EUROPEAN CENTRAL BANK

EUROSYSTEM

# Working Paper Series

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## EME financial conditions: which global shocks matter?

No 2282 / May 2019

**Abstract**

This paper provides a quantitative assessment of the relative importance of global structural shocks for changes in financial conditions across a sample of emerging market economies. We disentangle four key drivers of global financial markets (oil supply shocks, global economic news shocks, US-specific economic news shocks and US monetary shocks) and show that these global factors account for about half of the variation in risky asset prices across EMEs. The influence of global factors for EME interest rates and currencies is much smaller, suggesting that factors beyond the identified global shocks (e.g. domestic or regional shocks) might be more important. In contrast to the recent literature on the global financial cycle which has emphasised the prominent role of US monetary policy, we find that although US monetary shocks have some influence in shaping EME financial markets, the broader global environment plays a significantly stronger role.

**JEL Classification:** E44, E52, G15
**Keywords:** global shocks, international financial markets, asset prices, financial conditions, emerging markets, spillovers

# Non-technical summary

Key global events over the past years have highlighted the sensitivity of asset prices and currencies in emerging markets economies (EME) to global shocks. The accommodative monetary policy stance in advanced economies since the financial crisis created abundant liquidity in global financial markets and directed capital inflows to EME amid more attractive financial market returns. The capricious nature of such flows, mostly in the form of portfolio inflows, was observed in May 2013. When, remarks by Federal Reserve Chairman Bernanke about the unwinding of US monetary stimulus caused a sell-off in risky assets, with vulnerable EME being most hardly hit (Sahay et al. [2014]).

While the implications of US monetary policy actions on global financial conditions have been widely discussed, we believe that other global shocks have the potential to influence EME financial asset prices. Global economic news (e.g. about global growth or trade tariffs) are likely to affect EME's trade and growth prospects and thus EME financial asset prices. Oil price declines due to supply-expansion factors are also widely believed to be detrimental to oil-exporting economies and have been usually associated with depreciating currencies and lower equity and bond prices (Kinda et al. [2016]).

Largely inspired by Forbes et al. [2015], we propose to treat the daily changes in key global variables as endogenous and to identify the underlying shocks behind their movements. We then analyse the transmission of these global shocks to EME domestic financial conditions. By doing this we aim to better understand the transmission of global shocks to EME financial conditions and answer two main questions: (1) which global shocks are moving the most EME financial markets? and (2) do EME retain control over their financial conditions, or are financial fluctuations mostly dominated by global shocks?

Our findings are as follows. In part, we confirm the existing literature which finds a role for global factors and spillovers for EME financial conditions. Across the sample as a whole (i.e. from 2006 onwards), we find that global factors account for about half of the variation in risky asset prices across EMEs. The influence of global factors for EME interest rates and currencies is much smaller, suggesting that these variables are shaped more by factors other than identified global shocks (e.g. domestic or regional factors). Finally, in contrast to the recent literature on the global financial cycle which has emphasised the prominent role of US monetary policy, we find that although US monetary shocks have some influence in shaping EME financial markets, the broader global environment (represented by economic news and oil shocks) plays a significantly stronger role.

# 1 Introduction

Key global events over the past years have highlighted the sensitivity of asset prices and currencies in emerging markets economies (EME) to global shocks. The accommodative monetary policy stance in advanced economies since the financial crisis created abundant liquidity in global financial markets and directed capital inflows to EME amid more attractive financial market returns. The capricious nature of such flows, mostly in the form of portfolio inflows, was observed in May 2013. Then, remarks by Federal Reserve Chairman Bernanke about the unwinding of US monetary stimulus caused a sell-off in risky assets, with vulnerable EME being most hardly hit (Sahay et al. [2014]).

While the implications of US monetary policy actions on global financial conditions have been widely discussed, we believe that other global shocks have the potential to influence EME financial asset prices. Global economic news (e.g. about global growth or trade tariffs) are likely to affect EME's trade and growth prospects and thus EME financial asset prices. Oil price declines due to supply-expansion factors are also widely believed to be detrimental to oil-exporting economies and have been usually associated with depreciating currencies and lower equity and bond prices (Kinda et al. [2016]).

Largely inspired by Forbes et al. [2015] , we propose to treat the daily changes in key global variables as endogenous and to identify the underlying shocks behind their movements. We then analyse the transmission of these global shocks to EME domestic financial conditions. By doing this we aim to better understand the transmission of global shocks to EME financial conditions and answer two main questions: (1) which global shocks are moving the most EME financial markets? and (2) do EME retain control over their financial conditions, or most of the financial fluctuations are dominated by global shocks?

To answer these questions we propose a two-step approach. In a first step we use a sign-restriction Bayesian Structural Vector Autoregressive (BVAR) model for daily financial data to identify underlying global shocks that have shaped key global financial variables. The identification strategy extends the bi-variate model proposed by Matheson and Stavrev [2014], which decomposes shifts in US equity prices and 10-year bond yields into monetary and economic news shocks. While the model retains the US economic news and monetary shocks, we augment the set of variables to allow for the identification of oil supply shocks and global economic news shocks (i.e. shocks that originate outside the US) as in Jonathan and Tilton [2016]. In the second step we analyse the effect of these structural shocks in shaping EME financial conditions similar to Arregui et al. [2018]. More precisely, we use the local projection method proposed by Jorda [2005] to estimate the response of domestic EME financial variables (equity prices, sovereign spreads, nominal effective exchange rate, short- and long-term interest rates) to global shocks. The relative importance of the structural shocks is assessed by computing the forecast error variance decomposition.

