CHAPTER 2

EXTERNAL SECTOR IMPLICATIONS OF THE GLOBAL DOLLAR CYCLE

US dollar appreciations can inflict sizable negative spillovers on emerging markets. Building on the methodology of Obstfeld and Zhou (2023), this chapter investigates implications of the "global dollar cycle" for the current account balance and other external sector indicators. It finds that negative real sector spillovers from US dollar appreciations fall disproportionately on emerging markets. In contrast, effects on advanced economies are small and short-lived. Current account balances increase in both country groups, with larger and more persistent effects on emerging markets, driven by a fall in investment. Emerging market commodity exporters historically experienced larger negative spillovers than commodity importers, reflecting a strong negative link between the US dollar and commodity prices. More flexible exchange rates and more anchored inflation expectations can mitigate negative spillovers to emerging markets.

Introduction

During the post–Bretton Woods era of flexible exchange rates, the US dollar has followed pronounced decade-long swings. The most recent sharp US dollar appreciation in 2021–22 is part of these oscillations. An extensive literature has studied determinants of US dollar fluctuations, including contributions from established macroeconomic factors and policies, albeit recognizing their limited explanatory power (see, for example, Frenkel 1976; Dornbusch 1976; Obstfeld and Rogoff 1996; Engel and West 2005; and Gourinchas and Rey 2007). More recent research has focused on the close association between the US dollar and global financial conditions, with appreciations accompanied by tightening financing constraints (see, for example, Rey 2013; and Miranda-Agrippino and Rey 2022).

Policymakers scrutinize strong US dollar episodes closely because of potential negative cross-border spillovers and ensuing policy challenges, especially in emerging markets. A large literature has highlighted the impact of global financial cycles on economic activity and policy trade-offs and studied the channels of transmission (see, for example, Rey 2013; Bruno and Shin 2015; and Kalemli-Özcan 2019). A more recent strand of this literature has put the US dollar at the center of global financial market booms and busts (see, for example, Druck, Magud, and Mariscal 2018; Shin 2020; Shousha 2022; Akinci and others 2022; Obstfeld and Zhou 2023; and Fukui, Nakamura, and Steinsson 2023). In particular, Obstfeld and Zhou (2023) find that the US dollar is closely related to global financial conditions even after established factors such as US monetary policy and US domestic financial conditions are controlled for, and they link the "global dollar cycle" to large negative spillovers to economic activity in emerging markets, through both financial and trade channels. Given the US dollar's dominant role in global finance, the global dollar cycle is a convenient barometer for studying the implications of booms and busts in global financial markets, capturing factors such as changes in investor risk appetite and preference for liquidity.

Building on Obstfeld and Zhou (2023), this chapter zooms in on the external sector implications of the global dollar cycle for a sample of emerging markets and small advanced economies. The chapter's external sector focus is motivated by the centrality of the current account for exchange rate–induced macroeconomic adjustment, capturing the propensity of countries to buffer or magnify the impact of US dollar fluctuations. The chapter addresses three questions pertaining to the global dollar cycle:

- Are there systematic external sector spillovers from the global dollar cycle?
- Do effects differ across countries, and if so, what explains the heterogeneity?
- What are the implications for global current account balances?[1]

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[1]Global current account balances are defined as the sum of absolute current account balances across all countries. It is a key metric in the *External Sector Report* that can signal increasing financial vulnerabilities and rising trade tensions (see Chapter 1).

To answer these questions, the chapter studies current account determinants, including the behavior of investment and saving, components of trade and capital flows, and foreign asset and liability positions. The chapter further examines the heterogeneous impact of US dollar fluctuations based on countries' policies and structural characteristics, which can shed light on the trade and financial channels of transmission. Given the lagged nature of the current account response, both short- and longer-term responses for variables of interest are examined. To benchmark findings, the chapter contrasts emerging markets with smaller advanced economies.

The chapter estimates cross-border spillovers with a state-dependent local projections (LP) methodology, following Obstfeld and Zhou (2023). To isolate the role of the global dollar cycle, the analysis simultaneously controls for other established factors influencing US dollar fluctuations, including monetary policy developments, broader US financial conditions, and economic activity trends in the rest of the world. Estimated impulse responses are allowed to vary by different characteristics of interest, with commodity exporter or importer status as a key exogenous structural feature.

Leveraging the close correlation between the global dollar cycle and uncovered interest parity (UIP) deviations, the chapter employs model-based simulations to shed light on its empirical findings. Analyzing global risk premium shocks in the Flexible System of Global Models (FSGM; Andrle and others 2015) helps disentangle some of the mechanisms behind the chapter's external sector findings. The model employed in this chapter also provides an interpretation for the link between the global dollar cycle and other key global variables studied, including commodity prices and global trade openness.

The chapter's main findings confirm that US dollar appreciations inflict negative spillovers on emerging markets and expand on this result along several dimensions:

- Negative spillovers from US dollar appreciations fall disproportionately on emerging markets when compared with smaller advanced economies.[2] Impacts on emerging markets are large in economic terms: a 10 percent US dollar appreciation decreases output by 1.9 percent after one year, and the negative effect dissipates only after 10 quarters. In contrast, the negative effects in advanced economies are considerably smaller in size and short-lived, peaking at 0.6 percent after one quarter.
- Current account balances, as a share of GDP, increase in both country groups, but the effect is again larger, peaking at 1 percent of GDP for a 10 percent appreciation in the US dollar, and more persistent for emerging markets. A depressed investment rate accompanying the negative spillovers is the main contributor to the current account increase. Exchange rate depreciation and accommodative monetary policy facilitate the external sector adjustment for advanced economies, while "fear of floating" and less accommodation limit the shock-absorbing contribution of exchange rates in emerging markets, where income compression dominates.
- Among structural characteristics, the chapter finds commodity exposure to be a key contributor to spillovers from US dollar appreciations. Commodity exporters exhibit larger negative spillovers owing to a pronounced deterioration in their terms of trade, reflecting a strong negative link between commodity prices and the US dollar, in which most commodities are invoiced. The opposite holds for commodity importers. The ensuing economic adjustment has contrasting implications for current account changes: sizable surpluses for commodity importers, in contrast to broad balance or even deficits for commodity exporters.
- Policies can mitigate negative spillovers to emerging markets from US dollar appreciations. In line with Obstfeld and Zhou (2023), the chapter finds that monetary policy credibility facilitates accommodative policy responses to a US dollar appreciation, including through reduced policy rates and real effective exchange rate (REER) depreciations. The result is a shallower initial negative spillover. Meanwhile, a more flexible exchange rate regime systematically speeds up economic recovery. These mitigating policies moderate current account increases.
- The chapter estimates that global current account balances decline significantly in response to US dollar appreciations, with a 10 percent appreciation associated with a decline in global current account balances by 0.4 percent of GDP after one year.

[2]The chapter uses terms such as "US dollar appreciation" and "upswing in the global dollar cycle" interchangeably to refer to an increase in the value of the US dollar against that of currencies in other major advanced economies.

The chapter's empirical strategy puts some limits on the interpretation of the global dollar cycle. The latter is estimated as a residual, potentially containing many endogenous factors that the chapter does not attempt to further disentangle. Instead, following established practices in macroeconomics, the focus is on the unexplained residuals, that is, the portion of US dollar fluctuations that cannot be attributed to established factors.[3] The chapter estimates these residuals and shows, with the help of model simulations, that global financial market shocks—distinct from other fundamentals such as interest rate differentials—could contribute to the global dollar cycle. However, the analysis does not preclude other interpretations, which could be made possible by further advances in analyzing the drivers of US dollar fluctuations.

Characterizing the Global Dollar Cycle

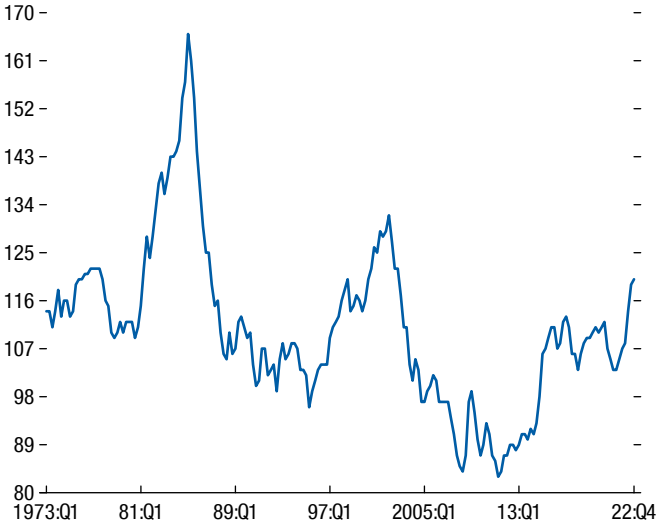
This section links fluctuations in a US dollar index[4] to contributing factors, distinguishing between established exchange rate determinants and a residual contribution from global financial factors. The latter contribution—the global dollar cycle—is then related to other financially motivated indicators, including UIP deviations and the global financial cycle.

The US dollar exhibits pronounced decade-long swings. There have been three distinct upswings since the 1970s (Figure 2.1). The sharp US dollar appreciation during 2021–22 constitutes the most recent of these "strong-dollar" episodes.[5] In the analysis of US dollar cycles, this chapter focuses on a trade-weighted index of the US dollar against currencies of major advanced economies, as such an index is plausibly more exogenous for a study of spillovers to emerging markets. However, a similar cyclical pattern emerges for broader specifications of the US dollar index.[6] A more direct link to exchange rate fluctuations motivates the focus on a nominal, as opposed to a real, index.

Established factors explain some of the cyclical pattern. To account for their roles in dollar movements, the chapter relates the US dollar index to short- and long-term interest rate developments in the US as well as differences with major advanced economies, which capture the effect of a broad set of conventional macroeconomic shocks and policies on the US dollar exchange rate. The aim is to account for established exchange rate determinants, such as a US monetary tightening episode or an increase in productivity that through interest rates lead to a US dollar appreciation. Quantitative easing or a change in public debt management policies, through its impact on short- and longer-term interest rates,

Figure 2.1. Nominal US Dollar Trade-Weighted Index against Major Advanced Economies
(Index, 100 = January 2006)

The US dollar exhibits pronounced decade-long swings, with the recent sharp appreciation constituting the most recent strong dollar episode.



Sources: Federal Reserve Bank of St. Louis, Federal Reserve Economic Data (FRED); and Haver Analytics.
Note: Series retrieved from Haver Analytics, based on the Nominal Advanced Foreign Economies US Dollar Index from FRED, using goods and services trade weights. Values before 2006 are constructed with services trade data estimates from the Federal Reserve Board. Index constructed as the trade-weighted average against the currencies of seven major advanced economies: Australia, Canada, euro area, Japan, Sweden, Switzerland, and the United Kingdom.

