Unveiling the Dance of Commodity Prices and the Global Financial Cycle*

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Abstract

We investigate the effects of changes in commodity prices on the business cycles and capital flows of emerging market and developing economies (EMDEs). Our findings reveal that surges in export prices, triggered by commodity price shocks, boost domestic GDP, an effect further amplified by the endogenous decline of EMBI spreads. However, the effects on capital flows appear muted. Shifts in U.S monetary policy and global risk appetite drive the global financial cycle in EMDEs. Eased global credit conditions, attributed to looser U.S. monetary policy or lower global risk appetite, lead to a raise in export prices, higher output, decreases in EMBI spreads, and stimulate greater capital flows. To thoroughly understand the impact of commodity price fluctuations on EMDEs' business cycle and capital flows, it is crucial to acknowledge the significant role of global financial conditions and global economic activity in driving commodity price dynamics.

JEL Classification: F41, F44, E32
Keywords: Commodity Prices, Emerging Market and Developing Economies, Global Financial Cycle, Terms of Trade.

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1 Introduction

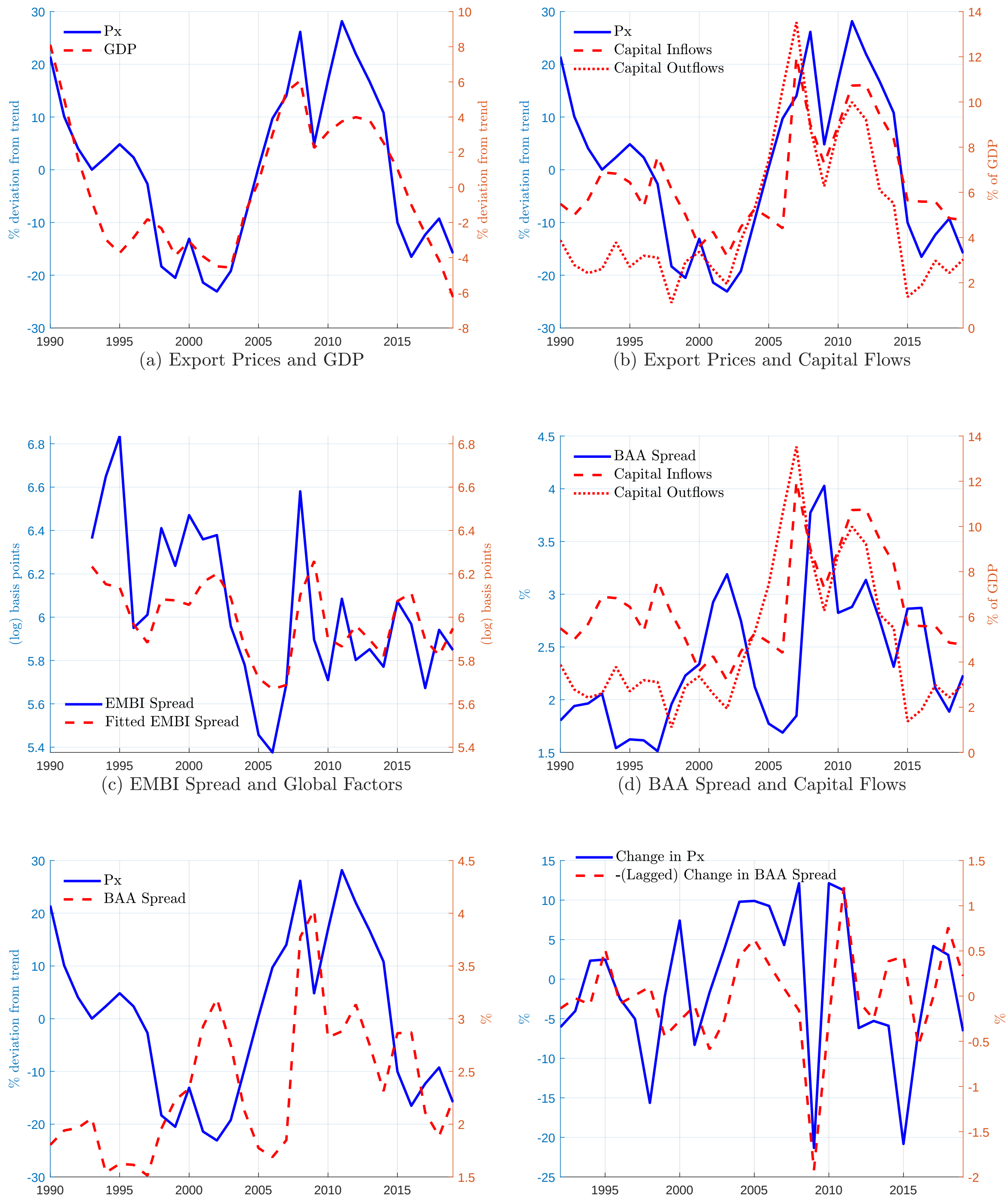
Emerging market and developing economies (EMDEs) are highly vulnerable to the dynamics of global economic conditions, with commodity price fluctuations acting as drivers of business cycles and capital flows (Reinhart and Reinhart, 2009; Reinhart, Reinhart, and Trebesch, 2016). This interplay arises primarily due to EMDEs' extensive reliance on raw commodity exports. As a result, shifts in commodity prices primarily manifest as export price fluctuations, the impacts of which propagate through terms-of-trade channels (Di Pace, Juvenal, and Petrella, 2020; Fernández, González, and Rodríguez, 2018) and potentially affecting debt financing costs (Drechsel and Tenreyro, 2018). Rey (2013) emphasizes the importance of acknowledging common determinants driving the coordinated ebbs and flows of capital, asset price fluctuations, and crises worldwide—phenomena collectively known as the Global Financial Cycle (GFC). The GFC has traditionally been linked to shifts in U.S monetary policy and to changes in risk aversion and uncertainty (Bruno and Shin, 2014; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020). However, more recently, Davis et al. (2021) and Miranda-Agrippino and Rey (2021) underscore commodity prices as a potential engine of the GFC.

In order to shed light on main stylized facts underscoring the significance of commodity price movements for business cycle fluctuations, capital flows, and their interplay with the GFC, we present a collection of main indicators in Figure 1. These metrics are derived as average measures, encompassing the countries in our sample. Figure 1, Panels a and b, illustrate the key role of export price booms (and busts) in driving business cycles, and their strong association with surges (and flights) of capital flows in EMDEs. Increase in commodity prices and improved global financial conditions are associated with lower sovereign spreads. In fact, most of the common variation in domestic financing conditions can be explained by a combination of these two global factors (Panel c).

Capital flow movements in EMDEs are also closely tied to global financial conditions: heightened worldwide financial stress typically triggers capital flights from EMDEs (Panel d). However, export prices do not show a pronounced correlation with global financial conditions (Panel e). This reflects two elements of the global financial cycle: one associated with global risk and financial stress, and the other typifying the fluctuations in commodity prices (Davis et al., 2021; Miranda-Agrippino and Rey, 2021). Nonetheless, changes in global financial conditions predict export price movements (Panel f), underpinning a powerful interplay between these two drivers of the GFC. An initial examination of the raw data underscores the pivotal role that commodity price fluctuations play within this dynamic for EMDEs. However, to truly grasp the impact of commodity price fluctuations on the business cycle and capital flows in EMDEs, it is essential to recognize the pervasive influence of global financial conditions and global economic activity, as drivers of commodity price fluctuations.

This paper investigates the role of commodity prices in shaping the business cycle and driving capital flows to EMDEs. Figure 2 presents a comprehensive conceptual framework for the subsequent analysis. As depicted in the center of the chart, commodity prices are intrinsically linked to global demand conditions and global financial conditions. Higher global growth boosts the demand for commodities, leading to an increase in their prices. This mech-

Figure 1: Motivating Evidence



(a) Export Prices and GDP

(b) Export Prices and Capital Flows

(c) EMBI Spread and Global Factors

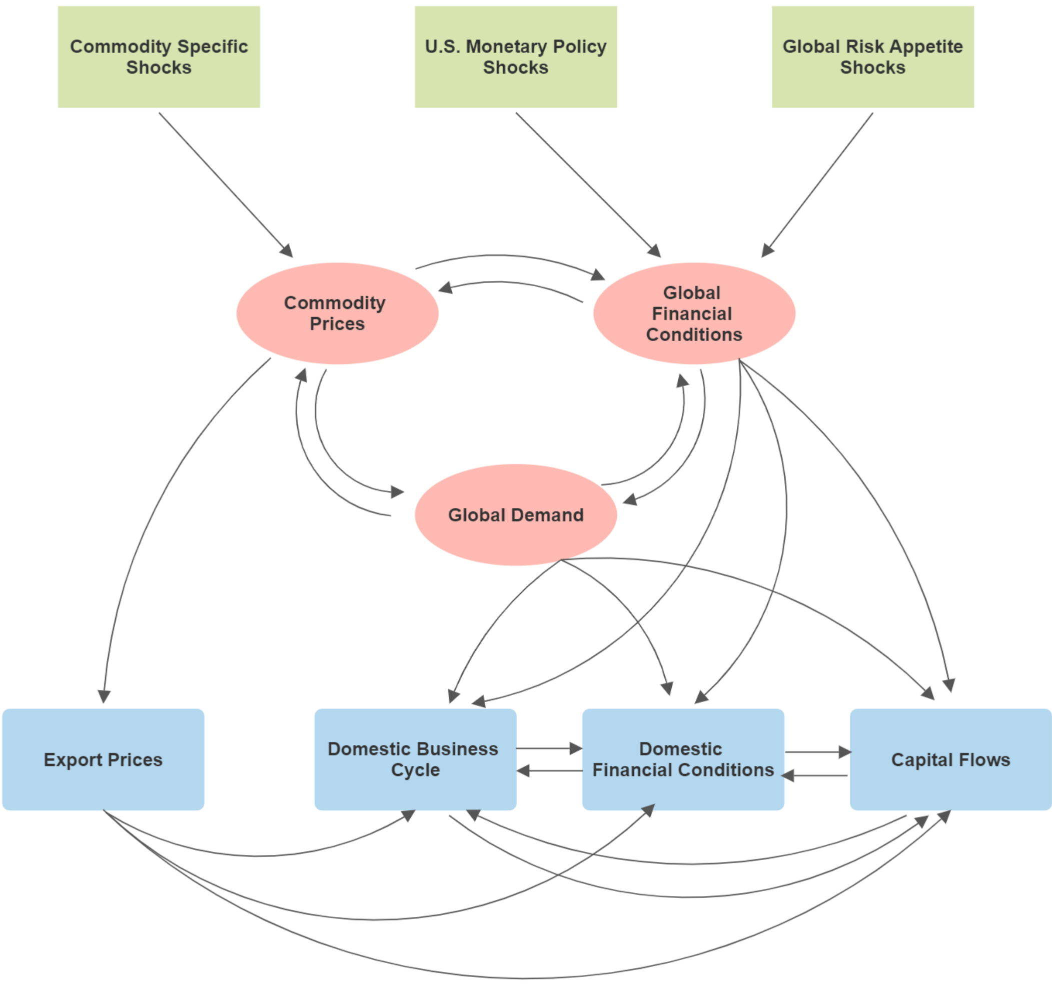
(d) BAA Spread and Capital Flows

(e) Export Prices and BAA Spread

(f) (Change in) Export Prices and BAA Spread (t-1)

Notes: Export prices and GDP are presented in percent of log deviation from quadratic trend. Capital inflows and outflows are presented as a ratio with respect to the trend of GDP in U.S. dollars. The BAA spread is in percent and the EMBI spreads are reported in logs of basis points. All the variables (except the BAA spread) are plotted as an average for the countries in our sample. Panel (c) reports the (cross-sectional) average of the (log) EMBI spreads against the fitted value of the same variable from a linear regression using the BAA spreads and the (detrended) log of the price of exports for each of the countries in the sample.

Figure 2: Transmission of Global Shocks



Notes: This flowchart delineates the conceptual framework for the transmission channels of each global shock analyzed.

anism is thoroughly explained in Di Pace et al. (2020).[1] Moreover, a decrease in interest rates and improved financial conditions, in general, reduce inventory-holding costs, fueling the demand for commodities and causing their prices to rise (Frankel, 1986, 2008).[2] Global financial conditions, in turn, affect global economic activity (see, e.g., Caldara et al., 2016) and through this channel also commodity prices. Simultaneously, fluctuations in commodity prices shape global demand both directly, as demonstrated in studies on oil prices (Hamilton, 1983) and agricultural prices (De Winne and Peersman, 2016), and indirectly. Higher commodity prices can trigger domestic inflation in major economies, prompting central banks to respond (Mishkin, 2007; Bodenstein et al., 2008), consequently affecting global financial conditions and global demand.

Given that EMDEs heavily depend on raw commodity exports, export prices play a crucial role in transmitting shifts in commodity prices, as outlined in Di Pace et al. (2020).[3] As illustrated in the lower part of Figure 2, shifts in export prices directly influence domestic GDP through terms-of-trade channels and indirectly via changes in domestic financial conditions. Specifically, an increase in export prices can enhance a country's financial stability, reduce default risk, and consequently narrow the interest rate spread (see Drechsel and Tenreyro, 2018; Hamann et al., 2023). Therefore, fluctuations in export prices have the potential to attract capital inflows, which, in turn, can further affect domestic business cycles. Additionally, commodity prices could indirectly affect domestic business cycles, financial conditions, and capital flows in EMDEs due to their effects on global demand and financial conditions, as previously elaborated.

To understand the significance of commodity price fluctuations for EMDEs, we proceed in two steps. First, we examine the role of commodity price shifts associated with exogenous shocks to commodity markets. Specifically, we identify the causal impact of a shift in commodity prices triggered by exogenous events such as weather shocks, geopolitical incidents or natural disasters that directly affect commodity prices. Second, we investigate how the endogenous response of commodity prices contributes to the transmission of improved global financial conditions to EMDEs. In particular, we focus on the transmission of shocks from U.S. monetary policy and shocks related to global risk appetite, which have been identified as important drivers of the GFC. We find that shifts in commodity prices play a central role in the transmission and amplification of the effects of global shocks to EMDEs.

We rely on the panel local projection (LP) method with instrumental variables (IV) augmented to incorporate the Kitagawa-Blinder-Oaxaca decomposition, KBO hereafter (Cloyne et al., 2023; Jordà et al., 2020). The KBO decomposition allows us to examine the responses heterogeneity over time and over states of the economy. To instrument export prices we use major events in commodity markets, exogenous to individual countries. To translate an event into an instrument we construct a metric of surprise for each event which allows us to isolate

[1] The specific link between global demand and commodity prices has been documented in Alquist et al. (2020), Juvenal and Petrella (2015). Kilian (2009) makes a strong case for the importance of shifts in global demand to explain fluctuations in oil prices.

[2] Frankel and Rose (2010) and Frankel (2014) provide evidence on this channel.

[3] Note that import prices may also influence this transmission, although Di Pace et al. (2020) emphasizes that this channel has a lesser impact on EMDEs.

commodity price shocks from movements in commodity prices that are linked to global conditions. We use the BAA spread as an indicator of the global financial cycle, instrumented with a proxy for U.S. monetary policy and also with uncertainty shocks.

We find that increases in commodity prices stemming from significant idiosyncratic events in commodity markets yield a robust positive impact on output and an increase in foreign exchange reserves. Interestingly, these commodity price shocks trigger a relatively muted response of capital flows. Therefore, this pattern does not replicate the comovement between capital inflows and outflows evident in the raw data. These results suggest that, while commodity price shocks are potent forces driving business cycles, their impact on the capital flows cycle in EMDEs is not as pronounced. We find that, on average, the increase in export prices driven by commodity price shocks leads to a small contraction in the EMBI spread. However, it is crucial to acknowledge the significant role of the EMBI spread's endogenous response in amplifying the transmission of commodity price shocks. In fact, countries experiencing a more substantial contraction in the EMBI spread during commodity booms tend to display higher increases in GDP.

We then drill deeper into the role of commodity prices as a conduit in transmitting global shocks. Using the BAA spread as a proxy for the global financial cycle, we argue that it is imperative to distinguish between its primary drivers. We focus on two of them: U.S. monetary policy shocks and shifts in global risk appetite (see, e.g., Habib and Venditti, 2019). Movements in the BAA spread associated with looser U.S. monetary policy lead to a sustained, hump-shaped increase in export prices and GDP. In fact, countries with sustained export price surges due to heightened global economic activity (often because their export sector is more concentrated on highly cyclical commodities) experience higher increases in GDP. These shocks also reflect into a decline in the EMBI spread and lead to higher capital flows. Notably, we observe significant capital outflows, which appear to be predominantly associated with the banking sector's activities, falling under the "other investment" category.

Our results indicate that reductions in the BAA spread triggered by lower global risk appetite and financial uncertainty, generate a surge in export prices. This surge is associated with a marked and sustained expansion in domestic GDP and a large albeit temporary decrease in EMBI spreads (consistent with Gilchrist et al., 2022). We also find that GDP increases by more the larger the decline in the EMBI spread. This shock leads to pronounced increases in both capital inflows and outflows - particularly in portfolio flows. The response pattern maps the comovement we observe in the raw data and shown in Figure 1.

While the transmission of the two shocks linked to the BAA spread share qualitative similarities, the strength of their channels of transmission is different. The extent of U.S. monetary policy transmission to EMDEs can vary considerably, largely depending on the intensity of the response in export prices. Conversely, the transmission strength of global risk appetite shocks seems to be propagated more through financial channels and hinges on the endogenous, varying response of EMBI spreads. For both types of shocks, we document a pronounced negative comovement between export prices and the EMBI spread. This relationship is important when considering the formulation of appropriate policy responses to global shocks (see, e.g., Drechsel et al., 2019; Frankel, 2010; Kaminsky, 2010).

Our findings highlight the critical role of commodity prices, serving as a significant channel for the transmission of world shocks to EMDEs. This paper contributes to the literature that analyzes the impact of commodity price fluctuations on business cycles (Di Pace et al., 2020; Fernández et al., 2017; Schmitt-Grohé and Uribe, 2018) and capital flows in EMDEs (Reinhart and Reinhart, 2009; Reinhart et al., 2016). It also connects with the literature that underscores the relationship between export price surges and borrowing cost reductions - the financial channel, as highlighted by Drechsel and Tenreyro (2018) and Hamann et al. (2023). Our analysis aligns with studies emphasizing the significant role played by commodity prices in the propagation of the GFC (Davis et al., 2021; Miranda-Agrippino and Rey, 2021). More broadly, we contribute to the literature that investigates the drivers of the GFC. This is typically split into studies focusing on the role U.S. monetary policy (Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020), and those emphasizing fluctuations to shifts in global risk perceptions (Bruno and Shin, 2014; Forbes and Warnock, 2012; Obstfeld and Zhou, 2023). Our work stands out by carefully distinguishing between these two channels and, most importantly, demonstrating how their transmission mechanism to EMDEs hinges on the endogenous responses of commodity prices. Our findings provide significant insights into the transmission of global shocks that fall beyond the scope of our analysis, such as the impacts of China's monetary and credit policies (see, e.g., Barcelona et al., 2022; Miranda-Agrippino et al., 2020). These policies, by exerting influence on global demand and global financial conditions, have a direct impact on fluctuations in commodity prices. Consequently, through this channel, they also affect EMDEs.

The paper is organized as follows. Section 2 presents the data and Section 3 details the research design and the identification strategy. Our empirical methodology and baseline results are shown in Section 4 while Section 5 includes extensions and robustness. Section 6 discusses the presence of regime asymmetries. The interaction effects are presented in Section 7 and Section 8 concludes.

2 Data

The estimation period runs from 1990 to 2019. The yearly dataset covers 54 emerging and developing countries. Within this category, 32 belong to the upper middle income group, 15 to the lower middle income group, and 10 to the low income group. The sample of countries covers all the regions in the world. The dataset includes information on output, real exchange rates, domestic interest rates, capital flows, EMBI spreads, BAA spreads, and export prices. The selection of countries is dictated by data availability, taking into account that EMBI spreads are only available from the 1990s.

The sources of data and details on coverage are presented in Appendix A. Country-specific real GDP is sourced World Bank's World Development Indicators (WDI) database. Gross capital inflows and outflows data are obtained from the International Monetary Fund (IMF) International Financial Statistics (IFS). In line with the literature, we use the standard balance of payments definitions and terminology on capital flows (e.g. Avdjiev et al., 2022; Forbes and Warnock, 2012) such that *inflows* are defined as net inflows from foreign residents into the domestic economy and *outflows* are defined as net outflows from domestic residents to the rest of the world. We refer to the difference between capital inflows and outflows, as net inflows.[4] International capital flows (acquisition of claims) are broken down into several categories: direct investment; portfolio investment (equity and debt); other investment, which is mainly bank-related; and foreign exchange reserves, which is a category that only exists for outflows. The interest rate is the Central Bank Policy Rate and is sourced from the IFS and Haver. Emerging market sovereign spreads are measured as spreads over Treasuries of J.P. Morgan EMBI global diversified index obtained from Datastream, Bloomberg, and J.P Morgan. BAA spreads are from the Federal Reserve Bank of St. Louis FRED.

We compute country-specific export price indices denominated in U.S. dollars using sectoral export shares, commodity prices, and disaggregated U.S. PPI data as a proxy for manufacturing prices. Export shares are calculated based on disaggregated product export values sourced from the MIT Observatory of Economic Complexity.[5] Commodity prices are obtained from the World Bank's Commodity Price Data. The U.S. PPI for manufacturing categories and the U.S. CPI are sourced from the Federal Reserve Bank of St. Louis FRED. In our empirical analysis we deflate export and import price indices by the U.S. CPI, and therefore consider real dollar export prices (hereafter denoted as Px). The methodology for calculating this index follows the recommendations of the IMF Export and Import Prices Manual and is explained in Di Pace et al. (2020).[6]

3 Identification

The main purpose of the empirical analysis is to investigate the role of world shocks in shaping the business cycle of emerging market economies. Specifically, we are interested in the impact of commodity price fluctuations and global financial conditions.

We use the price of exports as the primary channel through which fluctuations in commodity prices are transmitted to EMDEs. In fact, the share of raw commodities in total exports is substantial in each country in our sample, with a median share of 0.68.[7] Additionally, the volatility of commodity prices is significantly higher than goods prices, meaning that fluctuations in commodity prices dominate the overall variation in export prices (Di Pace et al., 2020). By using Px instead of focusing on a specific commodity price, we can account for variations in export specialization over time, since the share of a particular commodity within the export basket is time-varying.

[4]Our analysis excludes financial derivatives due to data limitations. When these derivatives are incorporated, the difference between capital inflows and outflows constitutes the financial account balance, which corresponds to the current account balance (up to a statistical discrepancy).

[5]The data can be accessed at `https://atlas.media.mit.edu/en/`.

[6]`https://www.imf.org/en/Publications/Manuals-Guides/Issues/2016/12/31/Export-and-Import-Price-Index-Manual-Theory-and-Practice-19587`.

[7]Figure A1 in Appendix A shows the probability distribution of the share of raw commodities in total exports for the countries in our sample.

