Global Dollar Shocks and Spillovers into EMDEs: The Channels of Commodity Prices and Country Risk

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Abstract

This paper shows how global dollar appreciations transmit to emerging market and developing economies (EMDEs) through commodity prices and country risk. Using quarterly data for 22 EMDEs from 1999–2019, I combine the Obstfeld & Zhou (2023) dataset with country-specific commodity price indices and classify countries as commodity exporters or importers via a trade-balance rule. Global dollar appreciation shocks explain up to 16% of the forecast-error variance of commodity terms of trade (CToT) and up to 9% of EMBI spreads. A global dollar appreciation depreciates EMDE currencies, raises EMBI, depresses investment, and lowers GDP, with muted CPI effects. Stratifying by commodity status reveals sharp heterogeneity: exporters suffer larger and more persistent adverse responses, while importers seem stable. To uncover mechanisms, I implement an approach à la Cloyne–Jordà–Taylor (2023) to estimate indirect effects. A more favorable CToT response mitigates output and demand contractions, whereas higher commodity import prices and larger EMBI responses amplify adverse outcomes.

Keywords: Global dollar cycle, EMDEs, Commodity prices, Country risk, Local projections

JEL codes: F44, O11, Q02, G15, C32

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1 Introduction

Empirical work has documented that cycles of U.S. dollar appreciation have been followed by a global slowdown in economic activity, with a more pronounced negative correlation for emerging market and developing economies (EMDEs). A key underlying phenomenon is the intensive growth of global financial markets in the past three decades and the U.S. dollar's central role in those markets.

After the Subprime Crisis, research has shown the presence of synchronized cycles in capital flows and asset prices around the globe, typically called "Global Financial Cycles". These cycles are shaped not only by U.S. factors such as the monetary policy of the Federal Reserve, but also by a relevant global dimension reflecting the influence of other leading central banks. In this scenario, the dollar's nominal exchange rate serves as a proxy of global financial conditions, where an appreciation of the dollar is associated with a tighter financial environment worldwide (see Miranda-Agrippino and Rey 2022). Additionally, there is a link between the U.S. dollar and commodity prices. Chen et al. (2014) documented that highly persistent movements of these prices are mostly due to a common component closely related to the U.S. nominal exchange rate.

On the other hand, Kohn et al. (2021) shows that countries with a higher share of commodity exports exhibit a higher volatility of real GDP. Also, regarding the impact of external price shocks into EMDEs, Di Pace et al. (2025) find that the economy's response to a positive export price shock does not mirror the response to a negative import price shock, while documenting that a negative shock to import prices has an insignificant impact on domestic GDP, but negatively affecting consumption and investment. In addition, by calibrating a model with Argentine data in which there is a commodity sector and the country risk depends negatively on commodity prices, Drechsel and Tenreyro (2018) has documented that fluctuations in commodity prices generate excess consumption volatility relative to output, large investment volatility, and substantial contributions of commodity price shocks to fluctuations in output, consumption, and investment growth.

For its part, Obstfeld and Zhou (2023) documents that dollar appreciation shocks predict economic downturns in EMDEs on average, and shows how, for example, countries with less flexible exchange rate regimes seem to suffer more from such shocks. In a related work, Cristi et al. (2024) shows that following a global dollar appreciation shock, there is a persistent expected depreciation in spite of the actual depreciation at the time of the shock. This suggests that the dollar appreciation captures more fundamental shocks, which require macroeconomic adjustment in the form of more depreciated emerging market currencies in the medium term rather than temporary downturns associated with financial shocks. In addition, the authors find that, unlike FED hikes, an appreciation

of the U.S. dollar does not lead to higher risk premia in emerging markets, even though their currencies depreciate vis-à-vis the dollar.

In this paper, I complement and expand the analysis in Obstfeld and Zhou (2023) and related work by examining how responses to the shock differ between commodity exporters and importers, and by assessing the relevance of two channels through which global dollar shocks could affect EMDEs: commodity prices and country risk. In particular, after making a distinction in how the shock affects differently commodity exporters and importers, the methodology proposed by Cloyne et al. (2023) is applied to estimate the indirect effects of these "propagation variables" on the response of EMDEs' economic variables. In this way, the paper aims to extend recent research on the international propagation of financial shocks by integrating the literature on global dollar shocks with the documented links between the U.S. dollar, commodity prices, and risk appetite.

In summary, commodity exporters seem to be the ones that suffer the most against global dollar shocks, experiencing significant declines in real variables such as output, consumption, and investment, as well as upticks in consumer price level and country risk. Also, even though commodity prices go down in general against the shock, while importers experience an increase in their commodity terms of trade (as their import prices fall more than their export prices), exporters go through a decrease (as their import prices fall less than their export prices).

In addition, the results suggest that the way in which commodity terms of trade, commodity import prices and the EMBI spread respond to the shock have a significant impact in the response of other economic variables such as output, private consumption, investment, consumer prices, and nominal exchange rate. While, following a global dollar shock, a more positive response of commodity terms of trade is associated with a less severe contraction of real variables, a higher (less negative) response of commodity import prices and a larger uptick in the EMBI spread are associated with a more adverse response of EMDEs' economic variables.

The remainder of the paper is organized as follows. Section 2 presents the empirical analysis. Subsection 2.1 provides a brief description of the dataset. Subsection 2.2 describes the identification strategy for global dollar shocks and quantifies the share of the forecast error variance (FEV) of commodity terms of trade and the EMBI spread accounted for the shock. Subsection 2.3 presents the average responses of EMDEs' real and financial variables to the dollar shock. Subsection 2.4 examines the heterogeneity of these responses between commodity exporters and importers. Subsection 2.5 estimates the indirect effects of commodity prices and country risk on the responses of the other economic variables. Finally, Section 3 concludes.

2 Empirical analysis

2.1 Data

This work uses the public dataset of Obstfeld and Zhou (2023), which contains quarterly data of EMDEs' real and financial variables, and spans from 1999 to 2019.[1] Then, the mentioned dataset is combined with data of country-specific commodity export and import prices (IMF).[2] In particular, I use the Commodity Export Price Index (CToT_pX) and Commodity Import Price Index (CToT_pM), and also construct the Commodity Terms of Trade (CToT) as:

$$\text{CToT}_{i,t} = 100 \times \frac{\text{CToT\_pX}_{i,t}}{\text{CToT\_pM}_{i,t}}$$

where $i = country$ and $t =$ year-quarter.

Further, to be able to classify countries as "Commodity Exporter" or "Commodity Importer" in a way consistent with the commodities included in the indices mentioned, data from Gruss and Kebhaj (2019) of Commodity Trade Balance as percent of GDP for each country is used.[3]

Here a country is defined as commodity exporter (importer) if its average 2013-15 commodity trade balance is greater (lower) or equal than 3% (−3%) of its GDP. The sample average is 0 and the standard deviation (SD) is 6, so the countries defined as commodity exporters are the ones that are 0.5 SD or more above the average, while the countries that are 0.5 SD or more below the average are defined as commodity importers. Then, countries that are within ±0.5 SD of the average are defined as "other".[4]

2.2 Identification of Global Dollar Shocks

A first step of the analysis, that is not present in Obstfeld and Zhou (2023), consists in identifying the global dollar shocks in a separate way. Instead of including the dollar index and the global controls in the EMDEs' local projections (as they do), I capture the desired shock in a first step and then run cleaner local projections. However, as it is done in a way that is consistent with theirs, the same shock is captured (Frisch–Waugh–Lovell theorem).

[1] Refer to Table A.1 in Appendix to see the 22 EMDEs that are included in the sample.

[2] Quarterly datapoints are calculated by averaging monthly values. Individual commodities are weighted by ratio of exports (imports) to GDP. See Table A.2 in Appendix to find the individual commodities included.

[3] Unfortunately, only the average 2013-15 value is available. However, countries defined as "Commodity Exporter" are fairly consistent with the classification made by IMF (2023).

[4] See Table A.3 to find the list of country classifications.

Therefore, I estimate the following time-series regression to capture the shock:

$$\Delta s_t = \mu + \gamma' \Delta z_t + \sum_{l=1}^{p} \delta_l' \Delta g_{t-l} + u_t \tag{1}$$

with $g_t = [s_t, z_t]$.

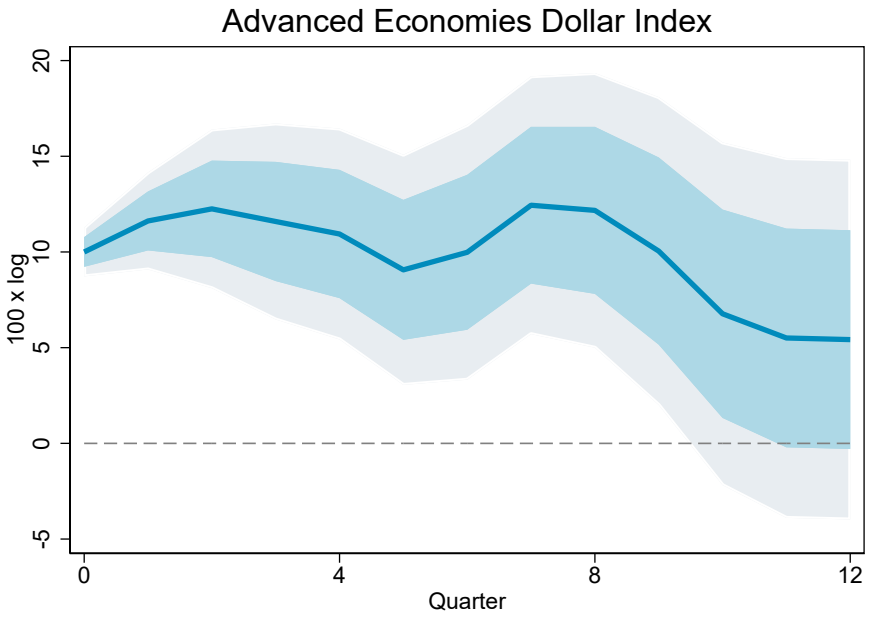
In Equation (1), s_t represents the trade-weighted dollar index against a basket of advanced economy (AE) currencies, and z_t denotes a set of global controls. Considering that emerging market economies would generally exert minimal direct influence on bilateral exchange rates between AE currencies, the nominal AE–dollar index could be considered reasonably exogenous to EMDEs once appropriate controls have been included to account for common shocks to EMDEs that could feed back into the dollar's nominal exchange rate against other major economies.