[3]The approach is analogous to that involving Solow residuals, which represent the portion of output fluctuations that cannot be attributed to established production factors and are commonly used to measure productivity.

[4]"US dollar index" in this chapter refers to a nominal US dollar trade-weighted index against currencies of major advanced economies. See Figure 2.1 for details.

[5]The chapter defines exchange rates, including bilateral, nominal effective, and real effective, in terms of foreign currency per US dollar, so that an increase represents an appreciation of the US dollar and a depreciation of the foreign currency (or a basket of currencies, in the case of an effective exchange rate).

[6]To boost the sample of advanced economies, those with weights in the US dollar index smaller than 4 percent in 2020 are included in the sample for spillover estimates. Results are robust to excluding such countries from the sample (Online Annex 2.3).

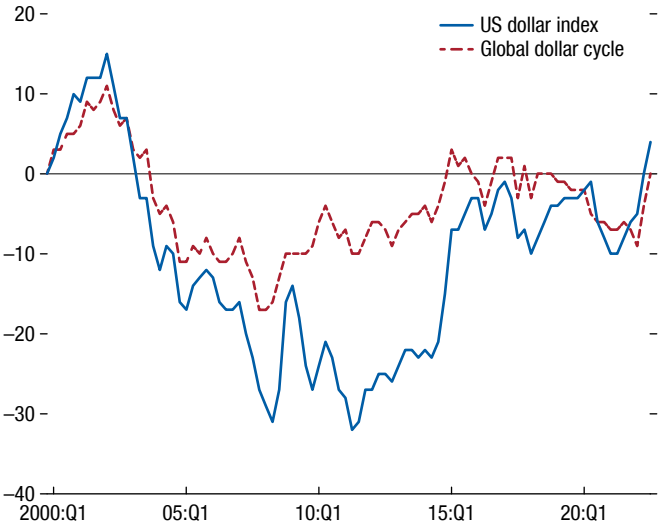
would also be accounted for. The specific explanatory variables used to capture interest rate developments are (1) policy rates, including shadow rates[7]; (2) differences between US policy rates and those of major advanced economies; and (3) an index for US financial conditions to capture longer-term interest rate developments. The estimation further controls for (4) a common component of economic activity in the rest of the world and (5) the lagged change in the US dollar index.[8] Established factors are found to exhibit expected relationships with the US dollar index. For example, a tightening of measured financial conditions is associated with a US dollar appreciation, as is an increase in the policy rate differential in the United States with respect to that in other advanced economies. With the US financial conditions index and the lagged change in the US dollar index making the largest contributions, established factors altogether explain about one-fifth of US dollar fluctuations (see Online Annex Table 2.2.1).

However, a significant unexplained residual in the estimation—labeled "global dollar cycle" in this chapter—remains. This unexplained residual accounts for the bulk of US dollar fluctuations over the last two decades (Figure 2.2). Its correlation with the US dollar index is 84 percent. Zooming in on recent years, the exchange rate movement attributable to established factors, represented in Figure 2.2 by the difference between the US dollar index and the residual global dollar cycle, closely traces exchange rate fluctuations during the 2020–21 pandemic-related downturn and recovery, but the global dollar cycle accounts for a sizable portion of the sharp US dollar appreciation in 2022. Extensive robustness tests, results of which are reported in Online Annex 2.4, show that the estimated role of the global dollar cycle is broadly unchanged under a wide variety of alternative specifications of explanatory variables, including alternative series for monetary policy shocks, alternative horizons for interest rates, and the addition of commodity market developments.[9]

Recent literature views this residual as reflecting global financial market forces. With the rise of financial globalization, the literature has focused on the role of global financial markets in driving and magnifying exchange rate fluctuations, as captured by, for example,

Figure 2.2. The US Dollar Index and the Global Dollar Cycle
(Index, 0 = 1999:Q4)

The global dollar cycle closely tracks movements in the US dollar trade-weighted index against the currencies of advanced economies.



Sources: Federal Reserve Bank of St. Louis, Federal Reserve Economic Data; Haver Analytics; and IMF staff calculations.
Note: Global dollar cycle constructed as cumulated residuals after established factors are controlled for (1) monetary policy, (2) policy rate differences with major advanced economies, (3) US financial conditions, and (4) an economic activity factor.

[7]Shadow rates used are the Wu-Xia shadow federal funds rate (Wu and Xia 2016) for the United States; the LJK Limited shadow rates for Australia, Canada, euro area, Japan, Switzerland, and the United Kingdom (Krippner 2015); and the shadow rate from De Rezende and Ristiniemi (2023) for Sweden.

[8]Online Annex 2.2 reports details on the empirical specification and regression results of this exercise.

[9]However, the analysis refrains from directly including commodity prices or the terms of trade as explanatory variables, as the global dollar cycle (as proxied by risk premium shocks) can be an important driver of commodity prices and, hence, the terms of trade. This channel is confirmed in the FSGM simulations. Furthermore, the focus on the US dollar index against currencies of major advanced economies weakens the applicability of the commonly held assumption that the terms of trade in a small open economy can be treated as exogenous. To account for commodity market developments, robustness tests instead consider global commodity supply shocks, proxied with oil supply shocks (Baumeister and Hamilton 2019), as an additional explanatory variable. Results in Online Annex 2.4 show that in historical data this variable has only a marginal explanatory power. However, this finding does not preclude the possibility that commodity price surges in 2021–22, linked to recovery from the COVID-19 pandemic and Russia's war in Ukraine, have contributed to the strong US dollar.

the portfolio-balance approach to capital flows and exchange rates (see, for example, Gabaix and Maggiori 2015) and renewed interest in the exchange rate disconnect puzzle (Itskhoki and Mukhin 2021). The literature also emphasizes the unique role of the US dollar in global financial markets, linked to safe-haven and liquidity considerations. Financial markets can be a key transmission channel through which conventional macroeconomic shocks and policies (such as monetary tightening) affect the exchange rate (see, for example, Miranda-Agrippino and Rey 2022; and Kalemli-Özcan 2019). Perhaps more important, financial markets can also be a source of financial shocks that trigger short- and longer-term exchange rate fluctuations. An example would be a decrease in investor risk appetite and resulting appreciation of a safe-haven currency, such as the US dollar.[10] A notable empirical challenge for studying the role of financial markets is that the underlying financial shocks that have an impact on the US dollar are not directly observable. The chapter addresses this issue by resorting to identification by exclusion, linking financial market forces to the residual not explained by established exchange rate determinants.

The global dollar cycle can be related to other financial indicators. The chapter examines several measures:

- An index of UIP deviations is found to be strongly positively correlated (69 percent) with the global dollar cycle.[11] During episodes of US dollar appreciations, investments in currencies of other major advanced economies carry excess returns relative to US dollar investments, stemming from decreased risk appetite for other advanced economies, and the opposite is true when the US dollar depreciates. A statistical decomposition reveals that most movements in UIP deviations are associated with the expected rate of exchange rate depreciation[12]; that is, US dollar appreciations coincide with *expected* dollar depreciations, while cross-border interest rate differentials vary relatively less.[13] Zooming in on UIP deviations of individual advanced economy currencies reveals comparable positive correlations for all currencies except the Japanese yen and Swiss franc, which could reflect safe-haven considerations.
- The global dollar cycle shows a strong negative correlation with the global financial cycle, emphasized by Bruno and Shin (2015) and Miranda-Agrippino and Rey (2022) (Table 2.1). The global financial cycle is the global common factor estimated from a worldwide cross-section of risky asset prices, covering equity, bonds, and commodities (Miranda-Agrippino, Nenova, and Rey 2020). Tightening of financial conditions, as captured by a downswing in the global financial cycle, accompanies an upswing in the global dollar cycle.

Table 2.1. Correlates of the Global Dollar Cycle

Comparison of the global dollar cycle with other global financial indicators reveals the strongest correlation with uncovered interest parity deviations and the global financial cycle.

Indicator	Correlation
Uncovered interest parity deviations from major advanced economy currencies	0.69*
Global financial cycle	–0.53*
Chicago Board Options Exchange Volatility Index (VIX)	0.04
Global uncertainty index	0.09

Sources: Consensus Economics; Davis (2016); Federal Reserve Board; Haver Analytics; Miranda-Agrippino, Nenova, and Rey (2020); Refinitiv Datastream; and IMF staff calculations.
Note: Quarterly correlations over 2000:Q1–22:Q4 depending on data availability (global financial cycle variable ends in 2019:Q2).
" * " indicates the correlation is significant at the 1 percent level.

[10]Examples of recent studies that examine financial market shocks include Itskhoki and Mukhin (2021); Devereux, Engel, and Wu (2023); and Lilley and others (2022).

[11]UIP is an arbitrage condition in international financial markets stating that the difference in interest rates between two countries will equal the expected relative change in the exchange rates over the corresponding horizon. Deviations from UIP indicate excess returns in one market, which in the case of US dollar fluctuations could stem from frictions in global financial markets. Online Annex 2.3 reports UIP deviations for individual currencies, along with index construction details. Bilateral deviations of advanced economies included in the US dollar index are aggregated using trade weights to arrive at a measure that can be directly compared with the global dollar cycle.

[12]UIP deviations, λ_t^i, for a foreign currency i against the US dollar, capturing excess returns on the foreign currency, can be statistically decomposed into changes in the interest rate differential between the yields on comparable assets (term in bold) and an expected exchange rate adjustment (bracketed term), expressed as

$$\lambda_t^i = \boldsymbol{i_t^i - i_t^{US}} - \left(\ln\left(E\left(S_{t+k}^{LC/\$}\right)\right) - \ln\left(S_t^{LC/\$}\right)\right),$$

where i_t^i is the interest rate in country i, ln denotes the natural logarithm, $S_t^{LC/\$}$ the nominal exchange rate expressed in terms of local currency per US dollar, and $E\left(S_{t+k}^{LC/\$}\right)$ the expectation of the exchange rate k periods out (the same horizon as the interest rate maturities).

[13]See Online Annex Figure 2.3.2. This is in contrast to UIP deviations in emerging markets, which are predominantly associated with changes in interest rates (Kalemli-Özcan 2019).