When studying the impact of commodity price fluctuations in a panel setting, it is important to account for the varying exposure of the countries in our sample to different commodity markets. Estimating the average effect of a commodity price shock can be challenging without categorizing countries appropriately. Nonetheless, implementing such categorization can be complicated due to the large heterogeneity among the sample countries, which may not exclusively rely on a single commodity or commodity group. To overcome this challenge, we can examine export prices directly, concentrating on the average effect of price shifts. This approach allows us to study the impact of major shifts in commodity prices, circumventing the necessity for categorization.[8]

The examination of commodity price shocks, with particular focus on the export price bundle, provides insight into a country's time-varying vulnerability to specific commodity markets. For instance, consider Mozambique, which initiated natural gas production in 2004. By the end of the study period, natural gas comprised nearly 10% of its total exports. Price variations in natural gas were initially irrelevant to Mozambique's terms of trade. However, in the past decade, the price of natural gas emerged as a pivotal determinant of Mozambique's export price. Consequently, Mozambique developed a pronounced vulnerability to significant energy price shocks. Overlooking these salient structural shifts in the economy could introduce considerable bias into our estimates.

We rely on the BAA spread as an indicator of global financial conditions. Akinci (2013) emphasizes its importance as a propagator of global financial shocks in small open economies. Additionally, Miranda-Agrippino and Rey (2021) show that fluctuations in the BAA spread are closely related to a broad factor summarizing common fluctuations in asset prices and capital flows, which is associated with the GFC.

We can reasonably claim that, for the sample of countries under investigation, the usual small open economy assumption applies. Therefore, domestic conditions are unlikely to affect global variables. However, this does not imply that we can use these variables as proxies for the exogenous shocks of interest. For example, consider the variation in export prices or similarly, the underlying fluctuations in commodity prices. While some of these movements are certainly related to commodity-specific idiosyncratic shocks, a significant portion reflects the endogenous response of international prices to changes in aggregate demand at the global level. The way the domestic economy reacts to each of these disturbances can be drastically different. Failing to distinguish between the two can give a misleading picture of the overall importance of commodity prices for EMDEs and the transmission channels of world shocks. Likewise, while examining the causal impacts of fluctuations in BAA spreads on EMDEs, the effects can significantly vary depending on the underlying causes of the BAA spread shifts. Hence, taking these factors into account, our identification of the causal impact of export price changes - that reflect either idiosyncratic shocks to commodity prices or BAA spread shifts - is based on the use of external instrumental variables.

[8]However, it is important to note that this approach precludes the identification of whether certain commodity prices are more impactful than others when studying EMDEs. Further, it curtails our capacity to examine the heterogeneity in response to specific commodity price shocks.

3.1 Commodity Prices Instrument

We use a series of events specific to commodity markets that are associated with large swings in prices as a quasi-natural experiment to identify the transmission of commodity price shocks. As a first step, we examined historical documents and newspaper articles to identify episodes that were unrelated to important macroeconomic developments such as natural disasters, weather-related shocks, or significant local geopolitical events and have a disproportionate impact on the price of specific commodities. This analysis led us to identify a total of 24 events, summarized in Table 1. For instance, a positive shock in the price of cotton in 2003, resulting from global shortages associated with severe weather damage to cotton crops in China, provided us with an event for an exogenous shift in the price of cotton. We use this event for cotton exporters in our sample such as Burkina Faso. To avoid selecting events that might represent both an export price shock and a capital or productivity shock, we exclude events that arise from weather conditions or political events within a specific country. For example, an attempted coup in Côte d'Ivoire in 2002, a leading cocoa producing country, generated an increase of 66 percent in cocoa prices. This shock served us for an event for cocoa exporting countries except Côte d'Ivoire.

We examine events linked to exogenous shifts in commodity prices, arising from global changes in commodity-specific demand or supply. Each country in our study behaves as a price taker in the global commodity market they serve. Therefore, changes in global demand or supply inevitably influence the domestic demand for the respective exported commodity. This is a prevalent scenario, with foreign demand often so dominant that the domestic price mirrors the global commodity price. For instance, during a severe drought, unaffected countries would witness a spike in foreign demand, compensating for the production shortfall. Consequently, the demand curve for these unaffected countries would shift, elevating the price to match the escalated global price. This implies that, for our empirical analysis, supply and commodity-specific demand shocks have similar impacts on a small open economy's local market. Hence, we focus on a generic "export price" shock, obviating the need to differentiate between those originating in global demand or supply shifts.

A detailed narrative and evidence in support of our choice of events are provided in Appendix B. By pinpointing these events, we can construct an instrument to analyze the impact of commodity price shocks on various economic variables. This instrument is a key contribution and an essential ingredient for our analysis since it allows us to isolate commodity price shocks from movements in commodity prices that are linked to global conditions.

To create the commodity price instrument, we begin by generating a metric of surprise for each event. This metric is calculated as the difference between the observed (log) price of the commodity, which is deflated using the U.S. CPI and the price that would have been expected based on the commodity's own price history as well as the overall (log) level of real commodity price indices (including lags) for the group of commodities to which the commodity does not belong. The latter set of variables is included to control for global economic conditions that affect all commodity price indices.

Specifically, the surprise is defined as: $e_{c,t} = p_{c,t} - E_{t-1}[p_{c,t}]$, where $p_{c,t}$ is the (log real) price

Table 1: List of Events

Year	Commodity	Sign	Source of Shock
1993	Timber	+	Clinton's environmentally friendly policies
1993	Tobacco	-	Worldwide increase in competition for exports
1994	Aluminum	+	Reduction in stocks of major producing countries
1994	Coffee	+	Frost in Brazil
1994	Cotton	+	Decline in production due to bad weather in key producing countries
1997	Cereals/Food	-	Favorable production forecast
1998	Crude oil	-	Expectations of higher supply
1999	Cocoa	-	Supply surplus in major producing countries
2000	Natural gas	+	California gas crisis
2000	Nickel	+	Technical problems in key producing countries
2002	Cocoa	+	Attempted coup in Cote d'Ivoire
2003	Cotton	+	Severe weather damage in China
2005	Natural gas	+	Effects of hurricanes Katrina and Rita
2006	Sugar	+	Severe draughts in Thailand
2007	Lead	-	Rising stocks and suspended production from the Magellan mine in Australia
2008	Rice	+	Trade restrictions of major suppliers
2008	Soybean	+	Expectations of a reduction in supply
2010	Cereals/Food	+	Adverse weather conditions in key producing countries
2010	Cotton	+	Negative weather shocks in the U.S. and Pakistan
2010	Rubber	+	Severe draughts in Thailand and India
2015	Energy	-	Booming in U.S. shale oil production
2017	Cocoa	-	Favorable weather conditions in major producing countries
2019	Energy (excluding crude oil)	-	The U.S. became a net energy exporter
2019	Iron ore	+	Collapse of a mining dam in Brazil

Notes: This Table lists each of the episodes identified as generating large exogenous variations in commodity prices and indicates provides a brief description of the source of the shock.

of commodity c at time t, and E is the expectation operator. The expectation of the price prior to the event is retrieved from the following regression model $p_{c,t} = \sum_{j=1}^{2} a_j p_{c,t-j} - \sum_{\forall g \neq g_c} \sum_{j=1}^{2} b_{g,j} p_{t-j}^{g} + e_{c,t}$, where g_c represents the commodity group g to which commodity c belongs.[9] For each event, j, we define $q_{j,t} = e_{c,t}$ for t corresponding to the year of the event, and $q_{j,t} = 0$ for all other periods. By doing so, we are essentially assuming that a predominant part of the unexpected variation in the commodity price at the time of the event can be attributed to the exogenous event. This procedure is in line with the approach proposed by Hamilton (2003), who identifies oil supply shocks as reductions in oil prices from their previous peaks and shows these to be closely related to a fall in oil supply for the countries specifically affected by the event over the same period. The use of the surprise avoids the inclusion of price fluctuations into $q_{j,t}$, which would have been anticipated "ex-ante" based on the information available.[10]

The instrument puts together the unexpected variation in prices for each of the events we

[9]We consider the three main commodity indices, namely agricultural, energy, and metals. When we evaluate, for instance, the surprise in one of the agricultural commodity prices, we include as a proxy of the global component the lagged value of the energy and metal commodity price indices.

[10]To clarify the importance of the use of the surprise as opposed to the change in prices at the time of the event, it is useful to consider a specific case associated with a price increase. Suppose the event occurs during a phase of robust economic expansion; in that case, it is plausible to expect that the price at time t would surpass the observed price at time $t-1$, thereby leading to a smaller surprise than the price change from the previous year. In contrast, if the same event were to occur during a period of sluggish economic growth, it is reasonable to expect prices to be lower than current prices "ex-ante," resulting in a surprise that could exceed the price change from the preceding year. As a matter of fact, the surprise component is not always required to be of the same sign as the price change. Nonetheless, for each of the events we examine, the significant price change is predominantly influenced by the surprise component, resulting in the signs of both components being identical.

consider. Since the changes in the price of exports can be approximately viewed as a weighted average of the changes of the underlying commodity prices, we construct the instrument $z_{i,t} = \sum_j \mathbf{1}(w_{i,c,t-1} > \underline{w}) w_{i,c,t-1} q_{j,t}$, where $w_{i,c,t}$ denotes the export weight of commodity c (associated with event j) for country i at time t and $\mathbf{1}(x)$ denotes an indicator function that takes value 1 when condition x is satisfied. The surprise component, $q_{j,t}$, reveals that the exogenous fluctuations in the export price for two countries with equivalent exposure to relevant commodities for two distinct events are approximately proportional to the surprise in the commodity price changes that occurred during the respective events. The instrument, however, is also a function of the commodity weight in the export basket. Therefore, we are able to exploit the (predetermined) cross-sectional and time-series variation in export patterns. Specifically, two events that exhibit comparable levels of price surprise are anticipated to have varying effects on the same country, depending on their distinct degrees of exposure to different commodities. Most importantly, within a panel setting, we can take advantage of the cross-sectional variation in the sensitivity of different countries to the same commodity for each of the events, i.e., $w_{i,c,t-1} \neq w_{j,c,t-1}$ for each $i \neq j$. Lastly, we choose a lower bound $\underline{w} = 2\%$, so that the term $\mathbf{1}(w_{i,c,t-1} > \underline{w})$ limits the amount of noise in the instruments for countries with limited exposure to the commodity price at the time of specific events.[11]

Thus, for a country like Mozambique, we can take advantage of the the exogenous variations across an array of commodity groups to identify the average effect of commodity price shifts. More specifically, we exploit the historical economic dynamics where cotton was a dominant sector in production and exports during the 1990s, whereas in the last decade, natural gas exports have constituted a significant fraction of Mozambique's output. Correspondingly, for a country like Brazil, we use the exogenous shifts in various commodities such as aluminum, coffee, and tobacco during the early 1990s. The relevance of oil market events, however, only rose in the last decade with the discoveries of substantial offshore oil reserves in the 2000s.

In summary, unanticipated variations in the commodity prices during major, commodity-specific events, modulated based on the significance of each commodity in the total export basket, give rise to exogenous fluctuations in the price of exports for all the countries under investigation. This leads us to conclude that the correlation between the instrument and the price of exports can be used to calculate a local impulse response in the sense of the local average treatment effect in Imbens and Angrist (1994). The instrument puts together the information of multiple events, while the use of an instrument for each of the events separately could give rise to the presence of weak instruments (see, e.g., Giacomini et al., 2022). Table 2 reports first-stage regression results of the endogenous variable, the (change in) detrended log of export prices for country i (Δp^x_{it}), on the instrument z_{it} without controls and then more formally with controls (including country fixed effects). The F-statistic clearly shows that z_{it} is not a weak instrument.

[11] The results that we report are robust to an alternative choice of $\underline{w}$ at 1% or 0.5%.

Table 2: First-stage F-Statistic for Alternative Instrument Sets

	No Controls	With Controls
Commodity Events	60.15	710.68
U.S. Monetary Policy	35.42	256.38
Global Risk Appetite	38.75	673.75

Notes: In the first row, we present the results of the first state regression for the country-specific (change in detrended log of) export prices. The left panel displays results with only country fixed effects as controls, while the right panel includes all of the controls specified in the baseline model discussed in Section 4. The second and third rows present the first stage regression outcomes for the change in BAA spread. The left column shows results without any controls, while the right column displays the outcomes with the controls used in the baseline model. All statistics are significant at the 1% level, with $F > 10$, indicating that the instruments are not weak (Staiger and Stock, 1997).

3.2 Financial Conditions Instrument

We are also interested in measuring the impact of shifts in global financial conditions, specifically the BAA spread, and examine its transmission to the EMDEs. This aligns with the expanding body of research focused on identifying key drivers of the GFC, as summarized by Kaminsky (2019) and Miranda-Agrippino and Rey (2021). Our analysis is designed to distinguish between two distinct scenarios. The first posits that changes in the BAA spread are a result of the international spillover of U.S. monetary policy, whereas the second attributes BAA spread fluctuations to shifts in global risk perceptions. Miranda-Agrippino and Rey (2020) highlight the importance of the former channel. More broadly, the idea that monetary policy in the financial center affects capital flows and the business cycle in EMDEs is in line with the earlier papers of Calvo, Leiderman, and Reinhart (1993, 1996) and has been recently reinforced by by Kalemli-Özcan (2019). By contrast, the role of changes in global risk is emphasized in, e.g., Bruno and Shin (2014), Forbes and Warnock (2012), Ghosh et al. (2014), Obstfeld and Zhou (2023), and Shin (2012).

We argue that it is crucial to differentiate between the two channels when estimating the causal impact of a change in the BAA spread. To do that, our methodology relies on the use of instrumental variables, setting our research apart from prior literature, notably Akinci (2013), who identifies the transmission of "BAA spread shocks" controlling for the contemporaneous effect of movements in the U.S. real rate. This exclusion restriction would identify the impact of a particular combination of the two effects we highlight above, where both components are combined in such a manner that their impact is offset on the U.S. real rate.[12]

To measure the causal effect of BAA movements associated with shifts in U.S. monetary policy, we use a "proxy" for a U.S. monetary policy shock as our instrument. The chal-

[12] Specifically, a shift in global risk appetite does not necessarily, and indeed, is unlikely to induce a null movement in the U.S. real rate. Consider a plausible scenario where an increase in global risk appetite, i.e., a rise in the BAA spread, contracts economic activity (without raising inflation) in the U.S. economy. This would very likely be accompanied by a more accommodative monetary policy stance and, therefore, a fall in U.S. real rates (as in, e.g., Caldara et al., 2016). In this context, the exclusion restrictions employed by Akinci (2013) effectively merge shifts in global risk appetite and monetary policy shocks. The latter is introduced to counterbalance the endogenous response of the U.S. real rate movements to the former shock.

lenge here is that there are alternative proxies available (e.g. constructing the proxy from high-frequency movements in prices such as Gertler and Karadi (2015); Paul (2020); Miranda-Agrippino and Ricco (2021); Aruoba and Drechsel (2022), or lower-frequency movements in the nominal interest rate such as Romer and Romer (2004); Wieland and Yang (2020), but none of the available measures cover the entire sample we focus on. To tackle both of those challenges, we take as an instrument the first principal component from an unbalanced panel of (standardized) monetary policy shock proxies. We cumulate the shocks over the calendar year to get a yearly measure and then extract a principal component following Stock and Watson (2002). A common concern when using "proxies" to capture monetary policy shocks is the possibility of contamination by the "central bank informational effect" (see, e.g., Nakamura and Steinsson, 2018). If the residual component of this effect is not systematically associated with the various proxies being examined, the common factor derived from the proxies has the additional benefit of minimizing the variation in the proxy that is related with this channel.

To quantify the causal impact of BAA spread fluctuations tied to shifts in global risk appetite, we use two instruments. The first one is a proxy for uncertainty shocks computed from variations in the price of gold around uncertainty-related events constructed by Piffer and Podstawski (2017). Gazzani et al. (2023) make the case that those events are related to "risk-off" behavior in financial markets. This proxy captures shifts in global risk perceptions and is used in line with the literature emphasizing the role of global risk in driving financial conditions. In addition, we use a measure of U.S. financial uncertainty constructed by Ludvigson et al. (2021). This index captures financial uncertainty specific to the U.S. economy and complements the gold-based proxy in capturing shifts in global risk perceptions. The use of both instruments allows us to disentangle the causal effect of BAA spread movements that originate from shifts in global risk perceptions from those that originate from other sources, such as U.S. monetary policy shocks or other drivers of the GFC. Table 2 reports the F-statistic without and with controls for the two set of instruments.

4 Empirical Model and Main Results

We use the framework proposed by Cloyne et al. (2023), which expands upon the conventional LP method (Jordà, 2005) to incorporate the Kitagawa-Blinder-Oaxaca decomposition (Kitagawa, 1955; Blinder, 1973; Oaxaca, 1973). The KBO decomposition enables the evaluation of three distinct effects for an LP response. Firstly, the *direct* effect of an intervention on outcomes, which corresponds to the average effect typically identified in a standard LP framework. Secondly, the *indirect* effect of the intervention, which is mediated by the way in which other variables impact outcomes. Finally, the *composition* effect, which reflects the significance of including an appropriate set of controls.

The LP panel regression augmented by the KBO extension can be written as:

$$y_{i,t+h} - y_{i,t-1} = \mu_i^h \; + \; (x_{i,t} - \bar{x_i})\gamma_0^h + f_{i,t}\beta^h \; + \; f_{i,t}(x_{i,t} - \bar{x_i})\theta_x^h \; + \; \omega_{i,t+h}, \tag{1}$$

for $h = 0, 1, ..., H$, where the dependent variable is the cumulative change in country i's outcome variable y from year $t-1$ to $t+h$; f is the intervention, for example, a one standard deviation increase in export prices; μ_i^h is a country fixed effect; and $x_{i,t}$ is a vector of additional covariates, with mean $\bar{x}_i$. In the conventional LP approach, β^h is the object of interest, underpinning, for example, the effects of a one standard deviation increase in export prices on GDP.

The outcome variables used in our analysis are the log of GDP (detrended), log of export prices (detrended),[13], the log of the policy rate, the log of the EMBI spread, the log of the real exchange rate (detrended), capital inflows and outflows in terms of trend GDP, and foreign exchange reserves in terms of trend GDP. In our baseline specification, $x_{i,t}$ includes two lags of real GDP growth, Px growth, the BAA spread, net capital inflows, and the lag of the dependent variable, both as a control and interacted, offering an interpretation of non-linearity.[14]

As a starting point, we present the impulse response functions (IRFs) estimated from Equation 1. This serves as a baseline treatment effect and is in line with specifications used in existing literature. Unlike the traditional LP approach, we consider indirect interaction effects. This enables us to examine how the variables of interest are affected by changes in other macro controls while holding the other variables constant. Specifically, we show three main set of results: (i) the response of a one standard deviation increase in Px driven by shocks in commodity prices, (ii) the response of a one standard deviation fall in the BAA spread driven by U.S. monetary policy shocks, and (iii) the response of a one standard deviation decline in the BAA spread driven by a shift in global risk appetite. The reported IRFs can be interpreted as the local average treatment effect (LATE, see, e.g., Jordà et al., 2020). The treatment is instrumented as discussed in Section 3.

Moving forward, we will extend the exercise to evaluate the effects from the KBO decomposition. This will help us assess whether the endogenous response of EMBI spreads influences the transmission of export price increases. Additionally, we will investigate if the individual endogenous responses of export prices and EMBI spreads to a decline in the BAA spread amplify the effects of U.S. monetary policy and global risk appetite shocks.

4.1 Impact of Commodity Shocks

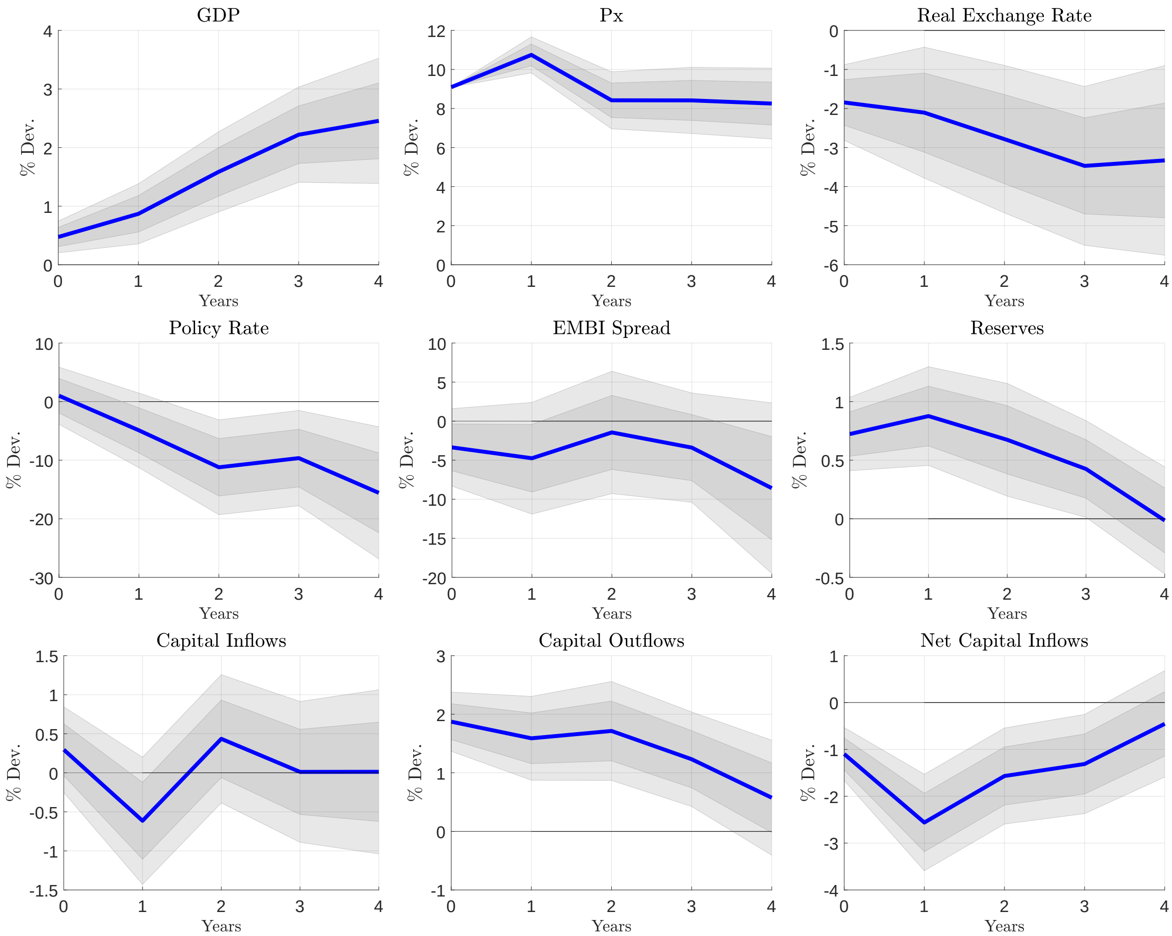
In Figure 3 we show the baseline average effect of a one standard deviation increase in export prices driven by commodity specific shocks.[15] As described in Section 3, these are shocks driven by idiosyncratic commodity events. The figure shows that an increase in Px leads to a steady increase in domestic GDP, in line with Di Pace et al. (2020). This is what would be expected from a positive terms-of-trade shock in a standard SOE model (Mendoza, 1995; Schmitt-Grohé and Uribe, 2018). In such a model, a surge in export prices triggers a shift

[13] Focusing on the detrended movements of export prices, we abstract from the influence of trends in commodity prices (see, e.g., Kellard and Wohar, 2006; Harvey et al., 2010).

[14] The interaction terms include only one lag.