Inherent in our two-step approach, this paper is linked to two strands of the empirical literature: first, the identification of economic shocks in a SVAR approach; and second, the international transmission of shocks. On the first strand, there is an extensive number of empirical studies building on the seminal work of Sims [1980] that attempt to isolate economic shocks using structural VARs with different identification schemes (for a critical review of sign-restriction VAR (see Fry and Pagan [2011]). For example, SVARs have been used to document the effect of monetary policy shocks on output (Bernanke and Mihov [1995], Sims and Zha [2006] and Uhlig [1999]) and more recently the impact of unconventional monetary policy (Peersman [2011], Baumeister and Benati [2012], Gambacorta et al. [2014], Nakashima [2005]). In similar frameworks, others have looked at the relative importance of supply and demand shocks for the business cycles (Blanchard and Quah [1989]), the isolation of oil supply and demand shocks (Kilian [2009], Lutkepohl and Netsunajev [2012]) or financial shocks (Fornari and Stracca [2012]) and uncertainty shocks (Bekaert et al. [2013]), among many other empirical applications. While most of these papers have focused on identifying specific structural shocks and used monthly or quarterly frequencies, we propose the joint identification of a set of shocks by exploring the content of daily financial data. Beaudry and Portier [2006] have rightly pointed out that, while there is a large literature suggesting stock price movements reflect the market's expectation of future developments in the economy, there is limited empirical literature exploring the informational content of financial market price movements, which is even more surprising given the appeal of having such a rich data set. The first part of this paper explores this possibility.

The second part of our paper deals with the spillovers of global shocks to EME financial markets. Equally vast, this strand of the empirical literature attempts to understand how shocks originating in a source economy (usually the US) affect other advanced and emerging economies. Central to the recent literature has been the concept of a global financial cycle (Rey [2015]). The debate raises important policy questions about the impact of global factors on asset prices in EMEs and how or whether this limits the space for local polices to managing EME domestic financial conditions and economic cycles. Miranda-Agrippino and Rey [2015] have documented the existence of a global factor in driving risky asset prices and have argued that US monetary policy represents a major factor shaping credit conditions worldwide. Meinusch and Tillmann [2014] suggest that quantitative easing has strong effects on EME's financial conditions and plays a large role in explaining capital inflows, equity prices and exchange rates. Using high-frequency US monetary policy shocks, Chari et al. [2017] show that US monetary policy surprises matter more for EME asset returns than for capital flows, and across asset returns, the authors find larger effects on EME equity prices than on fixed income markets. Yet, the literature is not conclusive on the relative importance of global factors for EME financial markets. Akinci [2013] finds that a global financial risk factor explains about 20 percent of movements in spreads and aggregate activity in emerging economies, but concludes that the impact of shocks to the US risk-free interest rate on macroeconomic fluctuations in EME is negligible. Arregui et al. [2018] find that a common component (global financial conditions) accounts for about 20 to 40 percent of the variation in domestic financial conditions, but with notable heterogeneity across countries, and argue that EMEs still retain control of domestic financial conditions. Thus, while these studies seem to conclude that either a global factor and/or US monetary policy plays a key role in driving asset prices, our reading of the literature points to inconclusive empirical evidence on these issues, and in particular on the nature of the 'structural forces' behind movements in financial conditions across EME. Our paper aims at filling this gap.

Our work therefore contributes to the existing literature in three major ways. First, it jointly identifies a set of global economically meaningful shocks by exploring the informational content of daily financial data. By doing this we are able to capture 'drivers' of global financial markets rather than either focusing on the existence of a single 'global factor' across risky asset returns, or limiting our explanations to investigations of single shocks (e.g. often US monetary policy shocks). Second, the paper examines quantitatively the relative importance of different global shocks for changes in EME financial conditions, while contributing to the debate on the existence of a global financial cycle. Third, the papers provides evidence on the non-linear effects of global shocks propagation conditional on low/high volatility periods.

Our findings are as follows. In part, we confirm the existing literature which finds a role for global factors and spillovers for EME financial conditions. Across the sample as a whole (i.e. from 2006 onwards), we find that global factors account for about half of the variation in risky asset prices across EMEs. The influence of global factors for EME interest rates and currencies is much smaller, suggesting that these variables are shaped more by factors other than identified global shocks (e.g. domestic or regional factors). Overall, that would suggest that the role of global factors in shaping EME financial conditions can be overstated. Finally, in contrast to the recent literature on the global financial cycle which has emphasised the prominent role of US monetary policy, we find that although US monetary shocks have some influence in shaping EME financial markets, the broader global environment (represented by economic news and oil shocks) plays a significantly stronger role.

The remainder of this paper is organized as follows. Section 2 describes the methodology for the identification of structural shocks and discusses the results. Section 3 presents the methodology for quantifying spillovers to EME financial conditions; it shows the results together with a discussion on robustness. Section 4 concludes.

## 2 Identification of global shocks

### 2.1 Methodology: Structural Bayesian VAR

We use a structural BVAR to disentangle the contributions of different drivers shaping movements in global financial variables and oil prices. The structural representation is given by equation (1) where: the vector of endogenous variables $Y_t$ includes 4 variables (oil prices, US equity prices relative to global equity prices, US non-energy equity prices and US long-term yields), $A_0$ is the matrix of contemporaneous influences, $A_p$ is the matrix of influences at lag p and $\epsilon_t$ is a vector of (uncorrelated) structural shocks $[\epsilon_t^{Oil}, \epsilon_t^{GlobalEconomicNews}, \epsilon_t^{USEconomicNews}, \epsilon_t^{USMonetary}]'$, normally distributed with mean 0 and variance $I_k(0,1)$

$$A_0 Y_t = C_1 + A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + \epsilon_t \tag{1}$$

The starting point for estimating the structural model is to assume that $A_0$ is invertible and express the model in its reduced form:

$$Y_t = C_2 + \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + ... + \theta_p Y_{t-p} + u_t \tag{2}$$

Where:

$$\theta_p = A_0^{-1} A_p$$

$$C_2 = A_0^{-1} C_1$$

$$u_t = A_0^{-1} \epsilon_t$$

$$E[u_t u_{t'}] = \Omega = E[A_0^{-1} \epsilon_t \epsilon_t' A_0^{-1'}] = A_0^{-1} I_k A_0^{-1'}$$