- The Chicago Board Options Exchange Volatility (VIX) Index—a measure of US stock price volatility and one of the components of the global financial cycle—has been explored by the literature (di Giovanni and others 2022; Obstfeld, Ostry, and Qureshi 2019) as an indicator of global risk sentiment, but does not correlate significantly with the global dollar cycle for the period of investigation, although a somewhat stronger correlation is present for subperiods. This is due to an already low correlation of 0.2 between the VIX and the US dollar index during our sample period and the fact that the VIX is one among a large set of factors of the US financial conditions index for which the global dollar cycle controls.
- Finally, the global uncertainty index from Davis (2016), which is another news-based indicator of global financial distress, shows only a weak positive correlation with the global dollar cycle.

Overall, the correlation is the strongest with UIP deviations and the global financial cycle.

The chapter interprets underlying global dollar cycle shocks through a prism of UIP deviations that exhibit the strongest correlation.[14] If UIP held, as is the case in standard macro models, the global dollar cycle would show no correlation with UIP deviations. Even when UIP does not hold, US dollar fluctuations need not be systematically related to UIP deviations. Risk premium considerations could be one underlying driver of the correlation. When risk appetite falls, the US dollar appreciates, as it is a relatively safe asset. But reduced risk appetite is expected to be temporary, so there is an expected depreciation of the dollar, which generates the correlation between UIP deviations and the global dollar cycle. Another explanation could be that, when faced with higher demand for US dollars, financial market intermediaries demand a higher expected return for supplying the dollars. Ultimate sources of financial-market-driven US dollar fluctuations remain an active area of research, beyond the scope of the current study. Nevertheless, the chapter will leverage the strong correlation between UIP deviations and the global dollar cycle through two concrete applications. First, simulated risk premium shocks—a candidate source of UIP deviations—in a general equilibrium model can help provide deeper understanding of the channels through which spillovers from the global dollar cycle to emerging markets operate. Second, constructed UIP deviations offer an alternative source of global financial market shocks whose spillovers to emerging markets can be estimated (see Online Annex Figure 2.4.5 for details). The chapter explores both avenues.

[14]The link between US dollar fluctuations and the global financial cycle has been explored in previous work (see, for example, Miranda-Agrippino and Rey 2022 for a survey) and does not have to be mutually exclusive with UIP deviations.

Empirical Analysis: Spillovers from the Global Dollar Cycle

This section examines the differential impact of US dollar appreciations on emerging market and advanced economies, explores the contribution of policies and structural features to negative spillovers to identify potential channels of transmission, and examines the impact of fluctuations in the US dollar index on global current account balances.

Empirical Framework

Following Obstfeld and Zhou (2023), the empirical analysis uses an LP framework (Jordà 2005) to examine the impact of US dollar fluctuations on real, external sector, and financial variables for a sample of countries included in the IMF's External Balance Assessment, subject to the availability of quarterly data. To limit the feedback from the External Balance Assessment sample economies to the US dollar, the analysis uses the first difference of a trade-weighted US dollar index against currencies of major advanced economies as the main regressor of interest and excludes from the sample countries with a weight in the index greater than 4 percent.[15] The empirical framework controls for the established global variables listed in the previous section, covering US policy rates and their differences with those of other advanced economies, US financial conditions, and an economic activity factor for the sample of spillover countries. Such controls further improve the exogeneity of US dollar fluctuations for the analysis of spillovers. In addition

[15]The sample consists of 15 advanced and 19 emerging market economies. It retains advanced economies with a weight in the index of less than 4 percent in 2020 (that is, Australia, Austria, Belgium, Finland, Greece, The Netherlands, Portugal, Spain, and Sweden) to boost the size of the advanced economy sample. The chapter's main findings regarding spillovers are robust to dropping from the sample all economies included in the US dollar index. Online Annex 2.2 reports details on the country sample.

to these global controls, the specification includes a set of lagged country-specific controls—GDP growth, the policy rate, and the bilateral exchange rate against the US dollar—as well as lags of the global control variables, the change in the US dollar index, and the dependent variable. Lastly, as the sample of countries includes potentially heterogeneous smaller advanced and emerging market economies, the empirical framework estimates state-dependent LP, following Ramey and Zubairy (2018), allowing for differential responses for sets of countries split by policy and structural characteristics.[16] Overall, this empirical specification makes it possible to interpret the estimated impulse responses as spillovers from the global dollar cycle discussed in the previous section.

Spillovers to Advanced and Emerging Market Economies

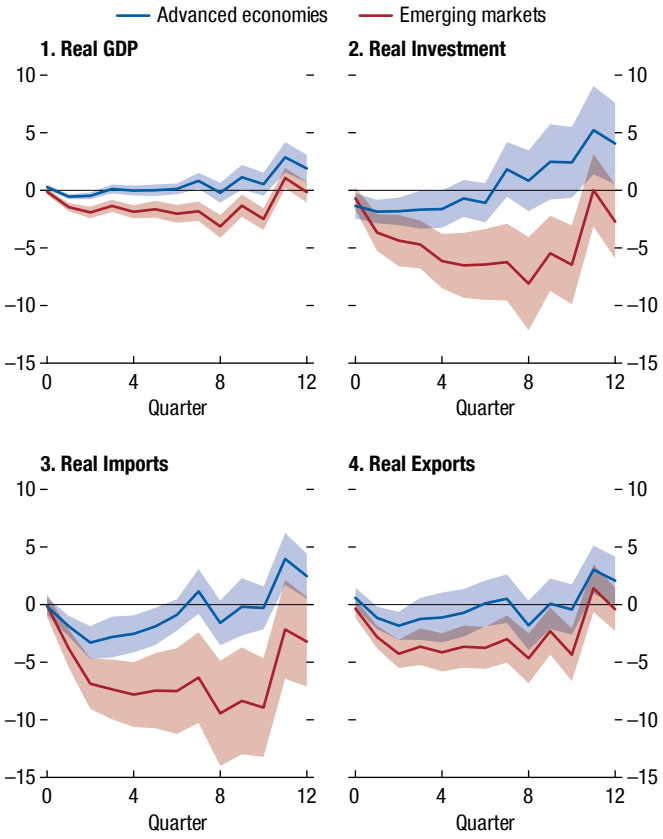
Negative spillovers from a US dollar appreciation are concentrated in emerging markets. Emerging markets experience a deeper and longer-lasting contraction than advanced economies (Figure 2.3, panel 1). An appreciation of the US dollar index by 10 percentage points is associated with a decline in real output by 1.9 percent in emerging markets and 0.5 percent in advanced economies 2 quarters after the initial appreciation. Output in advanced economies recovers 3 quarters after the appreciation, while emerging market output remains depressed 10 quarters out. An outsized decline in real investment in emerging markets drives the differential impact on output (Figure 2.3, panel 2). Trade volumes decline disproportionately more than economic activity for both country groups, with the magnitude of the decline in imports roughly double the decline in exports (Figure 2.3, panels 3 and 4). The chapter's estimated large negative real spillovers for emerging markets confirm the findings in Obstfeld and Zhou (2023) and are consistent with results of several other recent studies, including Druck, Magud, and Mariscal (2018), Shousha (2022), and Fukui, Nakamura, and Steinsson (2023).

In response to US dollar appreciations, the current account, as a share of GDP, increases in both emerging markets and smaller advanced economies. Mimicking output responses, the impact is larger and more persistent for emerging markets (Figure 2.4, panel 3). The impact is sizable in economic terms: a 10 percent appreciation in the US dollar increases the current account after five quarters by about 1 percent of GDP in emerging markets and 0.7 percent of GDP in advanced economies. Further analysis from the saving-investment perspective, linking the current account to changes in investment and saving rates, all expressed in percent of GDP, reveals that a decline in investment drives the current account increases around one year out in both country groups (Figure 2.4, panels 1 and 2). Investment is also the main driver of the divergent longer-term current account response, recovering strongly in advanced economies

[16]Online Annex 2.2 reports details of the regression specification.

Figure 2.3. Spillovers from a US Dollar Appreciation: Macro Aggregates
(Percent change)

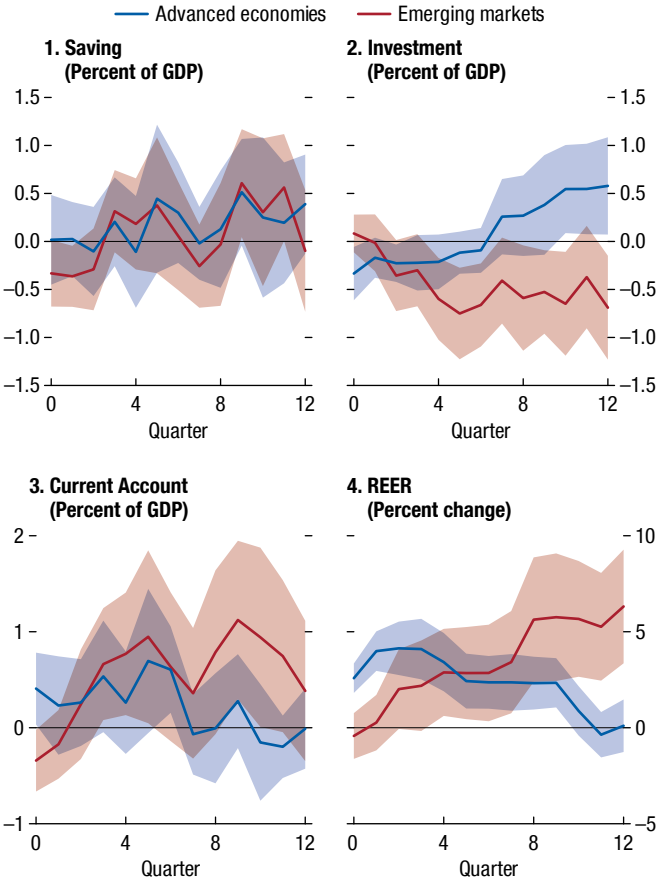
A US dollar appreciation affects emerging markets more adversely than advanced economies.



Source: IMF staff calculations.
Note: Impulse responses show a 10 percent appreciation in the nominal US dollar index with 90 percent confidence intervals. Macro aggregates are measured in national currencies at constant prices. Advanced economies exclude countries with weights in the US dollar index that are larger than 4 percent in 2020: Canada, France, Germany, Ireland, Italy, Japan, Switzerland, and the United Kingdom.

Figure 2.4. Spillovers from a US Dollar Appreciation: External Sector Variables

When the US dollar appreciates, the current account increases in both emerging market and advanced economies, but through distinct channels, as investment is persistently depressed in emerging markets but recovers quickly in advanced economies. Because of "fear of floating," in emerging markets income compression drives the fall in imports and the external adjustment, while in advanced economies depreciation in the real effective exchange rate (REER) and the resultant expenditure switching facilitates the adjustment.