[15] If we extend the horizon, all impulse response functions exhibit mean reversion. However, the bands become considerably larger after four periods. This can be attributed to the fact that many countries have relatively short samples.

Figure 3: Increase in Export Prices Driven by Commodity Specific Shocks



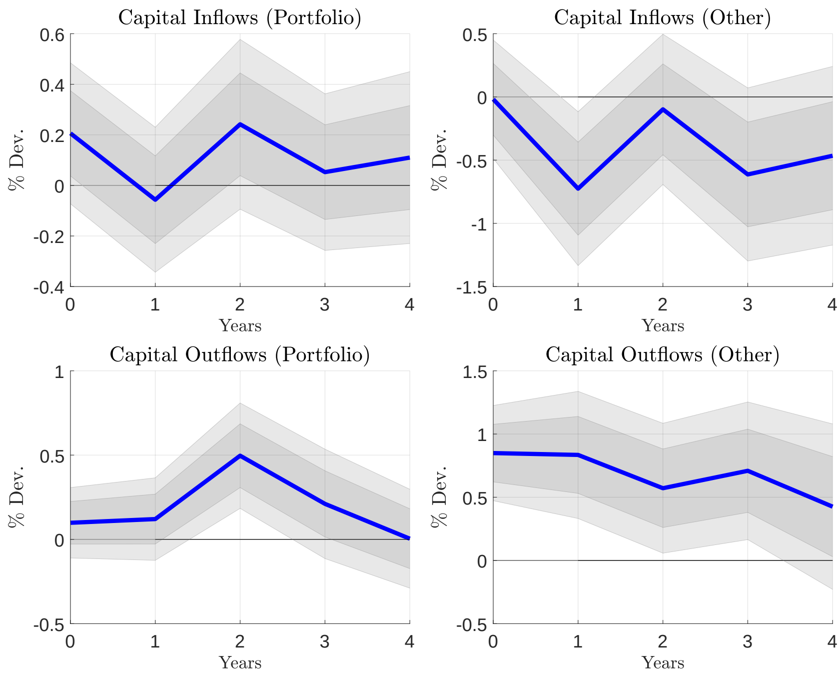
Notes: The Impulse Responses show the LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals.

from exportable goods towards importable and nontradable goods, an income effect whereby households increase their demand for all goods, including nontradables, and an exchange rate appreciation. This, in turn, fuels an expansion in consumption, investment, and output. However, these outcomes stand in stark contrast to the *"Dutch Disease"* phenomenon as outlined by Frankel (2012).

The increase in export prices has a small effect on borrowing costs, as shown by the decline of the EMBI spread. The policy rate, though initially demonstrating a statistically insignificant reaction, gradually displays a decrease over time. This trend suggests a pro-cyclical domestic monetary policy response. Capital outflows increase, mainly driven by other investment flows which are mostly bank-related (Figure 4) and countries accumulate foreign exchange reserves. Direct investment (inflows and outflows) show a small positive response (as illustrated in Figure C1 in Appendix C). Conversely, capital inflows, show a more muted response. Taken together, net capital inflows (the difference between capital inflows and outflows) decline.

The response of commodity prices to an idiosyncratic commodity shock can have simi-

Figure 4: Increase in Export Prices Driven by Commodity Specific Shocks: Effects on Capital Flows



Notes: The Impulse Responses show the LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals.

lar effects as the endogenous response of commodity prices to the GFC, but the impact on macroeconomic variables can differ significantly both in terms of persistence and outcomes. Notably, the literature has documented a strong association between a country's spreads and its export prices (or terms of trade). For example, Drechsel and Tenreyro (2018) and Drechsel et al. (2019) propose a framework that shows how increased commodity prices in emerging countries can lead to a contraction in interest rate spreads, resulting in favorable borrowing conditions and output expansion. Similarly, Hamann et al. (2023) document a negative association between oil prices and country spreads. Our findings, however, reveal that the correlation between commodity prices and country spreads weakens significantly when we consider the commodity price shock. Therefore, the association between export prices and countries' spreads is not driven by idiosyncratic commodity shocks. This suggests that the relationship may not be direct, but potentially influenced by other elements like the GFC or shifts in global demand.[16]

Easier global financial conditions can lead to a significant surge in commodity prices, thereby intensifying the transmission of U.S. monetary policy or global risk appetite shocks through their impact on export prices. This, in turn, has expansionary implications for EMDEs by reducing borrowing costs and attracting capital inflows. However, in response to commodity shocks, we observe a restrained response of capital inflows to fluctuations in commodity prices, as depicted in Figures 3 and 4. This suggests that an increase in commod-

[16]Xiong (2019) emphasized this observation during his discussion of Drechsel et al. (2019) at the Jackson Hole Symposium.

ity prices does not consistently result in a corresponding rise in capital inflows. Contrary to the stylized facts presented in Figure 1, IRFs to commodity shocks do not demonstrate a general pattern of comovement between capital inflows and outflows, which would be more indicative of the GFC. In the spirit of Kaminsky et al. (2004), the effects of negative commodity shocks suggest that ”it does not always pour when it rains.”

4.2 Decline in the BAA Spread

In this section, we analyze the transmission mechanism operating through the global financial cycle and use the BAA spread as an indicator of global financial conditions (Akinci, 2013; Miranda-Agrippino and Rey, 2021). We argue that in examining the consequences of a shift in the BAA spread, it is crucial to identify its underlying causes. We explore two factors driving the BAA spread: a U.S. monetary policy shock and a change in global risk appetite.[17]

4.2.1 Decline in the BAA Spread Driven by U.S. Monetary Policy

The baseline average effect of a one standard deviation drop in the BAA spread, driven by a U.S. monetary policy shock, is depicted in Figure 5. As discussed in Section 3, we use a proxy for U.S. monetary policy to instrument the BAA spread. Previous research by Miranda-Agrippino and Rey (2021) emphasizes the significant influence of U.S. monetary policy shocks on global financial variables associated with the GFC. Furthermore, consistent with the findings of Kalemli-Özcan (2019), U.S. monetary policy plays a pivotal role in shaping global investor risk perceptions, consequently impacting capital flows to and from EMDEs and leading to direct fluctuations in credit spreads.

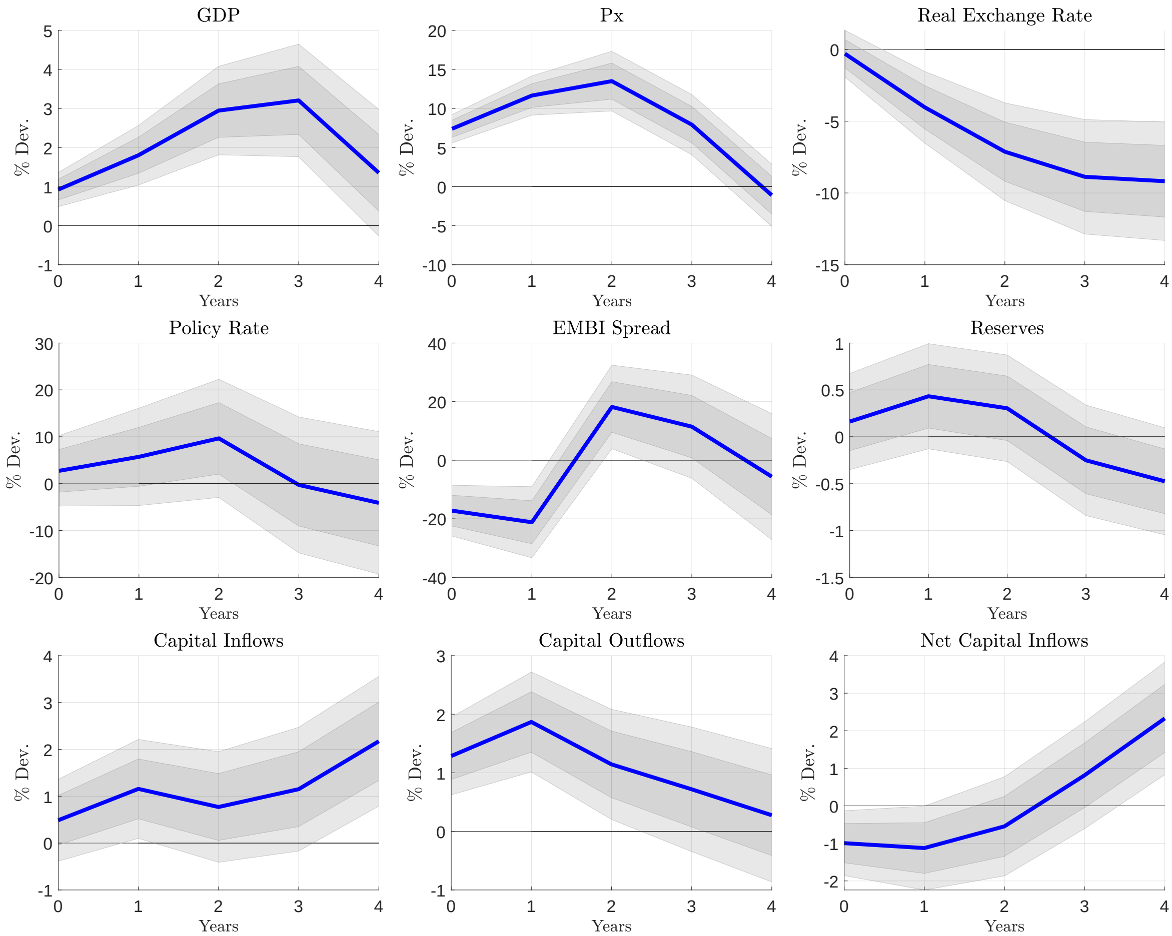
U.S. monetary policy impacts commodity prices via two principal channels: global demand and supply. An accommodative U.S. monetary policy leads to higher U.S. growth, which propels global growth—both directly, due to the considerable influence of the U.S. on the world economy, the positive spillovers of easier financial conditions, and indirectly, through trade and financial linkages with other economies (Frankel and Rose, 1998; Imbs, 2004; Juvenal and Santos Monteiro, 2017). Higher global growth pushes up the demand for commodities, and consequently drives up export prices.[18] Conversely, reduced interest rates diminish the costs associated with holding inventories, fueling the demand for commodities, and leading to an increase in their prices (Frankel, 2008).

Notably, the impulse responses of export prices and output exhibit a similar humped-shaped response, suggesting that the transmission of U.S. monetary policy shocks to EMDEs primarily occurs through its effect on global commodity prices. In line with De Leo et al. (2022), in response to a cut in U.S. rates, EMDEs central banks rise interest rates. However, even though they increase policy rates, the EMBI spread decreases on impact due to easier global financial conditions. This leads to a negative comovement between the EMBI spread

[17] In Appendix C, we present the impulse responses of the BAA spread to both shocks (Figure C2). The cumulative impact of the risk appetite shock on the BAA spread is larger and more persistent.

[18] This mechanism is thoroughly explained in Di Pace et al. (2020). The specific link between global demand and oil prices has been documented in Alquist et al. (2020), Juvenal and Petrella (2015), and Kilian (2009).

Figure 5: Decline in the BAA Spread Driven by U.S. Monetary Policy



Notes: The Impulse Responses show the LATE (in blue) of one standard deviation decline in the BAA spread driven by a U.S. monetary policy shock. Gray areas denote 68% and 90% confidence intervals.

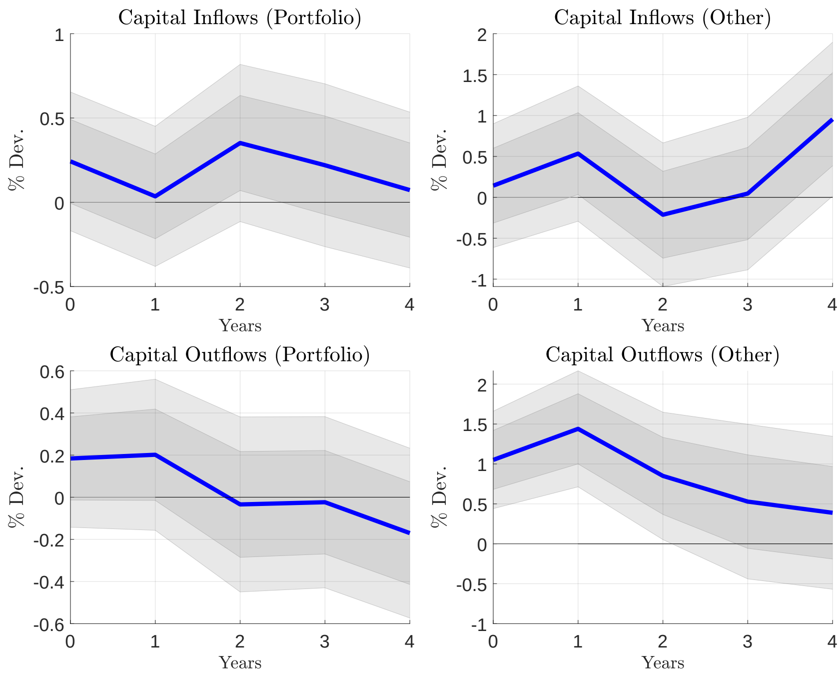
and Px, in line with the mechanism described in Drechsel and Tenreyro (2018) and Reinhart et al. (2016). The real exchange rate appreciation is the counterpart of the dollar weakening in the U.S. (Kalemli-Özcan, 2019).

Additionally, we observe substantial increases in capital outflows, with other investment serving as the primary driver. The accumulation of foreign currency reserves experiences only a slight increase on impact. By contrast, the movements in capital inflows are comparatively subdued and lagged in relation to capital outflows.[19] Although both capital inflows and outflows exhibit an upswing, net inflows show a negative response. This differing effects between inflows, outflows, and net inflows lends support to the focus of the literature on the importance of considering gross capital movements instead of net flows (Forbes and Warnock, 2012; Milesi-Ferretti and Tille, 2014). The broad pattern of the impulse responses is consistent with the GFC, and also with the reduced form evidence of Reinhart et al. (2016).

The analysis highlights the significance of U.S. monetary policy shocks on macroeconomic

[19]The exception is direct investment, where the response of inflows is higher than the response of outflows. See figure C1 in Appendix C.

Figure 6: Decline in the BAA Spread Driven by U.S. Monetary Policy: Effects on Capital Flows



Notes: The Impulse Responses show the LATE (in blue) of one standard deviation decline in the BAA spread driven by a U.S. monetary policy shock. Gray areas denote 68% and 90% confidence intervals.

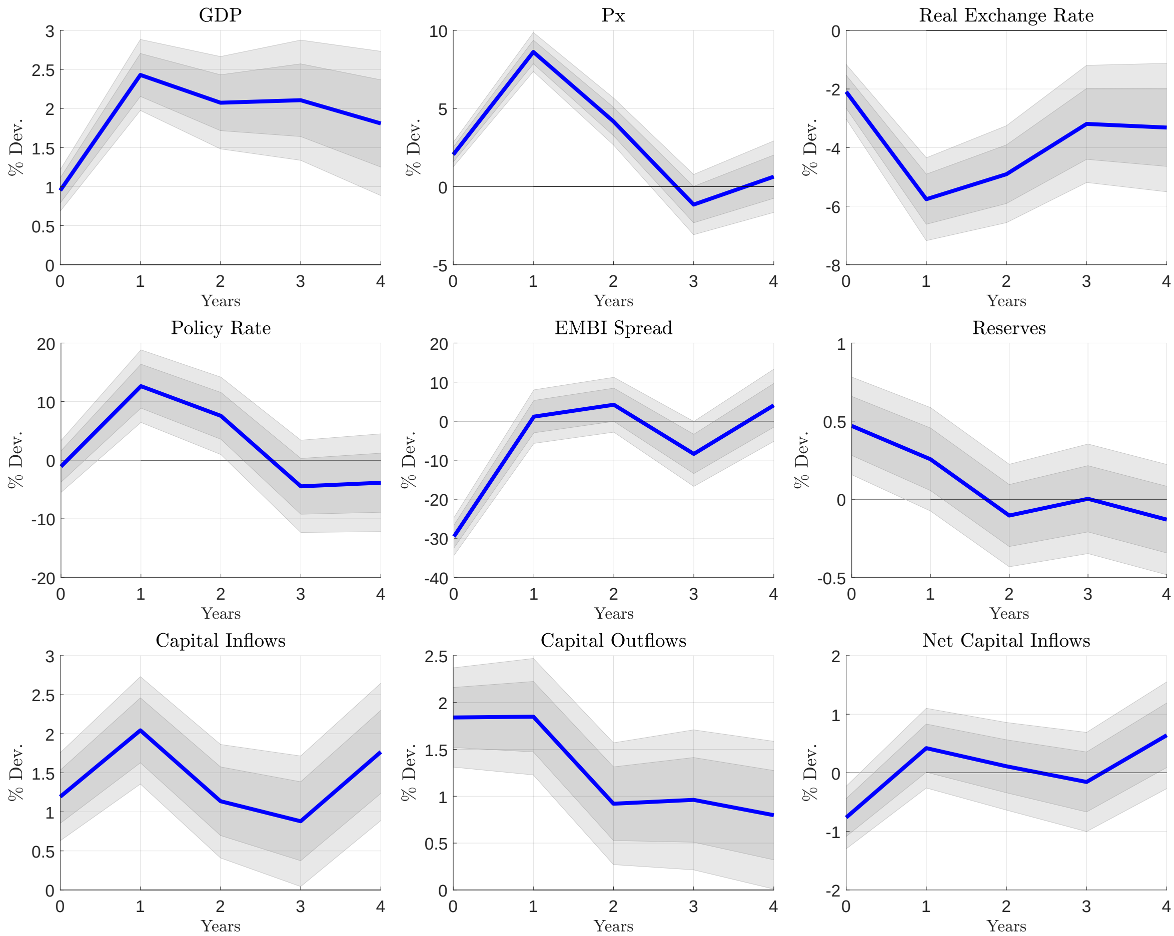
fluctuations in EMDEs through their impact on the BAA spread. This contrasts with Akinci (2013), who concludes that the effects of monetary policy shocks on EMDEs' macroeconomic developments are minimal. Our findings indicate that the impact can be considerable when the BAA spread is affected. This reinforces the importance of identifying the origin of BAA spread fluctuations instead of merely focusing on a ''BAA spread shock.''

4.2.2 Decline in the BAA Spread Driven by a Shift in Global Risk Appetite

Figure 7 illustrates the average impact of a one standard deviation decline in the BAA spread, driven by shifts in global risk appetite, a phenomenon often termed as "risk-on/risk-off" event (Chari et al., 2020). This type of event provides a different source of BAA spread fluctuations. The transmission of eased global financial conditions resulting from a change in global risk appetite differs significantly from those driven by U.S. monetary policy. There is an immediate increase in Px, followed by a significant surge after one year. The positive effect on GDP exhibits greater persistence. The policy rate exhibits a gradual increase, and reverts after one year. However, easier global financial conditions push the EMBI spread downwards. The reduction in the EMBI spread is quite pronounced, surpassing the response observed in the prior scenario. The impact of global risk appetite on spreads is consistent with Gilchrist et al. (2022).[20] In addition, we observe a strong comovement between export prices and the EMBI spread, a relationship underscored in Drechsel and Tenreyro (2018). The

[20]Notably, even the "profile" of the IRFs parallels the pattern presented in Gilchrist et al. (2022), with the shock's effect reverting within a year.

Figure 7: Decline in the BAA Spread Driven by Shifts in Global Risk Appetite



Notes: The Impulse Responses show the LATE (in blue) of one standard deviation decline in the BAA spread driven by shifts in global risk appetite. Gray areas denote 68% and 90% confidence intervals.

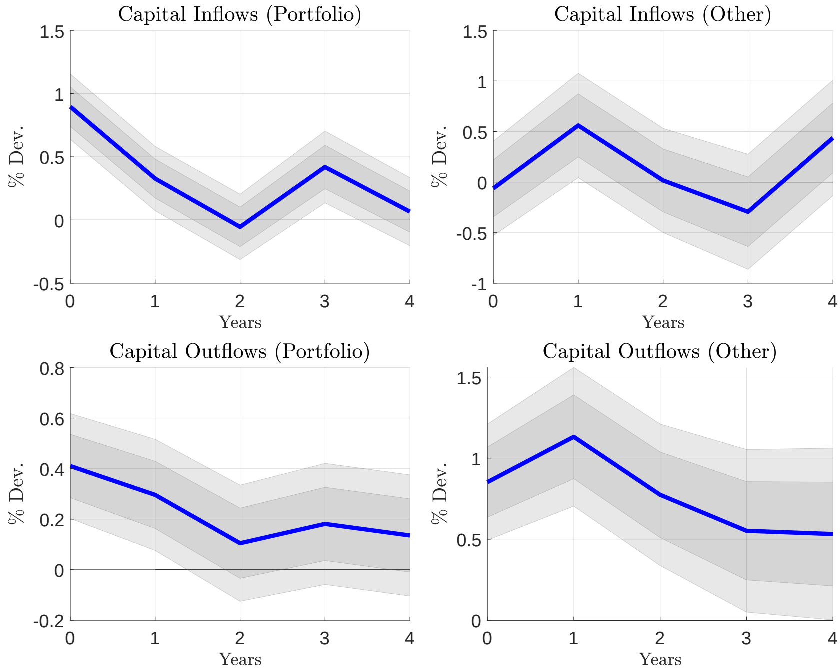
real exchange rate appreciation mirrors the effects of a weakening of the dollar to be expected when financial conditions ease (Obstfeld and Zhou, 2023).

The effect on capital flows is remarkably large, impacting both inflows and outflows across all components, as depicted in Figure 8.[21] Notably, portfolio flows account for the largest portion of the impact on capital inflows, thereby implying that eased financial conditions enable countries to accumulate more external debt. While the effects on portfolio inflows and outflows appear to be relatively short-lived, the impact on other investment, both inflows and outflows, shows a more persistent response. Net inflows exhibit a negative response on impact but become positive rapidly. The reaction of net inflows to a global risk appetite shock stands in stark contrast to their response to a U.S. monetary policy shock, which led to a negative impact.

The effects of this shock resemble the prototype effect of capital flows in the context of the GFC, especially when we think about periods of heightened risk aversion, such as during the global financial crisis (Milesi-Ferretti and Tille, 2014) or in recent risk-off periods like the

[21] The responses of direct investment are shown in Figure C1 in Appendix C.

Figure 8: Decline in the BAA Spread Driven by Shifts in Global Risk Appetite: Effects on Capital Flows



Notes: The Impulse Responses show the LATE (in blue) of one standard deviation decline in the BAA spread driven by shifts in global risk appetite. Gray areas denote 68% and 90% confidence intervals.

taper tantrum (Chari et al., 2020). The former describes the collapse in both capital inflows and outflows, following the risk shock triggered by Lehman Brothers' failure. In this context, banking flows were the hardest hit due to their sensitivity of risk perception. The latter documents the negative impact of high frequency portfolio flows following Chairman's Bernanke announcement that the Fed would reduce the volume of its bonds purchases. Overall, the behavior of capital flows is aligned with the ''when it rains it pours dynamics" (Kaminsky et al., 2004)

The links between shifts in global risk appetite and the direction of capital flows in EMDEs is in principle unclear from a theoretical and empirical point of view. As explained in Kalemli-Özcan (2019), the impact of an increase in global risk on capital flows to EMDEs remains uncertain and ambiguous. On the one hand, risk aversion drives a flight to safety, while on the other hand, EMDEs' sovereign borrowing increases during bad times, which is why total capital flows to EMDEs and global risk can be positively correlated at times. Our results provide evidence that both capital inflows and outflows increase following a reduction in global risk appetite. These findings are in line with Forbes and Warnock (2012), who show that lower levels of global risk appetite are negatively correlated with *stops* (sharp decrease in capital inflows) and *retrenchments* (sharp decrease in capital outflows) and positively correlated with *surges* (sharp increase in capital inflows) and *flights* (sharp increase in capital outflows).