Fluctuations in the dollar are shaped by a combination of global influences and U.S.-specific dynamics. Adjustments in U.S. monetary policy and financial conditions, together with shifts in investor risk sentiment, play a central role in driving dollar movements. However, some of these determinants are themselves endogenous, as they may respond to common shocks affecting both the United States and other economies, such as EMDEs. A vector of global controls z_t was included in Equation (1) in order to be closer to an isolated dollar shock component that is exogenous to EMDEs' dynamics, while recognizing that other global factors could simultaneously influence EMDEs' outcomes.

Within z_t, U.S. monetary policy is captured by the effective Federal Funds rate when it is positive, and by the Shadow Rate during periods when the zero lower bound is binding. In addition, as a way to control for U.S. financial conditions, the Chicago Fed's Adjusted National Financial Conditions Index (ANFCI) is included. Considering that EMDEs taken as a group are large enough that common EMDE shocks could potentially move the dollar exchange rate relative to other AEs, a control for aggregate economic activity in the EMDEs bloc is needed. Using a dynamic factor model like the one that underlies the ANFCI, Obstfeld and Zhou (2023) extract a common dynamic real GDP factor from an unbalanced quarterly panel of more than 60 EMDEs. This global control is included in z_t as a way of capturing EMDE business cycle fluctuations at a reasonably high frequency.

After all, $\widehat{u}_t$ is the shock of interest– i.e., innovations to the AE Dollar Index after controlling for key variables. The response of the AE Dollar Index against the shock is shown below. It can be seen that its effects are highly persistent and statistically significant until 10 quarters after the shock takes place.

Figure 1: Shock: 10% appreciation of Advanced Economies Dollar Index



Note: Heterokedasticity-robust 90% and 68% confidence bands are reported.

For motivational purposes, I estimated a VAR model with 3 variables ($\hat{u}$, CToT, EMBI) to see how much of the forecast error variance (FEV) of the commodity terms of trade and EMBI spread of EMDEs are explained by the described global dollar shock. I estimated a VAR model for each country for which data on both CToT and EMBI were available.[5] Exogeneity restrictions of the global dollar shock were applied, which means that the shock variable does not receive any feedback from the other variables in any horizon. For each country, lags were chosen following the Schwarz Information Criterion (SIC).[6] Summary statistics for the cross section distribution of the FEVD are shown in Table 1 below.

Table 1: Percentage of the FEV explained by the global dollar shock

Commodity Terms of Trade

	Min	Median	Mean	Max
h_4	1.0	7.8	7.8	14.6
h_8	1.0	8.7	8.3	15.6
h_{12}	1.2	8.8	8.4	15.9

EMBI Spread

	Min	Median	Mean	Max
h_4	0.3	2.7	3.6	8.6
h_8	0.2	2.5	3.7	8.3
h_{12}	0.3	2.6	3.9	8.3

[5]The dataset does not include EMBI data for 5 of the 22 countries in the sample (Czech Republic, Israel, South Korea, Romania, and Thailand).

[6]Ivanov and Kilian (2005) study the performance of lag selection criteria and find that, for quarterly VAR models and small samples, the Schwarz Information Criterion (SIC) is the most accurate.

As it can be observed in this simple exercise, the global dollar shock seems to be relevant to explain a non-negligible fraction of the variance of the commodity terms of trade and EMBI spread of EMDEs across time. The results are stronger in the case of commodity prices, with the global dollar shock explaining up to 16% of the forecast error variance of CToT, compared to up to 9% in the case of EMBI.

2.3 Baseline responses

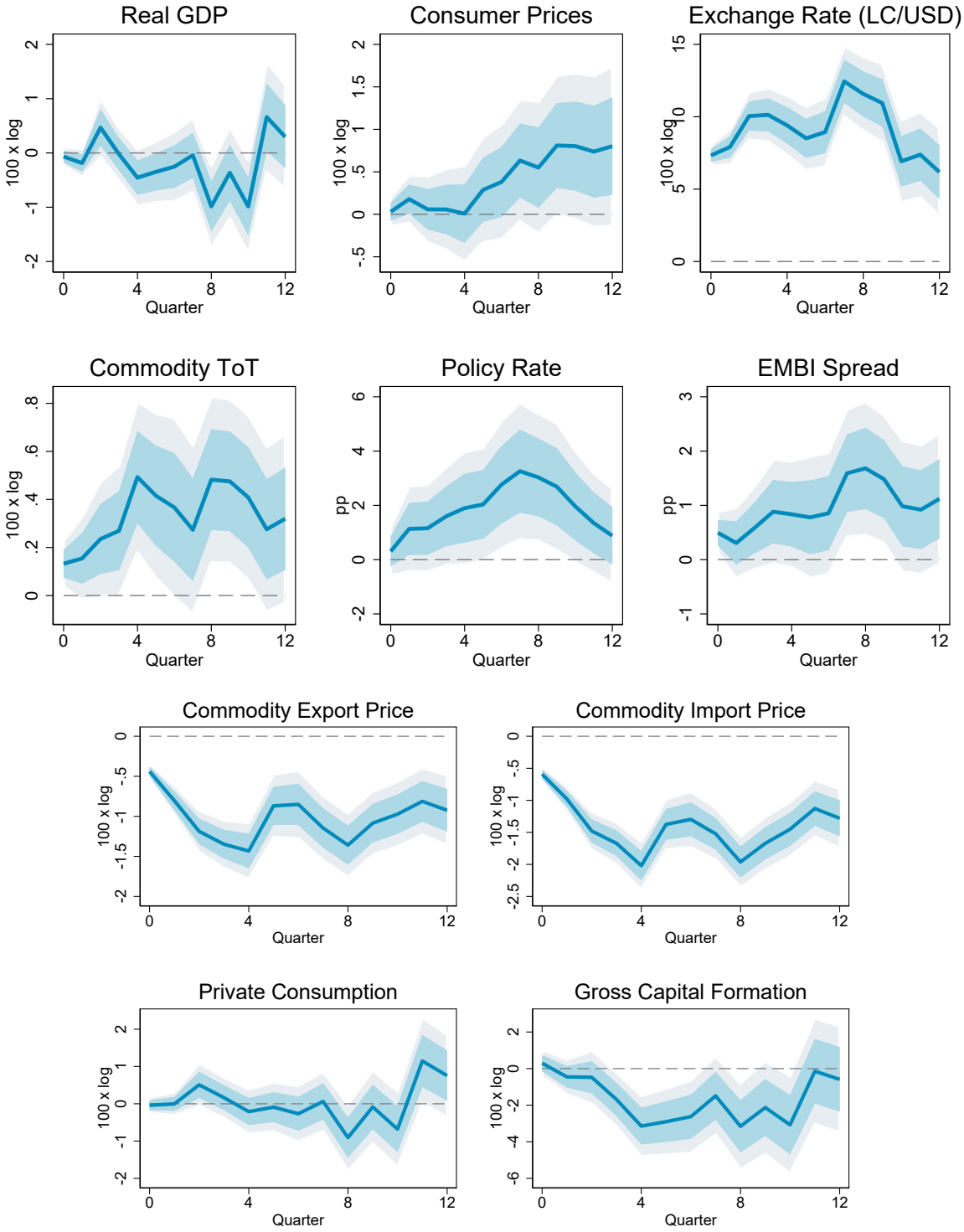
Now, following Obstfeld and Zhou (2023) baseline specification, which is based on Jordà (2005), I estimate the following set of panel local projections:

$$y_{i,t+h} - y_{i,t-1} = \mu_{i,h} + \beta_h \, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{h,l} \, \Delta w_{i,t-l} + \varepsilon_{i,h,t} \tag{2}$$

The dependent variable is the cumulative change in country i's economic or financial variable y from quarter $t-1$ to $t+h$, for $h = 0, ..., H$. On the right-hand side of Equation (2), a country and horizon-specific intercept $\mu_{i,h}$ accounts for unobserved country heterogeneity as well as for linear trends in y. The impulse response function of y is represented by the set of coefficients $\{\beta_h\}_{h=0}^{H}$. The vector w includes lags of the respective dependent variable and country-specific domestic controls such as real GDP, nominal exchange rate (LCU per USD) and monetary policy interest rate. By lagging the local controls, an implicit ordering assumption is made: global dollar shocks have instantaneous impacts on EMDE variables, but the effects of the EMDE local controls arrive with delay.

The average response of EMDEs' economic and financial variables against the global dollar shock are shown in Figure 2 below.

Figure 2: Impulse responses: 10% appreciation of the Advanced Economies Dollar Index



Note: Figure 2 reports the impulse response functions of EMDEs' variables to a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (2). Heteroskedasticity-robust 90% and 68% confidence bands are reported.

Focusing on GDP level, after some noise along the first few quarters, there is a negative impact that reaches -1% eight quarters after the shock takes place. Regarding the consumer price level, the impact is very small, not significant, and arrives with delay, implying a price level only 0.8% higher at the 9th quarter. The strongest and most significant effect is observed in the nominal exchange rate, which rises 7% on impact in response to the shock, and continues depreciating until the 7th quarter, when it starts going down from 12% to around 5% above its initial level. Even though the commodity prices go down in response to the global dollar appreciation shock, the average EMDE experiences an improvement in its commodity terms of trade with a peak of 0.5% (its commodity import prices fall more than its commodity export prices, 2% versus 1.4% respectively). Also, there is an upward response of the EMBI spread, reaching 1.5 percentage points 7 quarters after the shock takes place. Looking at some GDP components, there is no significant effect in private consumption until the 8th quarter where it falls 1% and then recovers (in some way, in line with the GDP response), but, in contrast, a negative, significant, and persistent effect in the investment level can be noted, which goes down 3% and does not recover for several quarters. Finally, regarding the interest rate, there is a significant uptick that peaks 3 percentage points (300 bps) in the 7th quarter after the shock takes place.

