénétrix and others (2019) because they do include FX liabilities by other

5. IMF, "Balance of Payments and International Investment Position Statistics (BOP/IIP)," https://data.imf.org/?sk=7a51304b-6426-40c0-83dd-ca473ca1fd52&sid=1542633711584.

sectors as well, and hence cannot single out the role of nonfinancial corporate sector liabilities in foreign currency. As argued above, I don't see this broader definition as a weakness. In the online appendix the authors run a robustness check using data on total external debt from the same source (as opposed to external debt denominated in foreign currency), but the results do not seem to show differences between high-debt and low-debt countries. A very recent paper by Allen, Gautam, and Juvenal (2023) updates and improves the Bénétrix and others (2019) currency composition data for countries' external balance sheets, supported by the publication of official data on such currency composition by a number of advanced economies and emerging markets (the data used in the construction of figure 1). It should provide a valuable tool for questions like the one used in this paper.

THE RESILIENCE TO POST-COVID-19 TIGHTENING OF US MONETARY POLICY The very limited time period limits the generality of the analysis of the post-COVID-19 period. The authors provide evidence that shows how during this episode the standard response to US monetary policy tightening (depreciation, rising risk premia, weaker GDP) has not materialized. This is undoubtedly correct for the main emerging markets. But with the data available so far, one cannot establish that this increased resilience is explained by stronger monetary policy frameworks or reduced foreign exchange exposures. In addition to other aspects of increased resilience mentioned earlier, the strength of commodity prices and an ongoing process of monetary policy tightening in emerging market economies starting well in advance of monetary policy tightening in the United States are likely to play a role as well.

One important feature of this episode has been the differentiation in markets between emerging market economies with varying levels of vulnerability.[6] The main emerging markets have so far emerged unscathed from the episode while a number of others (including Argentina—see figure 16 in the paper) and several low-income countries have faced market pressures and, in several cases, outright crises. In fairness to the authors, it may be difficult to capture this differentiation in their data given that several emerging market countries facing external challenges (for instance Egypt, Sri Lanka, and Tunisia) are not in the sample of countries with monetary policy credibility data.

HOW TO MEASURE MONETARY POLICY TIGHTENING The measures of monetary policy tightening used in the paper are standard in the literature and

6. Figure 16 in the paper illustrates the impact of widening Argentina's CDS spreads on the average for all emerging market economies.

well explained. Furthermore, the authors have undertaken a variety of robustness exercises using alternative measures of monetary policy shocks, which go beyond those presented in the final paper. I am still left with a question, particularly salient in an episode like the one we just observed. Namely, do monetary policy surprises (measured as changes in interest rates during a narrow time window around the monetary policy announcement) convey all relevant information on the extent of "surprise tightening"? The surprises during the latest US monetary policy tightening episode (shown by the authors in a previous draft) are generally small—yet changes in the Federal Open Market Committee (FOMC) "dot plot" from the first increase in rates in March 2022 to later that year and the most recent ones have been quite dramatic—as illustrated in Kristin Forbes's comment (Forbes 2024). While one could argue that these changes were not "surprises" but were driven by macroeconomic developments during the period, it is plausible that the Federal Reserve communication—for instance, speeches, testimonies, interviews with journalists, and so on—has played an important role in shaping market expectations about future rates, even outside FOMC meeting dates. A good historical example is the taper tantrum episode: it would not appear as a monetary policy surprise since it was a reaction to congressional testimony, and not to an FOMC meeting.

In conclusion, this paper will certainly stimulate much additional work. The authors have made a strong effort to be comprehensive and show a variety of results from different samples and specifications. But fully addressing all the issues the paper raises calls for more research in this area—and I very much look forward to that.

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GENERAL DISCUSSION Jonathan Pingle began the discussion by highlighting that in addition to the countries the authors consider in their paper, the US economy also remained unusually resilient to the 2022–2023 US Federal Reserve interest rate hikes. He asked to what extent this plays a role, noting that it would affect risk premia, risk sentiments, equity evaluations, business investment, and foreign direct investment. Pingle wondered whether there could have been additional factors affecting the resilience of emerging markets.

Jason Furman pointed out that one hypothesis explaining the lack of spillover posits that, due to the common shock element, emerging markets began to raise rates before the Federal Reserve decided to do so and likely would have even absent rate hikes in the United States. This stands in contrast to previous tightening cycles where emerging markets were less macroeconomically synchronized with the United States, leading to undesirable rate hikes in those economies. Furman inquired about the authors' thoughts on this and suggested controlling for a pooled common shock or using time fixed effects to address this possibility.