Source: IMF staff calculations.
Note: Impulse responses show a 10 percent appreciation in the nominal US dollar index with 90 percent confidence intervals. An increase in the REER is a depreciation. Advanced economies exclude countries with weights in the US dollar index that are larger than 4 percent in 2020: Canada, France, Germany, Ireland, Italy, Japan, Switzerland, and the United Kingdom.

but remaining depressed for emerging markets. Meanwhile, saving does not reveal a clear systematic response or differences between the two country groups, except for a contemporaneous significant but short-lived drop in emerging markets.

Exchange rate depreciation facilitates external sector adjustment in advanced economies. For this country group, the REER depreciates persistently on impact, allowing the expenditure switching channel to contribute to the external sector adjustment (Figure 2.4, panel 4). Subsequent analysis of the role of exchange rate flexibility (see Online Annex Figure 2.4.2) further highlights the benefits stemming from the shock-absorbing role that the exchange rate plays in response to US dollar appreciations. By contrast, in emerging markets the REER does not respond to a US dollar appreciation on impact, consistent with well-documented fear of floating for this country group and depreciates only gradually over subsequent quarters.[17] In the absence of an exchange rate adjustment, income compression plays an outsized role, driving a large fall in imports.[18]

Net trade in goods and services contributes differently to external sector adjustment in advanced economies and emerging markets. Detailed gross and net trade flow responses reveal that in advanced economies, where (as noted) the REER depreciates on impact, the current account increase is driven mainly by an increase in the services trade balance and, in particular, a boost to service exports, as a share of GDP (see Online Annex Figure 2.4.1). In emerging markets, where (again, as noted) the REER does not adjust on impact, the current account increase is driven mainly by a fall in imports of goods, as a share of GDP, consistent with the income compression channel.[19]

Financial transmission channels magnify the adverse spillovers in emerging markets. Contemporaneously with the US dollar appreciation, capital inflows to emerging markets, both private and public, decline (see Figure 2.5, panels 1 and 2).[20] There is also evidence of systematic negative valuation effects impacting the net international investment position (NIIP) over the examined horizon, as NIIP does not increase despite

[17]Fear of floating here, as well as in subsequent estimation results, is applied in a more expansive manner to refer to all non-floating exchange rate regimes. However, this emerging market REER response is not driven by the sample's limited number of pegged exchange rate observations.

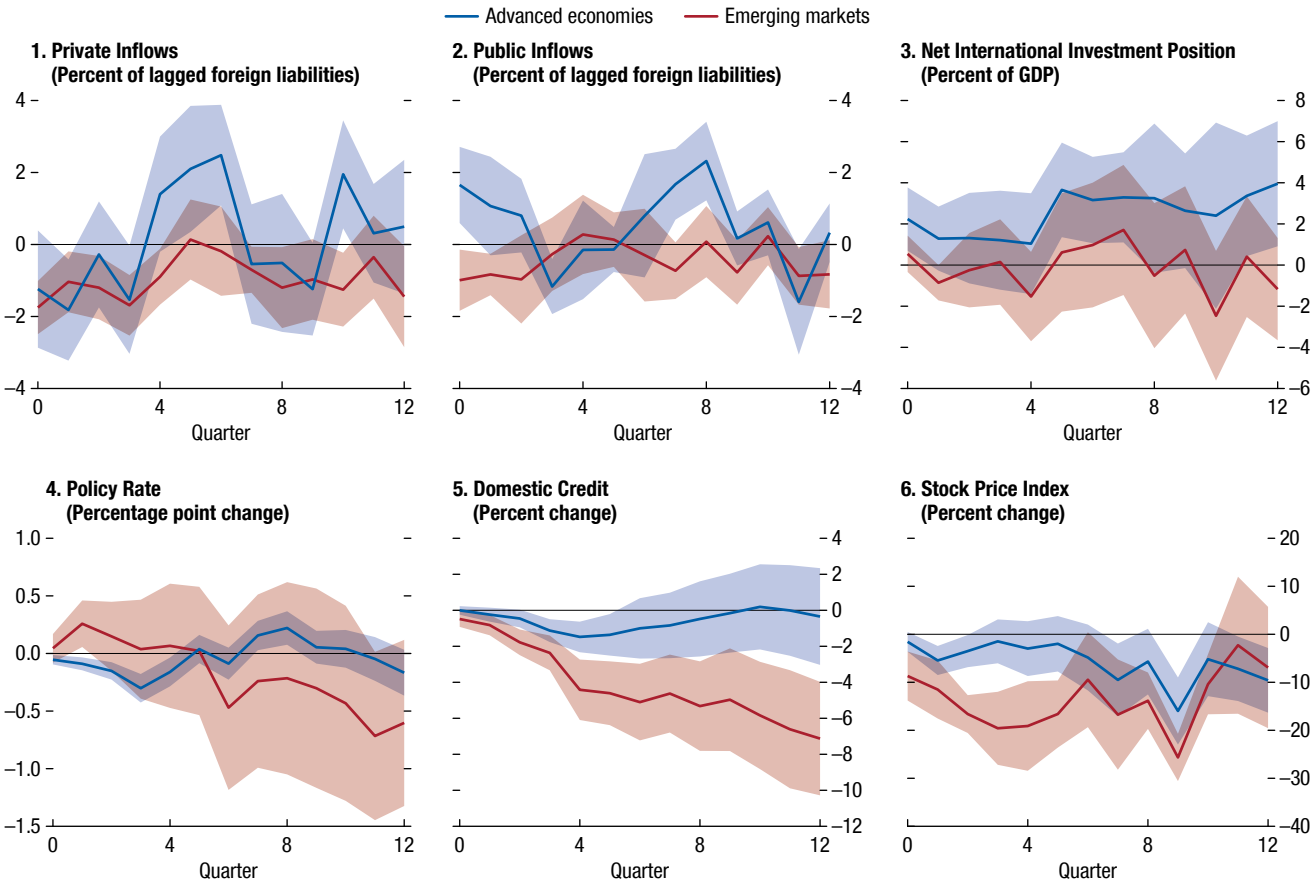
[18]The expenditure switching channel is further hindered by the US dollar invoicing in trade, which is more prevalent in emerging markets (see Online Annex Table 2.4.1 and Gopinath and others 2020).

[19]The fall in imports of goods is observed in all broad economic categories, including capital goods, intermediate consumption goods, and final consumption goods.

[20]Private and public inflows are normalized by lagged foreign liabilities to account for the differences in financial integration across countries.

Figure 2.5. Spillovers from a US Dollar Appreciation: Financial Variables

Advanced economies continue to borrow externally after US dollar appreciations and implement countercyclical monetary policy to mitigate negative spillovers. Neither of these channels operates in emerging markets.



Source: IMF staff calculations.
Note: Impulse responses show a 10 percent appreciation in the nominal US dollar index with 90 percent confidence intervals. Advanced economies exclude countries with weights in the US dollar index that are larger than 4 percent in 2020: Canada, France, Germany, Ireland, Italy, Japan, Switzerland, and the United Kingdom.

persistent current account surpluses (see Figure 2.5, panel 3). These findings contrast with advanced economies, where the NIIP increases, driven by both current account surpluses as well as an initial positive valuation effect stemming from the US dollar appreciation. Furthermore, public capital inflows to advanced economies increase, smoothing the impact of the global dollar cycle. In terms of domestic financial conditions and policies, in advanced economies US dollar appreciations are systematically associated with accommodative monetary policy, mitigating negative spillovers. Accordingly, the decline in domestic credit is shallow and short lived (see Figure 2.5, panels 4 and 5). In contrast, policy rate responses in emerging markets reveal no systematic pattern and are even procyclical on impact.[21] Domestic credit declines persistently, extending beyond the 12-quarter horizon. Stock prices decline by more in emerging markets than in advanced economies (see Figure 2.5, panel 6). These findings are broadly consistent with an extensive literature that has focused on financial transmission channels of global financial shocks to emerging markets (see, for example, Gourinchas 2018; di Giovanni and others 2022; and Kearns and Patel 2016).

[21]Using short-term interest rates instead of policy rates yields similar findings (De Leo, Gopinath, and Kalemli-Özcan 2023).

Table 2.2. Categorization of Countries by Policy Regimes and Structural Characteristics

Policies and Structural Features	Measure	Threshold
Exchange rate regime	The coarse classification from Ilzetzki, Reinhart, and Rogoff (2019)	Freely floating: 4; other regime: 1, 2, or 3
Monetary policy credibility	The country average of the measure in Bems and others (2021)	Median
US dollar liability exposure	The share of foreign liabilities in US dollars from Bénétrix and others (2019)	75th percentile
US dollar export invoicing	The country average of the share of exports invoiced in US dollars from Boz and others (2022)	75 percent of exports
Trade openness	(Exports + Imports)/GDP from the IMF's Balance of Payments Statistics	Median
Commodity exporter/importer	The country median trade balance in all commodities from UN Comtrade	5 percent of GDP

Sources: Bems and others (2021); Bénétrix and others (2019); Boz and others (2022); Ilzetzki, Reinhart, and Rogoff (2019); IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, Balance of Payments Statistics; IMF, Global Data Source; UN, Comtrade; and IMF staff calculations.
Note: Coarse classification categories 5 and 6 are dropped. Countries with a coarse classification of 1, 2, or 3 that are anchored to a currency other than the US dollar that is freely floating against the US dollar are classified as freely floating. Classification into freely floating and other exchange rate regimes is extended through 2021 using the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* as a guide (see Online Annex Table 2.1.1 for details). The country average for the monetary policy credibility measure in Bems and others (2021) and the share of exports invoiced in US dollars from Boz and others (2022) is used for the whole sample period. The US dollar liability exposure classification is kept constant after 2017, given the end date of the measure in Bénétrix and others (2019). The classification of monetary policy credibility, US dollar export invoicing, and commodity exporter/importer do not vary over the sample period. The classification of exchange rate regime, US dollar liability exposure, and trade openness does vary across the sample period.

The Role of Policy Regimes and Structural Characteristics

To investigate why emerging markets experience larger negative spillovers than advanced economies, this section analyzes how US dollar appreciation differentially affects economies based on their policies and structural characteristics. For each factor considered, the analysis estimates state-dependent responses based on a sample split into two corresponding subgroups, mirroring the estimation procedure for the whole sample. The set of examined factors is motivated by the commonly studied policies at countries' disposal and structural characteristics impacted by US dollar fluctuations, including commodity prices and financial and trade exposures to the US dollar (see Table 2.2).