Taken together, the results suggest that, on average, a stronger dollar tightens external and domestic financial conditions, depresses commodity prices and investment, and ultimately weighs on output.

Nevertheless, the average responses could be hiding a lot of heterogeneity. The figure shows that the shock affects significantly the commodity prices but not equally between export and import prices. So, if there are countries with different commodity export and import baskets, with some acting as net exporters and others as net importers, they could experience different impacts in quantities and prices. For example, the potential inflationary effect of the exchange rate depreciation could be moderated by the fall in the commodity import prices, but that fall could be heterogeneous across countries. Also, the relative weight of the commodity sector (and, then, the relevance of export prices) in GDP is different in commodity exporters and importers.

It is therefore worthwhile to examine how these responses vary between commodity exporters and importers.

2.4 Stratification by commodity exporter/importer status

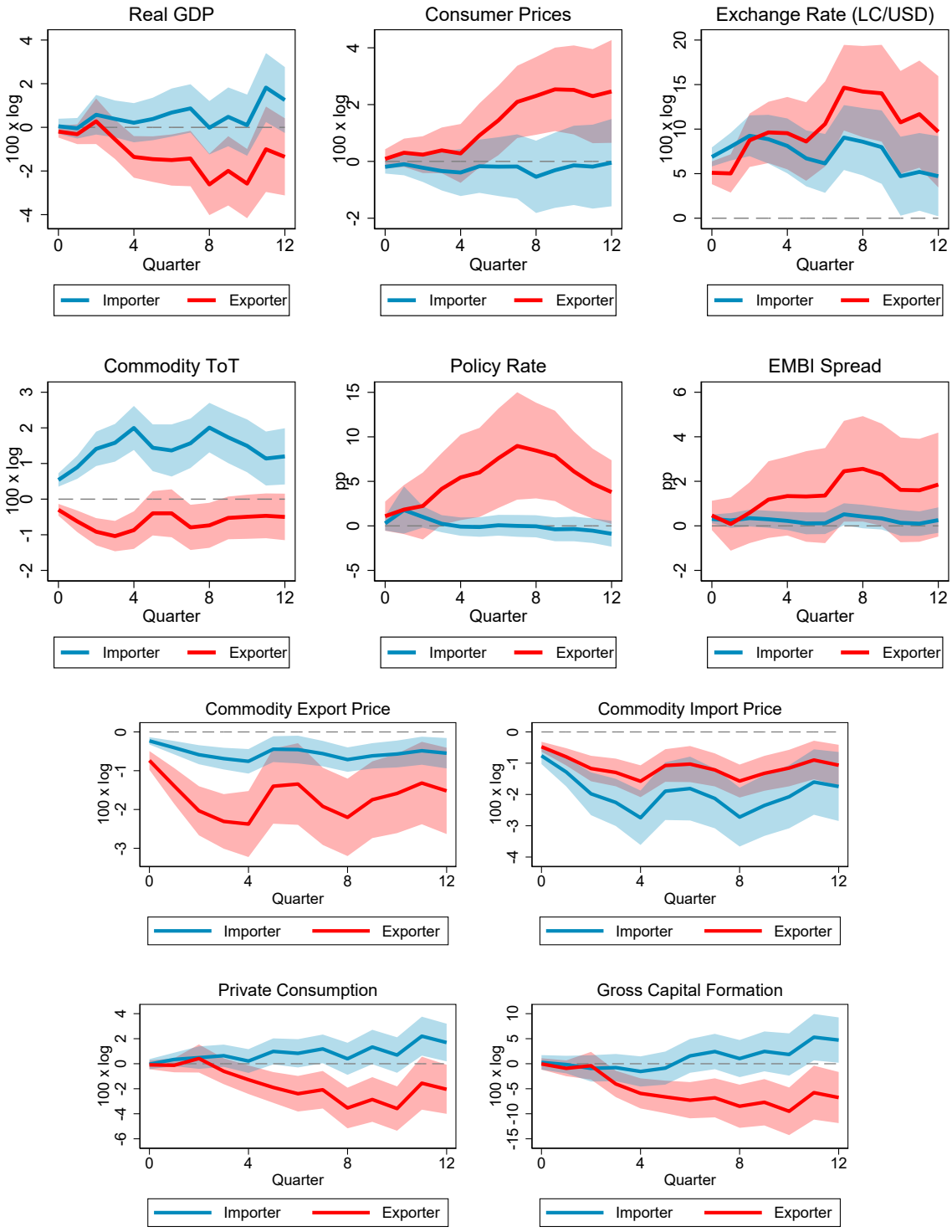
In this subsection, the following set of panel local projections is estimated, with country stratification by commodity exporter, importer, and other.

$$y_{i,t+h} - y_{i,t-1} = I_i^E \big[\mu_{E,i,h} + \beta_{E,h}\, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{E,h,l} \Delta w_{i,t-l}\big] + \\ + I_i^I \big[\mu_{I,i,h} + \beta_{I,h}\, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{I,h,l} \Delta w_{i,t-l}\big] + \\ + (1 - I_i^E - I_i^I) \big[\mu_{O,i,h} + \beta_{O,h}\, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{O,h,l} \Delta w_{i,t-l}\big] + \varepsilon_{i,h,t} \quad (3)$$

where I_i^E is a dummy equal to one if country i is classified as "Commodity Exporter" and zero otherwise, and I_i^I is a dummy equal to one if country i is classified as "Commodity Importer" and zero otherwise. The slope coefficients associated with $I_i^E \cdot \hat{u}$ in category E, $\{\beta_{E,h}\}_{h=0}^{H}$, can be interpreted as the impulse response function conditional on the economy being a commodity exporter, and analogously with the other categories.

As previously described, in this framework, a country is classified as a commodity exporter (importer) if its average 2013-15 commodity trade balance is greater (lower) or equal than 3% (-3%) of its GDP. The sample average is 0 and the SD is 6, so the countries defined as commodity exporters are the ones that are 0.5 SD or more above the average, while the countries that are 0.5 SD or more below the average are defined as commodity importers. Then, countries that are within ± 0.5 SD of the average are defined as "other". Figure 3 shows the heterogeneity in the responses that arises when stratifying by these country groups.

Figure 3: Impulse responses: 10% appreciation of the Advanced Economies Dollar Index (stratified)



Note: Figure 3 reports the impulse response functions of EMDEs' variables to a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (3). Heteroskedasticity-robust 90% confidence bands are reported. The "Other" responses were omitted in these plots in order to avoid "overcrowding" them, but you can find them in Figure A.1.

While importers do not seem to suffer with the shock (except for a moderate exchange rate depreciation), the average commodity exporter experiences very adverse responses.[7]

The GDP decreases significantly and persistently, falling up to 2.5% 8 quarters after the shock. This can be decomposed into a significant and persistent fall of private consumption and investment, that reaches 3.5% and 9%, respectively.

On the other hand, exporters' consumer prices start to increase in the 4th quarter and reach a new level, scaling 2.5% from the baseline, while importers' price level remains unaffected. In the case of exporters, this is accompanied by a significant local currency depreciation (up to 14%) and an upward response of the monetary policy interest rate (up to 8 p.p.), and the latter starts reversing at the 7th quarter when the price level and the exchange rate depreciation stabilize.

Regarding commodity prices, importers experience an uptick in their commodities terms of trade (up to 2%), while exporters suffer a decrease (up to 1%). For commodity exporters, this is explained by a fall of 2.3% in commodity export prices (0.5% in the case of importers), and by a decline of only 1.3% in commodity import prices (2.5% in the case of importers). Also, while commodity importers do not suffer an uptick in their EMBI spread, exporters suffer a persistent one, up to 2.5 percentage points.

After all, there is considerable heterogeneity in the responses, with commodity exporters experiencing disproportionately greater adverse effects. Additionally, an interesting correlation can be noted: more adverse responses in commodity prices and EMBI spread are associated with more adverse responses in the rest of variables.

In the next section, I test if commodity prices and EMBI spread responses have significant indirect effects in the responses of the other economic variables.

[7] In Obstfeld and Zhou (2023), it is shown how countries with less flexible exchange rate regimes suffer relatively more with the shock. In Table A.4 and Figure A.2 (Appendix) you can see that commodity exporters do not seem to have less flexible exchange rate regimes than the other groups.

2.5 Indirect effects estimation

In line with Cloyne et al. (2023), the following baseline specification is considered:

$$y_{i,t+h} - y_{i,t-1} = \mu_{i,h} + \beta_h \, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{h,l} \, \Delta w_{i,t-l} + \underbrace{d'_h \, x_{i,t} \, \hat{u}_t}_{\text{Interaction}} + \varepsilon_{i,t+h} \tag{4}$$

where y is a variable of interest (e.g., GDP or Commodity Terms of Trade, denoted by CToT); t refers to the time period and i refers to the country; $\mu_{i,h}$ is a country-horizon fixed effect; $\hat{u}_t$ is the global dollar shock; and $w_{i,t}$ is the vector of local control variables.

Usually, β_h is the coefficient of interest: the percent effect on, e.g., GDP, following a 10% dollar appreciation shock. The interaction terms are typically ignored in Equation 4 but, in principle, a broad range of $x_{i,t}$ variables could modulate the effects of global dollar shocks.

As an empirical starting point, the figures of the previous section showed the impulse response functions estimated from Equation 4 under the assumption that $d_h = 0$, which is typically seen in the existing literature and provides a baseline average effect.

It was also shown how commodity terms of trade, commodity export and import prices, and the EMBI spread change on average. However, the exact effect on indicators such as GDP, will depend on the precise changes in these variables experienced by each country. For instance, if the decline in the Commodity Terms of Trade were less pronounced (or the increase more pronounced), one would expect the contraction in GDP to be less severe. The objective of this section is to decompose the average effect and to characterize the heterogeneity surrounding it.