Donald Kohn similarly noted that many of the central banks in emerging markets raised rates before the Federal Reserve recognized the problem because many emerging markets now have the independence to do so. This independence has developed over time and ultimately protected their credibility and better insulated their economies.

Ayşegül Şahin brought up the transmission mechanism of Fed hikes in the authors' analysis. She asked whether the transmission of interest rate hikes was primarily through the trade channel and commodity markets or the financial channel, and whether the authors had a sense of the relative magnitudes of the transmission mechanisms.

In response to the observations about US resilience to Fed hikes, Şebnem Kalemli-Özcan commented that, rather than the response of the US economy, what is important is how global financial conditions responded to Fed hikes. She highlighted that the primary channel Fed hikes pass through is the risk sentiment of financial investors and how tight global financial conditions are. She emphasized the focus of the authors on these two factors for a given change in US interest rates. She also remarked that while not all changes in US interest rates affect risk sentiments, changes in risk sentiments can have a large impact on real macroeconomic variables.

Kalemli-Özcan further noted that their paper focuses on the financial channel because the trade channel, which they define as expenditure switching, works in a smoothing way, thus the effects of Fed hikes are not immediately realized in the trade channel. She also argued that the adverse effects of Fed hikes often materialize in the financial channel, rather than the trade channel, through changes in risk premia. Kalemli-Özcan pointed out that their model does control for changes in the trade channel, including the current account and capital account balances, among other trade-related variables.

Jordi Galí commented that the Gertler-Karadi shocks used in the paper may not constitute a pure exogenous shock but may have an endogenous component if the central banks have private information about the prospects of the economy that the financial markets do not.[1] He mentioned that if the relative importance of the endogenous and the exogenous components had changed over time, possibly due to improved, more systematic Federal Reserve policy, perhaps that could partly explain the authors' results.

1. Mark Gertler and Peter Karadi, "Monetary Policy Surprises, Credit Costs, and Economic Activity," *American Economic Journal: Macroeconomics* 7, no. 1 (2015): 44–76.

He noted that what one may have interpreted as exogenous in the most recent tightening of monetary policy in the United States may instead have reflected the prospect of an improvement in the US economy—which may have also had positive impacts on emerging market economies through trade links, for example.

Kalemli-Özcan remarked that they experimented with different types of shocks in their analysis, including Bauer-Swanson, Nakamura-Steinsson, and Gertler-Karadi shocks, as well as additional risk sentiment measures.[2] In response to Galí's comment, she agreed that the sensitivities can be important domestically but noted that internationally the effects of a rate hike work similarly as long as the shock detects changes in the risk sentiment. She emphasized that it is not about the size of the monetary policy shock—not every shock will change the risk sentiment—but rather the extent to which the risk sentiment changes, arguing that the trade channel and other forms of linkages are not as important.

Caroline Hoxby inquired about the rise in external financing through foreign direct investment and other equity instruments and asked about the authors' thoughts on whether these could have played a role in emerging markets' resilience.

Steven Kamin agreed with the paper's findings but suggested the authors include the global financial market's reactions to the Federal Reserve tightening, noting that it spills into emerging markets by affecting global risk sentiment, thereby causing capital outflows from emerging markets. One way this can be observed is through US high-yield corporate spreads, which are highly correlated with emerging market dollar-bond credit spreads. Kamin highlighted that if the US financial conditions were to deteriorate in the coming years, it could lead to greater deterioration for emerging markets as well.

In response, Kalemli-Özcan affirmed that US high-yield corporate spreads did not drastically change during the recent Federal Reserve interest rate hikes and emphasized that this is corroborating evidence that the rapid tightening didn't create a risk-off shock.[3]

2. Michael D. Bauer and Eric T. Swanson, "A Reassessment of Monetary Policy Surprises and High-Frequency Identification," *NBER Macroeconomics Annual* 37, no. 1 (2023): 87–155; Emi Nakamura and Jón Steinsson, "High-Frequency Identification of Monetary Non-neutrality: The Information Effect," *Quarterly Journal of Economics* 133, no. 3 (2018): 1283–330.

3. Collin Martin, "High-Yield Bonds: Yields Are Up, but Risks Remain," Charles Schwab, August 31, 2023, https://www.schwab.com/learn/story/high-yield-bonds-yields-are-up-but-risks-remain.