We use Bayesian estimation methods assuming a normal-diffuse prior distribution to obtain the posterior estimates of the reduced-form parameters $\theta_p$, $C_2$ and $\Omega_t$ . The identification scheme, based on sign-restrictions, is implemented using the technique recently developed by Arias et al. [2014]. The structural shocks ($\epsilon_t$) are obtained by applying sign-restrictions on the structural impulse response functions on impact. This approach implies using the Choleski factorisation on the variance-covariance matrix of the reduced-form residuals $\Omega$ = *P*P'* to obtain the P matrix and drawing an orthonormal matrix Q from a Haar-uniform distribution (see algorithm 4 from Arias et al. [2014]). Once P and Q are obtained, the authors propose a candidate draw for the impact matrix in the form of *P*Q* (that maps posterior-reduced form parameters into unrestricted posteriors), check whether the sign-restrictions are fulfilled and keep only the draws for which the restrictions are satisfied.

Our aim is to identify a vector of four structural shocks: an oil supply shock; a global economic news shock; a US-specific economic news shock and a US monetary shock. The choice of these shocks is motivated by our reading of the literature that these are prominent shocks driving global financial conditions. The sign restriction assumptions are described in Table 1.

Our sign-restriction approach relies on examination of correlations across markets and assets to understand the systematic drivers of daily price changes. The identification scheme builds on Matheson and Stavrev [2014] who distinguish between monetary shocks and economic news shocks. In a two-variable VAR, Matheson and Stavrev [2014] decompose changes in US 10-year yields and equity prices into 'monetary' and 'economic news' shocks, building on the observation of Beaudry and Portier [2006] that stock prices can be used to identify news shocks on future productivity. In

Table 1: Sign restrictions for financial market decomposition

| | Oil Supply | Global Ec. News | US Ec. News | US Monetary |
|---|---|---|---|---|
| Oil price | + | + | | |
| US vs global equity prices | | - | + | - |
| US non-energy equity prices | - | + | + | - |
| US long-term yield | | + | + | + |

their framework, US monetary shocks push up US bond yields but depress US equities, while positive economic news shocks raise both equity prices and yields.

Yet, while this provides an intuitive approach, it potentially misses some key drivers of global financial markets. Our approach therefore extends the work to include shocks to the oil market, which can be important for shaping expectations for the global economy. We assume that a contractionary oil supply shock increases oil prices, while it decreases US non-energy equity prices as higher production costs lower corporates' expected profits. Kilian and Park [2011] show that distinguishing between demand and supply forces is essential as the reaction of US real stock returns to an oil price shock differs greatly depending on whether the change in the price of oil is driven by demand or supply shocks in the oil market. Jan Groen and Middeldorp [2014] proposes an alternative approach which identifies oil market demand and supply shocks, using daily financial market information by exploring the correlations within a set of financial prices and commodities prices.

We also augment the model to capture global economic news (e.g. non US related). We distinguish between global and US-specific economic news shocks by using relative sign-restrictions and assume that global economic news shocks have a stronger effect on global equity prices then they do on US equities. The use of relative variables follows the approach of Farrant and Peersman [2005], which is widely used in empirical work (e.g. Furlanetto et al. [2014], Eickmeier and Ng [2015]). One advantage of this approach is that it is less restrictive than applying restrictions through ordering of variables or applying zero contemporaneous restrictions. Having made the distinction between global and US-specific economic news shocks, we further assume that US monetary shocks push up yields, but depress US equities more than global equities. Moreover, we assign the positive contemporaneous correlation between oil prices and global equities to global demand shocks.

In specifying these shocks, we aim to identify a parsimonious set of broad macroeconomic shocks that may shape global financial conditions. Inevitably, the identification of this limited numbers of shocks means that each shock can capture a variety of factors. Our 'global economic news' shock could encompass a number of factors shaping global economic growth momentum, including expectation of higher demand or improved supply conditions. We have not separately identified shifts in global growth expectations that reflect policy outside of the US. Neither have we separately identified global economic news shocks from shifts in global uncertainty or risk aversion. Studies in the macro-theoretical literature show that uncertainty shocks operate partly through an aggregate-demand channel and, as a consequence, act in a similar manner to negative aggregate demand shocks (Leduc and Liu [2016] and Xu [2016][1]) making it difficult to distinguish them through our sign-restriction approach. Likewise, US economic news shocks do not allow distinguishing between supply or demand-driven forces. The 'US monetary' shocks include not only monetary policy actions, but also exogenous shocks to the term premium, inflation surprises and unanticipated changes in inflation expectations. Finally, we have not isolated speculative oil demand shocks which could cause a temporary increase in prices as demand for inventories goes up (Kilian and Murphy [2010]; Juvenal and Petrella [2011]). Thus, while for ease of reference throughout the paper, we will apply shortened labels i.e. 'oil supply', 'US monetary', 'global economic news' and 'US economic news' shocks, it is important to bear in mind that the shocks identified in this model have broader interpretations.

## 2.2 Data

The Bayesian estimation of the structural VAR is done with the BEAR toolbox (Dieppe et al. [2016]). The model is estimated on daily data from 2006 to 2017 including 12 lags. The choice of our sample period reflects the availability of daily financial market data for EME for the second stage of our analysis. All variables are included in log differences with the exception of the short- and long- term interest rates, which are included in first differences. Table 2 describes the data, sources and transformation applied.

## 2.3 Results

The responses of financial market prices to the structural shocks are in line with the sign-restrictions imposed in Table 1 (see Appendix A). The historical decomposition (HD) of our model (Figure 1) and the forecast error variance decomposition (Appendix B)[2], shows that the relative importance of structural shocks is different for each endogenous variable.