To decompose the average effect into the part related to the commodity prices or EMBI, the interaction term in Equation (4) will be used. Let $w_{i,t}$ denote the vector of local controls. In addition, a covariate that captures the sensitivity of commodity prices or EMBI to the global dollar shock will be included. Denote this variable $\Theta_{i,h}$. Then,

$$y_{i,t+h} - y_{i,t-1} = \mu_{i,h} + \beta_h \, \widehat{u}_t + \sum_{l=1}^{p} \delta'_{h,l} \, \Delta w_{i,t-l} + \underbrace{\widehat{u}_t \, \widehat{\Theta}_{i,h} \, \lambda_{s,h}}_{\text{Indirect effects}} + \varepsilon_{i,t+h} \tag{5}$$

The term $\widehat{u}_t \, \widehat{\Theta}_{i,h} \, \lambda_{s,h}$ explores how the effects of the dollar shock are modulated by commodity prices or country risk. Therefore, a measure of Θ that can be used for the identification of changes in Commodity Terms of Trade (CToT), the separate commodity import and export price indices (respectively, CToT_pM and CToT_pX), and the EMBI is needed.

To address this identification question, the differential sensitivity of these variables to

global dollar shocks across countries is exploited. The identifying assumption relies on the idea that there is some cross-country variation in the sensitivity of these variables. In this empirical approach, the panel structure of the dataset will be leveraged, and the focus will be on the average cross-country differences in the behavior of these "mediator" variables following a global dollar shock.

2.5.1 Sensitivity approach

In this subsection, I propose a simple proxy for Θ_i based on the cross-country sensitivity of CToT/CToT_pM/CToT_pX/EMBI to exogenous dollar shocks. A two-stage strategy is followed. First, I estimate Θ_i by regressing the change in the CToT (also CToT_pM, CToT_pX, and EMBI) from t–1 to $t+h$ on the dollar shock variable $\hat{u}_t$, allowing the coefficient to vary by country. In particular, the following set of local projections is estimated,

$$v_{i,t+h} - v_{i,t-1} = \mu_{i,h} + \sum_{l=1}^{p} \delta'_{h,l} \, \Delta w_{i,t-l} + \sum_{j=1}^{N} \widehat{u}_t \;\; \mathbf{I}[i=j] \widetilde{\Theta}_{i,h} + \varepsilon_{i,h,t} \tag{6}$$

where $v_{i,t}$ is the CToT (or CToT_pM, CToT_pX, EMBI) in country i in time t. Note that $\widetilde{\Theta}_{i,h}$ is the parameter of interest, allowed to vary by country. $\widetilde{\Theta}_{i,h}$ captures the differential sensitivity of CToT (or CToT_pM, CToT_pX, EMBI) in country i to dollar shocks. I therefore use this as the basis of the proxy for the CToT (or CToT_pM, CToT_pX, EMBI) response in a second-stage regression that explores heterogeneity in the response of different economic variables. The distribution of the first-stage coefficients can be found in the Appendix (see Figures A.3 to A.7).

In the second stage, Equation (5) is fitted using the estimated coefficients $\widetilde{\Theta}_{i,h}$ from the first stage above as proxy. Note that, in Equation (5), $\widehat{\Theta}_{i,h} = (\widetilde{\Theta}_{i,h} - \overline{\Theta}_h)/SD(\widetilde{\Theta}_h)$– i.e., the de-meaned and standardized version of the parameters estimated in the first stage using Equation (6).

Since the interest is on the dynamic effect via impulse response functions, all these steps are run for each h. The right-hand side of Equation (5) therefore contains $\hat{u}_t \widehat{\Theta}_{i,h} \lambda_{s,h}$. This is analogous to interacting the global dollar shock at time t with the predicted subsequent response of the CToT (or CToT_pM, CToT_pX, EMBI): $\hat{u}_t \Theta_{i,h}$ is the fitted value for the future CToT (or CToT_pM, CToT_pX, EMBI) response from the first-stage regression. As a result, this approach is equivalent to an instrumental variables estimation approach, where $\hat{u}_t \Theta_{i,h}$ is the fitted value taken from the first stage.

The identification assumption underlying this approach is that there is variation in the average response of CToT (or CToT_pM, CToT_pX, EMBI) to dollar shocks across countries but that this variation is not, on average, correlated with other factors that

make the economy more sensitive to dollar shocks. Cross-country average differences are not a threat to identification, as these factors are captured by the country fixed effects. It is still robust if CToT (or CToT_pM, CToT_pX, EMBI) are more sensitive to other macroeconomic shocks, because dollar shocks are identified as orthogonal to other global and EMDE factors.

The strategy is, therefore, identifying how economic responses vary with the cross-country sensitivity of CToT (or CToT_pM, CToT_pX, EMBI) to global dollar shocks.

2.5.2 Results

This subsection shows results from estimating Equation (5). While the coefficients β_h estimate the usual impulse response functions for the cumulative percent change in the level of the variables shown in Figure 2, the λ_h coefficients estimate the indirect effects of interest.

A positive value of λ_h implies that, following a dollar shock, the dependent variable response is more positive (or less negative) when the respective mediator variable captured by Θ goes up more (or goes down less) than its average response to the shock. Because $\widehat{\Theta}$ is standardized, the interpretation of λ should be "the additional percentage points that the dependent variable responds relative to the average, when the response of the mediator variable captured by $\widehat{\Theta}$ is 1 SD higher than its average".

Figure 4 shows the indirect effects (λ_h) obtained from this exercise, where Θ is capturing how the CToT respond to the global dollar shock.

Starting with panel (a), it is shown that, on average, a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated GDP response 0.4-0.5 percentage points (p.p.) above the average response of Figure 2. Considering that the cited average response implied a contraction up to 1% after some quarters, this would mean that a better response of CToT is associated with a less severe contraction of GDP following a dollar shock. Having said that, it can be seen that the significance is weak.

Moving to panel (b), the indirect effects of CToT over private consumption are positive and significant, leading to a response that is up to a 1 p.p. higher relative to the average seen in Figure 2. Recalling that the average response of private consumption was null for some quarters and then contractive up to 1%, this implies that a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated response of private consumption that is positive and then around null.

Focusing on panel (c), it is shown that the indirect effects of CToT over investment are positive but with weak significance, leading to a response that is up to a 2 p.p. higher relative to the average seen in Figure 2. Recalling that the average response of investment

against the dollar shock was negative leading up to a 3% decrease, this implies that a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated contraction of investment that is less severe.

Then, panel (d) shows that, on average, a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated CPI response up to 0.75 p.p. below the average response of Figure 2. Considering that the cited average response implied a null effect during 4 quarters and then an increase up to 0.8%, this would mean that a CToT response 1 SD above the average is associated with a null effect on CPI following a dollar shock.

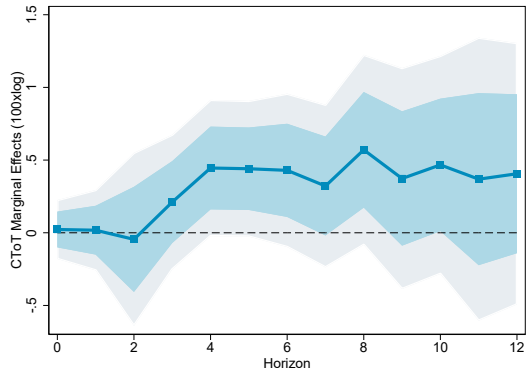
Looking at panel (e), the indirect effects of CToT over the nominal exchange rate are positive at the very beginning and then negative, leading to a response that is up to a 2.5 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of the exchange rate led to a depreciation up to 13%, this implies that a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated higher depreciation at the very beginning and then a persistent lower one. Having said that, it can observed a weak significance.

Finally, focusing on panel (f), the indirect effects of CToT over EMBI spread are negative but not significant, leading to a response that is up to a 0.3 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of the EMBI against the dollar shock was positive and led to an increase of up to 1.7 p.p., this implies that a country that following a dollar shock faces a CToT response 1 SD above the average, has an associated uptick in the EMBI spread that is less severe.

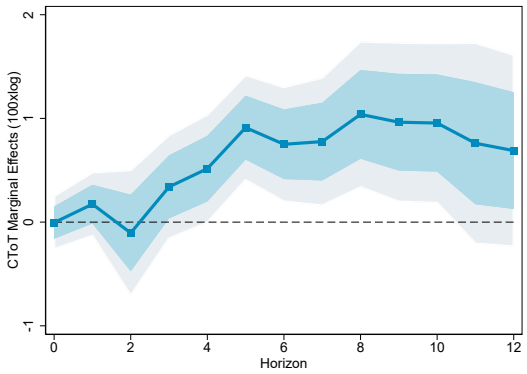
In summary, it could be said that, following a dollar shock, a better response of CToT softens the adverse impacts on EMDEs' economic variables, even though some indirect effects have weak significance. It is interesting to observe that these results correlate and are consistent with the ones obtained in Figure 3, where the group experiencing a more favorable response of CToT is the one that experiences less adverse responses in its economic variables.