Filiz Unsal discussed the confidentiality of the data. To measure the monetary policy credibility of countries, Kalemli-Özcan and Unsal collected data from central bank laws, websites, and communications. Using these data, they rated the credibility of each country using a framework developed by Unsal and colleagues.[4] She explained that this measure of monetary policy credibility extends beyond countries reaching their inflation targets, encompassing many aspects of the monetary policy-making process. Kalemli-Özcan further commented that the measure of monetary policy credibility can be summarized as "Do what you say, say what you do." This includes committing to price stability and being forthcoming about the methods of attaining goals. If a country were to make these commitments but then attempt to influence exchange rates and capital flows with the interest rate, it would not be considered credible monetary policy under their framework. Improvements in monetary policy credibility across emerging markets can be attributed in part to the use of macroprudential policies to manage debt denominated in foreign currency, resulting in decreased foreign debt.

Kalemli-Özcan also addressed questions posed by Kristin Forbes and Gian Maria Milesi-Ferretti during their discussant remarks. Milesi-Ferretti pointed out that some of the countries included in the initial sample had different reactions to the recent Fed hikes and different monetary policy regimes, in particular lower-income countries as well as Argentina and Saudi Arabia. Kalemli-Özcan explained that initially the authors included a sample of emerging markets and developing countries in line with Obstfeld and Zhou.[5] She noted that the response is late and heterogeneous for low-income countries and also agreed that the resiliency of countries to recent Fed hikes only applies to emerging markets. Kalemli-Özcan affirmed that they ended up dropping these countries from the sample.

In her presentation, Forbes discussed the paper's exclusion of nonbank financial sector foreign debt, which has gone up considerably in recent years due to tighter macroprudential policies, and the paper's focus on the nonfinancial private sector in the foreign exchange (FX) exposure data. She noted that this measure was restrictive and didn't have enough observations. Kalemli-Özcan responded that the vulnerability they attempted to

4. Filiz D. Unsal, Chris Papageorgiou, and Hendre Garbers, "Monetary Policy Frameworks: An Index and New Evidence," working paper 2022/022 (Washington: International Monetary Fund, 2022). https://www.imf.org/en/Publications/WP/Issues/2022/01/28/Monetary-Policy-Frameworks-An-Index-and-New-Evidence-512228.

5. Maurice Obstfeld and Haonan Zhou, "The Global Dollar Cycle," *Brookings Papers on Economic Activity*, Fall 2022, 361–427.

measure is the unhedged dollar debt in the private sector. She outlined that historically, during the Fed hikes, high levels of debt in the nonfinancial private sector of emerging markets led to economic contractions. Thus, countries would ideally seek to counteract the contraction by lowering interest rates, but at the same time countries needed to raise interest rates in line with the Federal Reserve to keep their currencies afloat. This is the vulnerability that the authors were attempting to capture.

In response to the discussant remarks about the FX exposure data, Kalemli-Özcan noted that they interacted the continuous FX exposure data in addition to high and low exposure categorical variable with the monetary policy shocks. Therefore, there is both a continuous and discrete aspect of the FX exposure variable. With the interacted regressor, the authors included a time fixed effect in the model, which controlled for commodity prices, oil prices, VIX, and other global financial variables. In terms of the time periods used in their paper, Kalemli-Özcan noted that capital outflows were much greater during the global financial crisis than in recent periods and affirmed that they could show the differences between periods.

Addendum

Kalemli-Özcan, Şebnem, and Filiz Unsal. 2023. "Global Transmission of Fed Hikes: The Role of Policy Credibility and Balance Sheets." *Brookings Papers on Economic Activity*, Fall. 169–225.

This addendum adds Hoek, Kamin, and Yoldas (2022) and Ahmed, Akinci, and Queralto (2024) to the literature discussion in footnote 10 on p. 179 of the paper:

> See also Hoek, Kamin, and Yoldas (2022) who provide evidence that spillovers depend greatly on the specific driver of the US monetary policy shift and on the degree of emerging market economy (EME) vulnerabilities. Ahmed, Akinci, and Queralto (2024) build on the model in Akinci and Queralto (2023) to explore the macro and financial spillovers of US policy shifts, depending on the shock driving the policy shift. They model key EME vulnerabilities—including currency mismatches and imperfect policy credibility—and explore the extent to which the 2022–2023 generated spillovers on EMEs.

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Hoek, Jasper, Steve Kamin, and Emre Yoldas. 2022. "Are Higher U.S. Interest Rates Always Bad News for Emerging Markets?" *Journal of International Economics* 137: 103585.