Most of the historical changes in the US non-energy equity prices are accounted by the US economic news shocks. Their collapse during the financial crisis is associated to a sequence of negative US-specific economic news shocks, which are likely to reflect worsening of the US growth outlook prospects. The subsequent improvement is driven by positive economic news shocks in line with the improved growth

[1] Xu shows that there exists a mapping between volatility shocks and preference shocks, such that an increase in uncertainty generates the same impulse responses of macroeconomic aggregates as a negative preference shock.

[2] Which presents the role of global economic news shocks in explaining the forecast error variance for each global variable according to the median of the estimated models

**TABLE 2: DATA & TRANSFORMATION**

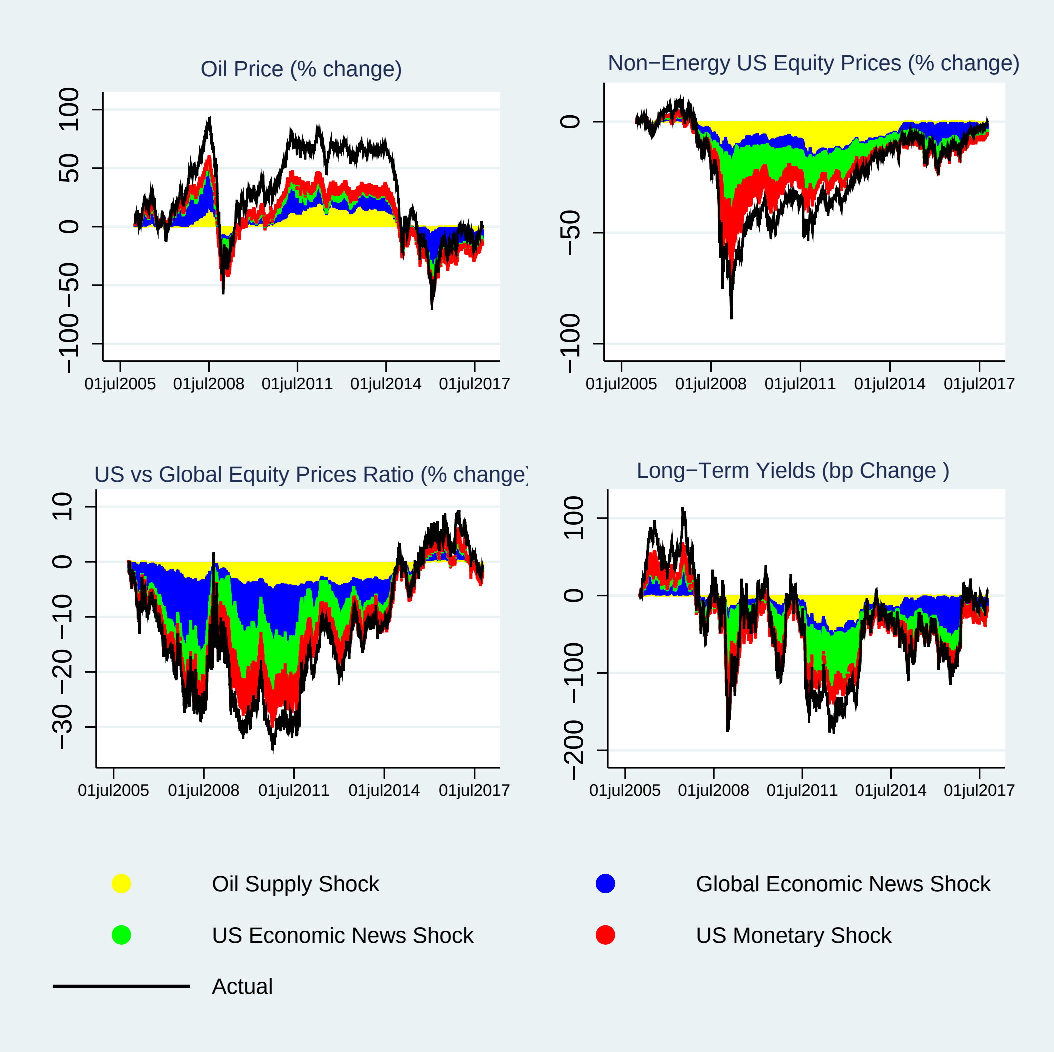
| SVAR variables | Description of raw variables | Source | Transformation |
|---|---|---|---|
| Oil price | Brent Crude Oil ($/Barrel) | Financial Times | dlog |
| US vs global equity index | S&P Composite (1941-43=100)<br>Dow Jones Global Index:<br>World excl. US (Dec -31-91=100) | Standard & Poor's<br>Wall Street Journal | dlog of the ratio between indices |
| US non-energy equity index | S&P 500: Energy (Dec-30-94=100)<br>S&P 500: Composite (1941-43=100)<br>S&P 500: Energy: Market Cap. (Bil. $)<br>S&P 500 Composite: Market Cap. (Bil $) | Standard & Poor's | dlog |
| US long-term yield | 10 Year Treasury Bond Yield<br>at Constant Maturity (Avg. % p.a.) | US Treasury | first diffrence |

expectations as the most acute period of the crisis was over. Overall, the forecast error variance decompositions (FEVD) shows that US economic news shocks account for about 40% of the variation in US equity prices. The HD would also suggest that the markets were pricing in a stronger loosening of US monetary conditions during the crisis, and as a consequence, it attributes to the (unanticipated) tightening of monetary conditions an important role in suppressing equity prices during the crisis. Yet, according to the FEVD, US monetary shocks are able to explain only less than 10% of the variation in the US equity prices. Oil supply shocks added only a modest negative contribution to equity prices changes and their impact dissipated almost entirely over the last year while global economic news shocks gained importance.

The variation in the US relative to global equity prices is explained to a larger extent by global economic news shocks. While US economic news and US monetary shocks are also important, they matter less in explaining past developments. The FEVD shows that both US and global economic news shocks, bear equal importance, and are able to account together for about half of the variation in the US relative to global equity prices.