4.3 Exogenous vs. Endogenous Response of Commodity Prices

The previous analysis highlights the importance of distinguishing between exogenous shocks to commodity prices and the endogenous response to shocks associated to the GFC. The existing empirical literature (see, e.g. Drechsel and Tenreyro, 2018; Fernández et al., 2017; Schmitt-Grohé and Uribe, 2018) starts with the premise that within the context of a small open economy, global prices can be viewed as exogenous. As such, the impact of a shift in commodity prices on the domestic economy can be readily identified. This understanding would imply no necessity to instrument export price variations when investigating the transmission of commodity price shocks.

Therefore, the empirical methodology conventionally used in previous studies is akin to determining the impact of export price changes using ordinary least squares (OLS), as opposed to the IV methodology we implement. The OLS approach yields a mean response, amalgamating the effects of both exogenous and endogenous shifts in export prices. The results derived from this method (as shown in Appendix Figure C3) differ significantly from the effects of increased export prices driven by commodity-specific shocks, which we identify using IV. The response of several variables is notably different. For instance, with OLS, the appreciation of the exchange rate is substantially larger and more persistent, and the policy rate exhibits an immediate increase. The response patterns for reserves and capital flows also deviate considerably from the LATE. In the context of OLS, we would be asserting that there is a persistent surge in capital inflows, whereas the IV response depicts a more muted reaction.

Attributing the impact of commodity price shifts on capital flows solely to commodity shocks could lead to a potentially erroneous conclusion. It may falsely suggest that all commodity price changes, irrespective of their origin, bear a strong correlation with capital flows, and thus play a substantial role in driving the GFC. This inference, however, presents a skewed representation of reality. The OLS responses are clearly integrating elements associated with other global shocks. Our analysis underscores the crucial need to differentiate between different types of shocks. More broadly, the asymmetries identified convincingly show that the global factor in capital flows which is correlated with commodity prices (Davis et al., 2021; Miranda-Agrippino and Rey, 2021) seems to be reflecting the U.S. monetary and risk shocks and not the exogenous shocks in commodity prices.

5 Additional Results and Robustness

In this section we summarize the main takeaways of some additional results and sensitivity analysis. The results are presented in Appendix C.

Omitting Events. Although the commodity events that we selected are idiosyncratic and unrelated to the business cycle, some of them overlap with recession periods. We therefore check the robustness of the effects of an increase in export prices driven by commodity specific shocks when we exclude from our sample events which can be contaminated by weak global growth. Specifically, we exclude the crude oil event of 1998 since it could be affected by the effects of the Asian Crisis and all events in 2008 which could be driven by the Global Financial Crisis. The results, shown in Figure C4, reveal that our results remain robust. In addition, we also ensure that our results are consistent when we construct the instrument with a subset of 15 events that are considered in Di Pace et al. (2020) (listed in Table C1). As shown in Figure C5, our results remain robust.

Omitting Countries. One concern in our analysis is related to the possibility that a country could be playing a large role in driving the results. We therefore assess the sensitivity of our findings by excluding from the sample one country at the time. The results for the commodity specific shock, presented in Figure C6, show that our results remain robust. Figures C7 and C8 highlight that the estimates of the causal effect of a fall in BAA spread, associated with either U.S. monetary policy or a shift in global risk, do not disproportionately rely on the response of any specific country in our sample.

Subsample analysis. Financial markets in EMDEs have witnessed substantial changes over the sample period. After weathering a series of challenges throughout the 1980s and 1990s, EMDEs began to truly flourish in the 2000s. They demonstrated impressive growth rates, while successfully mitigating issues such as inflation and changing the composition of their external debt, reducing their vulnerability to swings in capital flows. These changes may have affected the way shocks are transmitted to the economy. We therefore estimate the effects of each of the shocks using a subsample starting in 2000. Figures C9-C11 show the results. In response to commodity specific shocks, we observe that the results are qualitatively similar. However, responses of Px and the real exchange rate are higher in the post-2000 subsample. The latter could indicate a more prominent role of the exchange rate as a shock absorber. In response to a looser U.S. monetary policy, the responses of GDP is smaller but the responses of the real exchange rate, the policy rate, the EMBI spread, reserves, capital inflows, and outflows are amplified. Post-2000, the response of Px to a global risk appetite shock is notably larger. The exchange rate also shows a larger appreciation with respect to the baseline comprising the whole sample; and reserves, capital inflows and outflows also exhibit larger responses, which is in line with Forbes and Warnock (2012). Aside from the quantitative differences in the overall responses, the broad conclusions of our analysis are preserved when focusing on the last 20 years of data.

Events Associated with Energy Commodities. Energy commodities possess distinct attributes. First, they serve as indispensable inputs for production, with no viable substitutes. Second, energy shocks have historically been associated with contractions in economic activity (Hamilton, 1983) in a way other commodities have not. For our sample of countries, the export share in energy commodities provides us with enough cross-sectional and temporal variation to be able to look at a few events and have enough identification power to analyze the impact of a shift in export prices driven by commodity specific shocks.[22] The effects of an increase in Px driven by energy commodity specific shocks are shown in Figure C12. The results are not very different from the baseline. This evidence suggests that the heterogeneity associated with the different commodity prices with respect to the question we address

[22]However, it should be noted that such a degree of variation is not present in all energy commodities, thereby limiting the extent of cross-sectional variation required to identify the causal effect.

(i.e. the identification of the causal effect of a shift of the export price for EMDEs), is perhaps quantitatively secondary.

6 Asymmetries in the Transmission Mechanism

Within the LP framework, in equation (1), the covariates $(x_{i,t} - \bar{x_i})$ serve a dual role. They act as control variables and also embody the characteristics of the treated subpopulation. These characteristics may influence the way in which the treatment affects the outcome. The KBO decomposition is particularly instrumental in this context, as it allows us to consider how the causal effect associated with the relevant shocks varies along four key dimensions. The first dimension comprises the growth rate of export prices, differentiating periods of commodity price booms, represented by above-average growth, from those characterized by a bust or weak growth in commodity prices, denoted by below-average growth. The second dimension revolves around the growth rate of domestic GDP, providing a lens to compare the impact of shock transmission during periods of high versus low economic growth. The third dimension, the level of the BAA spread, becomes an effective demarcation of periods of elevated and diminished global financial stress, identified by a BAA spread higher or lower than the sample mean, respectively. Finally, the fourth dimension centers on the net capital inflow level, offering a distinction between periods of surges in capital flows and those defined by capital flow retrenchments.[23] Table 3 shows the ″peak″ response for some key macroeconomic indicators under the alternative stratifications considered.

The transmission of commodity prices shocks, captured by the causal effect of a shift in the price of exports, tends to exert a more pronounced impact on GDP during periods of commodity price downturns (although this difference is not statistically significant). Furthermore, the expansionary effects of an increase Px are more prevalent during periods of weak economic growth (or contraction), as well as during periods of heightened global risk as indicated by a high BAA spread. Relatedly, the decline in the EMBI spread is significant during periods of sluggish economic growth and when net capital inflows are lower than the average. This impact is even larger than it would be if the shock were to occur during an economic expansion or during periods of above-average net capital inflows. The observed effects substantiate the theoretical relevance of nonlinearities associated with the onset of ″sudden stops″ (see, e.g., Mendoza, 2006). The anticipation of such a regime can can alter the behavior of economic agents, thereby magnifying the impact of economic shocks. As the domestic economy nears a point of ″sudden stop″, contractionary shocks bear an amplified potential to heighten the transition probability into this regime. Conversely, expansionary shocks are amplified as agents predict that the shock-induced transition to a ″sudden stop″ regime becomes less likely. Consequently, these shocks tend to exert larger aggregate effects.

Interestingly, the decline in EMBI spreads is on average larger during periods of low global financial stress, which are also periods characterized by large and negative capital inflows. This observation underscores the relevance of domestic characteristics and pull

[23]Results where we condition with respect to the level of gross inflows, as opposed to net capital inflows, are qualitatively similar to the baseline reported in this section.

Table 3: Regime Multipliers

	Baseline	Px change			GDP growth			BAA Spread			Net Inflows		
		UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF
GDP	**2.41**	1.78	**3.05**	-1.27	**1.55**	**3.28**	**-1.73**	**3.56**	**1.49**	**2.07**	**2.53**	**2.30**	0.24
EMBI Spread	-8.81	-17.84	**-7.63**	-10.21	-5.72	**-14.34**	**8.63**	-5.60	**-20.00**	**14.40**	-5.42	**-12.19**	6.77
Capital Outflows	**1.25**	1.49	**1.29**	0.21	**1.52**	**1.57**	-0.05	**2.77**	**0.83**	**1.94**	**1.82**	**0.71**	**1.11**
Capital Inflows	-0.62	**-2.21**	**1.13**	**-3.34**	0.91	-0.82	**1.73**	1.10	**-1.37**	**2.47**	-0.49	-0.74	0.25

(a) Commodity Price Shock

	Baseline	Px change			GDP growth			BAA Spread			Net Inflows		
		UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF
GDP	**3.22**	**2.62**	**4.78**	**-2.16**	**2.74**	**3.70**	-0.97	**1.45**	**5.68**	**-4.23**	**2.03**	**4.78**	**-2.75**
EMBI Spread	**-20.95**	**-30.35**	**-35.67**	5.32	**-23.28**	**-18.62**	-4.66	**-31.17**	**-67.31**	**36.14**	**-28.52**	**-13.38**	**-15.14**
Capital Outflows	**1.79**	**1.96**	**1.63**	0.32	**1.26**	**2.33**	-1.06	0.94	**2.65**	**-1.71**	**2.07**	**1.52**	0.55
Capital Inflows	**2.16**	1.11	**3.22**	**-2.11**	**2.03**	**2.30**	-0.27	1.57	**2.76**	-1.19	**1.37**	**2.98**	**-1.61**

(b) U.S. Monetary Policy Shock

	Baseline	Px change			GDP growth			BAA Spread			Net Inflows		
		UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF	UP	DOWN	DIFF
GDP	**2.40**	**2.94**	**3.10**	-0.15	**2.37**	**2.44**	-0.07	**3.30**	**1.55**	**1.75**	**2.31**	**2.49**	-0.18
EMBI Spread	**-29.30**	**-31.53**	**-27.08**	-4.45	**-27.43**	**-31.17**	3.74	**-28.47**	**-30.14**	1.66	**-30.85**	**-27.76**	-3.09
Capital Outflows	**1.47**	**1.52**	**1.90**	-0.38	**1.65**	**1.64**	0.02	**1.98**	**1.25**	0.73	**1.79**	**1.57**	0.22
Capital Inflows	**2.00**	**1.78**	**2.53**	-0.75	**2.21**	**1.88**	0.33	**2.50**	**1.57**	0.94	**2.66**	**1.73**	0.93

(c) Global Risk Appetite Shock

Notes: For each variable we report the ”peak” response, which corresponds to the value of the IRF from the initial impact to 4 years after the shock, where the maximum response in absolute value is observed. All values are expressed in percentage. The ”up” and ”down” stratifications refer to years in which the variables in the top column are one standard deviation above or below their average over the sample, respectively. We use the term ”DIFF.” to denote the difference between these two stratifications. Bold characters denote whether the reported number is statistically different from 0 at the 10% level.

factors when global risk is low. Conversely, during periods of heightened global financial stress, global push factors dominate and can potentially curtail the advantageous expansionary effects of an increase in commodity prices, especially for a country that exports those commodities.

A decrease in the BAA spread associated with a more accommodative monetary policy stance in the U.S., tends to exert a stronger expansionary influence on domestic GDP during periods marked by low growth, commodity price downturns, and below-average capital inflows. The interpretation of these effects can potentially be anchored to the critical role of potential nonlinearities that arise in association with the presence or threat of ‘‘sudden stop” regimes. The shift in risk associated with entering such a regime significantly impacts economic activity and the country’s attractiveness for foreign capital.

During periods of of low global risk, a more accommodative U.S. policy stance tends to have substantially larger effect on export prices and a more pronounced expansionary impact on the domestic GDP of emerging markets. This relationship, in turn, corresponds with higher capital flows (encompassing both inflows and outflows), and a significantly larger contraction in the EMBI spread. This type of nonlinearity is consistent, for instance, with the possibility that the expansionary impact of a more accommodative U.S monetary policy in the global economy is partially hindered in periods of high global financial stress, when impairments in the monetary transmission mechanism may occur (see, e.g., Bech et al., 2012).

Lastly, the effect of a fall in the BAA associated with eased global risk appetite remains consistent across various regimes, with one notable exception. The response of domestic GDP exhibits significantly more sensitivity when the shock arises during periods of heightened global risk, a phase typically coupled with more pronounced fluctuations in capital flows. Taken together, these observed nonlinearities align with the notion that EMDEs are increasingly susceptible to abrupt changes in global risk appetite during times of intensified global financial stress.

7 KBO Decomposition: Exploring the Channels of Transmission

In this section, we use the KBO decomposition to examine the responses heterogeneity over time and over states of the economy. This approach enables us to evaluate how, in response to a shock, the indirect effect of certain variables modifies the response of key variables. Specifically, we investigate (i) whether endogenous fluctuations in EMBI spread magnify the impact of export price increases on output; (ii) whether endogenous response of export prices to BAA spread reductions amplifies the effects of shocks on domestic output; and (iii) whether the endogenous response of the EMBI spread to a BAA spread decrease augments the effects of the shocks on domestic output.

To decompose the average effect into the part mediated by export prices or the EMBI spread, we build on the general KBO specification of Equation (1). In order to capture the effect of the intervention on either export prices or the EMBI spread over a certain horizon (h), we incorporate an extra term, denoted as Θ_i^h, which measures their responsiveness. It follows that

$$y_{i,t+h} - y_{i,t-1} = \mu_i^h \ + \ (x_{i,t} - \bar{x}_i)\gamma_0^h + f_{i,t}\beta^h \ + \ f_{i,t}(x_{i,t} - \bar{x}_i)\theta_x^h \ + \ f_{i,t}\Theta_i^h\theta_f^h \ + \ \omega_{i,t+h}. \quad (2)$$

The term $f_{i,t}\Theta_i^h\theta_f^h$ sheds light into how the effects of the intervention are mediated by movements in Px or the EMBI spread. From the KBO decomposition, this indirect effect is coming from the interaction term $\Theta_i^h\theta_f^h$.

We use the varying sensitivity of export prices or the EMBI spread across countries to the alternative identified treatment, which we proxy through Θ_i^h. This identification strategy is grounded on the assumption that there exists heterogeneity in the response of the relevant mediating variable to the shock under consideration across countries, owing to differences in their respective characteristics such as history, institutional quality, and economic structure. The panel structure of our analysis enables us to leverage this cross-sectional variation for the purpose of identifying the specific channel of interest.

Specifically, we follow Cloyne et al. (2023) and construct Θ_i^h estimating a local projection of the variable of interest, ζ_t, on the intervention variable (instrumented as discussed in Section 3) but allowing the coefficient associated with this variable to vary across countries:

$$\zeta_{i,t+h} - \zeta_{i,t-1} = \mu_i^h \ + \ (x_{i,t} - \bar{x}_i)\gamma_0^h + \sum_{j=1}^{N} \mathbf{1}(i = j) f_{i,t} \widetilde{\Theta}_i^h \ + \ \omega_{i,t+h}, \tag{3}$$

for $h = 0, 1, ..., H$. We can therefore use estimates of $\widetilde{\Theta}_i^h$ from this regression (expressed relative to its mean over all countries, $\Theta_i^h = \widetilde{\Theta}_i^h - \frac{1}{N}\sum_{j=1}^{N}\widetilde{\Theta}_j^h$) as our proxy of the effect of the offset of the variable $\zeta_{i,t}$ in the LP in equation (2).[24]

In order to improve the precision of the estimates, we choose a parsimonious specification and include only two lags of $\zeta_{i,t}$ among the controls in order to capture the persistence in the variable. The identification assumption underlying this approach is that there is variation in the average response of variable $\zeta_{i,t}$ to shocks of interest across countries but that this variation is not, on average, correlated with other factors that make the economy more sensitive to the same shock.

7.1 Results

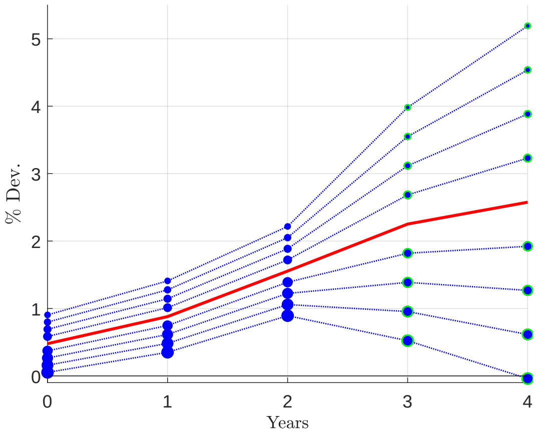
Figure 9 presents the GDP response to a surge in export prices, obtained by estimating the KBO specification outlined in Equation 2. The impulse response in red depicts the average effect of a one standard deviation increase in Px on GDP, which is equivalent to those shown in Figure 3. To examine how the effects vary with the EMBI spread, we present various scenarios (illustrated by the blue lines) by modifying the sensitivity of the EMBI spread to changes in Px through $\Theta_{i,t}$. The results show how the effect of Px on output varies as the EMBI spread deviates from its sample mean (represented by the direct effect). The circular markers' sizes correspond to higher EMBI spreads, and the green shaded markers indicate a statistically significant difference from the baseline. We adjust $\Theta_{i,t}$ by one standard deviation.

In response to an increase in export prices driven by commodity specific shocks, the response of GDP is higher in countries in which the EMBI spread falls by more. Therefore, countries in which the relationship between commodity prices and spreads is stronger exhibit a larger output response. By contrast, in countries where the EMBI spread's decrease is less pronounced, we observe a more subdued GDP response both in terms of magnitude and duration. This latter scenario seems to imply a situation where the output effects of traditional terms-of-trade channels are mitigated by the EMBI response. Given that the average effect, as depicted by the LATE, is small, our results emphasize the necessity of acknowledging the heterogeneity in EMBI sensitivity to commodity price shocks. This also highlights the significance of the financial channel (Drechsel and Tenreyro, 2018) operating through borrowing costs which has the potential to magnify the effects of an increase in export prices on domestic output.[25] Accordingly, in the presence of a positive commodity price shock, elevated EMBI

[24]When we look at the impact of a shift in the price of exports, we have set $\Theta_i^h = 0$ for those countries for which we have less than 3 non-zeros entries for the instrument (i.e. are directly affected by a small number of major commodity events).

[25]Specifically, commodity prices bolster the fiscal position and enhance the debt sustainability of exporting countries (see also Kaminsky, 2010; Hamann et al., 2023), thereby easing borrowing costs.

Figure 9: Response of GDP to Increase in Px mediated by the EMBI Spread



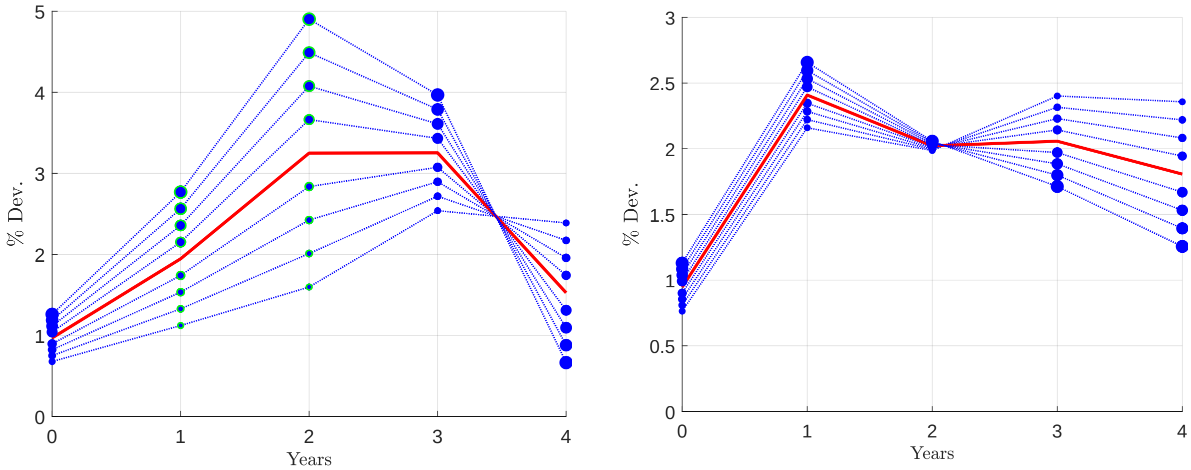
Notes: This figure shows how the response of GDP varies with the endogenous response of the EMBI spread (ranging from -1 to 1 standard deviation from the average effect in steps of $1/4^{th}$ of a standard deviation unit). The red line reports the direct effect, which is comparable to the average effect in Figure 3. The blue lines represent experiments that alter the degree of the endogenous response of the EMBI spread. A larger circular marker denotes EMBI spread movements above the average effect (in which case the EMBI spread response is more muted), the smaller circular marker denotes EMBI spread responses below the average effect (cases in which the decline in the EMBI spread is more pronounced). Green dots imply the indirect effect is statistically significant at a 10% level.

spreads may potentially constrain the effect on GDP. Hence, it is crucial for policymakers to incorporate the financial channel when formulating a policy response to accommodate these dynamics (Drechsel et al., 2019; Frankel, 2010). These findings further underscore the importance of robust institutions within EMDEs. The presence of such institutions can isolate fluctuations in domestic financing conditions from global factors.

The red impulse responses in Figure 10 and 11 show the average effect of a one standard deviation fall in the BAA on GDP driven by U.S. monetary policy (Panel a) and global risk appetite (Panel b). The red impulse responses are equivalent to those in Figures 5 and 7. Figure 10 illustrates how the endogenous response of Px amplifies the effects on the domestic business cycle while Figure 11 shows how the response of the domestic business cycle varies with the EMBI spread. As before, we present various scenarios (illustrated by the blue lines) by modifying the sensitivity of Px to changes in the BAA spread and the sensitivity of the EMBI spread to changes in the BAA spread.