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

Şebnem Kalemli-Özcan and Filiz Unsal

April 2024

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,

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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

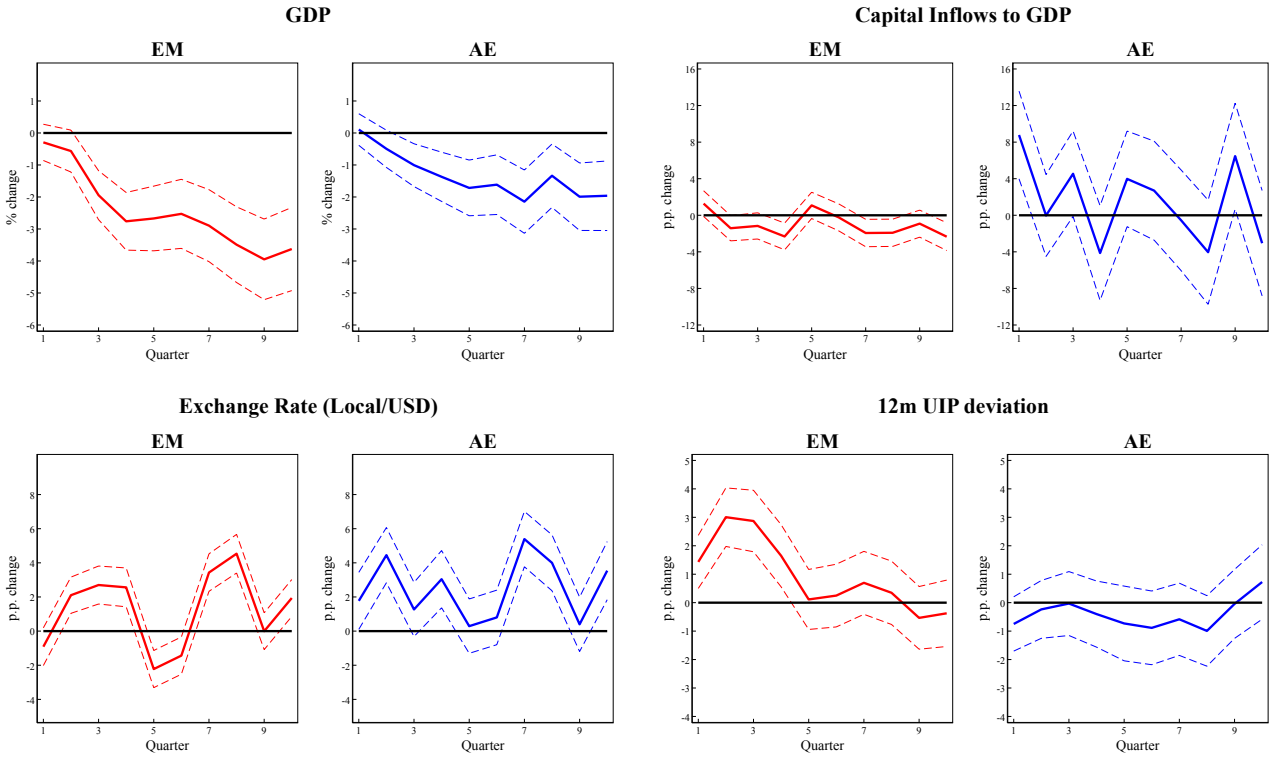
Criterion	Principle	Options and Scoring
INDEPENDENCE AND ACCOUNTABILITY		
2. Mandated Goals and Numerical targets		
2.2. By law, is it stated that there is a numerical monetary policy target?	**T**	Yes—1 No—0
2.2.1. By law, is it stated which body(s) is responsible for setting the numerical monetary 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.