The structural drivers of the long-term yields vary more over time. In the aftermath of the financial crisis, lower US yields were associated with negative US economic news shocks as well as with more relaxed US monetary conditions, while over the last three years, global economic news shocks are the main factors behind the decline. The FEVD places US economic news shocks as the most important factor in explaining their variation (accounting for about 30%) followed by equally important global economic news and oil supply shock, while US monetary shocks explain only around 10% of the variations.

**FIGURE 1: SVAR MODEL: HISTORICAL DECOMPOSITION**




Note: To show the historical decompistion we have used as a point estimate the median for each posterior distribution. Thus, the summation of all shocks contributions would depart significantly from its actual values whenever the posterior distribution is strongly skewed or has a large variance, as in the case for oil prices.

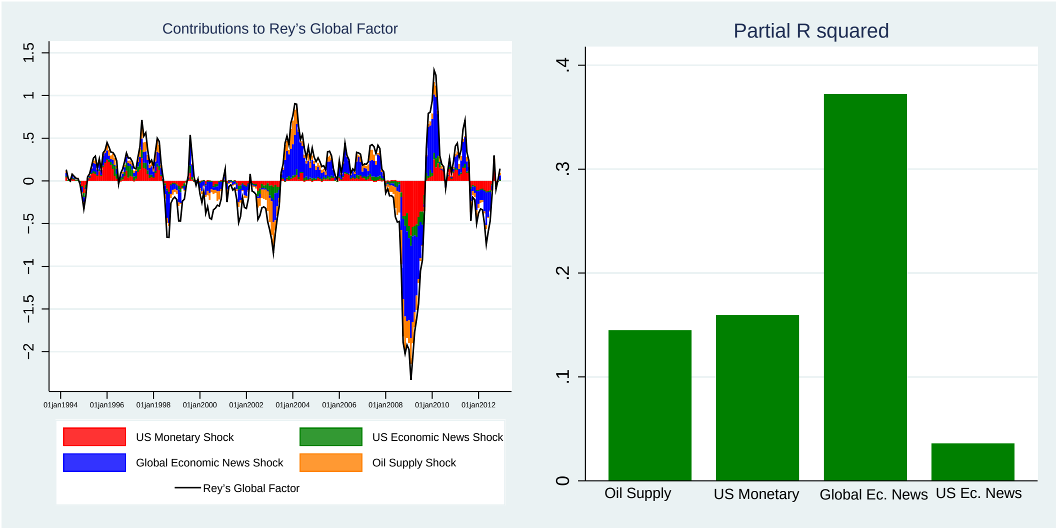
Oil prices changes are explained by a mix of structural shocks, but in general the fit is poorer for this variable, reflecting a skewed distribution of estimated historical shock contributions. The FEVD suggest that oil prices are explained mostly by global economic news shocks (changes in global demand conditions) followed by oil supply shocks.

How do our findings add to the understanding of the global financial cycle? Miranda-Agrippino and Rey [2015] have documented the existence of a global factor in driving risky asset prices and have argued that US monetary policy represents a major factor shaping credit conditions worldwide such that EME face essentially a dilemma, rather than the traditional trilemma over whether to open capital markets and accept foreign influence on monetary policy. Our model provides a slightly different slant. We analyse the drivers of the Miranda-Agrippino and Rey [2015] global financial cycle through the lenses of our structural shocks. To do that, we regress the monthly changes in the global factor estimated by Miranda-Agrippino and Rey [2015] on our structural shocks over the period 1993 to 2013:

$$\Delta GlobalFactor_t = \beta_0 * \epsilon_t^{Oil} + \beta_1 * \epsilon_t^{GlobalEc.News} + \beta_2 * \epsilon_t^{USEc.News} + \beta_4 * \epsilon_t^{USMonetary} + u_t \quad (3)$$

We then compute $partial R^2$ statistics as well as simple contributions based on the estimated coefficients.

**FIGURE 2: REY'S GLOBAL FACTOR AND ESTIMATED STRUCTURAL SHOCKS**




Note: The contributions to the global factor are computed by multiplying the estimated coefficients $\beta$ in equation 3 with the corresponing structural shock. The $partial R^2$ is defined as the proportion of variation that can be explained by adding one more structural shock into the regression model.

Overall, our analysis indicates that changes in the global financial cycle are primarily associated with global economic news shocks. This is line with the findings of Forbes and Warnock [2012] who show that global risk factors are significantly associated with extreme capital flow episodes. Yet, it is somewhat in contrast with the argument that US monetary shocks are the main cause of fluctuations in global markets, albeit their role cannot be neglected.

We find that our shocks can explain a large part of the movement in the estimated global factor. The R-squared is 84%. At the same time, our analysis indicators that changes in the global financial cycle are primarily associated with global economic news shocks.

We emphasise that our identification scheme does not allow us to disentangle the economic news shocks from uncertainty shocks or changes in agents' risk aversion. In the literature, the identification of these shocks is often achieved through ordering assumptions (e.g. in Choleski identification[3]) or relative magnitude effects (e.g. as in Caldara et al. [2016]). However, these are rather ad-hoc assumptions and, in our daily

[3] assuming VIX affects contemporaneously all the variables, but is endogenously affected only with lags

financial market set-up, they become even more difficult to justify due to the strong contemporaneous correlation between the VIX and equity prices. Nonetheless, we can gain an informal insight into the potential role of uncertainty or risk shocks by looking at the reaction of the VIX to our economic news shocks since the VIX is often used in empirical analysis to represent such shocks. Appendix C confirms that there is indeed a negative correlation between the VIX and positive economic news shocks.

### 2.4 Discussion of structural shocks

The main novelty of our paper is the use of high-frequency financial data to capture structural drivers of financial markets, which allows us to explore the relative importance of these global structural shocks to daily EME financial market conditions. However, standard structural VAR models typically identify similar structural macro shocks using macroeconomic variables that are available only at lower frequency (monthly or quarterly).