Identifying contributions to spillovers from individual country characteristics presents several challenges. First, the examined characteristics are closely correlated with the split of the sample between emerging market and advanced economies. The issue is most striking for the US dollar liability exposure and the extent of monetary policy anchoring, where, based on categorization in Table 2.2, all of the more exposed and less anchored countries are found among emerging markets. Hence, any identification of these characteristics' contribution to spillovers requires limiting the sample to emerging markets. This issue is a concern for the other examined characteristics as well, except commodity exporter status, which is more evenly distributed within the two country groups (Figure 2.6, panel 1). Second, many of the characteristics are closely correlated with one another, making it difficult to identify individual impacts on spillovers. An instructive example is the relation between exchange rate regimes and the extent of US dollar invoicing of exports; countries with floating exchange rate regimes disproportionately exhibit low shares of US dollar invoicing, while countries with less flexible exchange rate regimes exhibit high shares of US dollar invoicing (Figure 2.6, panel 2). Another important example in this regard relates to commodity-exporting status. Categorization results reveal that commodity-exporting countries are disproportionately associated with less flexible exchange rate regimes and lower trade openness, as well as higher shares of US dollar invoicing in exports and US dollar liabilities.[22]

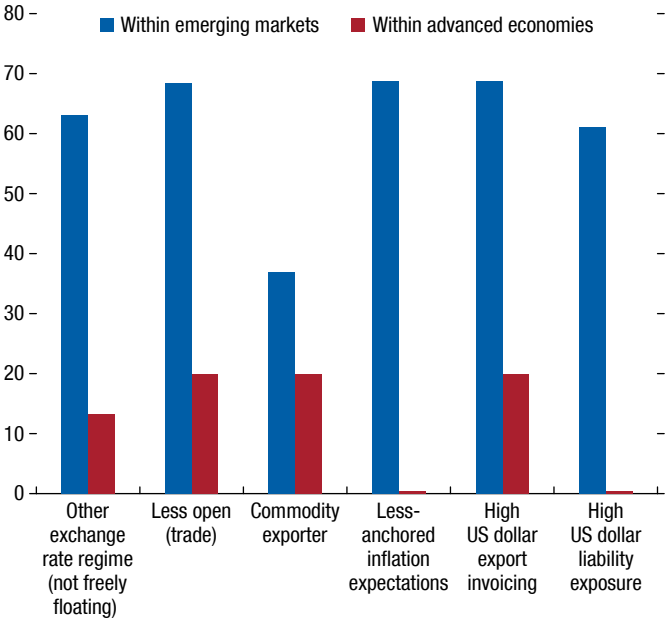
The chapter uses commodity exporter or importer status as a key exogenous structural feature. Using commodity exporter status avoids problems arising from the fact that most characteristics are endogenous, collinear, or both, which complicates identification. Moreover, this status is slow moving over the study's time frame and should arguably not respond to policies and other structural features. The contribution of other characteristics is then estimated, after the role of commodity exporter status is controlled for. Where overlap with the split in the sample between advanced and emerging market economies is severe, estimation is limited to the emerging market sample. Monetary policy credibility is found to be the least correlated

[22]Online Annex Table 2.4.1 details the country composition of each examined policy and structural feature.

Figure 2.6. Country Characteristics

Country characteristics are closely correlated with the split in the sample between advanced economies and emerging markets, complicating the identification of contributions to differential spillovers from a particular characteristic. Some country characteristics are closely correlated with each other, further complicating the identification of the role of an individual characteristic.

1. Share of a Category in a Characteristic by Country Group (Percent)



2. Sample Split Between Categories of Exchange Rate Regime and US Dollar Export Invoicing

	US dollar export invoicing below 75 percent of exports	US dollar export invoicing above 75 percent of exports
Other exchange rate regime		ARG; CHL; COL; ISR; IDN; IND; KOR; MYS; PAK; PHL; RUS; THA
Freely floating exchange rate regime	AUT; BEL; CZE; DNK; ESP; FIN; GRC; HUN; NLD; NOR; NZL; POL; PRT; ROU; SWE; TUR; ZAF	AUS; BRA

Sources: Bems and others (2021); Bénétrix and others (2019); Boz and others (2022); Ilzetzki, Reinhart, and Rogoff (2019); IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, Balance of Payments Statistics; IMF, Global Data Source; UN, Comtrade; and IMF staff calculations.
Note: Advanced economies exclude countries with weights in the US dollar index that are larger than 4 percent in 2020: Canada, France, Germany, Ireland, Italy, Japan, Switzerland, and the United Kingdom. Countries that are not freely floating that are anchored to a currency other than the US dollar, that is freely floating against the US dollar, are classified as freely floating. Data labels in the figure use International Organization for Standardization (ISO) country codes. In panel 2, a country is in the freely floating exchange rate regime category if it spent any part of the sample period in that category.

with commodity-exporting or -importing status and is thus studied separately.[23]

Monetary policy anchoring mitigates negative spillovers from US dollar appreciations by facilitating accommodative policy responses. Emerging markets with more anchored inflation expectations exhibit a shallower initial decline in output. The difference between emerging markets with more and those with less anchored inflation expectations is statistically significant (Figure 2.7, panel 1). When inflation expectations are anchored, the REER depreciates, and the policy rate becomes more accommodative (Figure 2.7, panels 3 and 4). Credibility of monetary policy limits imported inflation (not shown) and thus creates room for these policy adjustments, which support investment rate in the aftermath of the US dollar appreciation (Figure 2.7, panel 2). In contrast, policy rates increase in emerging markets with less anchored monetary policy, though with only marginal statistical significance, and the REER appreciates, rather than depreciating on impact, thereby contributing to larger negative spillovers.

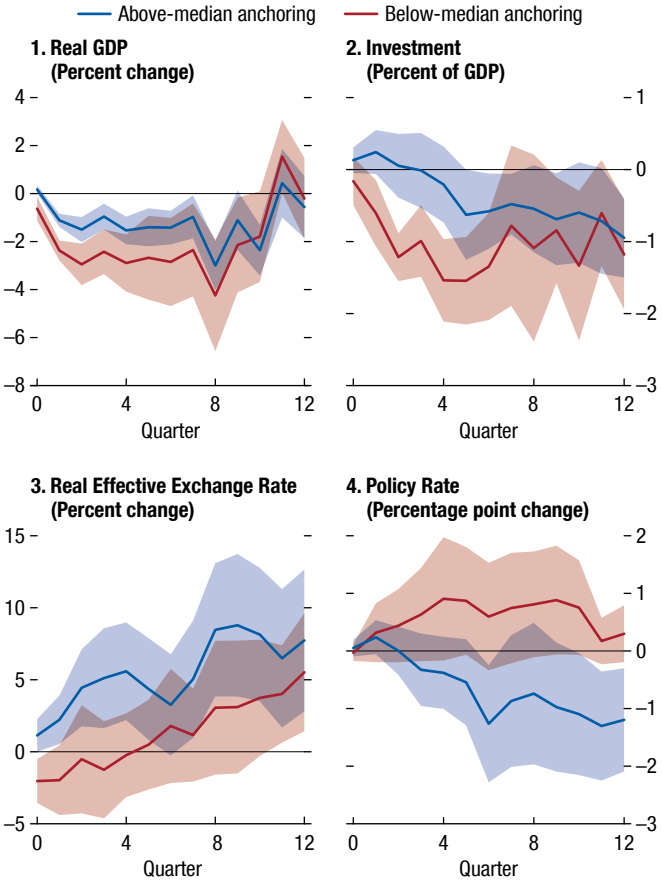
In response to US dollar appreciation, commodity exporters exhibit larger negative spillovers owing to concurrent deterioration in their terms of trade.[24] The magnitude of the terms-of-trade deterioration is sizable and persistent, with a 10 percent US dollar appreciation decreasing the terms of trade by 10 percent after five quarters (Figure 2.8, panel 2). On the flip side, the terms of trade improve for commodity importers. These contrasting terms-of-trade responses drive the difference in spillovers between the two country groups. Commodity exporters smooth the temporary

[23]Controlling for commodity-importing or -exporting status does not change the chapter's findings with respect to the role of monetary policy credibility for spillovers from US dollar appreciations.

[24]A country's terms of trade are defined as the ratio of its export prices to its import prices.

Figure 2.7. Spillovers from a US Dollar Appreciation by Degree of Anchoring of Inflation Expectations

In the aftermath of a US dollar appreciation, investment remains stable in countries with more anchored monetary policy, contributing to a shallower decline in output. More accommodative exchange rate and interest rate responses contribute to more muted negative spillovers.



Source: IMF staff calculations.
Note: Emerging markets sample only. Inflation expectations are anchored when the country average of the measure in Bems and others (2021) is above the sample median. Impulse responses show a 10 percent appreciation in the nominal US dollar index with 90 percent confidence intervals. An increase in the real effective exchange rate is a depreciation.

drop in income by reducing saving and decreasing trade balances (Figure 2.8, panels 4 and 8). For this country group, the current account does not increase in response to the US dollar appreciation (Figure 2.8, panel 3). Notably, there is no evidence that the REER depreciates disproportionately for commodity exporters to compensate for the fall in the price of commodity exports, consistent with fear of floating (Figure 2.8, panel 6). The same holds for the bilateral exchange rate against the US dollar (not shown). The results also reveal no evidence for accommodative monetary policy among commodity exporters (Figure 2.8, panel 7).[25] Overall, the strong negative link between the US dollar and commodity prices is an important cross-border transmission channel for the negative spillovers. The importance of this channel is further highlighted by the 2021–22 strong US dollar episode, which was accompanied by a commodity price surge, rather than a decrease, driven by the unique nature of the pandemic recovery and commodity supply disruptions stemming from Russia's war in Ukraine. An event study of this episode, presented in Box 2.1, reveals that the commodity price surge significantly muted, or even reversed, the negative spillovers from the US dollar appreciation for commodity-exporting countries.