Figure 4: CToT Indirect Effects

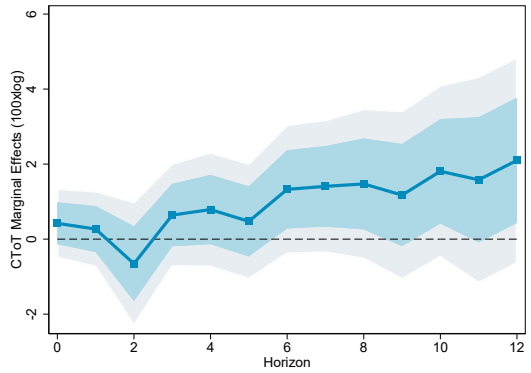
(a) Real GDP



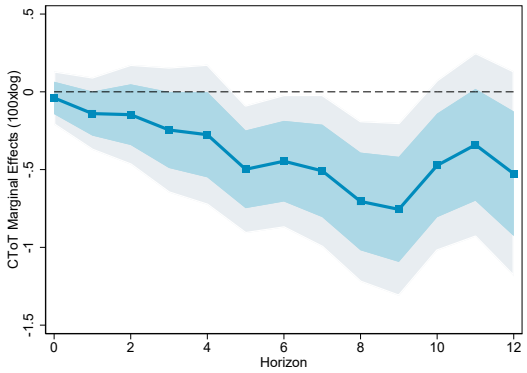
(b) Private Consumption



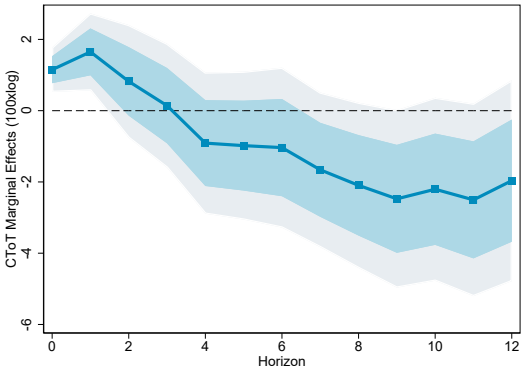
(c) Gross Capital Formation



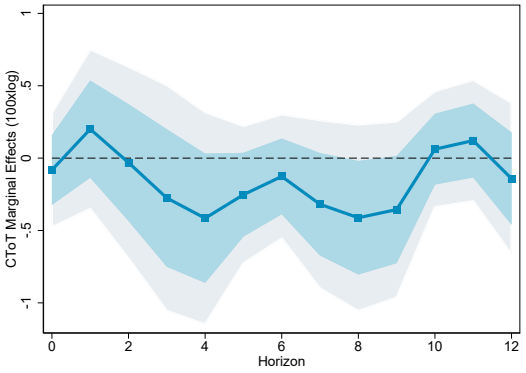
(d) Consumer Prices



(e) Exchange Rate (LCU/USD)



(f) EMBI Spread



Note: Figure 4 reports the CToT indirect effects (λ) in EMDEs' variables facing a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (5). Heteroskedasticity-robust 90% and 68% confidence bands are reported.

Now, both stages are repeated but changing the indirect effect variable (i.e., now Θ is capturing another "mediator" variable). This is performed with commodity import prices (CToT_pM), country risk (EMBI), and commodity export prices (CToT_pX). The results are reported in Figures 5, 6, and A.8 (Appendix), respectively.

Starting with Figure 5, panel (a) shows that, on average, a country that following a dollar shock faces a CToT_pM response 1 SD above the average (i.e., a less pronounced decrease), has an associated GDP response up to 1.2 percentage points below the average response of Figure 2. Considering that the cited average response implied a contraction up to 1% after some quarters, this would mean that a higher response of CToT_pM is associated with a more severe contraction of GDP following a dollar shock.

Moving to panel (b), it is shown that the indirect effects of CToT_pM over private consumption are negative and significant in the mid-term, leading to a response that is up to 1.2 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of private consumption was null for some quarters and then contractive up to 1%, this implies that a country that following a dollar shock faces a CToT_pM response 1 SD above the average, has associated a more adverse response of private consumption.

Focusing on panel (c), the indirect effects of CToT_pM over investment are negative, leading to a response that is up to 2.5 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of investment against the dollar shock was negative leading up to a 3% decrease, this implies that a country that following a dollar shock faces a CToT_pM response 1 SD above the average, has associated a more severe contraction of investment.

Then, panel (d) shows that, on average, a country that following a dollar shock faces a CToT_pM response 1 SD above the average, has an associated CPI response up to 1.7 percentage points above the average response of Figure 2. Considering that the cited average response implied a null effect during 4 quarters and then an increase up to 0.8%, this would mean that a CToT_pM response 1 SD above the average is associated with a larger increase of CPI level following a dollar shock.

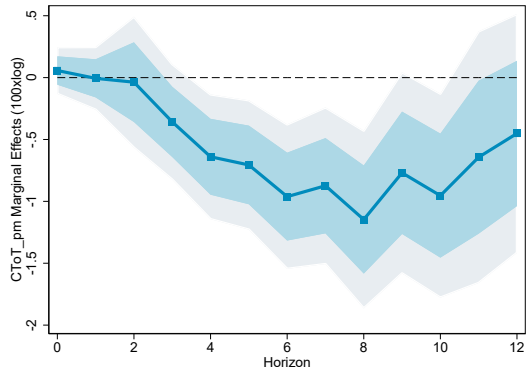
Looking at panel (e), it can be seen that the indirect effects of CToT_pM over the nominal exchange rate are positive, leading to a response that is 3.9 p.p. higher relative to the average seen in Figure 2. Recalling that the average response of the exchange rate led to a depreciation up to 13%, this implies that a country that following a dollar shock faces a CToT_pM response 1 SD above the average, has associated a higher nominal depreciation.

Finally, focusing on panel (f), it can be observed that the indirect effects of CToT_pM over EMBI spread are positive but with weak significance, leading to a response that is up to 1.8 p.p. higher relative to the average seen in Figure 2. Recalling that the average response of the EMBI spread against the dollar shock was positive and led to an increase of up to 1.7 p.p., this implies that a country that following a dollar shock faces a CToT_pM response 1 SD above the average, has associated a more severe uptick in the EMBI spread.

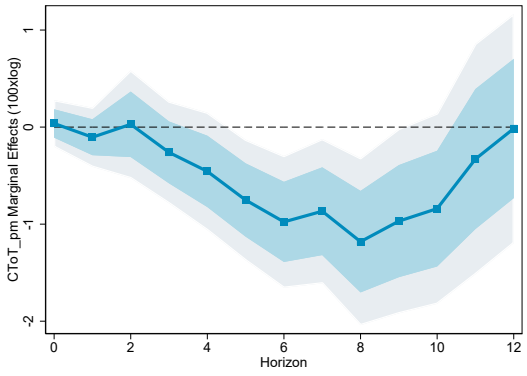
In summary, it could be said that, following a dollar shock, a higher response of CToT_pM (less pronounced fall) plays the role of amplifying the adverse impacts on EMDEs' economic variables, even though some indirect effects have weak significance. It is interesting that these results correlate and are consistent with the ones obtained in Figure 3, where the group experiencing a less negative response of CToT_pM is the one that experiences more adverse responses in its economic variables.

Figure 5: CToT_pM Indirect Effects

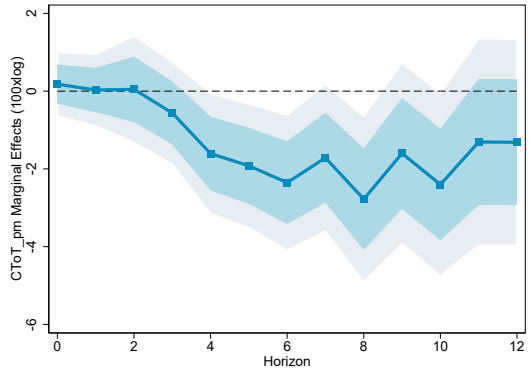
(a) Real GDP



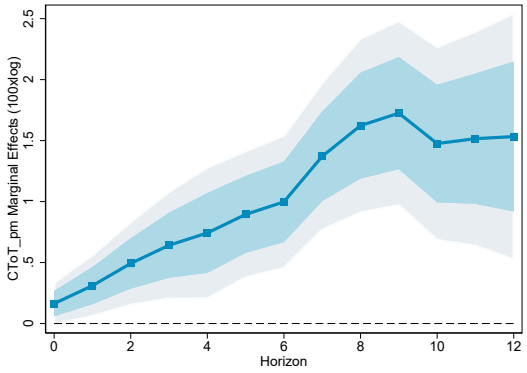
(b) Private Consumption



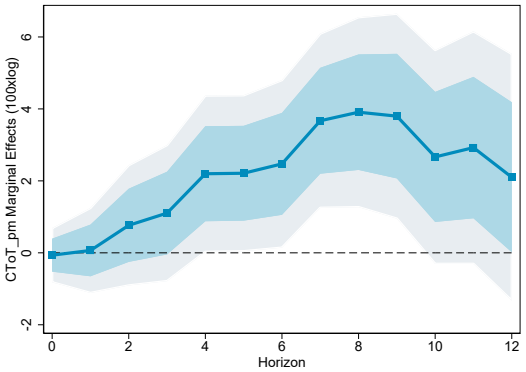
(c) Gross Capital Formation



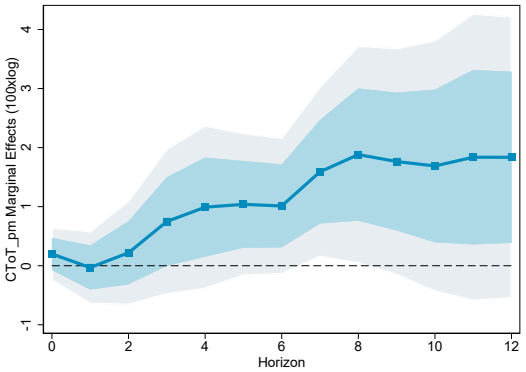
(d) Consumer Prices



(e) Exchange Rate (LCU/USD)



(f) EMBI Spread



Note: Figure 5 reports the CToT_pM indirect effects (λ) in EMDEs' variables facing a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (5). Heteroskedasticity-robust 90% and 68% confidence bands are reported.

When the same exercise is performed to look at the indirect effects of the response of commodity export prices (CToT_pX) on other economic variables, it is found that they are not significant on average (see Appendix, Figure A.8).

Finally, analyzing Figure 6, it is shown that, on average, following a dollar shock, a higher response of the EMBI spread is associated with worse performance in economic variables.

First, panel (a) conveys that, on average, a country that following a dollar shock faces an EMBI response 1 SD above the average, has an associated GDP response up to 1.3 percentage points below the average response of Figure 2. Considering that the cited average response implied a contraction up to 1% after some quarters, this would mean that a higher response of the EMBI spread is associated with a more severe contraction of GDP following a dollar shock.

Moving to panel (b), it is shown that the indirect effects of the EMBI over private consumption are negative but with weak significance, leading to a response that is up to 1.8 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of private consumption was null for some quarters and then contractive up to 1%, this implies that a country that following a dollar shock faces an EMBI response 1 SD above the average, has associated a more adverse response of private consumption.

Focusing on panel (c), it can be observed that the indirect effects of the EMBI over investment are negative, leading to a response that is up to a 4.5 p.p. lower relative to the average seen in Figure 2. Recalling that the average response of investment against the dollar shock was negative leading up to a 3% decrease, this implies that a country that following a dollar shock faces an EMBI response 1 SD above the average, has associated a more severe contraction of investment.