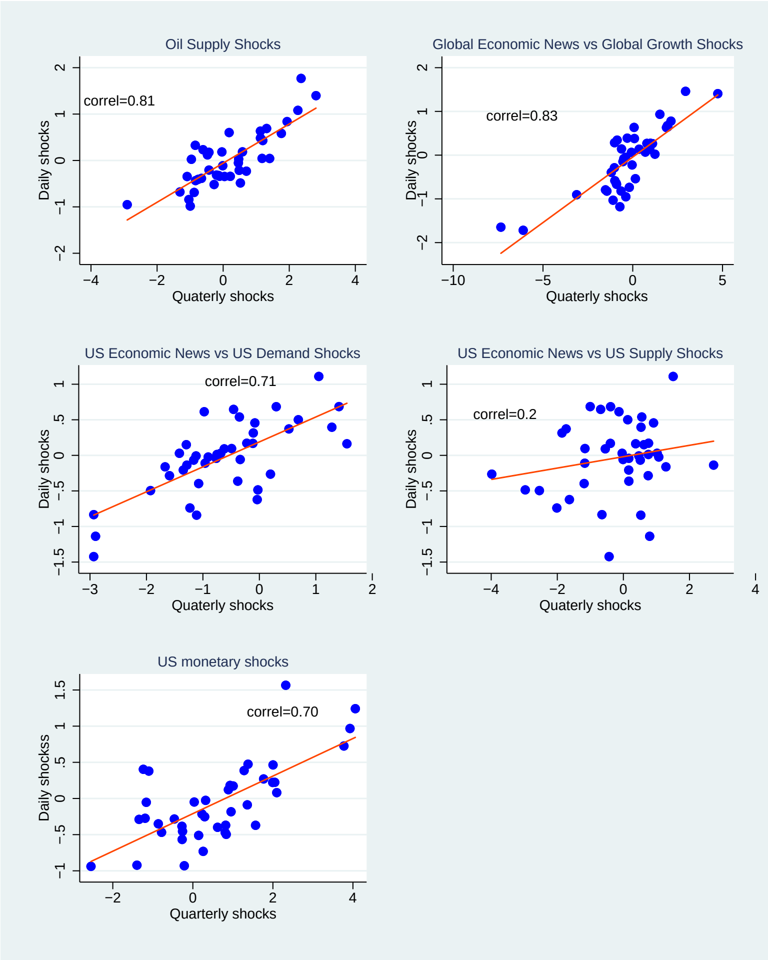
TABLE 3: SIGN RESTRICTIONS FOR STRUCTURAL SHOCKS ON MACRO-DATA

| | Oil Supply | Global growth | US Demand | US Monetary | US Supply |
|---|---|---|---|---|---|
| Oil price | + | + | | | |
| US growth vs Global growth | | - | + | - | + |
| US growth | - | + | + | - | + |
| US long-term yield | | + | + | + | |
| US inflation | | | + | - | - |

We cross-check our daily structural shocks with comparable quarterly structural shocks using standard structural BVARs. In doing so, we follow broadly the sign-restrictions scheme proposed by Peersman and Straub [2005], which is justified by the conditional responses of variables in theoretical models, to identify US demand shocks, US supply shocks and US monetary shocks. We depart from their approach by identifying two additional shocks, global growth shocks an oil supply shocks, to broadly align our quarterly VAR framework with the daily one. We estimate a quarterly five-variable VAR using the following variables: oil price, real US economic growth, real US economic growth relative to real global economic growth, 10-year US treasury yield changes and US CPI inflation. The sign restriction scheme is shown in Table 3.

While we do not expect the daily structural shocks to be identical with the quarterly structural shocks, they should be, in principle, correlated. Figure 3 compares the quarterly-frequency structural shocks with the daily-frequency structural shocks. The high correlation coefficients for all shocks suggest a broad correspondence between shocks identified in our high-frequency BVAR with those using a lower fre-

**FIGURE 3: SVAR MODEL: CORRELATION BETWEEN DAILY AND QUARTERLY STRUCTURAL SHOCKS (AVERAGE ANNUAL SHOCKS)**




Note: For the quarterly shocks we take the sum of shocks over a 4-quarter moving window, while for the daily shocks we have first averaged over a month and then summed the shocks over a 4-quarter moving window.

quency BVAR model. One important finding is that the US economic news shocks are more closely related to standard US demand shocks, rather than US supply shocks as indicated by the significantly lower correlation with the latter, suggesting that our 'economic news' shocks seems to be pricing in shifts in aggregate demand rather than aggregate supply. In addition, our structural identification does not allow an explicit decomposition of economic news into aggregate demand and uncertainty channels, the close correlation with the movements in the VIX suggests that our global economic news shock may indeed be partly capturing shifts in sentiment associated with changes in risk aversion or uncertainties.

# 3 Spillovers to EME financial conditions

## 3.1 Data and Methodology

Having used the SVAR to decompose global financial market variables into structural shocks, the second stage of our research assesses the causal effects of theses global shocks on EME financial market variables. We investigate the impact on five financial variables: equity prices, short- and long-term interest rates, the nominal effective exchange rate and EMBI sovereign spreads, which should provide a broad overview of developments in financial conditions across EME. The sample includes 13 economies: Brazil, Chile, Czech Republic, Hungary, India, South Korea, Malaysia, Mexico, Poland, Russia, Taiwan, Thailand, Turkey (see table 4).