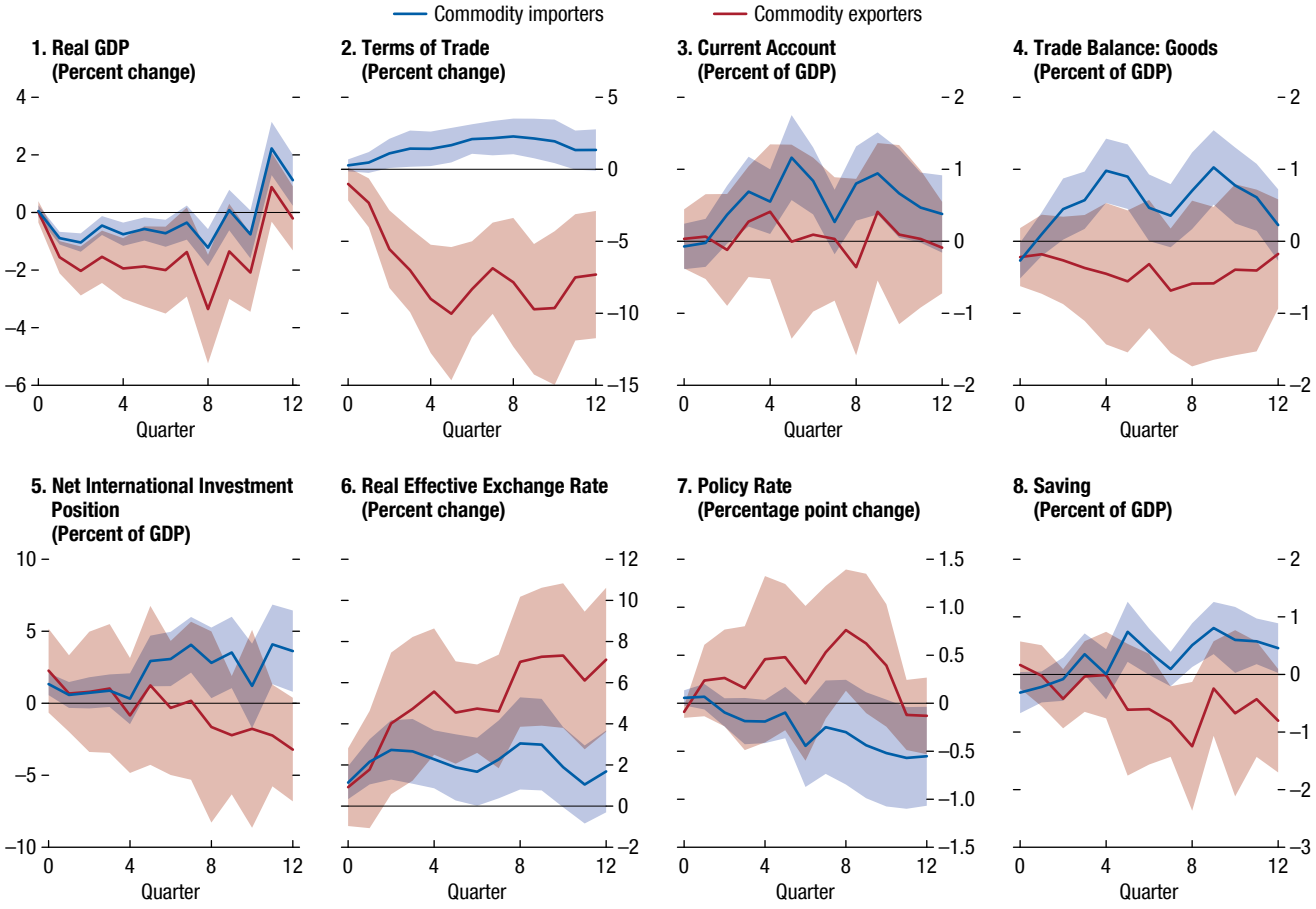
For commodity importers, the improvement in the terms of trade partially offsets the negative spillovers from a US dollar appreciation. The decline in output is shallower and the REER and monetary policy further buffer the impact of the negative shock. The current account increase is magnified, as the initial fall in investment (not shown) is accompanied by a significant increase in saving from the fifth quarter onward, leading to a gradual improvement in the NIIP (Figure 2.8, panel 5).

Among other examined country characteristics, exchange rate flexibility is found to significantly impact output spillovers, after the influence of commodity trade is accounted for. In support of the shock-absorbing properties of flexible exchange rates, emerging markets with freely floating exchange rate regimes exhibit systematically faster recoveries in output than emerging markets with less flexible exchange rates (see Online Annex 2.4 and Online Annex Figure 2.4.2). Current account balances in the latter country group show a larger increase, as both saving increases and investment falls. However, a floating exchange rate

[25]Within the advanced economy sample, accommodative policy responses mitigate negative spillovers from US dollar appreciations to commodity-exporting countries. A more detailed examination of commodity-exporting advanced economies shows more muted negative spillovers, present in the real investment response but absent from the response of output. In this case, the difference with emerging market commodity exporters can partly be explained with policies. Advanced economy commodity exporters exhibit more anchored inflation expectations. Accordingly, after US dollar appreciations and the accompanying fall in commodity prices, these economies allow the REER to depreciate significantly more than commodity importers. Advanced economy commodity exporters also pursue more accommodative monetary policy than commodity importers. Analysis of this subsample provides evidence on how accommodative policies can mitigate negative spillovers from US dollar appreciations.

Figure 2.8. Spillovers from a US Dollar Appreciation by Net Commodity Exporter Status

Commodity exporters are hard hit by a US dollar appreciation as a result of a concurrent deterioration in their terms of trade. On the flip side, the terms of trade improve in commodity importers, which helps counter the effect of the appreciation.



Source: IMF staff calculations.
Note: Full sample. A country is a commodity exporter if its median trade balance in commodities is larger than 5 percent of GDP (UN Comtrade). Impulse responses show a 10 percent appreciation in the nominal US dollar index with 90 percent confidence intervals. An increase in the real effective exchange rate is a depreciation.

regime might not be an option readily available to all countries. Emerging market economies with severe financial frictions and balance sheet vulnerabilities should resort to complementary policy tools, such as macroprudential measures and capital flow management measures, which can play a useful role in mitigating negative cross-border spillovers under limited exchange rate flexibility (see IMF 2020). For such emerging market economies, adopting flexible exchange rate regimes and benefiting from their shock-absorbing properties would have to wait until preexisting structural vulnerabilities are overcome, including by strengthening the domestic financial market and policy framework.

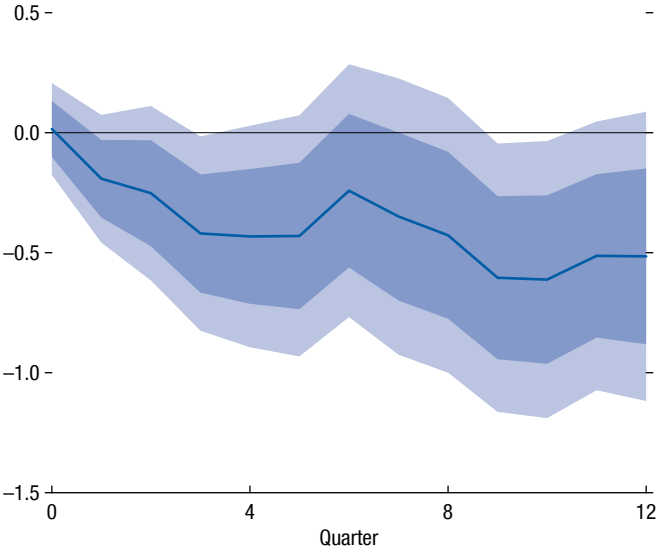
Finally, the focus of this section on commodity exporter or importer status and monetary policy credibility is motivated by concerns about identification of conditional impulse responses to US dollar fluctuations among sample countries of this chapter, which examines aggregate data. It should not be interpreted as evidence that other policies or structural features do not affect spillovers from US dollar fluctuations to emerging markets.

Implications for Global Balances

Beyond negative cross-border spillovers, US dollar appreciations are associated with a compression of global balances. To estimate the impact on global balances, a time-series LP exercise is applied, similar to the panel approach used in this section to estimate

Figure 2.9. Impact of a US Dollar Appreciation on Global Balances
(Percent of GDP)

An increase in the US dollar index leads to a sustained decrease in global balances.



Source: IMF staff calculations.
Note: Impulse responses show a 10 percent appreciation in the nominal US dollar index against advanced economies with 68 and 90 percent confidence intervals in a time series local projections exercise. Controls are the US shadow policy rate, policy rate differentials, the Federal Reserve Bank of Chicago's adjusted National Financial Conditions Index (ANFCI), the economic activity factor for the sample of emerging markets and smaller advanced economies, and lagged US GDP, all in changes and with four lags, including lags of the shock and the global balances variable.

cross-border spillovers.[26] Estimates suggest that a 10 percent appreciation of the US dollar is associated with a decrease in global balances of about 0.4 percentage points after one year (Figure 2.9). The magnitude of the decline is economically significant, as average global balances in the period examined stand at 3.5 percent of GDP, with a standard deviation of 0.7 percent of GDP. The decline in global balances is persistent, with a significant negative effect lasting for up to four years, but reversing thereafter. One possible channel through which a stronger US dollar may reduce global balances is falling commodity prices, as chronic current account surpluses of commodity exporters and deficits of importers are simultaneously reduced. The compression of global balances resulting from US dollar appreciations is also consistent with Gopinath and others (2020), who link a stronger US dollar with lower trade flows in the presence of dominant currency pricing. This effect can be further amplified when US dollar appreciation tightens collateral constraints for importers that borrow in US dollars (Casas, Meleshchuk, and Timmer 2022).

[26]Online Annex 2.2 reports details of the estimation and the sample. The measure of global balances relies on an extended country sample to account for global trends.

Model Simulations: FSGM

Many shocks hit the global economy continuously. The chapter's estimated cross-border spillovers from US dollar appreciations can result from a combination of shocks operating through different channels. This section uses a global general equilibrium model to examine one candidate structural shock—a change in global risk premiums—that may be driving the spillovers. By isolating a specific shock, the model can illuminate the main channels that drive the empirically estimated relationships.

Model Description

FSGM (Andrle and others 2015) is a semistructural multiregion general equilibrium model of the global economy. The framework combines both microfounded and reduced-form formulations of various economic sectors. The analysis presented in this chapter uses the G20MOD module of FSGM, which includes every Group of Twenty (G20) economy. Online Annex 2.5 presents further model details.

The following model features are particularly relevant for the chapter's analysis.

- *Monetary authorities and interest rates*: An interest rate reaction function represents the behavior of monetary authorities. The standard form is an inflation-forecast-based rule operating under a flexible exchange rate, with a higher weight on exchange rate deviations for emerging markets, consistent with fear of floating. The long-term (10-year) interest rate is based on the expectations theory of the term structure, plus a term premium. Interest rates on consumption, investment, government debt, and net foreign assets are weighted averages of the 1- and 10-year interest rates, reflecting their differing term structures and allowing for a meaningful role of the term premium.