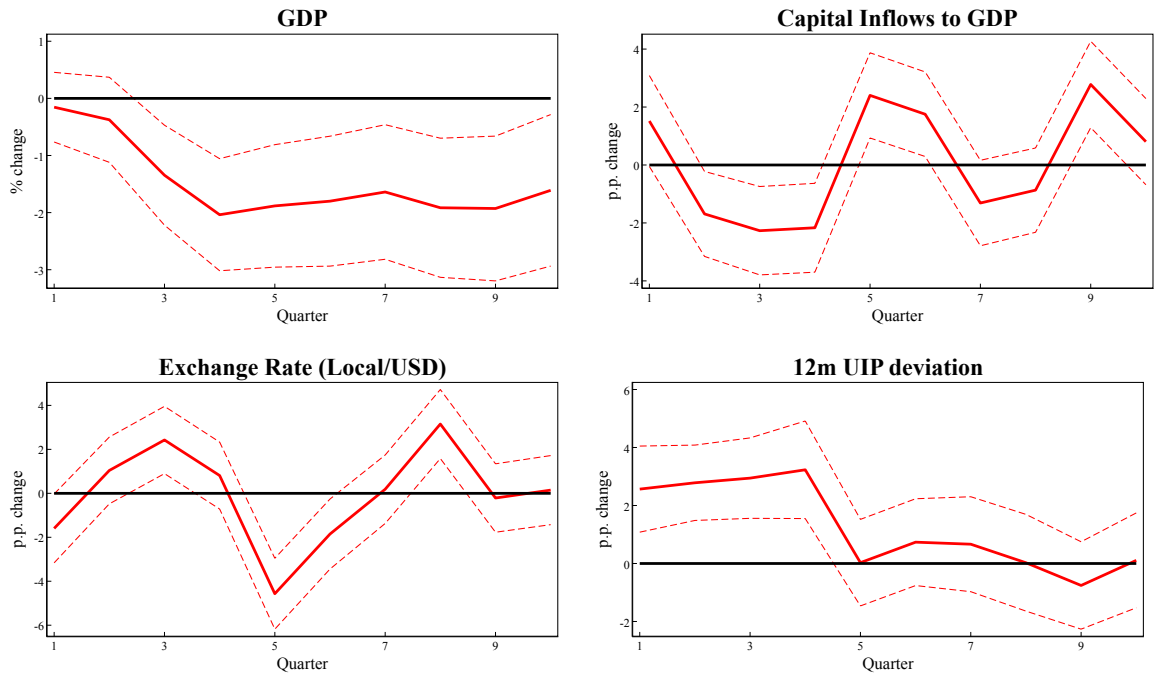
Figure A1: International Transmission of FED Hikes: Emerging vs. Advanced Economies (GK surprises), controlling for FX reserves



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.

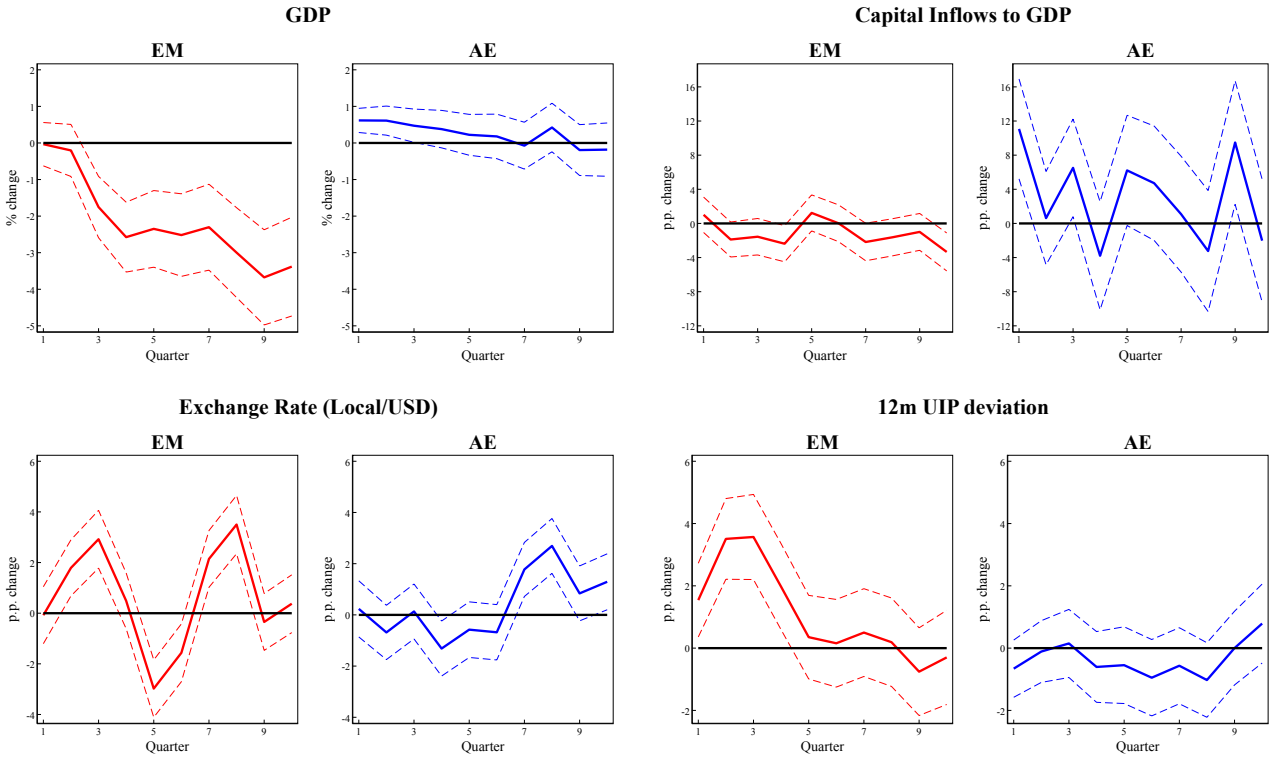
Figure A2: International Transmission of FED Hikes: Emerging Economies (GK surprises), Smallest Sample