The results in Figure 10 indicate that the GDP response to a BAA spread reduction is greater and statistically significant in instances of higher export prices, particularly when this reduction is stimulated by U.S. monetary policy. This heterogeneity could be attributed to the specific specialization of different countries. Accommodative U.S. monetary policy typically correlates with robust global growth, thus increasing demand for commodities and subsequently their prices. Therefore, the strength of transmission of U.S. monetary policy is affected by the magnitude of the Px response. This provides suggestive evidence that countries specialized in commodities tightly bound to global demand, might display pronounced export price responses, thereby leading to larger effects on output. Although there

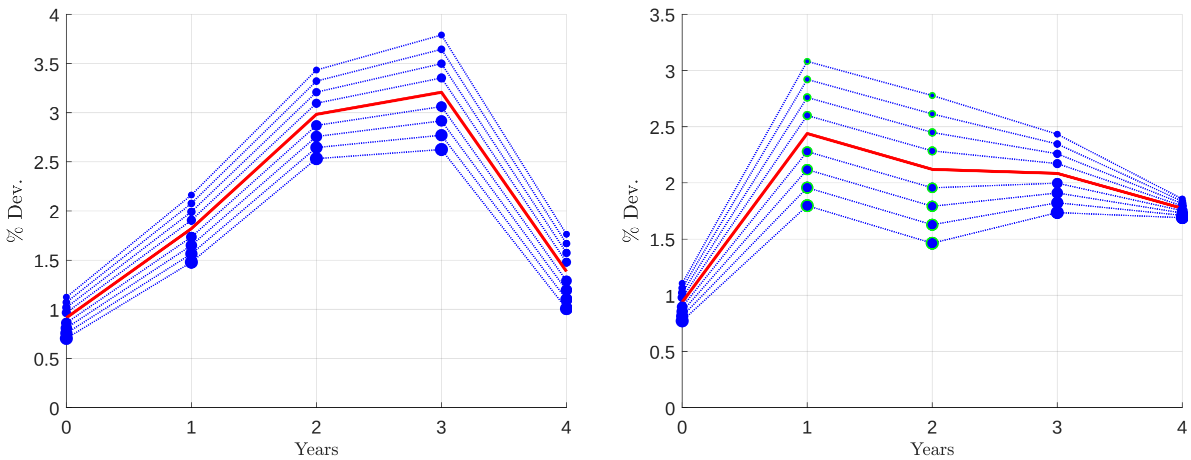
Figure 10: Response of GDP to a Decline in the BAA Spread Mediated by Px



(a) U.S. Monetary Policy (b) Global Risk Appetite

Notes: This figure shows how the response of GDP varies with the endogenous response of Px (ranging from -1 to 1 stdandard deviations from the average effect in steps of $1/4^{th}$ of a standard deviation unit). The left panel focuses on a fall in the BAA spread driven by a more accommodative U.S. monetary policy. The right panel examines the decline in the BAA spread resulting from a reduction in global uncertainty and risk.The red line reports the direct effect, which should be compared to the average effect in Figures 5 and 7. The blue lines consider experiments which vary the degree of the endogenous response in export prices. A larger circular marker denotes responses of the price of exports above the average effect (in which case the price of exports increases more than under the baseline case), the smaller circular marker denotes responses of export prices below the average effect (in which case the increase in the price of exports is less pronounced). Green dots imply the indirect effect is statistically significant at a 10% level.

Figure 11: Response of GDP to a Decline in the BAA Spread Mediated by the EMBI Spread



(a) U.S. Monetary Policy (b) Global Risk Appetite

Notes: This figure shows how the response of GDP varies with the endogenous response of the EMBI spread (ranging from -1 to 1 standard deviation from the average effect in steps of $1/4$ of a standard deviation unit). The left panel focuses on a fall in the BAA spread driven by a more accommodative U.S. monetary policy. The right panel examines the decline in the BAA spread resulting from a reduction in global uncertainty and risk. The red line reports the direct effect, which is comparable to the average effect in Figure 5 and 7. The blue lines represent experiments that alter the degree of the endogenous response of the EMBI spread. A larger mark denotes EMBI spread movements above the average effect (in which case the EMBI spread response is more muted), the smaller circular marker denotes responses of the EMBI spread below the average effect (in which case the fall in EMBI spread is more pronounced). Green dots denote when the indirect effect is statistically significant at a 10% level.

is no statistically significant variation in the GDP response to a decrease in the BAA spread driven by global risk appetite across different Px values, the pattern of responses aligns with previous discussions: output response increases with the export price response. However, the effects are more muted. These findings are consistent with the narrative proposed in Miranda-Agrippino and Rey (2021), where commodity prices are identified as a conduit for the propagation of the GFC.

Figure 11 shows the results mediated by different values of the EMBI spread. It demonstrates that GDP exhibits a larger increase in response to a BAA spread reduction when the EMBI spread is lower. While this effect is statistically significant when the BAA spread reduction is driven by global risk appetite, the heterogeneity is still visible in relation to a U.S. monetary policy shock. This suggests that countries that experience a larger reduction in the EMBI spread due to a fall in the BAA spread typically show a greater response in GDP. This effect is stronger in response to a global risk appetite shock.

Although the two shocks related to the GFC demonstrate qualitative parallels, their transmission mechanisms are different. The propagation of U.S. monetary policy shocks to EMDEs can vary considerably depending on the degree of response in export prices. By contrast, the transmission of global risk appetite shocks seems to be linked to financial channels and in particular on the endogenous response of EMBI spreads. Therefore, export prices amplify the effects of a decline in the BAA spread driven by U.S. monetary policy while EMBI spreads amplify the effects of a decline in the BAA spreads driven by shifts in global risk appetite. Taken together, these findings underscore the significance of commodity prices and EMBI spreads as an important channel of transmission of global shocks to EMDEs.

8 Conclusion

We analyse the interplay between commodity price fluctuations, the global financial cycle, capital flows, and economic outcomes in EMDEs. Our findings substantiate the significant impact of export price shifts on business cycles, capital flows, and debt financing costs within EMDEs, underlining their susceptibility to commodity price fluctuations. We show that these fluctuations do not purely reflect idiosyncratic shocks in commodity markets, instead evidencing a robust and dynamic linkage to key determinants of the global financial cycle, notably shifts in U.S. monetary policy and changes in global risk appetite.

The strength and nature of the transmission mechanisms of these global shocks to EMDEs appear to vary considerably depending on the source of the shock. Commodity price shifts linked to significant idiosyncratic events in specific commodity markets exert a potent positive impact on domestic GDP and are associated with large changes in foreign exchange reserves, thereby validating their critical role in steering EMDEs' business cycles. This impact is amplified through the endogenous response of EMBI spreads, highlighting the crucial role of financial conditions in shaping the transmission process. However, the influence of these shocks on capital flows remains comparatively subdued, suggesting a more limited role in driving the global financial cycle in emerging markets.

Commodity prices also play a key role as a conduit for the transmission of world shocks: easing of U.S. monetary policy and a reduction in global financial risk trigger an increase in export prices, which, in turn, contributes to a positive response in output and capital flows in EMDEs and is also accompanied by large falls in EMBI spreads. The intensity and duration of the response, however, vary significantly, and this difference can be attributed to a distinct transmission mechanisms of the two shocks. The procyclical response of commodity prices and the countercyclical movements in EMBI spreads in response to global shocks, contribute to the overall transmission of these shocks to EMDEs. This relationship emphasizes the intertwined relationship between global financial conditions, domestic economic factors, and the dynamics of commodity prices. A nuanced understanding of these dynamics is fundamental for effectively managing economic performance and volatility in EMDEs.

Our findings underscore the need for policy makers in EMDEs to pay close attention to the financial implications of commodity price fluctuations and the different transmission channels of world shocks, as they formulate economic policies and strategies for navigating a world characterized by an interlinked global financial cycle.

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A Data

Our sample comprises a group of 54 emerging and low income countries. The split by income category is summarized in Table A1. The data set includes information on output, capital flows, spreads, and export prices. The sources of data are described in section A.1. Tables A2 and A3 provide a comprehensive summary of the macro data coverage for each country and variable considered in our analysis. Section A.2 includes specific details on emerging markets spreads data while SectionA.3 describes the criteria to select the countries into our sample. Finally, Figure A1 shows the probability distribution of raw commodity exports for all the countries in our sample.

A.1 Data Sources

- Real GDP in local currency units. Source: World Bank's World Development Indicators (WDI) database. Indicator code: NY.GDP.MKTP.KN

- Capital flows are scaled by trend GDP using the following sources:
  - Capital inflows. Source: International Financial Statistics.
  - Capital outflows. Source: International Financial Statistics.
  - Nominal GDP in dollar terms. Source: World Economic Outlook.

- Spreads are obtained combining data based on:
  - EMBI. Description: JP Morgan EMBI global diversified index and JP Morgan EMBI global index, in bps. Sources: Datastream, Bloomberg, and JP Morgan.
  - Interest rate spreads. Description: domestic rate over U.S. rate (lending rate or t-bill), in %. Source: International Financial Statistics.

- BAA Spread. Description: Moody's seasoned BAA corporate bond yield relative to yield on 10-year treasury constant maturity, bps. Source: Federal Reserve Bank of St. Louis FRED.

- Policy rate. Description: Central Bank policy rate, in bps. Source: International Financial Statistics, Haver, and CEIC Data Global Database.[1]

- Export Prices. Export price index, 2010=100. Sources: Authors' calculation using as inputs data from MIT Observatory of Economic Complexity, World Bank, Federal Reserve Economic Data (FRED, Federal Reserve Bank of St. Louis).

A.2 Emerging Market Spreads

Emerging market sovereign spreads are mainly derived from the J.P. Morgan EMBI global diversified index, which measures the spread over Treasuries. To expand coverage for cer-

[1]For a number of countries the Central Bank policy rate is not available. In such cases, we use alternative interest rates as follows. For Mozambique, Pakistan, Sri Lanka, Tanzania, Trinidad and Tobago, Uruguay, and Venezuela, we use treasury rates. For El Salvador and Panama, we use the money market rates; and for Cameroon, Ecuador, and Gabon, we use the discount rates.

tain countries, we supplemented this with the J.P. Morgan EMBI global index. Moreover, to further extend coverage, we also used interest rate spreads, which are calculated as the difference between the domestic t-bill and the U.S. t-bill. In cases where this data was not available, we used the domestic lending rate over the U.S. lending rate instead. A comprehensive breakdown of our calculations can be found in Table A4.

A.3 Country Selection

We restrict the set of countries that we study to ensure the availability of data for the variables analyzed. First, we focus on emerging countries according to the definition of the IMF World Economic Outlook. Second, we narrow the sample to countries with data available from 2007. Third, we drop large economies such as China and India. Finally, we drop economies which are classified as emerging but are part of the European Union such as Poland. After applying these filters, our sample consists of 54 emerging economies.

Table A1: Country Coverage by Income Classification

Upper Middle Income	Lower Middle Income	Low Income
Argentina	Algeria	Cameroon
Armenia	Angola	Côte d’Ivoire
Azerbaijan	Bolivia	Ghana
Belarus	Egypt	Kenya
Belize	El Salvador	Mozambique
Brazil	Indonesia	Nigeria
Chile	Lebanon	Tanzania
Colombia	Mongolia	Vietnam
Costa Rica	Morocco	Zambia
Dominican Republic	Pakistan	
Ecuador	Philippines	
Gabon	Sri Lanka	
Georgia	Tunisia	
Guatemala	Ukraine	
Iraq		
Jamaica		
Kazakhstan		
Kuwait		
Malaysia		
Mexico		
Panama		
Peru		
Qatar		
Russia		
Serbia		
South Africa		
Thailand		
Turkey		
Trinidad and Tobago		
Uruguay		
Venezuela		

Notes: This Table shows the country classification by income group. The low income classification is from the IMF while the breakdown between upper middle income and lower middle income is sourced from the World Bank.

Table A2: Macro Data Coverage

Country	Real GDP	EMBI Spreads	Export Prices	Interest Rate	Real Exchange Rate
Algeria	1990-2019	1999-2019	1990-2019	1990-2019	1990-2019
Angola	1990-2019	2006-2019	1990-2019	2005-2019	1990-2019
Argentina	1990-2019	1993-2019	1990-2019	2002-2019	1990-2019
Armenia	1990-2019	2000-2019	1993-2019	2000-2019	1993-2019
Azerbaijan	1990-2019	1998-2019	1993-2019	1997-2019	1992-2019
Belarus	1990-2019	2004-2019	1993-2019	2000-2019	1994-2019
Belize	1990-2019	2007-2019	1990-2019	1990-2019	-
Bolivia	1990-2019	1997-2019	1990-2019	1996-2019	1990-2019
Brazil	1990-2019	1994-2019	1990-2019	2000-2019	1990-2019
Cameroon	1990-2019	1993-2019	1990-2019	2009-2019	1990-2019
Chile	1990-2019	1999-2019	1990-2019	1996-2019	1990-2019
Colombia	1990-2019	1997-2019	1990-2019	1996-2019	1990-2019
Costa Rica	1990-2019	2002-2019	1990-2019	2007-2019	1990-2019
Côte d'Ivoire	1990-2019	1998-2019	1990-2019	2001-2017	1990-2019
Dominican Republic	1990-2019	2001-2019	1990-2019	2004-2019	1990-2019
Ecuador	1990-2019	1995-2019	1990-2019	2008-2019	2001-2019
Egypt	1990-2019	2001-2019	1990-2019	1991-2019	1990-2019
El Salvador	1990-2019	2002-2019	1990-2019	1997-2008	1990-2019
Gabon	1990-2019	2007-2019	1990-2019	2006-2017	1990-2019
Georgia	1990-2019	2007-2019	1993-2019	2008-2019	1996-2019
Ghana	1990-2019	2007-2019	1990-2019	1990-2019	1990-2019
Guatemala	1990-2019	2002-2019	1990-2019	2005-2019	1990-2019
Indonesia	1990-2019	2004-2019	1990-2019	1990-2019	1990-2019
Iraq	1990-2019	2006-2019	1990-2019	2004-2019	1990-2019
Jamaica	1990-2019	2007-2019	1990-2019	2002-2019	1990-2019
Kazakhstan	1990-2019	2007-2019	1993-2019	2006-2019	1994-2019
Kenya	1990-2019	1993-2019	1990-2019	2007-2019	1990-2019
Kuwait	1995-2019	2004-2019	1993-2019	1993-2019	1993-2019
Lebanon	1990-2019	1998-2019	1990-2019	1990-2019	2008-2019
Malaysia	1990-2019	1996-2019	1990-2019	2002-2019	1990-2019
Mexico	1990-2019	1993-2019	1990-2019	2002-2019	1990-2019
Mongolia	1990-2019	2012-2019	1990-2019	2008-2021	1992-2019
Morocco	1990-2019	1997-2019	1990-2019	1990-2019	1990-2019
Mozambique	1990-2019	2000-2019	1990-2019	1998-2019	2004-2019
Nigeria	1990-2019	1993-2019	1990-2019	2007-2019	1990-2019
Pakistan	1990-2019	2001-2019	1990-2019	1996-2019	1990-2019
Panama	1990-2019	1996-2019	1990-2019	2002-2019	1990-2019
Peru	1990-2019	1997-2019	1990-2019	2004-2019	1990-2019
Philippines	1990-2019	1993-2019	1990-2019	2002-2019	1990-2019
Qatar	2000-2019	2001-2019	1990-2019	2003-2019	1990-2019
Russia	1990-2019	1997-2019	1993-2019	2002-2019	1993-2019
Serbia	1995-2019	2005-2019	2007-2019	2002-2019	1997-2019
South Africa	1990-2019	1994-2019	1990-2019	1999-2019	1990-2019
Sri Lanka	1990-2019	2007-2019	1990-2019	2001-2019	1990-2019
Tanzania	1990-2019	1993-2019	1990-2019	1993-2019	1990-2019
Thailand	1990-2019	1997-2005	1990-2019	2001-2019	1990-2019
Trinidad and Tobago	1990-2019	2007-2019	1990-2019	1990-2019	1990-2019
Tunisia	1990-2019	2002-2019	1990-2019	1990-2019	1990-2019
Turkey	1990-2019	1996-2019	1990-2019	1990-2019	1990-2019
Ukraine	1990-2019	2000-2019	1993-2019	1993-2019	1993-2019
Uruguay	1990-2019	2001-2019	1990-2019	1991-2019	1990-2019
Venezuela	1990-2014	1993-2019	1990-2019	2001-2016	2008-2016
Vietnam	1990-2019	2005-2019	1990-2019	1996-2019	1995-2019
Zambia	1990-2019	1990-2019	1990-2019	2006-2019	1990-2019

Notes: This Table presents the macro data coverage for each country included in our sample.

Table A3: Capital Flows Data Coverage

Country	DIO	PDO	PEO	OIO	FXR	DII	PDI	PEI	OII
Algeria	1990-2019	1990-2013	1990-2019	1990-2019	1990-2019	1990-2019	1990-2013	1990-2013	1990-2019
Angola	1990-2019	2002-2019	2002-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Argentina	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Armenia	1994-2019	1994-2019	1994-2019	1993-2019	1990-2019	1993-2019	1994-2019	1990-2019	1993-2019
Azerbaijan	1995-2019	1995-2019	2003-2019	1995-2019	1990-2019	1995-2019	1995-2019	1990-2019	1995-2019
Belarus	1997-2019	1996-2019	1997-2019	1993-2019	1990-2019	1993-2019	1996-2019	1990-2019	1993-2019
Belize	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Bolivia	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Brazil	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1992-2019	1990-2019
Cameroon	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Chile	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Colombia	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Costa Rica	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1991-2019	1990-2019
Côte d'Ivoire	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Dominican Republic	1990-2019	1990-2019	1990-2016	1990-2019	1990-2016	1990-2019	1990-2019	1990-2019	1990-2019
Ecuador	1992-2019	1992-2019	1992-2019	1992-2019	1990-2019	1990-2019	1992-2019	1990-2019	1990-2019
Egypt	1990-2019	1990-2013	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
El Salvador	1996-2019	1999-2019	1996-2019	1990-2019	1990-2019	1990-2019	1995-2019	1990-2019	1990-2019
Gabon	1990-2015	1990-2014	1990-2018	1990-2015	1990-2018	1990-2015	1990-2015	1990-2015	1990-2015
Georgia	1997-2019	2000-2019	2000-2019	1997-2019	2005-2019	1997-2019	2000-2019	2005-2019	1997-2019
Ghana	1990-2019	1990-2010	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1993-2010	1990-2019
Guatemala	1990-2019	1990-2019	1990-2019	1990-2019	2002-2019	1990-2019	1990-2019	2002-2019	1990-2019
Indonesia	1990-2019	1990-2019	1990-2019	1990-2019	2011-2019	1990-2019	1990-2019	2011-2019	1990-2019
Iraq	2005-2019	2005-2019	2005-2019	2005-2019	1990-2019	2005-2019	2005-2019	1990-2019	2005-2019
Jamaica	1990-2019	1990-2019	1990-2011	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Kazakhstan	1995-2019	1995-2019	1997-2019	1995-2019	1990-2019	1995-2019	1995-2019	1990-2019	1995-2019
Kenya	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Kuwait	1993-2019	1993-2019	1993-2019	1993-2019	1993-2019	1993-2019	1993-2019	1993-2019	1993-2019
Lebanon	2002-2019	2002-2019	2002-2019	2002-2019	1990-2019	2002-2019	2002-2019	1990-2019	2002-2019
Malaysia	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Mexico	1990-2019	1990-2019	1990-2013	1990-2019	1996-2019	1990-2019	1990-2019	2005-2019	1990-2019
Mongolia	2005-2019	2007-2019	2004-2013	1992-2019	1990-2019	1992-2019	2000-2019	1990-2019	1990-2019
Morocco	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	2002-2019	1990-2019
Mozambique	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Nigeria	1990-2019	1990-2019	1990-2015	1990-2019	1990-2015	1990-2019	1990-2019	1990-2019	1990-2019

to be continued in the next page . . .

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Country	DIO	PDO	PEO	OIO	FXR	DII	PDI	PEI	OII
Pakistan	1990-2019	1990-2019	1990-2010	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Panama	1991-2019	1990-2019	1995-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Peru	1991-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1991-2019	1990-2019	1990-2019
Philippines	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Qatar	2011-2019	2011-2019	2011-2019	2011-2019	1990-2019	2011-2019	2011-2019	1990-2019	2011-2019
Russia	1994-2019	1994-2019	1994-2019	1994-2019	1990-2019	1994-2019	1994-2019	1990-2019	1994-2019
Serbia	2007-2019	2007-2019	2007-2013	2007-2019	1990-2019	2007-2019	2007-2019	1990-2019	2007-2019
South Africa	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Sri Lanka	1990-2019	1990-2019	1990-2019	1990-2019	1993-2019	1990-2019	1990-2019	1994-2019	1990-2019
Tanzania	1990-2009	1990-2019	1990-2019	1990-2019	1995-2019	1990-2019	1990-2019	2003-2019	1990-2019
Thailand	1990-2019	1990-2019	1990-2019	1990-2019	1993-2019	1990-2019	1990-2019	1998-2019	1990-2019
Trinidad and Tobago	1990-2019	1990-2019	1990-2019	1990-2019	1997-2019	1990-2019	1990-2019	1997-2019	1990-2019
Tunisia	1990-2019	1990-2013	1990-2019	1990-2019	1995-2019	1990-2019	1990-2013	2000-2019	1990-2019
Turkey	1990-2019	1992-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019
Ukraine	1994-2019	1995-2019	1996-2019	1994-2019	1994-2019	1994-2019	1994-2019	1994-2019	1994-2019
Uruguay	1990-2019	1990-2019	1990-2019	1990-2019	1994-2019	1990-2019	1990-2019	1996-2019	1990-2019
Venezuela	1990-2016	1990-2016	1990-2019	1990-2016	2007-2019	1990-2016	1990-2016	2007-2015	1990-2016
Vietnam	1996-2019	2005-2006	2005-2019	1996-2019	1990-2019	1996-2019	2005-2014	2005-2014	1996-2019
Zambia	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1990-2019	1995-2019	1990-2019

Notes: This Table presents the data coverage for each country included in our sample. The acronyms DIO, PDO, PEO, and OIO refer to capital outflows for direct investment, portfolio debt, portfolio equity, and other investment, respectively, while FXR represents the flows of foreign exchange reserves. Conversely, the capital inflows for direct investment, portfolio debt, portfolio equity, and other investment are denoted by DII, PDI, PEI, and OII, respectively.

Table A4: Spreads Data

Country	Years	Notes
Algeria	1999-2019	1999-2002 uses EMBI GD index. Coverage extended by splicing using the African EMBI GD index for 2003-2019.
Angola	2006-2019	2012-2019 uses EMBI G and GD indices. Spliced backwards using interest rate spread based on domestic t-bill over U.S. t-bill for 2006-2011.
Argentina	1993-2019	EMBI G and EMGI GD indices
Armenia	2000-2019	2013-2019 uses EMBI GD index. Spliced backwards using interest rate spread on domestic lending rate over U.S. lending rate for 2000-2012
Azerbaijan	1998-2019	2012-2019 uses EMBI GD index. Spliced backwards using interest rate spread on domestic lending rate over U.S. lending rate for 1998-2011.
Belarus	2004-2019	2010-2019 uses EMBI GD index. Spliced backwards using interest rate spread on domestic lending rate over U.S. lending rate for 2004-2009.
Belize	2007-2019	EMBI GD index.
Bolivia	1997-2019	2012-2019 uses EMBI G and GD indices. Spliced backwards using interest rate spread on domestic lending rate over U.S. lending rate for 1997-2011.
Brazil	1994-2019	EMBI GD index.
Cameroon	1993-2019	2015-2019 uses EMBI G and GD indices. Spliced backwards using the Sub-Saharan Africa GD index for 2003-2014.
Chile	1999-2019	EMBI GD index.
Colombia	1997-2019	EMBI GD index.
Costa Rica	2002-2019	2012-2018 uses EMBI GD index. Spliced backwards using the CACI index for Costa Rica for 2002-2011.
Côte d'Ivoire	1998-2019	EMBI GD index.
Dominican Republic	2001-2019	EMBI G and EMGI GD indices
Ecuador	1995-2019	EMBI GD index.
Egypt	2001-2019	EMBI GD index.
El Salvador	2002-2019	EMBI GD index.
Gabon	2007-2019	EMBI G and EMGI GD indices
Georgia	2007-2019	2008-2019 uses EMBI GD index. Spliced backwards using interest rate spread on domestic lending rate over U.S. lending rate for 2007.
Ghana	2007-2019	EMBI GD index.
Guatemala	2002-2019	2012-2019 uses EMBI GD index. Spliced backwards using the CACI index for Guatemala for 2002-2011.
Indonesia	2004-2019	EMBI GD index.
Iraq	2006-2019	EMBI GD index.
Jamaica	2007-2019	EMBI GD index.
Kazakhstan	2007-2019	EMBI GD index.
Kenya	1993-2019	2014-2019 uses EMBI GD index. Spliced backwards using the Sub-Saharan Africa GD index for 2003-2013.
Kuwait	2004-2019	Due to lack of EMBI data corresponds to MECI spread.
Lebanon	1998-2019	EMBI GD index.
Malaysia	1996-2019	EMBI GD index.
Mexico	1993-2019	EMBI G and EMGI GD indices.
Mongolia	2012-2019	EMBI GD index.
Morocco	1997-2019	EMBI GD index.
Mozambique	2000-2019	2012-2014 uses EMBI G index. Spliced backwards using interest rate spread based on domestic t-bill over U.S. t-bill for 2000-2011.
Nigeria	1993-2019	EMBI GD index.

to be continued in the next page . . .