- *UIP*: Deviations from UIP in the model are based on risk premiums.[27] Different borrowers (households, firms, government) in the model face varying interest rates depending on their time horizons and risk profiles. The UIP condition holds in the short term only for the sovereign, and only if the sovereign risk premium is set to zero. However, the calibrated model has a nonzero exogenous sovereign risk premium and a term premium on long-term bonds. More generally, a UIP equation holds when all risk premiums are accounted for. The model includes an endogenous corporate risk premium, which depends on the business cycle and on commodity prices. The sovereign risk premium affects all interest rates in the model, while the corporate risk premium affects only those for the private sector. Risk premiums vary across private sector borrowers because shocks affect the cost of financing differently or can apply to different borrowers.
- *Commodity exposure*: Data-driven calibration makes the FSGM particularly well suited to examining the differential impacts of economic disturbances on commodity exporters and importers. The FSGM incorporates three types of commodities: oil, food, and metals and their associated prices. The model is calibrated using countries' commodities production, consumption, and trade. Commodities are priced in the dominant currency: the US dollar.
- *External sector*: Foreign and domestic economic activity and the exchange rate determine exports and imports, with producer pricing assumed. Investment decisions of firms, saving decisions of households, and fiscal policy determine the current account and implied net-foreign-asset positions.

Simulation Setup and Model Results

The chapter's analysis of the global dollar cycle documents its strong association with UIP deviations, suggesting that economic disturbances driving UIP deviations contribute to the cycle. This section takes the UIP deviations as the primitive exogenous shock in the FSGM and studies their implications for cross-border spillovers and key global variables, drawing parallels with empirical findings of the previous section. There are different ways to introduce UIP deviations into the model. The one that most closely links to the chapter's empirical findings is a global (excluding the United States) disturbance to sovereign spreads, so that the direct effect of the disturbance is an increase in financing costs for firms and households.[28]

Figure 2.10 plots impulse responses for key variables of interest to this global persistent 1 percentage point shock to the sovereign premium, reported in the figure's panel 1. To facilitate comparison with the empirical findings, results for the G20 economies distinguish between an aggregated region of advanced economies, excluding the United States, and an aggregated region of emerging markets, with some results further distinguishing between emerging market commodity exporters and importers.

One of the direct effects of the sovereign premium shock is a US dollar appreciation. The shock increases the demand for US dollars by reducing risk-free returns on foreign bonds (short-term interest rates do not immediately change, and the risk premium increases) and creating an incentive to invest in US bonds absent changes in the policy rate (Figure 2.10, panel 2).[29] Another direct effect is an increase in financing costs, which leads to a reduction in domestic consumption, through the channel of intertemporal substitution, as it becomes more costly to borrow to smooth out consumption. The increase in financial costs also lowers investment, and the combined result is a fall in output in the rest of the world (see Figure 2.10, panel 3).[30] Thus, the modeled global risk premium shock generates

[27]At the normative level, there are two distinct approaches for modeling UIP deviations, with differing implications for policy, one based on risk premiums and the other on intermediary frictions. The former approach builds on nondiversifiable risk or reduced appetite for risk but does not feature price distortions. By contrast, the latter approach is based on market distortions, as intermediaries require rents to absorb risk (see, for example, Gabaix and Maggiori 2015), with a potential role for policy. The semistructural FSGM does not feature financial intermediaries, so that UIP deviations are a proxy for risk premiums.

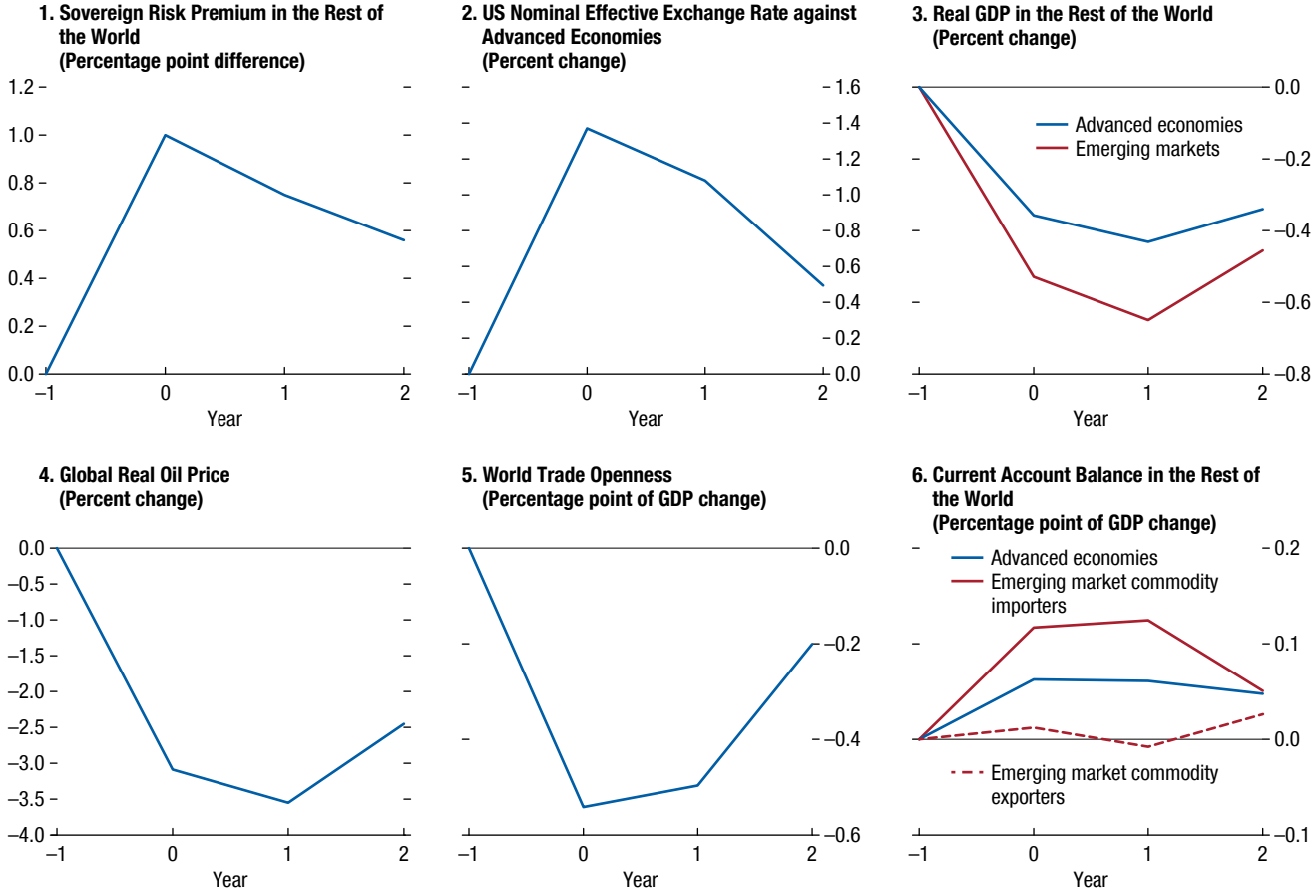
[28]Consistent with empirical literature (Kalemli-Özcan 2019) and findings in Online Annex 2.3, FSGM simulations show that exchange rate adjustment contributes more to UIP deviations in advanced economies than in emerging markets; as in the latter country group, the examined global risk premium shock endogenously triggers other mechanisms that increase the cost of capital, including through lower commodity prices tightening financing conditions.

[29]To facilitate comparison with the empirical findings, the figure reports US dollar index against currencies of other advanced economies, but the US dollar appreciation is broad based. Central banks in advanced economies react to the increase in financing cost by easing policy rates, which contributes to a further US dollar appreciation.

[30]Fiscal automatic stabilizers are allowed to operate and partially cushion the negative effects on activity.

Figure 2.10. Impulse Responses to a Global Risk Premium Shock in the Flexible System of Global Models

The Flexible System of Global Models' response to a global sovereign risk premium shock reveals that a US dollar appreciation is accompanied by (1) a fall in output in the rest of the world, with a more negative impact on emerging markets; (2) a fall in commodity prices; and (3) a contraction in trade openness, while (4) the current account increases in commodity-importing countries. These model results are consistent with empirical findings for spillovers from US dollar appreciations.



Source: IMF staff calculations.
Note: Emerging market commodity importers include China, India, South Africa, and Türkiye; emerging market commodity exporters include Argentina, Brazil, Indonesia, Mexico, Russia, and Saudi Arabia; emerging markets include both of these country groups; advanced economies exclude the United States. In panel 2, an increase equals appreciation.

the empirically observed negative real spillover, linking US dollar appreciations with falling foreign economic activity. The fall is larger in emerging markets mainly because of their more limited exchange rate flexibility (see Figure 2.4, panel 4).

Model simulations also generate a strong negative link between US dollar and commodity prices through the demand channel. As global demand declines, the demand for commodities is depressed and the real price of commodities falls (Figure 2.10, panel 4). For the simulated shock, a 1 percent appreciation in the US dollar is associated with a 2.3 percent decline in commodity prices at a one-year horizon. The more than proportional fall in the commodity price is magnified by the higher commodity intensity in the rest of the world, compared to the United States, and the pricing of commodities in terms of the appreciating US dollar.[31]

As countries invest less, there is a large worldwide drop in imports due to the high import propensity of investment goods. The combined effect of less trade in both commodities and investment goods lowers global trade openness (Figure 2.10, panel 5).

[31]The model decomposition of the quantitative results shows that the US dollar pricing channel accounts for about 10 percent of the overall fall in the commodity price after one year.

The commodity-induced terms-of-trade adjustment benefits commodity importers. As their import values temporarily fall, real income increases and households increase saving to smooth out consumption, representing an income effect. A substitution effect also operates, whereby the temporary fall in commodity prices, by lowering the consumption-based real interest rate households face, increases contemporaneous consumption, reducing saving. In the model calibration these two effects broadly offset one another, and the fall in investment is the main driver of the current account increase (Figure 2.10, panel 6). For commodity exporters, two opposing forces are at work. On the one hand, the rise in the cost of capital and resultant fall in investment increase the current account. On the other hand, falling commodity prices make commodity exporters temporarily worse off, as their export values decrease. This effect is buffered by reduced saving, which decreases the current account. In the model simulation, the investment response and the saving response broadly offset one another, leaving the current account unchanged. Overall, consistent with the empirical findings of the previous section, the current account increases only in commodity-importing countries, more so in emerging market commodity importers because of the larger fall in investment.

It is worth stressing that the model omits several potentially important factors. One relates to additional financial vulnerabilities stemming from balance sheet mismatches and a more nuanced modeling of the degree of central bank credibility, both of which are not captured by FSGM, and could potentially magnify the negative spillovers. Another important caveat relates to the modeling of spillovers. In some models (Georgiadis, Müller, and Schumann 2021), emerging market economies are directly exposed to a fraction of the shock imposed to the sovereign risk premium in an advanced economy. In the FSGM, this spillover is captured by an exogenous shock to financial conditions, representing a shortcut for incorporating financial spillovers not directly modeled but believed to be present in global risk-off episodes.