**TABLE 4: DATA DESCRIPTION OF FINANCIAL VARIABLES ACROSS EME**

| EMEs | Stock prices | | Short-term rates | | Long-term rates | |
|---|---|---|---|---|---|---|
| | Description | Source | Description | Source | Description | Source |
| 1. Brazil | Bovespa Index (Jan-2-68=1/10ˆ6) | Financial Times | Basic Financing Rate (% per month) | Banco Central do Brasil | Treasury Bond Mid Yield 5-Years (%) | Tullett Prebon Information |
| 2. Chile | IGPA General (Dec-31-80=100) | Financial Times | Nominal Avg. Interest Rate on 30-89 Day Loans (%) | Banco Central de Chile | Government Bond Yield 10-Years (%) | Banco Central de Chile |
| 3. Czeck Republic | PX50 Index (Apr-4-94=1000) | Financial Times | Prague Interbank Offered Rate 3-Months (%) | Czech National Bank | Government Bond Yield 10-Years (%) | Reuters |
| 4. Hungary | BUX Index (Jan-2-91=1000) | Financial Times | Interbank Offer Rate 3-Months (%) | Magyar Nemzeti Bank | Government Debt Securities Yield 10-Years (%) | Magyar Nemzeti Bank |
| 5. India | BSE 500 Index (1989-90=100) | Bombay Stock Exchange | Mumbai Interbank Offer Rate Rate 3-Months (%) | Reserve Bank of India | Government Bond Yield 10-Years (%) | Reuters |
| 6. South Korea | Composite EX (Jan-4-80=100) | Financial Times | Interbank Rate 3-Months ( % ) | Korea Federation of Banks | Government Bond Yield 10-Years, (%) | Reuters |
| 7. Malaysia | FTSE Bursa KLCI (Apr-4-86=100) | Financial Times | Interbank Rate 3-Months (%) | Bank Negara Malaysia | Treasury Bond Mid Yield 10-Years (%) | Tullett Prebon Information |
| 8. Mexico | IPC Index (Nov-78=0.78) | Wall Street Journal | Treasury Bill Mid Yield 3-Months (%) | Tullett Prebon Information | Treasury Bond Mid Yield 10-Years (%) | Tullett Prebon Information |
| 9. Poland | WIG Index (Apr-16-91=1000) | Warsaw Stock Exchange | PLN Warsaw Interbank Rate 3-Months (%) | Reuters | Government Bond Yield 10-Years (%) | Reuters |
| 10. Russia | MOEX Index (Sep-22-97=100) | Moscow Exchange | Moscow Interbank Mid Rate 31 to 90 Days (%) | Haver Analytics | GKO-OFZ Zero Coupon Yield Curve 10-Years (%) | Central Bank of the Russian Federation |
| 11. Taiwan | Taiwan Stock Price Index Weighted Price (Jun-30-66=100) | Financial Times | Taipei Interbank Offer Rate 3-Months (% p.a.) | Bankers Association of the Republic of China | Treasury Bond Mid Yield 10-Years (%) | Tullett Prebon Information |
| 12. Thailand | Bangkok SET Index (Apr-30-75=100) | Financial Times | Bangkok Interbank Bid Rate 3-Months (%) | Reuters | Government Bond Yield 10-Years (%) | Reuters |
| 13. Turkey | ISE National 100 Index (Jan-86=1) | Financial Times | Reference Mid Rate 3-Months (% per annum) | Banks Association of Turkey | Government Bond Yield 5-Years (%) | Reuters |

| | Nominal Effective Exchange Rate | EMBI Sovereign Spreads |
|---|---|---|
| For all EMEs | JP Morgan Nominal Broad Effective Exchange (2010=100) | EMBI Global Sovereign Spreads (bps) JP Morgan/Haver Analytics |

Under the assumption that EME are small economies, we apply the local projection method (LPM) developed by Jorda [2005] in a panel framework. The Jorda [2005] approach for calculating impulse response functions imposes fewer restrictions compared with a VAR approach and so is more robust to misspecification. However, the impulse response functions are often less precisely estimated and are sometimes erratic. Nonetheless, they are computationally simple, which allows us to explore in detail the effects of global shocks across a wide range of countries and asset classes. More precisely, for each horizon h (from 1 to 20) and for each of the four structural shocks we estimate a panel regression in the following form:

$$\Delta Y_{i,t+h} = \alpha_{i,h} + \sum_{j=1}^{p} \beta_{ij,h} \Delta Y_{i,t-j} + \phi_{i,h} \epsilon_t^s + v_{i,t+h} \quad (3)$$

Where $\Delta Y_{i,t-j}$ refers to changes in variable at period *t-j* in country *i*, *p* stands for the total numbers of lags of the depended variables, $\alpha_{i,h}$ is the fixed effect and $\phi_{i,h}$ is the estimated response of each financial variable at horizon h to a specific structural shock (e.g. $\epsilon_t^{Oil}$). To compute the impulse response functions 20 periods ahead, we run regression *3* with *h* taking values from 1 to 20 and stack all $\phi_{i,h}$ in an impulse response vector. Except for horizon *h = 0*, the error term is likely to be serially correlated because it is a moving average of the forecast errors from *t* to *t+h*. In a time series context, the standard errors need to incorporate corrections for serial correlation, such as a Newey-West (1987) correction. In the panel approach, the errors may also be subject to cross-sectional dependency, thus we use Driscoll-Kray corrected standard errors. While the presence of a lagged dependent variable as well as country fixed effects may introduce an estimation bias (Nickel, 1981), the long-time dimension of our sample mitigates such concerns.[4]

To assess the importance of each of these shocks for EME financial conditions we compute the forecast error variance decomposition. Its calculation is analogous to the computations following a VAR estimation which requires the coefficients of the structural moving average (MA) representation of the VAR (see e.g. Lutkepohl and Netsunajev [2012]). The local projection estimation provides those coefficients. We follow the LP estimator proposed by Gorodnichenko and Lee [2017] in the time-series context (see equation 9), but in a panel context as explained in Appendix D:

$$FEVD_{i,h} = \frac{\sigma^2(\epsilon_{t,i}) * \sum_{h=1}^{20} \phi_{i,h}^2}{\sigma^2(\epsilon_{t,i}) * \phi_{i,h}^2 + \sigma^2(v_{i,t+h})}$$

[4]We estimate equation (3) separately for each financial variable using the panel of EME i.e. equities, spreads, interest rates and exchange rates. While one could argue that other domestic variables should be controlled for in the estimation (e.g. changes in domestic interest rates are likely to impact exchange rate movements vis-a-vis the US dollar), the advantage of the Jorda [2005] local projection method is that as long as the shocks are exogenous to the variables of interest, impulse response functions can be computed variable by variable, ignoring the interactions across domestic financial variables see (Ramey [2016]).We tested the effects of including the lags of the other variables in the estimations of equation (3). We found that our IRF estimates were almost identical and that inclusion of other variables did not affect our estimates.