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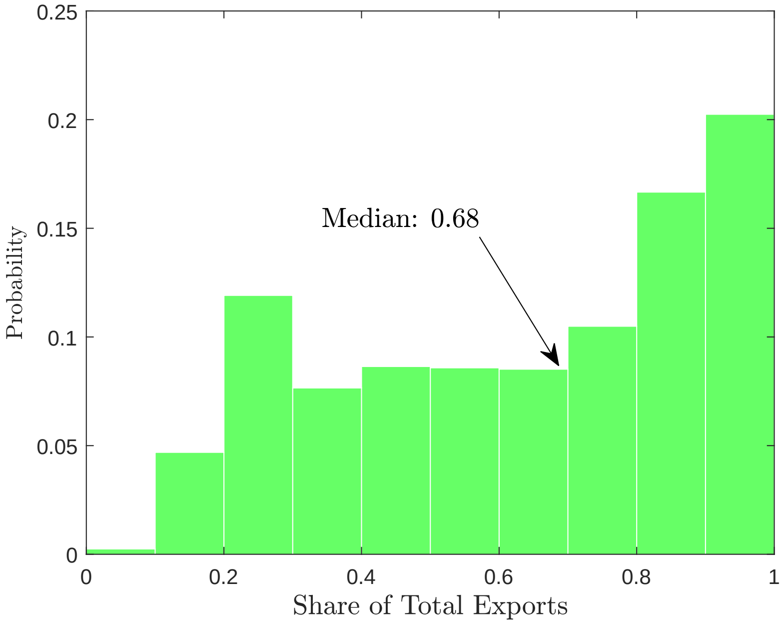
Country	Years	Notes
Pakistan	2001-2019	EMBI GD index.
Panama	1996-2019	EMBI GD index.
Peru	1997-2019	EMBI GD index.
Philippines	1993-2019	EMBI GD index.
Qatar	2001-2019	Due to lack of EMBI data corresponds to MECI spread.
Russia	1997-2019	EMBI G and EMGI GD indices
Serbia	2005-2019	EMBI GD index.
South Africa	1994-2019	EMBI G and EMGI GD indices
Sri Lanka	2007-2019	EMBI G and EMGI GD indices
Tanzania	1993-2019	2013-2019 uses EMBI G and GD indices. Spliced backwards using interest rate spread based on domestic t-bill over U.S. t-bill for 1993-2011.
Thailand	1997-2005	EMBI GD index.
Trinidad and Tobago	2007-2019	EMBI GD index.
Tunisia	2002-2019	EMBI GD index.
Turkey	1996-2019	EMBI GD index.
Ukraine	2000-2019	EMBI GD index.
Uruguay	2001-2019	EMBI GD index.
Venezuela	1993-2019	EMBI G and EMGI GD indices
Vietnam	2005-2019	EMBI G and EMGI GD indices
Zambia	1990-2019	2012-2014 uses EMBI GD index. Spliced backwards using interest rate spread based on domestic t-bill over U.S. t-bill for 1990-2011.

Notes: This Table displays the coverage for the country spreads data along with the specific indices used for each country.

Figure A1: Probability Distribution: Raw Commodity Exports



Notes: This figure shows the probability distribution of the share of raw commodities in total exports for all the countries in our sample.

B Commodity Events

This appendix delineates the methodology adopted to identify events tied to substantial commodity price fluctuations, which we use in building the instrument for export prices. Our approach involved examining historical documents, reports, and newspaper articles to pinpoint significant commodity price shifts, independent of global economic conditions. Following this, we classified each event into positive or negative price shocks, contingent on the price change trajectory. This categorization eventually influences the characterization of a country's export price shock as positive or negative, contingent on its role as an exporter of the particular commodity in question.

The series were constructed by using a number of sources: Food and Agriculture Organization (FAO) reports, publications from the International Monetary Fund (IMF) and the World Bank (WB), newspaper articles, academic papers and a number of online sources. In order to establish some rules at the time of selecting the dates, we followed the criteria listed below.

1. The event has to be important enough to affect a commodity market at a global level. Examples of these are natural disasters or weather related shocks in key areas where the commodity is produced, major geopolitical events, and unanticipated news on the volume of global production or demand of commodities.
2. The event should have an unambiguous effect on the price of the commodity.
3. The event has to be unrelated to important macroeconomic developments such as the global financial crisis or a U.S. recession. This aims at eliminating endogenous re-

sponses of commodity prices to the state of the economy.

By using this criteria we were able to identify 24 episodes of exogenous commodity price shocks that are unrelated to business cycle fluctuations. Of these events, 16 are favorable commodity price shocks and 8 are negative price shocks.

B.1 Agriculture: Food and Beverage Commodities

i. Coffee

Year of Event: 1994.
Type of Event: Positive price shock.

According to a report from the International Coffee Organization (ICO), climate shocks which affected coffee prices were recorded in Brazil in 1994.[2] Our data are in line with this observation given that we observe that Arabica coffee prices increased from 1.56 dollars per kilo in 1993 to 3.31 in 1994.

Newspaper Articles. A newspaper article from the New York Times documents that the climate shock of 1994 in Brazil is related to a frost. Some important aspects of the article are quoted in what follows.
New Frost Hits Brazilian Coffee, New York Times (July 11, 1994):[3]

"Frost struck in Brazil's biggest coffee-growing state early today, and farmers said the effects were harsher than a freeze that hit two weeks ago."

"(...)Coffee prices soared after the previous cold snap late last month, which destroyed one-third of next year's crop. Brazil is the largest coffee producer, accounting for about a quarter of world production. A threat to its crop can drastically affect world coffee prices(...)."

ii. Cereal

Year of Event: 1997.
Type of Event: Negative price shock.

As documented in De Winne and Peersman (2016), in 1996 the FAO issued a favorable forecast for world 1996 cereal output.[4] The largest increase was expected in coarse grains output, mostly in developed countries. Overall, global cereal production increased by 7.8 percent that year and this translated into lower prices. Our data show that the cereal price index experienced a sharp reduction from 1996 to 1997, going from 83.61 to 64.76.

Year of Event: 2010.
Type of Event: Positive price shock.

[2] Report available at: http://www.ico.org/news/icc-111-5-r1e-world-coffee-outlook.pdf.
[3] Article available at: https://www.nytimes.com/1994/07/11/business/new-frost-hits-brazil-coffee.html.
[4] The FAO document is available at: http://www.fao.org/docrep/004/w1690e/w1690e02.htm#I2.

De Winne and Peersman (2016) report that cereal output was seriously affected by adverse weather conditions in key producing countries in Europe. A group of countries that includes the Russian Federation, Kazakhstan and Ukraine suffered from a heatwave and droughts while the Republic of Moldova had floods. According to a report from the FAO, "International prices of grain have surged since the beginning of July in response to drought-reduced crops in CIS exporting countries and a subsequent decision by the Russian Federation to ban exports."[5]

iii. Cocoa

Year of Event: 1999.
Type of Event: Negative price shock.
According to a report from FAO, the drop in cocoa prices during 1999 was primarily attributed to a surplus in supply resulting from a rise in production levels across major cocoa-producing nations.

Newspaper Articles. An article from the New York Times documents the cocoa price decline in 1999.
The Market: Commodities, New York Times (November 3, 1999):[6]

"COCOA FALLS. Cocoa fell as shippers in the Ivory Coast, the world's largest supplier, begin exporting newly harvested beans at a time of weak demand. In New York, cocoa for December delivery fell $38, to $840 a metric ton."

Year of Event: 2002.
Type of Event: Positive price shock.

According to a report from the International Cocoa Organization, the increase in cocoa prices in 2002 was largely due to an attempted coup on 19th September in Côte d'Ivoire, which is the leading cocoa producing country. Uncertainty over potential disruptions emanating from the sociopolitical crisis and civil war pushed prices to a 16-year high at 2.44 dollars per tonne in October 2002.[7] Our data show that between 2001 and 2002 cocoa prices increased from 1.07 dollars per kilo to 1.78 dollars per kilo.

Year of Event: 2017.
Type of Event: Positive price shock.

According to a report from the International Cocoa Organization, the decline in cocoa prices in 2017 was driven by favorable weather conditions in major producing countries such as Côte d'Ivoire and Ghana.[8] Our data show that cocoa prices declined around 30 percent in

[5]Available at: http://www.fao.org/docrep/012/ak354e/ak354e00.pdf.
[6]Article available at: https://www.nytimes.com/1999/11/03/business/the-markets-commodities.html?searchResultPosition=24.
[7]https://www.icco.org/about-us/international-cocoa-agreements/cat_view/30-related-documents/45-statistics-other-statistics.html.
[8]https://www.icco.org/wp-content/uploads/2019/07/ICCO-Monthly-Cocoa-Market-

2017.

Newspaper Articles. A newspaper article from the New York Times documents the cocoa price increase originated in Cote d'Ivore in 2002. Some important aspects of the article are quoted below.
War Inflates Cocoa Prices But Leaves Africans Poor, New York Times (October 31, 2002):[9]

"As civil war raged in Ivory Coast, the world's biggest cocoa producer, speculative traders here and in New York sent prices this month to 17-year highs."

iv. Rice

Year of Event: 2008.
Type of Event: Positive price shock.

In 2008 rice prices nearly doubled. A report from the United States Department of Agriculture explains that the price increase was driven by trade restrictions of major suppliers.[10]

v. Sugar

Year of Event: 2006.
Type of Event: Positive price shock.

The sugar price increase in 2006 was caused by severe draughts in Thailand, the second largest sugar producer.[11]

vi. Soybean

Year of Event: 2008.
Type of Event: Positive price shock.

A report from the U.S. Bureau of Labor Statistics highlights that the high soybean prices in 2008 originated in the expectation of a reduction in supply.[12] We observe an increase of 40 percent in soybean prices in our data.

B.2 Agriculture: Raw Materials

i. Cotton

Year of Event: 1994.
Type of Event: Positive price shock.

Review-February-2017.pdf.

[9]Article available at: https://www.nytimes.com/2002/10/31/business/war-inflates-cocoa-prices-but-leaves-africans-poor.html.

[10]https://www.ers.usda.gov/webdocs/outlooks/38489/13518_rcs09d01_1_.pdf?v=242#:~:text=Global\%20rice\%20prices\%20increased\%20nearly,through\%20the\%20spring\%20of\%202008.

[11]see https://www.aa.com.tr/en/politics/thailand-facing-its-worst-drought-in-20-years-/552381.

[12]https://www.bls.gov/opub/btn/volume-9/a-historical-look-at-soybean-price-increases-what-happened-since-the-year-2000.htm

A report from the U.S. International Trade Commission describes that the 1994 cotton price increase was driven by a decline in production in key production areas such as China, and India.[13] The decline in production in China is explained by bad weather and a bollworm infestation. A study from the National Cotton Council of America explains that the price increase is also partly due to a recovery in world cotton consumption following the stagnation that resulted from the dissolution of the Soviet Union in the early 1990s.[14] Our data indicate that cotton prices declined from 1.28 dollars per kilo in 1993 to 1.76 dollars per kilo in 1994.

Year of Event: 2003.
Type of Event: Positive price shock.

MacDonald and Meyer (2018) analyze the challenges faced when forecasting cotton prices in the long run. The article highlights that in 2003 there was a severe weather damage to cotton crops in China which resulted in a surge in cotton prices. In addition, an article from the National Cotton Council of America highlights that in the 2003 season, "(...) USDA's forecast put world sticks at their lowest level since 1994/95, raising the specter of a world cotton shortage for the first time in nearly a decade."[15] Our data show that cotton prices increased from 1.02 dollars per kilo in 2002 to 1.40 dollars per kilo in 2003.

Year of Event: 2010.
Type of Event: Positive price shock.

Janzen et al. (2018) analyze the extent to which cotton price movements can be attributed to comovement with other commodities vis-à-vis cotton specific developments. They point at the fact that in 2010-2011 cotton was scarce as a consequence of a negative supply shock generated by lower than average planted crops and negative weather shocks in the USA and Pakistan. This led to an increase in the price of cotton. The authors explain that this boom-bust appears to be cotton-specific, unlike other cases in which a set of macroeconomic factors drive the price of a broad range of commodities. Our data confirm the findings of the paper. In fact, cotton prices increased from 1.38 dollars per kilo in 2009 to 2.28 dollars per kilo in 2010.

ii. Timber

Year of Event: 1993.
Type of Event: Positive price shock.

[13] Article available at: https://books.google.com/books?id=OZFDf6qLEosC&pg=SA3-PA5&lpg=SA3-PA5&dq=cotton+prices+1994&source=bl&ots=vi6JuOeGer&sig=DX9iSSIDP__dPIGTNKEfB03FkSA&hl=en&sa=X&ved=2ahUKEwiJkOOWztneAhVkneAKHWFOCWs4ChDoATADegQIBRAB#v=onepage&q=cotton\%20prices\%201994&f=false.

[14] Article available at: https://www.cotton.org/issues/2005/upload/WorldCottonMarket.pdf.

[15] Article available at: https://www.cotton.org/issues/2005/upload/WorldCottonMarket.pdf.

Sohngen and Hayne (1994) explain that the 1993 price spike was driven by the environmentally friendly policies that President Clinton issued to protect forests which limited the timber harvests.[16] The application of such policies is confirmed in the list of environmental actions taken by President Clinton and Vice President Al Gore and is documented in the White House Archives.[17] Our data reveal that the timber price index increased from 72.41 in 1992 to 100.58 in 1993.

Newspaper Articles. A newspaper article from the Washington Post documents this episode and describes how the environmental policy was viewed as a threat to the woods product industry.
Clinton to Slash Logging (July 2, 1993):[18]

"To protect the region's wildlife and old-growth forests, the administration plan will allow for average timber harvests over the next decade of 1.2 billion board feet per year. That is about half the level of the last two years, and only a third of the average rate between 1980 and 1992, when annual harvests swelled as high as 5.2 billion board feet."

iii. Tobacco

Year of Event: 1993.
Type of Event: Negative price shock.

A report from the FAO highlights that the worldwide increase in competition for exports in 1993 led to a substantial fall in tobacco prices.[19] Our data reveal that tobacco prices declined 22 percent between 1992 and 1993.

iv. Rubber

Year of Event: 2010.
Type of Event: Positive price shock.

In 2010 rubber prices almost doubled in 2010. This is due to severe draughts in Thailand and India, major rubber producers.

Newspaper Articles. A newspaper article from the Financial Times documents this.
Rubber price breaks 58-year record (March 31, 2010):[20]

"The price surge comes on the back of the worst drought in north Thailand in a decade, which meteorologists blame on the lingering impact of the El Niño weather phenomenon. Drought has also hit India, the world's fourth-largest producer."

[16] Article available at: https://www.fs.fed.us/pnw/pubs/pnw_rp476.pdf.
[17] Available here https://clintonwhitehouse4.archives.gov/CEQ/earthday/ch13.html.
[18] https://www.washingtonpost.com/archive/politics/1993/07/02/clinton-to-slash-logging/f2266e63-f45f-4f88-bd1f-5f1a1edd820f/
[19] Commodity Review and Outlook 1993-1994, Food and Agriculture Organization of the United Nations, page 156.
[20] https://www.ft.com/content/636c534c-3ce1-11df-bbcf-00144feabdc0

B.3 Energy Commodities

i. Combined Energy Commodities

Year of Event: 2015.
Type of Event: Negative price shock.
The booming U.S. shale oil production played a significant role in the oil price plummet in 2015. However, this event has affected the prices of the main fossil fuels commodities. Our data shows that crude oil prices declined 47 percent, while coal and natural gas prices contracted 16 and 26 percent, respectively, between 2015 and 2015.

Year of Event: 2019.
Type of Event: Negative price shock.

This is the first time that the United States became a net energy exporter following the development of shale technology (EIA, 2020). Therefore, this event can be understood as an event affecting crude oil, natural gas, and coal prices. However, it is not visible in crude oil price because there were attacks to Saudi Arabia oil facilities which disrupted oil exports (World Bank, 2021). This effect partially offset the price reduction from shale technology in the United States. In our dataset we observe that natural gas prices declined 25 percent in 2019 while coal declined 15 percent.

Newspaper Articles. A newspaper article explains the dimension of the oil price plunge.

How the U.S. and OPEC Drive Oil Prices, New York Times (October 5, 2015)[21]

"The global price of a barrel of oil remains near its lowest point since the depths of the 2009 recession — a result of a supply glut and battle for market share between the OPEC oil cartel and the United States, which has shifted toward the role of global swing producer."

iii. Crude Oil

Year of Event: 1998.
Type of Event: Negative price shock.
Känzig (2021) highlights the role played by oil supply expectations in driving the plunge in oil prices in 1998. Our dataset indicate that oil prices declined 32 percent in 1998.

iii. Natural Gas

Year of Event: 2000.
Type of Event: Positive price shock.

The Energy Information Administration (EIA) documents the California energy crisis of 2000-2001.[22] In terms of natural gas, a report from the Task Force on Natural Gas Market Stability

[21] https://www.nytimes.com/interactive/2015/09/30/business/how-the-us-and-opec-drive-oil-prices.html?searchResultPosition=28.

[22] https://www.eia.gov/electricity/policies/legislation/california/subsequentevents.html.

finds that "the 2000-2001 California natural gas crisis resulted in major part from a perfect storm of sudden demand increase, impaired physical capacity, natural gas diversion, and inadequate storage fill. The quick summary is as follows: Low hydroelectric availability in 2000, coupled with a modest increase in overall power needs resulted in a substantial increase in gas-fired generation usage, with little preparation."[23] A study from the Federal Reserve Bank of San Franciso documents the natural gas price increase in 2000.[24] Our data show that the natural gas price index jumped from 39.78 in 1999 to 73.85 in 2000.

Year of Event: 2005.
Type of Event: Positive price shock.

An article from the "Oil and Gas Journal" highlights that the effects of Hurricanes Katrina and Rita were the main source of the price increase. Some details of the article are quoted below.[25]

"The combined effects of the 2004 and 2005 hurricane seasons had an impact across all sectors of the US gas industry. Hurricane Ivan, which made landfall in September 2004, caused more long-term gas production interruptions than any previous hurricane, but its impacts were dwarfed by Hurricanes Katrina (landfall Aug. 29, 2005) and Rita (Sept. 24, 2005). The combined effects of Hurricanes Katrina and Rita were by far the most damaging in the history of the US petroleum industry."

A report from the Federal Energy Regulatory Commission highlights the following:[26]

"The pump was primed for significant energy price effects well before Hurricanes Katrina and Rita hit the Gulf Coast production areas in September. The Gulf storms exacerbated already tight supply and demand conditions, increasing prices for fuels in the United States further after steady upward pressure on prices throughout the summer of 2005. Most of this was due to increased electric generation demand for natural gas caused by years of investment in gas-fired generation and a significantly warmer-than-average summer. Supply showed some weakness despite increasing numbers of active drilling rigs. The result was broadly higher energy prices."

Our natural gas index data shows a clear spike in 2005, going up from 95.39 in 2004 to 142.40 in 2005.

Newspaper Articles. The increase in natural gas prices in the aftermath of the hurricanes received media attention. An example from NBC News is included in what follows.[27]

[23] http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/Introduction\%20to\%20North\%20American\%20Natural\%20Gas\%20Markets_0.pdf.

[24] https://www.frbsf.org/economic-research/publications/economic-letter/2001/february/economic-impact-of-rising-natural-gas-prices/#subhead3.

[25] https://www.ogj.com/articles/print/volume-104/issue-36/general-interest/us-gas-market-responds-to-hurricane-disruptions.html.

[26] https://www.ferc.gov/EventCalendar/Files/20051020121515-Gaspricereport.pdf.

[27] http://www.nbcnews.com/id/9146363/ns/business-local_business/t/pump-prices-

"Gas prices in cities across the United States soared by as much as 40 cents a gallon from Tuesday to Wednesday, a surge blamed on disruptions by Hurricane Katrina in Gulf of Mexico oil production."

B.4 Metals and Mineral Commodities

i. Aluminum

Year of Event: 1994.

Type of Event: Positive price shock.

According to the "Commodity Markets and Developing Countries" report from the World Bank, aluminum prices increased in 1994 due to a reduction in stocks, attributed primarily to the cutbacks in production by major producers.[28] Our data reveal that aluminum prices went up 30 percent in 1994.

Newspaper Articles. A newspaper article illustrates the cuts in supply.

A Loose Plan On Output of Aluminum, New York Times (January 31, 1994):[29]

"Six leading aluminum producers have agreed on ways to reduce a serious oversupply that has depressed prices on world markets."

ii. Iron ore

Year of Event: 2019.

Type of Event: Positive price shock.

The collapse of a mining dam in Brazil, the largest iron ore producer, led the price increase. Our data reveal that iron ore prices increased around 35 percent in 2019.[30]

iii. Lead

Year of Event: 2017.

Type of Event: Negative price shock.

According to the "Commodity Markets Review" from the World Bank, prices declined due to rising stocks and expectation that suspended production from the Magellan mine in Australia will be allowed to resume in the first quarter of 2008. In our data lead prices declined 32%.[31]

iv. Nickel

Year of Event: 2001.

Type of Event: Positive price shock.

jump-across-us-after-katrina/#.W3NQbehKiUk.

[28] http://https://thedocs.worldbank.org/en/doc/475131464184948121-0050022016/original/CMO1994November.pdf.

[29] Article available at: https://www.nytimes.com/1994/01/31/business/a-loose-plan-on-output-of-aluminum.html?.

[30] https://www.ft.com/content/8c2f26f6-72b0-11e9-bf5c-6eeb837566c5.

[31] https://thedocs.worldbank.org/en/doc/324111462981400952-0050022016/original/CMO2007December.pdf.

According to World Bank (2001), various supply problems contributed to the tight market, particularly technical problems bringing on new capacity in Australia and labor strikes in Canada.[32] In our data nickel prices increased by 44%.