Conclusion

Negative spillovers from US dollar appreciations are more pronounced in emerging market economies, with larger declines in output that are longer lived compared with those in advanced economies. The current account as a share of GDP increases in both emerging market and advanced economies, with weak investment driving the increase, but the dynamics differ, with investment rebounding in advanced economies but remaining persistently negative in emerging markets. A depreciation in the REER facilitates adjustment in advanced economies. Consistent with fear of floating, the REER does not adjust on impact in emerging markets and depreciates only gradually. Financial channels contribute to the adverse spillovers in emerging markets through reduced capital inflows, both public and private, and a decline in domestic credit. More broadly, global current account balances decline in response to a US dollar appreciation, reflecting a broad-based contraction in trade, facilitated by a fall in commodity prices.

Commodity exporter status magnifies spillovers from a US dollar appreciation. Given the historically negative relationship between commodity prices and the US dollar index, a US dollar appreciation is accompanied by deteriorating terms of trade for commodity exporters. In the absence of a real exchange rate depreciation that could buffer both shocks, emerging market commodity exporters smooth the temporary drop in income through reduced saving and decreased current account balances. In contrast, commodity importers experience improved terms of trade, which partly offsets the negative spillovers from the US dollar appreciation. In 2021–22, in contrast to the historical evidence, the simultaneous strengthening of commodity prices and the US dollar mitigated the impact to the US dollar appreciation on the vulnerable emerging market commodity exporters.

Policies can mitigate negative spillovers from US dollar appreciation to emerging markets. More anchored inflation expectations mitigate the negative effect on real output through accommodative policy responses, as the real exchange rate depreciates and policy rates decrease. A more flexible exchange rate regime systematically speeds up economic recovery. Implementation of such policies should be supported by complementary factors. Flexible exchange regimes can be supported and facilitated by domestic financial market development that helps deepen foreign exchange markets and expand foreign exchange hedging options (IMF 2020). The anchoring of inflation expectations can be strengthened by a sustained longer-term commitment to improving fiscal and monetary frameworks, including through ensuring a well-balanced mix of fiscal and monetary policies, consolidating and

enhancing central bank independence, and continuing to strengthen the transparency and effectiveness of communications (see Chapter 3 of the October 2018 *World Economic Outlook*). More broadly, findings of this chapter highlight the importance of precautionary policy tools, such as global safety nets as well as Integrated Policy Framework-linked policy tools (IMF 2020), in addressing global financial market cycles and their spillovers. In emerging markets with severe financial frictions and balance sheet vulnerabilities, macroprudential and capital flow management measures could help mitigate negative cross-border spillovers under the global dollar cycle.

Beyond these policy recommendations for emerging markets to manage the spillovers from the global dollar cycle, an analysis of multilateral policy that could affect the global dollar cycle would require a deeper understanding of UIP deviations, which this chapter has uncovered as a key driver of the global dollar cycle. UIP deviations can be attributed to the market-wide risk appetite and variations in the risk premia demanded by global financial intermediaries, which in turn reflect intermediary frictions, including spillover from financial regulation in other segments of the financial system. One indirect contribution of the chapter is to bring attention to these issues that warrant further research and would enrich policy analysis. Concrete avenues for such research would include understanding the spillover of national and global regulation of financial intermediaries as well as examining sources of intrinsic fluctuations in the market-wide risk appetite.

Box 2.1. The 2021–22 Strong-Dollar Episode and Spillovers to Commodity Exporters

Historically, US dollar appreciations have been accompanied by significant declines in commodity prices, as captured by the negative comovement between the two variables.[1] The recent 2021–22 strong-dollar episode stands out in this context because of the marked surge in commodity prices, linked to recovery from the COVID-19 pandemic and to Russia's war in Ukraine.

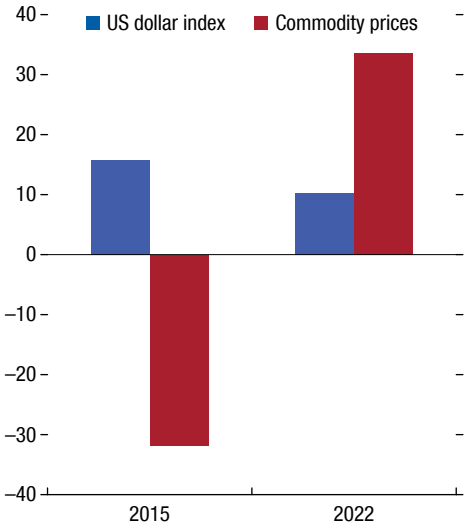
This box presents results of an event study contrasting the most recent US dollar appreciation with the only comparable year-over-year US dollar appreciation in the post-2000 period, which took place during 2014–15 (Figure 2.1.1):

- 2014–15 episode: The US dollar index appreciated by 16 percent, while commodity prices fell by 32 percent, in line with the historical relationship between the two variables (see Figure 2.1.1).[2]
- 2021–22 episode: The US dollar index appreciated by 10 percent, while commodity prices *increased* by 34 percent. A comparable simultaneous large and persistent positive comovement in the two variables has not been observed in recent decades.

How did cross-border real output spillovers from the US dollar appreciation differ for these two episodes? The study proxies output spillovers with real GDP forecast errors for each episode, constructed as actual GDP for 2015 and 2022 minus the GDP forecast prior to the US dollar appreciation (Figure 2.1.2).

Results reveal reversed spillovers to emerging market commodity exporters for the recent strong-dollar episode. In 2015, the US dollar appreciation was associated with systematic negative revisions to output for commodity exporters, more so for exporters with larger commodity trade surpluses (see Figure 2.1.2). Notably, the negative spillovers were driven entirely by emerging market commodity exporters, while there were no systematic negative GDP forecast errors for advanced commodity-exporting economies. These findings are broadly consistent with the outsized negative spillovers for emerging market commodity exporters, compounded by less flexible exchange rate regimes (see Figure 2.8).

Figure 2.1.1. US Dollar Index and Commodity Prices
(Percent change, year-over-year)



Sources: Federal Reserve Bank of St. Louis, Federal Reserve Economic Data (FRED); Haver Analytics; IMF, Global Data Source; and IMF staff calculations.
Note: Percent change is calculated using the year average for monthly data between 2015 (2022) and 2014 (2021).

In 2022, by contrast, the real GDP of emerging market commodity exporters was systematically revised upward following the US dollar appreciation, with the notable exception of Russia. Meanwhile, small downward revisions were observed for advanced commodity-exporting economies.

Findings of this event study suggest that emerging market vulnerabilities from the most recent US dollar appreciation episode require a nuanced interpretation. The accompanying surge in commodity prices—uncharacteristic by historical standards and triggered by unique circumstances—mitigated the impact of the US dollar appreciation on the more vulnerable commodity-exporting emerging markets during 2022. Instead, the negative spillovers fell disproportionately on emerging market commodity importers. However, the vulnerability of commodity importers was muted by their more limited exposure to commodities, when compared to commodity exporters (see *x*-axis range in Figure 2.1.2), and their more flexible exchange rate regimes. A return to the historically observed relationship between the US dollar and commodity prices could reverse the mitigating role that commodity prices played in 2022.

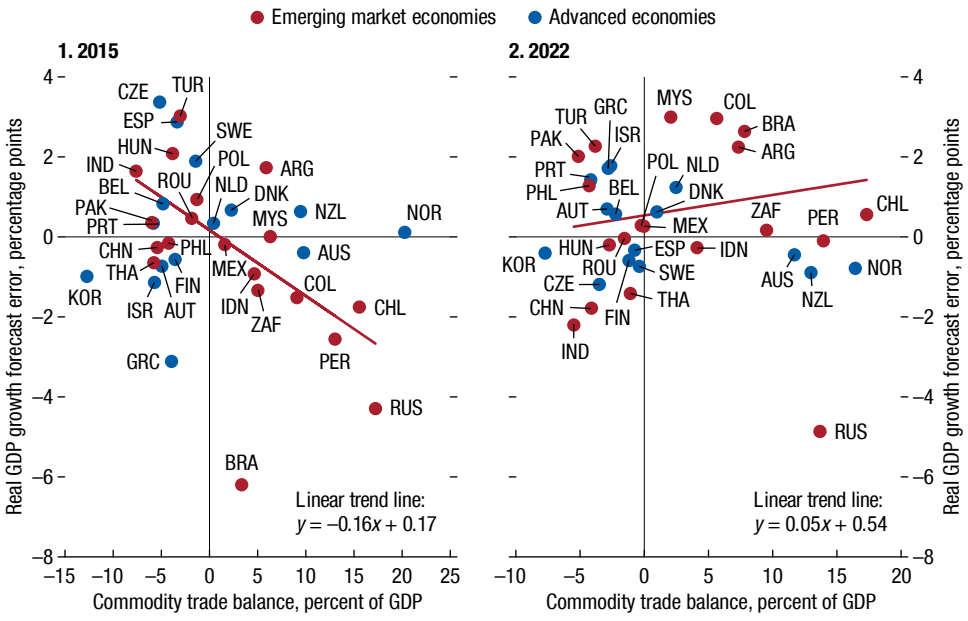
The authors of this box are Cian Allen, Rudolfs Bems, Lukas Boer, and Racha Moussa.

[1]The correlation between the US dollar index and commodity prices for the sample period is –0.38.

[2]Obstfeld (2022) reports a coefficient of –2.45 (standard error of 0.42, R^2 = 0.15) for a simple ordinary least squares regression of the oil-price change on dollar appreciation.

Box 2.1 *(continued)*

Figure 2.1.2. Real GDP Growth Revisions for Two Large US Dollar Appreciation Episodes



Sources: IMF, World Economic Outlook database; and IMF staff calculations.
Note: The forecast error for real GDP growth in 2015 is calculated as actual minus the IMF *World Economic Outlook* data for April 2014. The forecast error for real GDP growth in 2022 is calculated as the IMF *World Economic Outlook* data for April 2023 minus that for January 2022. Commodity trade balance is defined as the ratio of commodity exports to GDP minus the ratio of commodity imports to GDP. Trend line includes only emerging market economies. For 2015, the trend line excludes Brazil, and the coefficient is statistically significant at the 5 percent level. For 2022, the trend line excludes Russia. Data labels in the figure use International Organization for Standardization (ISO) country codes.

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