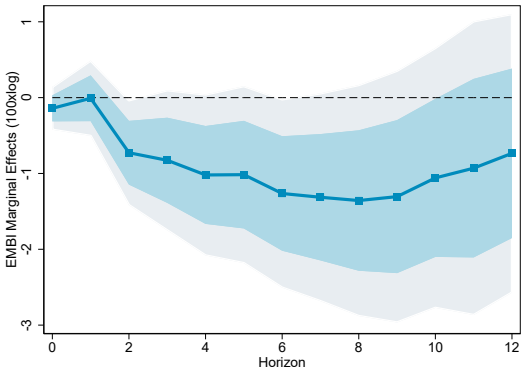
Then, panel (d) shows that, on average, a country that following a dollar shock faces an EMBI response 1 SD above the average, has an associated CPI level response up to 2.5 percentage points above the average response of Figure 2. Considering that the cited average response implied a null effect during 4 quarters and then an increase up to 0.8%, this would mean that an EMBI response 1 SD above the average is associated with a larger effect on CPI level following a dollar shock. Having said that, the mentioned effect is only significant between quarters 6-10.

Finally, focusing on panel (e), it is shown that the indirect effects of EMBI over the nominal exchange rate are positive but not significant.

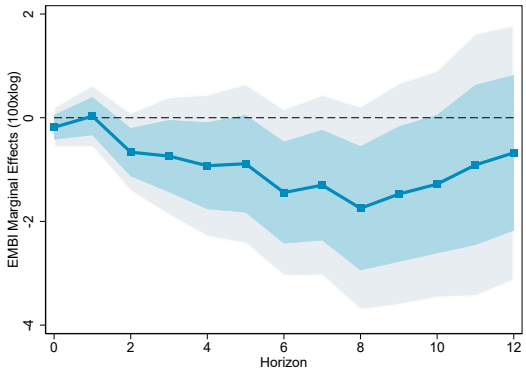
In summary, it could be said that, following a dollar shock, a higher response of the EMBI amplifies the adverse impacts on EMDEs' economic variables, even though some indirect effects have weak significance. As observed in the previous cases, it is interesting to note that these results correlate and are consistent with the ones obtained in Figure 3, where the group experiencing an uptick in the EMBI spread is the one that experiences more adverse responses in its economic variables.

Figure 6: EMBI Indirect Effects

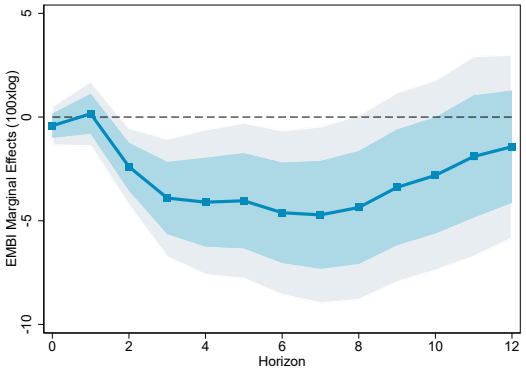
(a) Real GDP



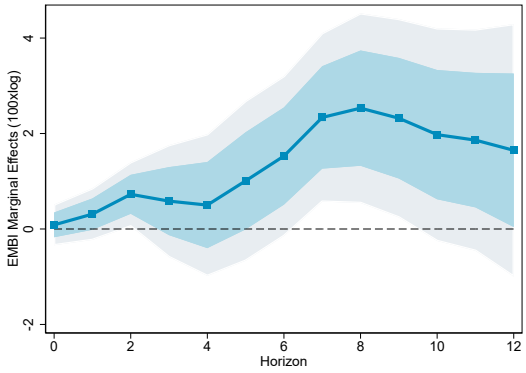
(b) Private Consumption



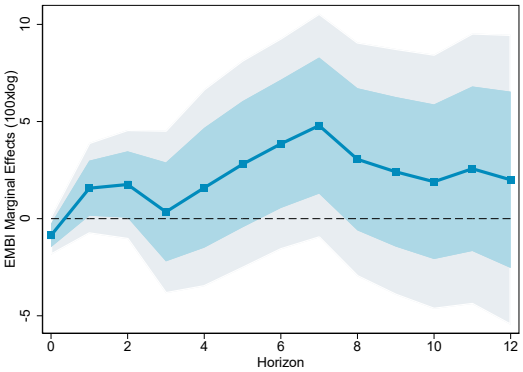
(c) Gross Capital Formation



(d) Consumer Prices



(e) Exchange Rate (LCU/USD)



Note: Figure 6 reports the EMBI indirect effects (λ) in EMDEs' variables facing a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (5). Heteroskedasticity-robust 90% and 68% confidence bands are reported.

3 Conclusions

This study expanded and complemented the work done in Obstfeld and Zhou (2023) by showing how the global dollar shock impacts heterogeneously on commodity exporters and importers. Also, it was shown how the country-specific commodity export and import prices respond to the shock on average, and the asymmetry in these responses between commodity exporters and importers. In summary, exporters seem to be the ones that suffer the most against global dollar shocks, experiencing significant declines in real variables such as output, consumption, and investment, as well as upticks in consumer price level and country risk. Also, even though commodity prices go down in general against the shock, while importers experience an increase in their commodity terms of trade (as their import prices fall more than their export prices), exporters go through a decrease (as their import prices fall less than their export prices).

Then, the analysis went further and estimated how the response of some economic variables against the shock depended on how commodity prices and country risk respond to the shock. This exercise was an attempt to shed light on the transmission mechanisms of global dollar shocks on EMDEs. To this end, the approach proposed in Cloyne et al. (2023) was applied to estimate the indirect effects of the response of commodity prices and the EMBI spread on the rest of economic variables. The results suggest that the way in which commodity terms of trade, commodity import prices and the EMBI spread respond to the shock have a significant impact in the response of other economic variables such as output, private consumption, investment, consumer prices, and nominal exchange rate. While a more positive response of commodity terms of trade is associated with a less severe contraction of real variables, a higher (less negative) response of commodity import prices and a larger uptick in the EMBI spread are associated with a more adverse response of EMDEs' economic variables.

Appendix

Table A.1: EMDEs in sample

Argentina	Indonesia	Romania
Brazil	Israel	South Africa
Bulgaria	South Korea	Philippines
Chile	Malaysia	Thailand
Colombia	Mexico	Turkey
Croatia	Morocco	Uruguay
Czech Republic	Peru	–
Hungary	Poland	–

Table A.2: Individual commodities included in the CToT and Commodity Trade Balance

Group	**Individual commodities**
Energy:	Coal, crude oil, natural gas.
Metals:	Aluminum, copper, gold, iron ore, lead, nickel, tin, uranium, zinc.
Food and beverages:	Bananas, barley, beef, cocoa, coffee, corn, fish, fish meal, groundnuts, lamb, olive oil, oranges, palm oil, poultry, rapeseed oil, rice, shrimp, soybean meal, soybean oil, soybeans, sugar, sunflower seed oil, swine meat, tea, wheat.
Agricultural raw materials:	Cotton, hard logs, hard sawnwood, hides, natural rubber, soft logs, soft sawnwood, wool.

Table A.3: Commodity Trade Balance (% of GDP) — Average 2013–15

Country	Commodity Trade Balance	Classification
Argentina	4.0%	Exporter
Brazil	3.1%	Exporter
Bulgaria	1.6%	Other
Chile	12.3%	Exporter
Colombia	7.6%	Exporter
Croatia	-4.0%	Importer
Czech Republic	-4.8%	Importer
Hungary	-1.7%	Other
Indonesia	3.7%	Exporter
Israel	-4.7%	Importer
South Korea	-11.5%	Importer
Malaysia	4.8%	Exporter
Mexico	0.2%	Other
Morocco	-10.2%	Importer
Peru	9.6%	Exporter
Philippines	-3.3%	Importer
Poland	-2.8%	Other
Romania	-1.0%	Other
South Africa	0.8%	Other
Thailand	-7.4%	Importer
Turkey	-3.8%	Importer
Uruguay	4.6%	Exporter