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. Results are in line with Figure 12.

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. Global controls (the last three) also enter contemporaneously. 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:

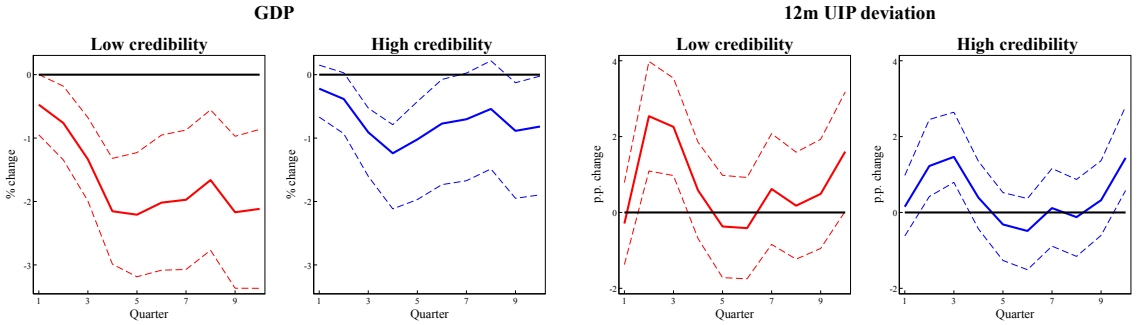
$$y_{c,t+h} = \alpha_c + \beta_{1,h}\hat{i}_t^{US} + \beta_{2,h}\hat{i}_t^{US} * IAPOC_{c,t-1} + \gamma X_t + \theta IAPOC_{c,t-1} + \sum_{i=1}^{i=4}\omega_i X_{t-i} + \sum_{i=1}^{i=4}\eta_i x_{c,t-i} + \varepsilon_{c,t+h} \tag{1}$$

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:

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

and we evaluate equation (2) 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. Global controls (the last three) also enter contemporaneously. 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:

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

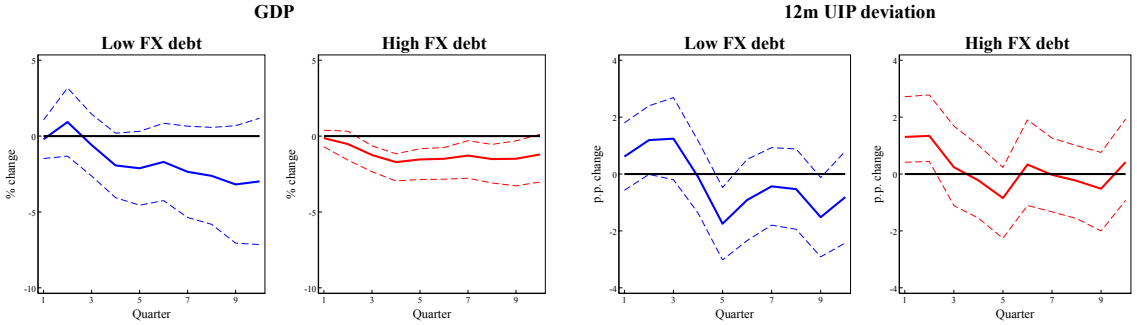
Relative to specification (5), we now use a time varying measure of FX debt, lagged. In particular, we use Bénétrix, Gautam, Juvenal and Schmitz (2019) measure of total external debt to GDP as measure of FX debt in this case.

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:

$$\frac{\partial y}{\partial \hat{i}} = \beta_{1,h} + \beta_{2,h} * FX_{t-1} \tag{4}$$

and we evaluate equation (4) 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, which are in line with our findings of Figure 15.

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 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 debt to GDP 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)
Total external debt to GDP	Bénétrix, Gautam, Juvenal and Schmitz (2019)
Total external FX debt to GDP	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.5 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

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