B.5 Country-Specific Assumptions

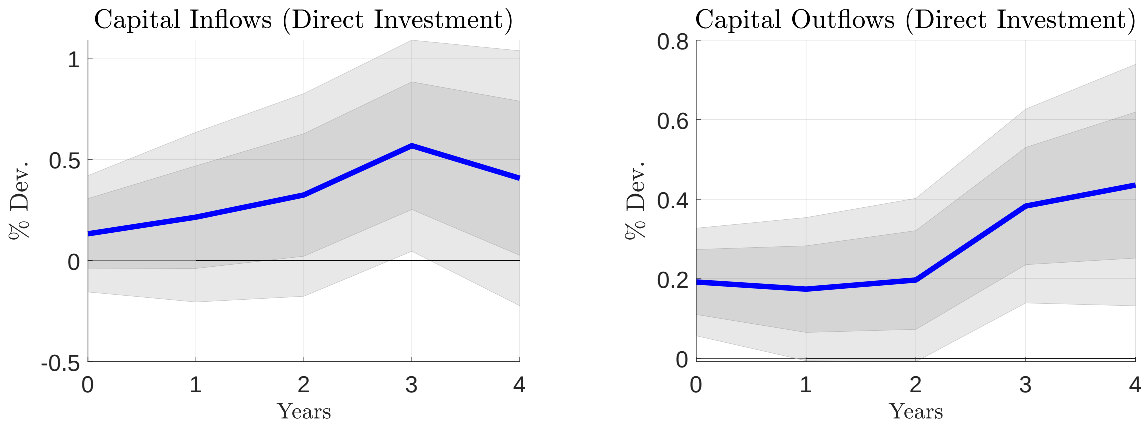
Our approach requires the omission of certain events when they are a result of unique weather conditions or political incidents exclusive to a specific country. The following exclusions have been implemented:

- The cocoa price surge of 2002, instigated by an attempted coup in Côte d'Ivoire amidst an ongoing civil war and escalating tensions, is omitted for this particular country.
- The sugar price shock in 2006, which was due to drought conditions in Thailand, is not considered in our analysis for this country.
- The 2019 disruption to iron ore prices, attributable to the collapse of a mining dam in Brazil, is specifically excluded for Brazil in our study.
- The 2010 spike in cereal prices, precipitated by weather conditions in Russia, Kazakhstan, and Ukraine, results in these countries' exclusion from the event.
- The cotton price shock in 2010, induced by weather-related incidents in Pakistan, is disregarded for Pakistan in our analysis.
- The rubber price shock in 2010, triggered by droughts in Thailand, leads to Thailand's exclusion from this event in our analysis.

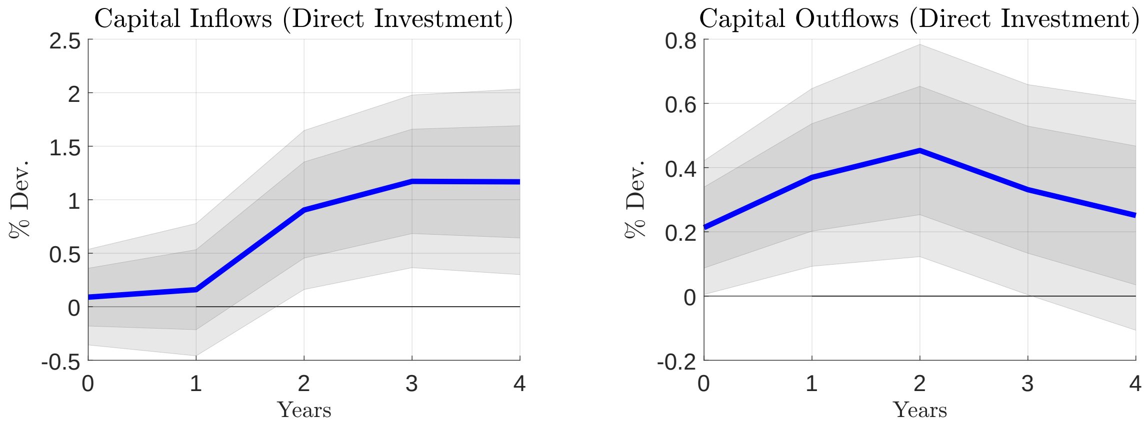
C Additional Results

[32] https://thedocs.worldbank.org/en/doc/398441462978606788-0050022016/original/CMO2001GEP.pdf.

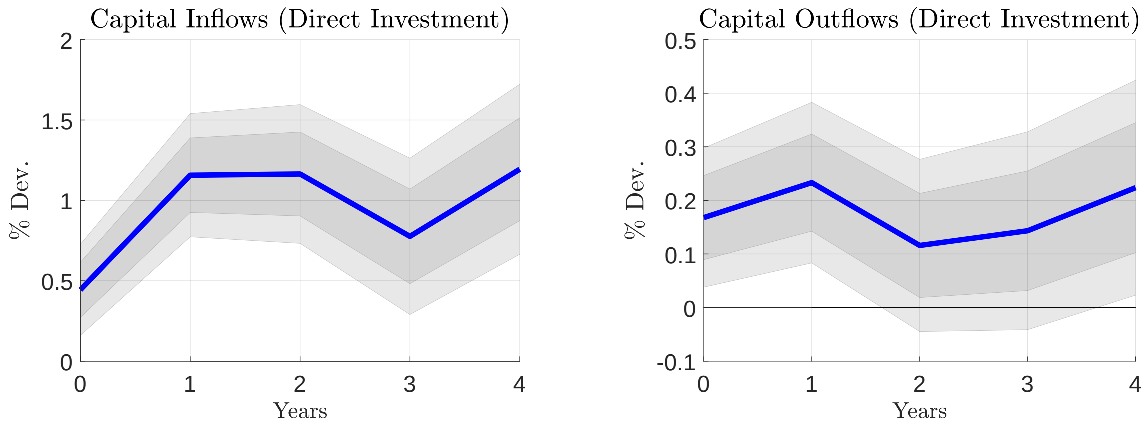
Figure C1: Impulse Responses of Direct Investment (Inflows and Outflows)



(a) Increase in Export Prices



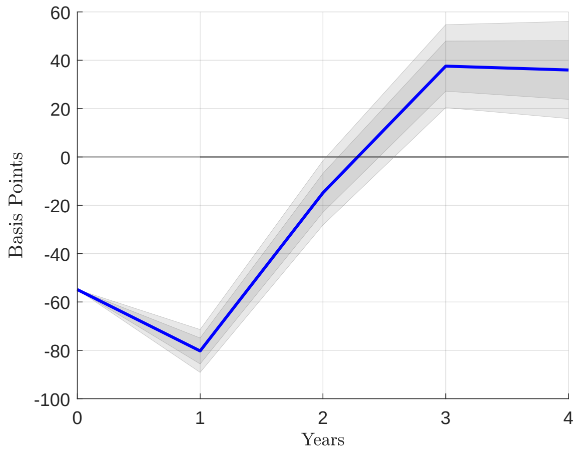
(b) Decline in the BAA Spread (driven by U.S. Monetary Policy)



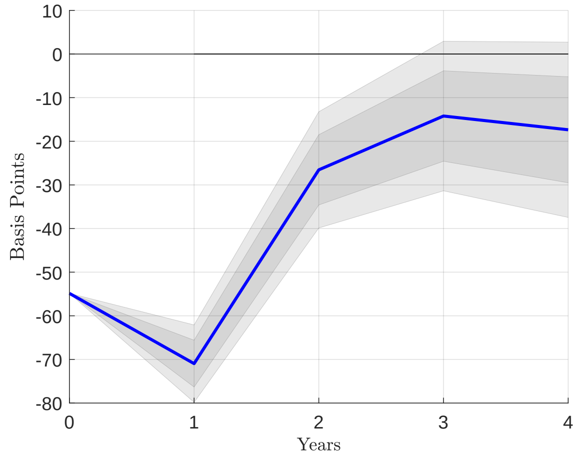
(c) Decline in the BAA Spread (driven by Global Risk Appetite)

Notes: The Impulse Responses show the LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks (Panel a), and a decline in the BAA spread driven by U.S. monetary policy (Panel b), and shifts in global risk appetite (Panel c). They complement figures 4, 6, and 8. Gray areas denote 68% and 90% confidence intervals.

Figure C2: Impulse Responses of the BAA Spread



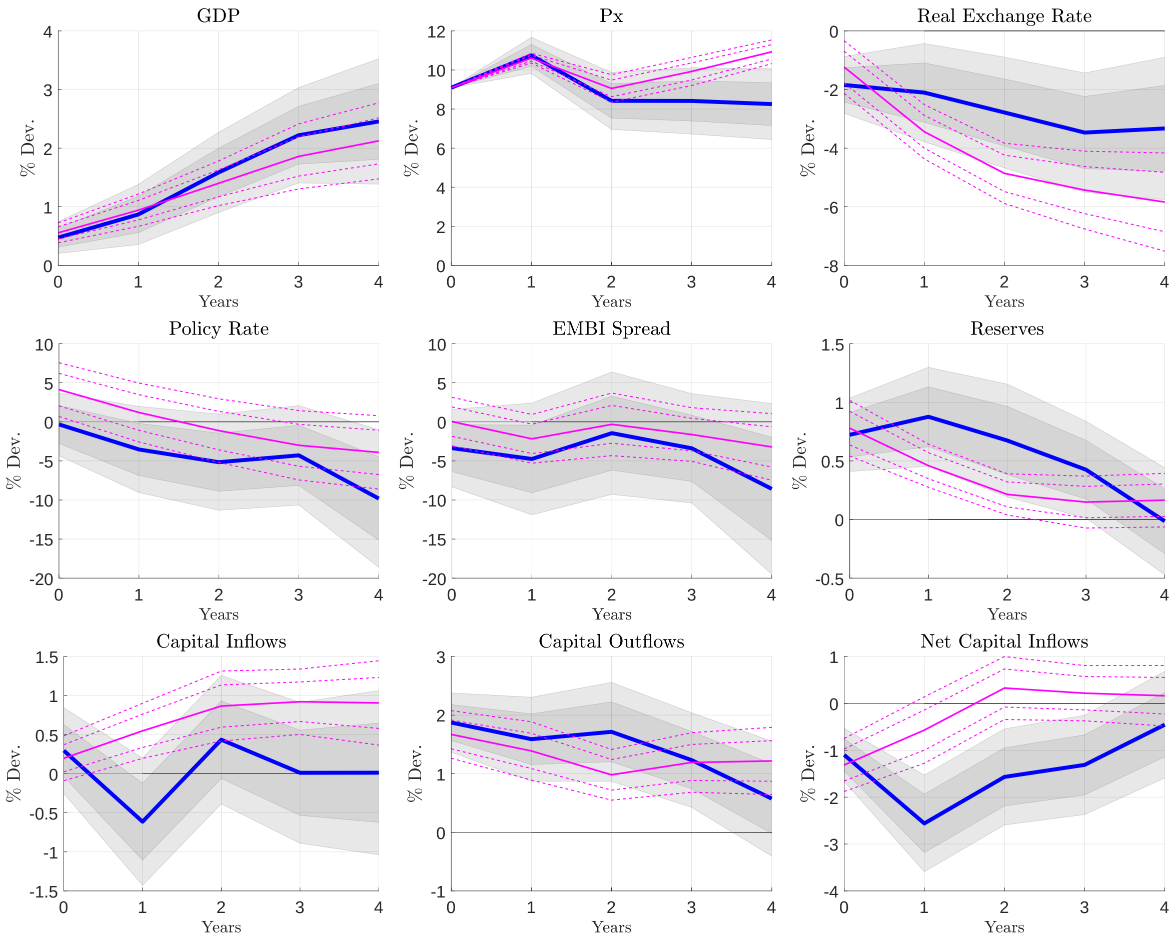
(a) Accomodative U.S. Monetary Policy



(b) Eased Global Risk Appetite

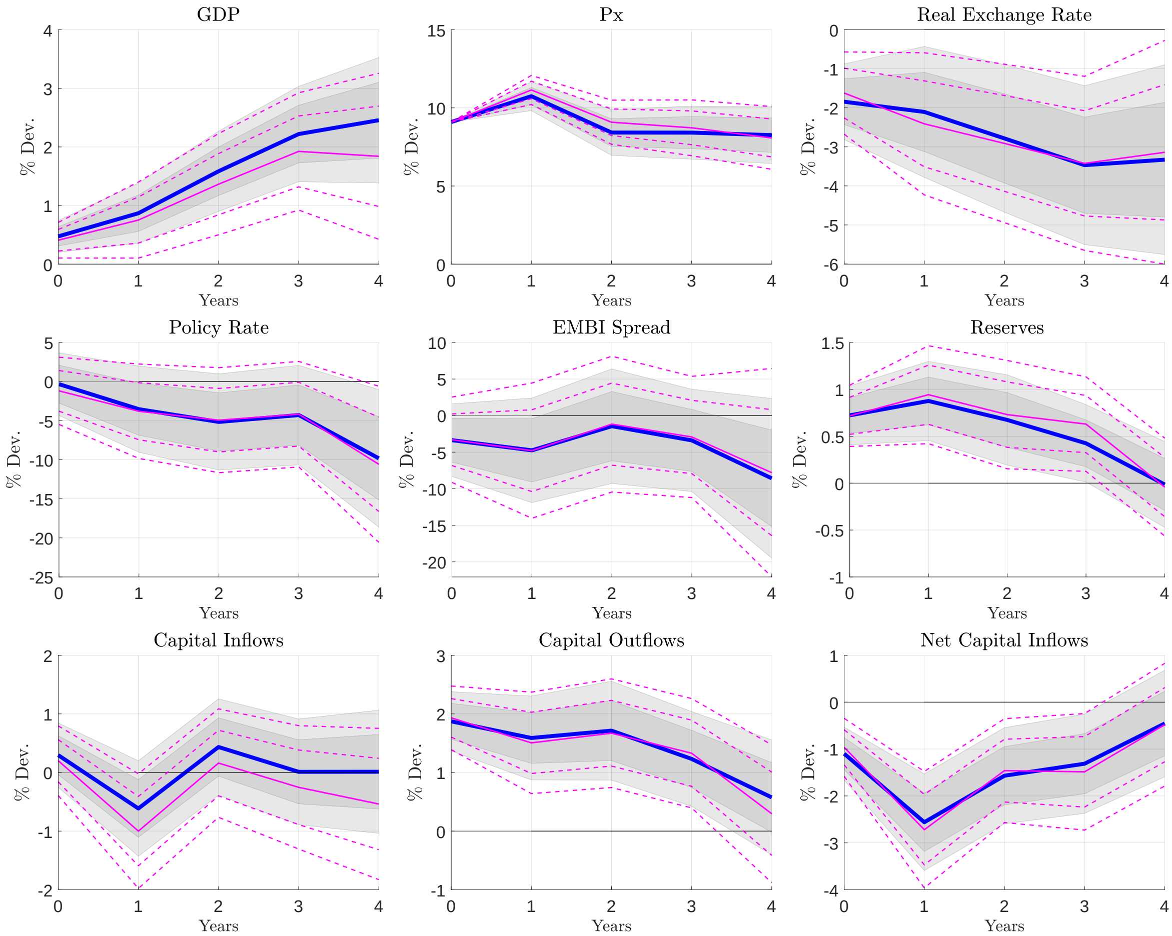
Notes: The Impulse Responses show the LATE (in blue) of the response of the BAA spread to a U.S. monetary policy shock and to shifts in global risk appetite.

Figure C3: Increase in Export Prices Driven by Commodity Specific Shocks: LATE vs. OLS Estimates



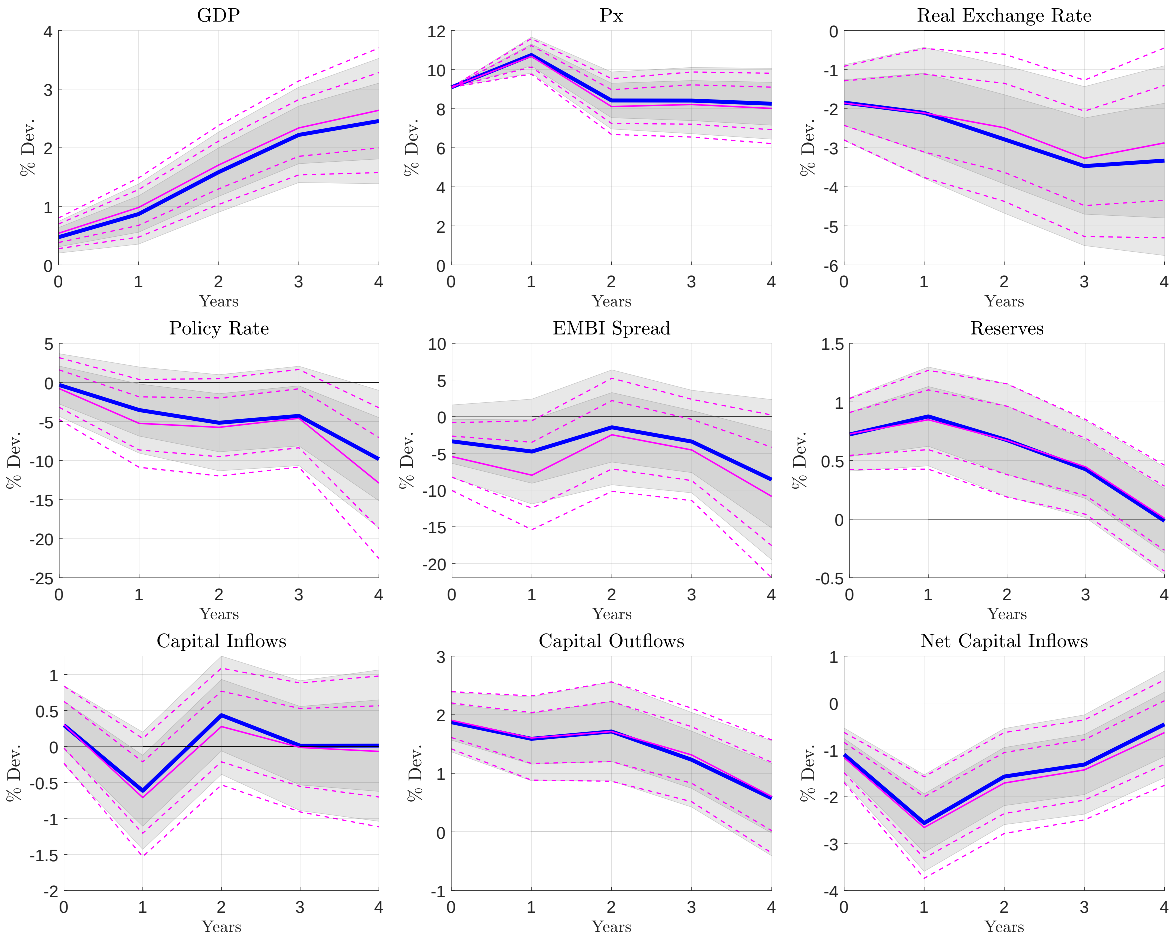
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Lines in magenta correspond to the same figure but estimated with OLS.

Figure C4: Increase in Export Prices Driven by Commodity Specific Shocks (excluding events of 1998 and 2008)



Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Magenta lines reproduce the same charts but excluding from the instrument all events of 1998 and 2008. The 1998 events could be contaminated by weak global growth related to the Asian Crisis and the 2008 events could be contaminated by the presence of the the Global Financial Crisis.

Figure C5: Increase in Export Prices Driven by Commodity Specific Shocks (subset of events considered by Di Pace et al., 2020)



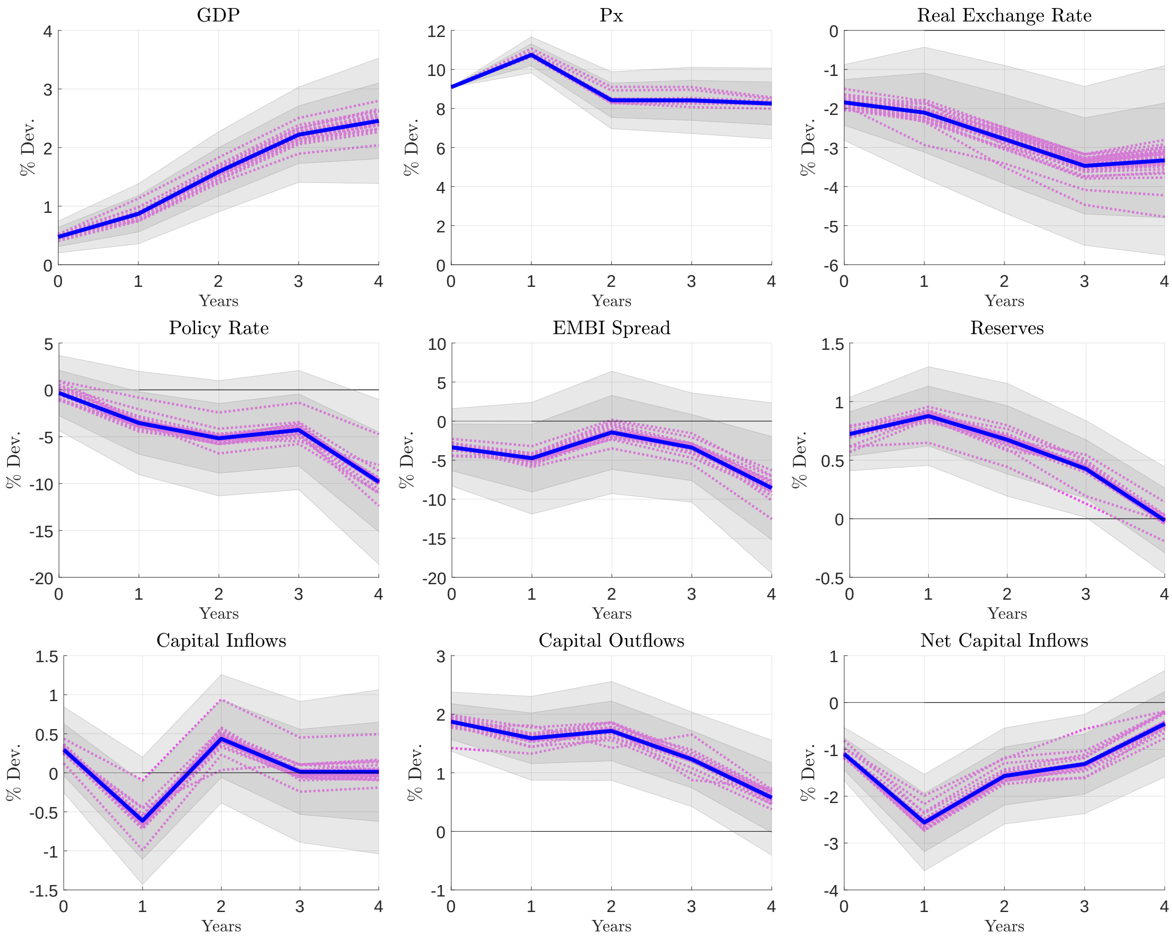
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Magenta lines reproduce the same charts but constructing the commodity specific shock instruments only relying on the subset of events considered by Di Pace et al. (2020). The list of events is listed in Table C1.