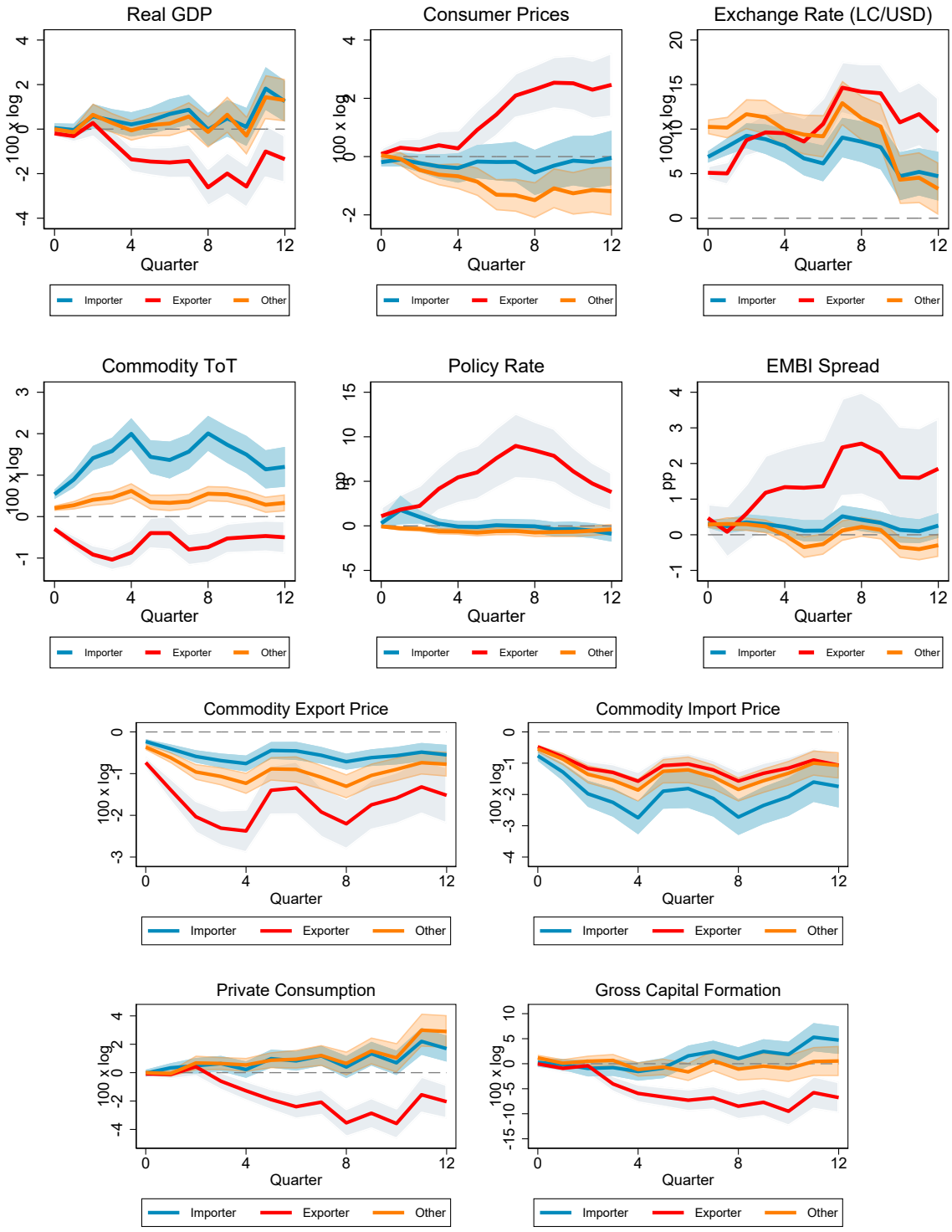
Note: A country is classified as commodity exporter (importer) if its average commodity trade balance in 2013-15 is greater (lower) or equal than 3% (-3%) of its GDP. The countries defined as commodity exporters are fairly consistent with the classification made by IMF (2023).

Table A.4: Exchange rate regimes - Summary statistics

Country Group	P.25	Mean	Median	P.75	SD
Commodity Exporters	2	2.76	3	3	0.76
Commodity Importers	2	2.43	3	3	0.94
Other	2	2.67	3	3	1.02

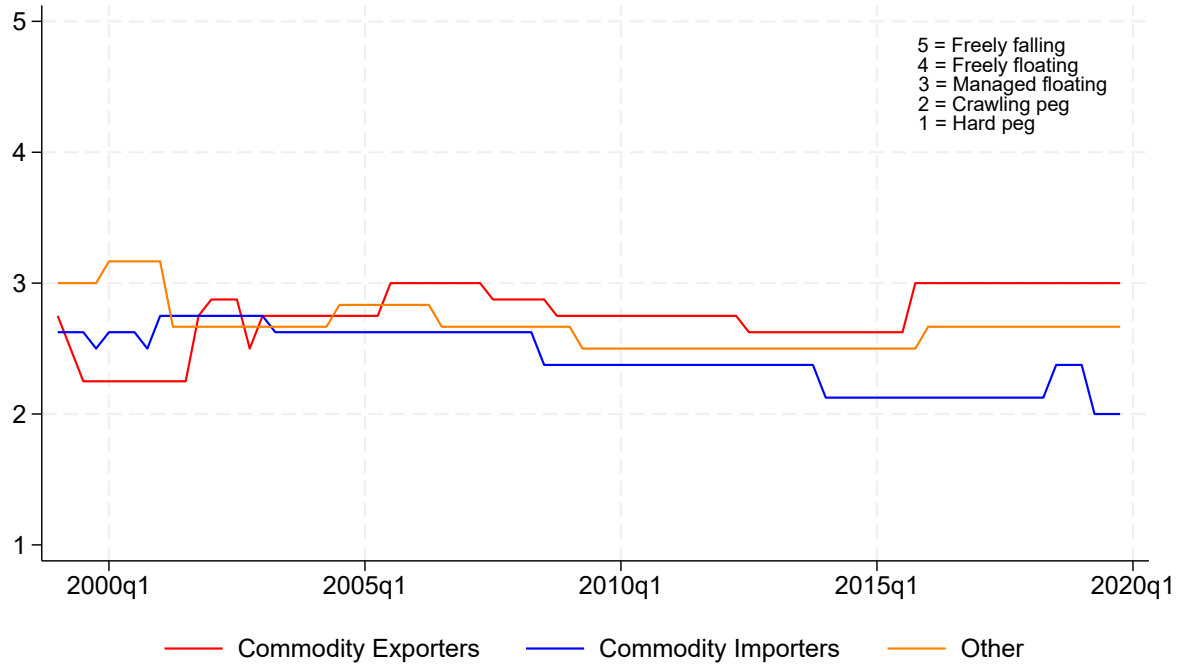
Note: A higher number corresponds to a more flexible "de facto" exchange rate regime, according to the Ilzetzki et al. (2019) classification.

Figure A.1: Impulse responses: 10% appreciation of the Advanced Economies Dollar Index (stratified)



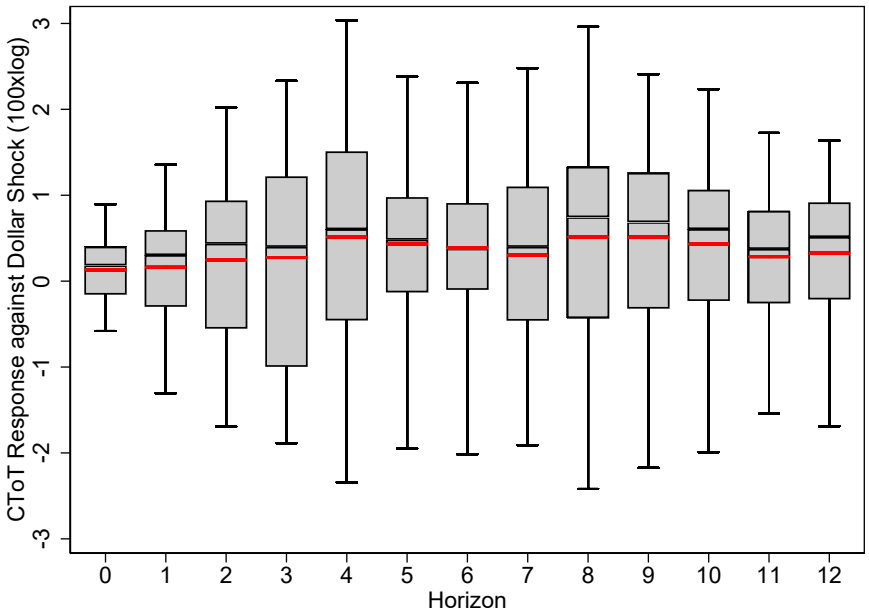
Note: Figure A.1 reports the impulse response functions of EMDEs' variables to a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (3). Heteroskedasticity-robust 68% confidence bands are reported.

Figure A.2: Average Exchange Rate Regime



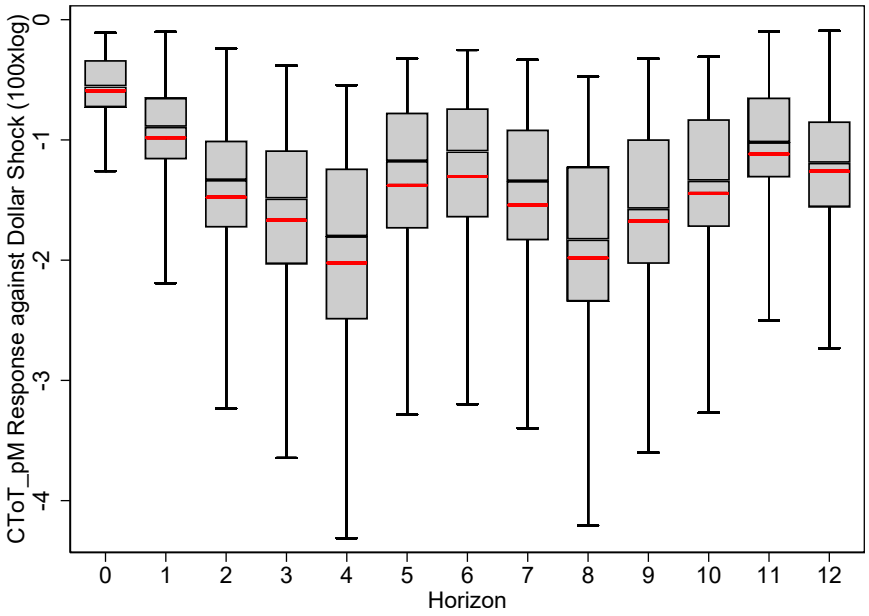
Note: Figure A.2 reports the average "de facto" exchange rate regime of each country group by quarter, according to the Ilzetzki et al. (2019) classification.

Figure A.3: CToT Indirect Effects - Distribution of First-Stage Coefficients ($\widetilde{\Theta}_{i,h}$)



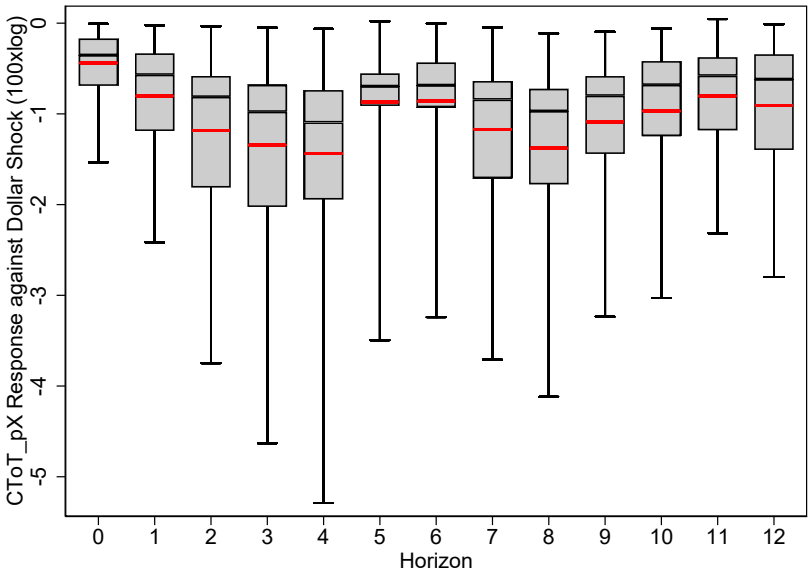
Note: The gray boxes go from the 25th to the 75th percentile of the distribution. The median is marked with a black line, the mean is marked with a red line, and the upper and lower whiskers are the maximum and minimum values, respectively.