Table C1: Subset of Events

Year	Commodity	Sign	Source of Shock
1993	Timber	+	Clinton's environmentally friendly policies
1993	Tobacco	-	Worldwide increase in competition for exports
1994	Aluminum	+	Reduction in stocks of major producing countries
1994	Coffee	+	Frost in Brazil
1994	Cotton	+	Decline in production due to bad weather in key producing countries
1997	Cereals/Food	-	Favorable production forecast
1998	Crude oil	-	Expectations of higher supply
2000	Natural gas	+	California gas crisis
2002	Cocoa	+	Attempted coup in Cote d'Ivoire
2003	Cotton	+	Severe weather damage in China
2005	Natural gas	+	Effects of hurricanes Katrina and Rita
2010	Cereals/Food	+	Adverse weather conditions in key producing countries
2010	Cotton	+	Negative weather shocks in the U.S. and Pakistan
2015	Energy	-	Booming in U.S. shale oil production
2019	Energy (excluding crude oil)	-	The U.S. became a net energy exporter

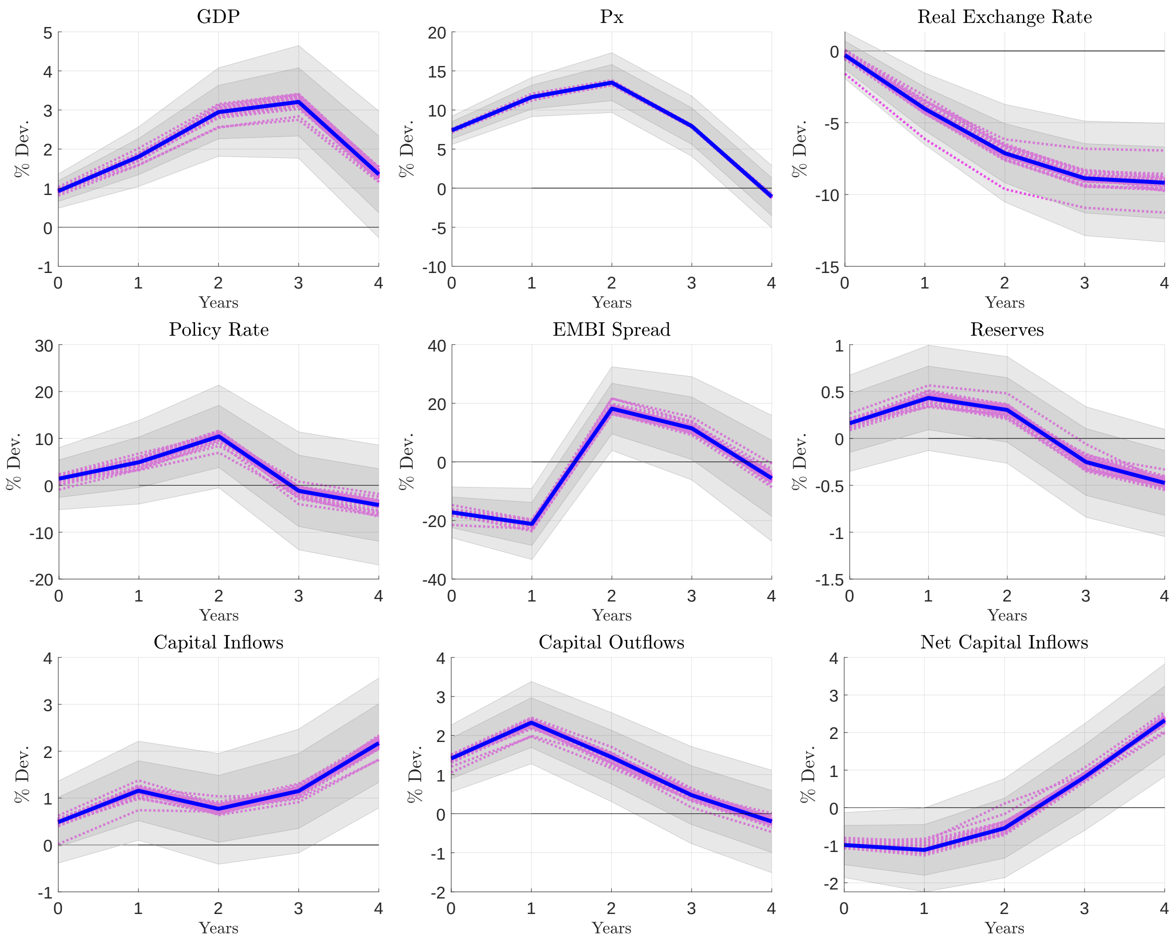
Notes: This Table lists each of the episodes considered in Di Pace et al. (2020). They are identified as generating large exogenous variations in commodity prices and provides a brief description of the source of the shock.

Figure C6: Increase in Export Prices Driven by Commodity Specific Shocks (Single Country Drop)



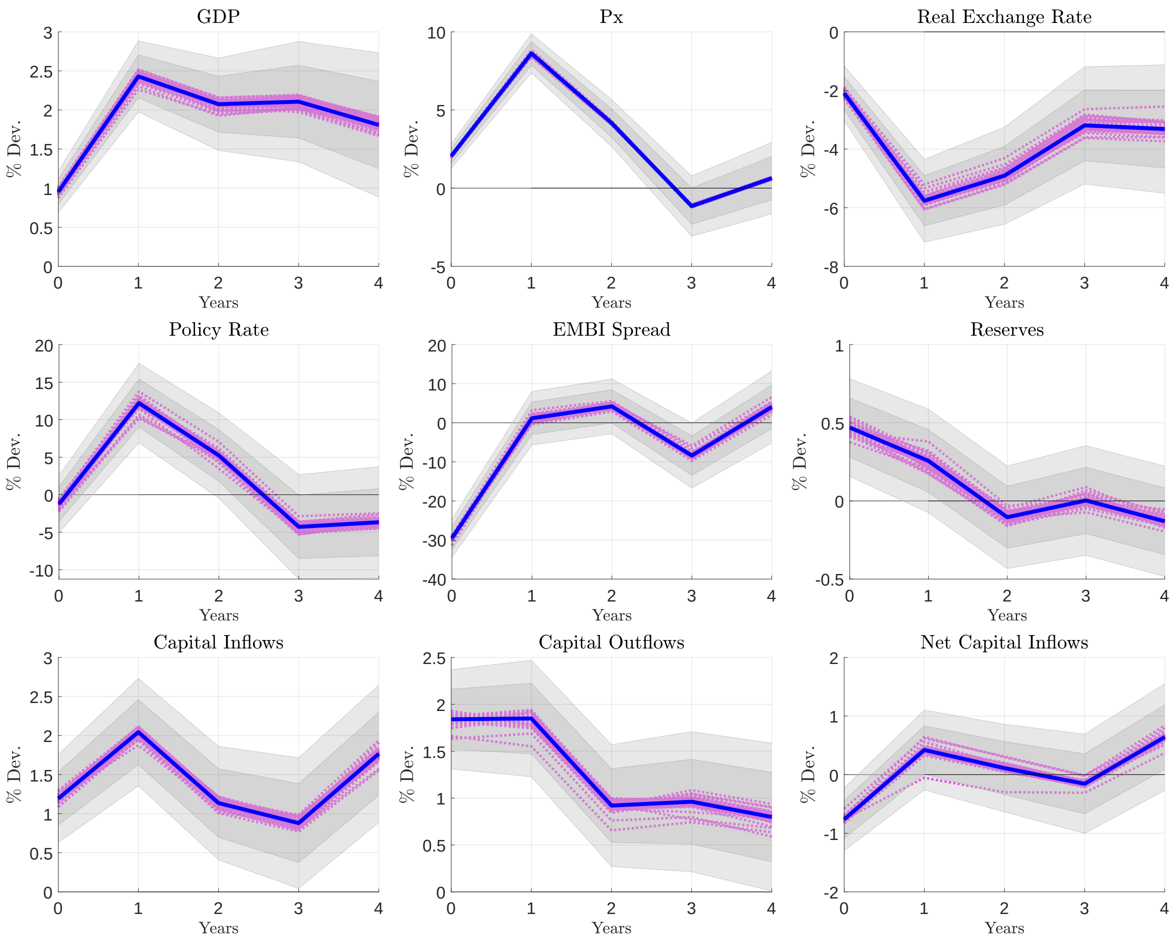
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Lines in magenta correspond to the LATE mean estimates dropping from the dataset one country at the time.

Figure C7: Effects of a Decline in the BAA Spread Driven by U.S. Monetary Policy (Single Country Drop)



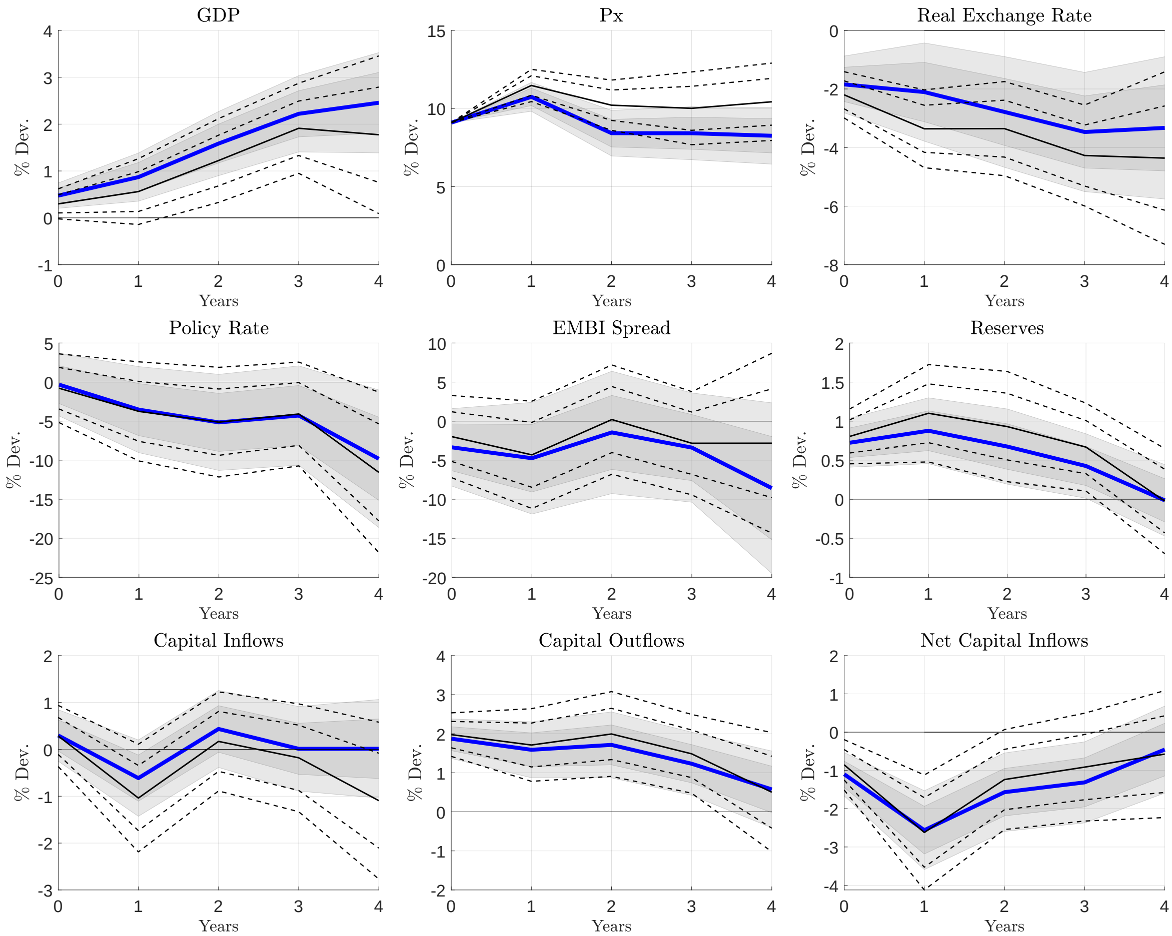
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation decline in the BAA spread driven by a U.S. monetary policy shock. Gray areas denote 68% and 90% confidence intervals. Lines in magenta correspond to the LATE mean estimates dropping from the dataset one country at the time.

Figure C8: Effects of a Decline in the BAA Spread Driven by Shifts in Global Risk Appetite (Single Country Drop)



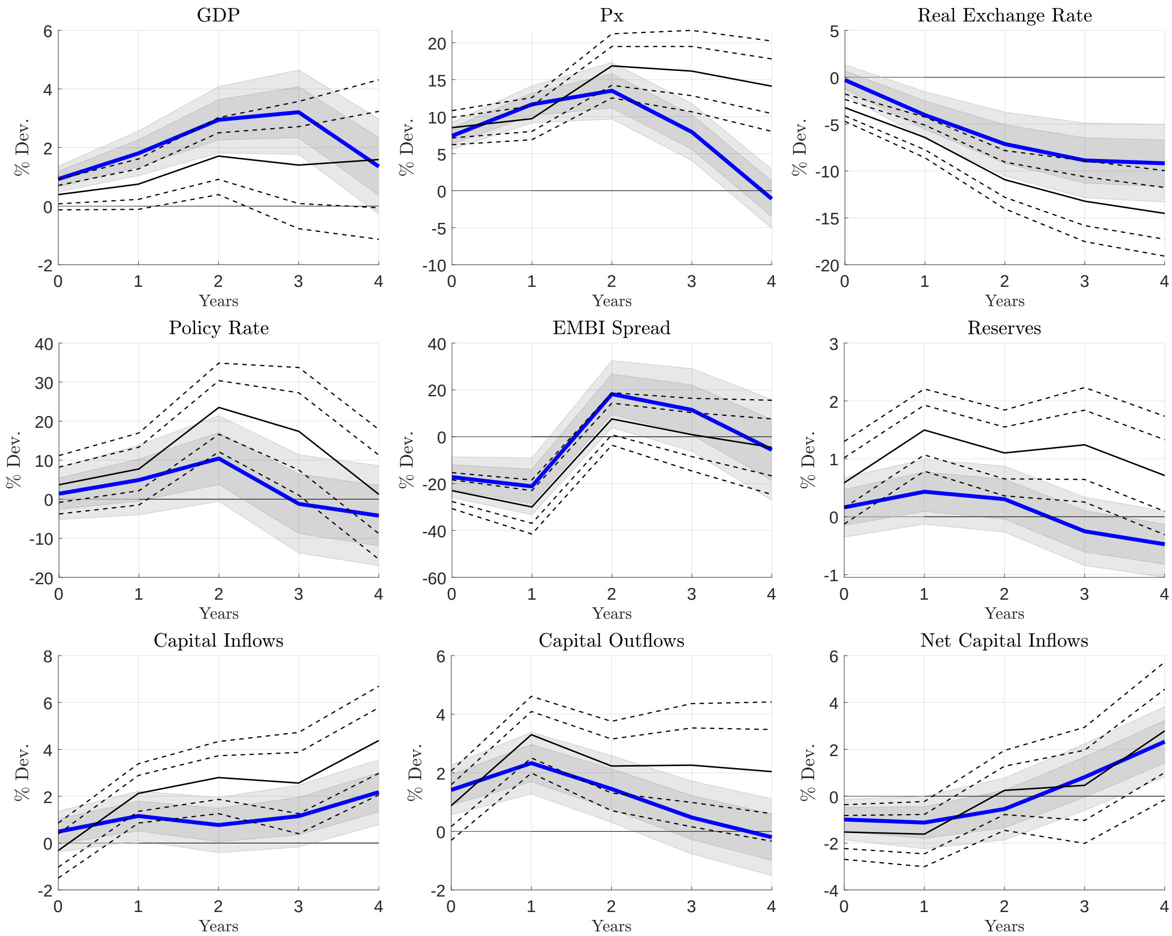
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation decline in the BAA spread driven by a global risk appetite shock. Gray areas denote 68% and 90% confidence intervals. Lines in magenta correspond to the LATE mean estimates dropping from the dataset one country at the time.

Figure C9: Increase in Export Prices Driven by Commodity Specific Shocks: Full Sample vs Post-2000



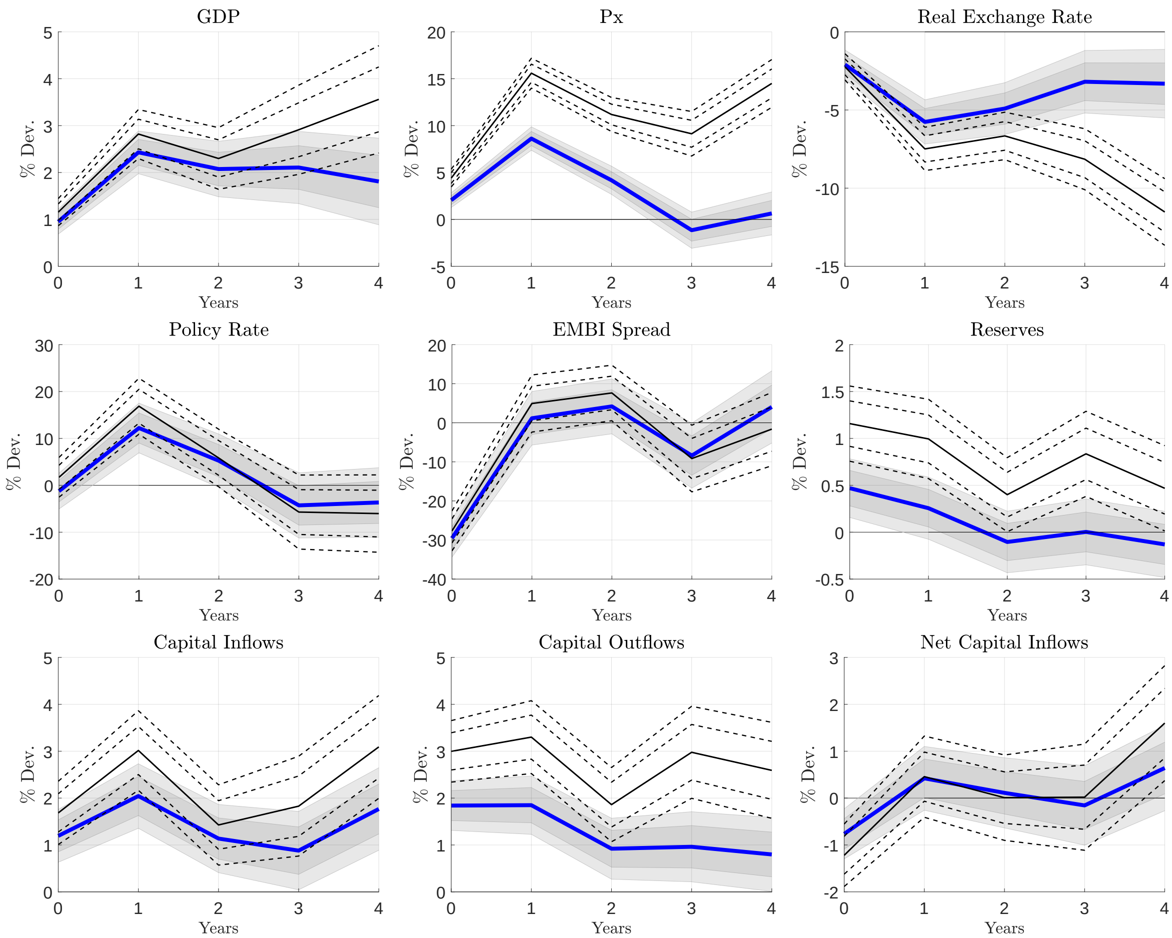
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Lines in black report the same for the post-2000 sample.

Figure C10: Fall in the BAA Spread Driven by U.S. Monetary Policy Shocks: Full Sample vs post-2000



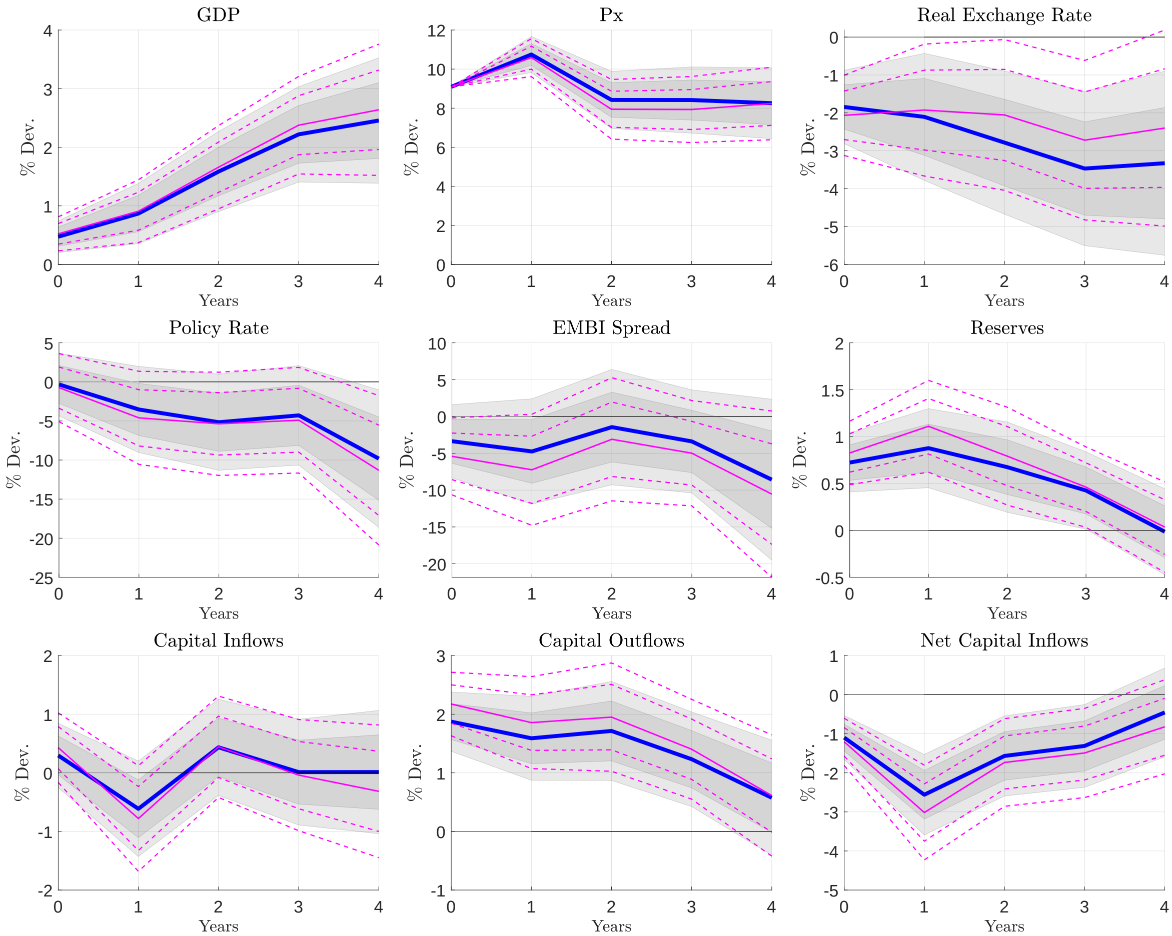
Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation fall in BAA spread driven by U.S. monetary policy shocks. Gray areas denote 68% and 90% confidence intervals. Lines in black report the evidence for the post 2000 sample.

Figure C11: Fall in the BAA Spread Driven by a Shift in Global Risk Appetite: Full Sample vs Post-2000



Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation fall in BAA spread driven by a shift in global risk appetite. Gray areas denote 68% and 90% confidence intervals. Lines in black report the same for the post-2000 sample.

Figure C12: Effects of an Increase in Export Prices driven by Energy Commodities Specific Shocks



Notes: The Impulse Responses show the baseline LATE (in blue) of one standard deviation increase in Px driven by commodity price shocks. Gray areas denote 68% and 90% confidence intervals. Lines in magenta are a comparable set of figures where the instrument is constructed only including events related to energy commodities.

Appendix References

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