Figure A.4: CToT_pM Indirect Effects - Distribution of First-Stage Coefficients ($\widetilde{\Theta}_{i,h}$)



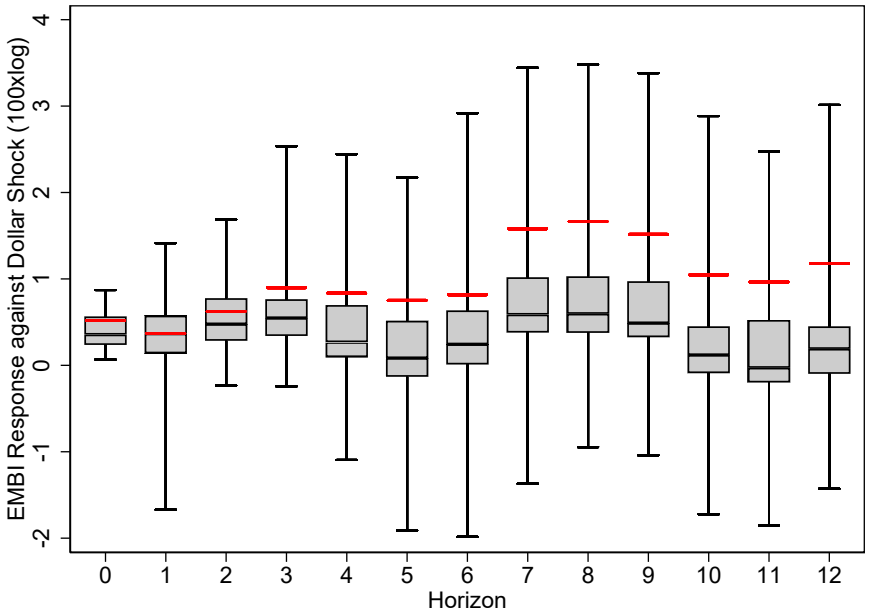
Note: The gray boxes go from the 25th to the 75th percentile of the distribution. The median is marked with a black line, the mean is marked with a red line, and the upper and lower whiskers are the maximum and minimum values, respectively.

Figure A.5: CToT_pX Indirect Effects - Distribution of First-Stage Coefficients ($\widetilde{\Theta}_{i,h}$)



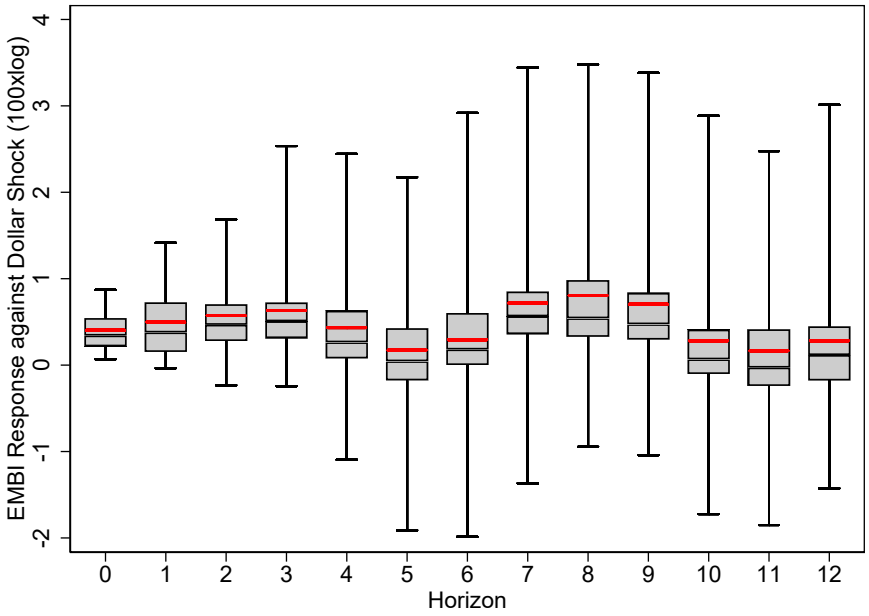
Note: The gray boxes go from the 25th to the 75th percentile of the distribution. The median is marked with a black line, the mean is marked with a red line, and the upper and lower whiskers are the maximum and minimum values, respectively.

Figure A.6: EMBI Indirect Effects - Distribution of First-Stage Coefficients ($\widetilde{\Theta}_{i,h}$)



Note: The gray boxes go from the 25th to the 75th percentile of the distribution. The median is marked with a black line, the mean is marked with a red line, and the lower whisker is the minimum value. The upper whisker is the maximum value without considering Argentina, because it has outliers that distort the plot. However, all core statistics (i.e., mean and median) include Argentina.

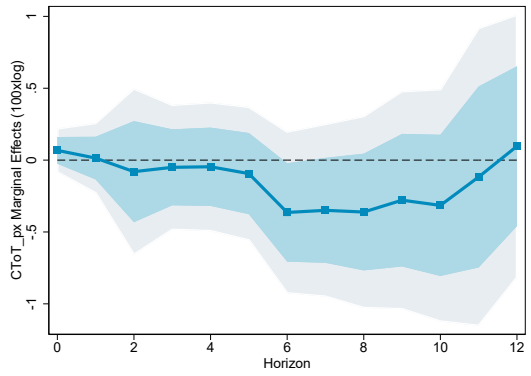
Figure A.7: EMBI Indirect Effects - First Stage Coefficients Distribution w/o ARG ($\widetilde{\Theta}_{i,h}$)



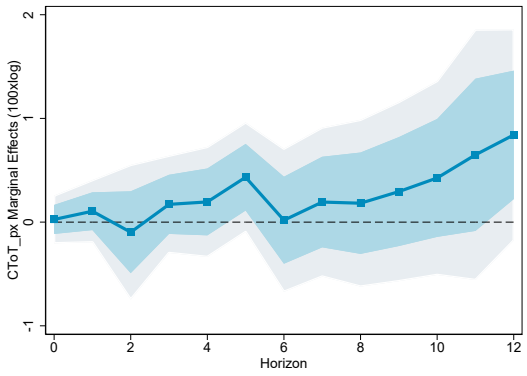
Note: The gray boxes go from the 25th to the 75th percentile of the distribution. The median is marked with a black line, the mean is marked with a red line, and the upper and lower whiskers are the maximum and minimum values, respectively. Argentina was excluded for all calculations in this plot. Please note that even though it affects the level, it does not affect the shape and dynamic movement of the mean.

Figure A.8: CToT_pX Indirect Effects

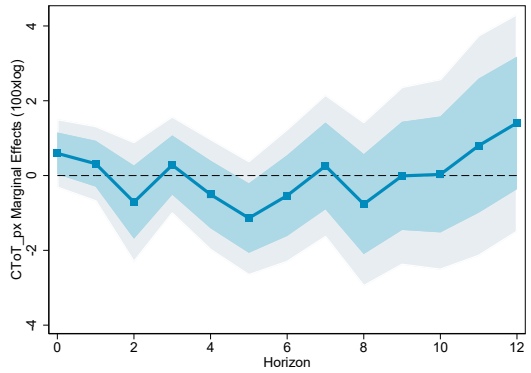
(a) Real GDP



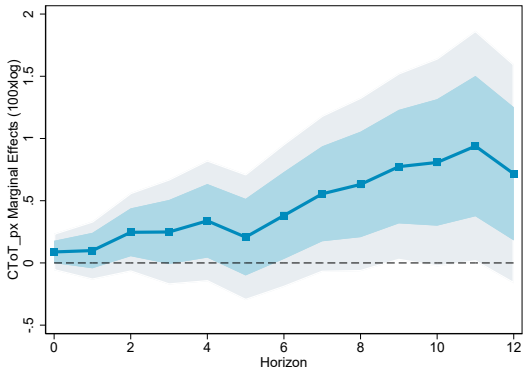
(b) Private Consumption



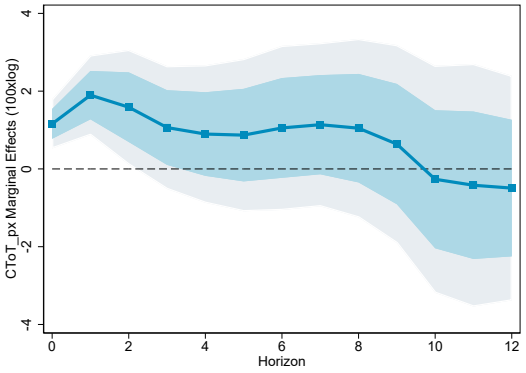
(c) Gross Capital Formation



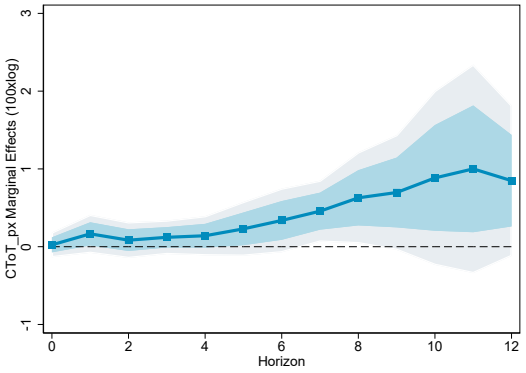
(d) Consumer Prices



(e) Exchange Rate



(f) EMBI Spread



Note: Figure A.8 reports the CToT_pX indirect effects (λ) in EMDEs' variables facing a 10% appreciation of the dollar exchange rate against a basket of advanced economy currencies, based on the local projection (5). Heteroskedasticity-robust 90% and 68% confidence bands are reported.

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