## 3.2 Results

### 3.2.1 Impulse Responses

We find that risky asset prices across EME move the most in response to global shocks.[5] The impulse responses (see Apendix E[6]) show a significant response of EME equity markets. They show that a contractionary oil supply shock is associated with a significant decline in equity prices on impact and in the following day. As most of the countries in our sample are net oil importers, the response is consistent with the view that a higher oil price represents a terms of trade shock that dampens growth expectations for these countries. Yet, it is notable that country-by-country estimations reveal that even for the oil exporters in our sample[7], such as Russia and Malaysia, the effect of the oil supply shock is negative for the domestic equity market (see Panel G.13). That may reflect investors' beliefs that, despite the domestic advantages from the favourable terms of trade shock, the global impact of a contractionary oil supply shock is still negative for oil producers.

EME equity markets also show significant declines following US monetary shocks. The contractionary implications of higher interest rates in the US are associated with declining optimism in equity markets. The response is also consistent with the literature which suggests that higher rates in the US are associated with portfolio flows out of EME (Koepke [2015]). By contrast, positive global and US economic news shocks are associated with a boost in equity prices. While EME stock prices go up in response to positive US economic news shocks, the impact is roughly half the effect of a global economic news shocks, suggesting that the news about the global economic cycle are substantially more important for investors in EME financial markets (Miranda-Agrippino and Rey [2015])

A broadly similar set of responses is found for EMBI sovereign spreads and the nominal affective exchange rates of EME. A contractionary oil supply shock is increasing the EME borrowing spreads and leads to EME currency depreciation, while positive global and US economic shocks are associated with the compression of EME sovereign borrowing costs and currencies appreciation. A contractionary monetary shock is found initially to compress EMBI sovereign spreads, but in the following day, EMBI sovereign spreads have typically widened, eventually outweighing the initial response. Following a US monetary shock, EME currencies are found to depreciate on an effective basis.

There is more mixed evidence on the role of the global shocks in shaping develop-

[5]Global shocks refer to each of the four structural shocks identified in Stage 1. We consider US-specific shocks of global relevance since US is the world's largest economy with significant effects far beyond its shores

[6]The IRF in Appendix C show the panel estimates from equation (3) for the impulse responses of each variable to the four global shocks identified in stage 1 of our estimation, up to a horizon of 20 days, with a 90 percent confidence interval based on Driscoll-Kray corrected standard errors. To provide some comparability across the different global shocks, the impulse responses are scaled to represent a shock that would shift (on impact) the US (non-energy) equity index by one percent.

[7]We define oil exporters as countries for whom: (1) nominal oil exports were at least 20 percent of a countrys gross exports; and (2) net oil exports were at least 5 percent of the average of exports and imports. A similar definition is applied in IMF [2015]

ments in emerging market short- and long-term interest rates. Global economic news shocks are associated with declines of the 1 year and 10-years bond yields, with short-term rates being more affected. The response of bond yields to US economic news shocks is typically not significant. Contractionary oil supply shocks and US monetary shocks tend to be associated with higher rates in EME.

### 3.2.2 Forecast Error Variance Decomposition

Table 5 shows the forecast error variance decomposition for each EME financial variable. This decomposition provides estimates only for the role of the global shocks identified in explaining the forecast error variance. The remaining proportion of the variance is assumed to be attributed to other unidentified (global, regional or domestic) structural shocks.

In total, the global shocks account for a high proportion of fluctuations in EME risky asset prices (EMBI sovereign spreads and equities), although there remains a large role for other factors.

TABLE 5: PERCENT OF VARIATION IN EME FINANCIAL VARIABLES DUE TO STRUCTURAL SHOCKS AFTER 20 DAYS

| | Oil Supply | Global Ec. News | US Ec. News | US Monetary | Total variance explained by global shocks |
|---|---|---|---|---|---|
| Equity Prices | 6.3% | 28.8% | 5.1% | 6.5% | 46.7% |
| EMBI Spreads | 7.8% | 27.2% | 13.7% | 7.7% | 56.4% |
| NEER | 1.8% | 8.3% | 2.9% | 2.6% | 15.7% |
| Long-term rates | 1.6% | 3.7% | 1.9% | 7.8% | 14.9% |
| Short-term rates | 1.8% | 3.3% | 2% | 1.9% | 9.1% |

On average across the sample, the global shocks account for more than 45% of daily equity price fluctuations and over half of the variation of sovereign spreads. This finding is broadly in line with the literature arguing that global forces are likely to play an important role in driving risky asset prices globally. In addition, our approach is able to shed light on the nature of these drivers. In contrast to the view that US monetary policy shocks are the most important driver of global financial conditions, we find that the economic news about the global environment play a stronger role in shaping EME financial markets. While US monetary shocks also matter, they are of secondary importance.

Nonetheless, our results also suggest that interest rates and exchange rates are less affected by the identified global shocks: overall our four shocks explain only one tenth of the variation in short-term interest rates and one seventh of the variation in the long-term rates. They also explain a small part of the variation in nominal effective exchange rates. We infer from these findings that, on average, the role of global factors in shaping EME financial condition should not be overstated. While global shocks affect risky asset prices, other factors (domestic or regional) remain key for changes in short- and long-term rates. Appendix D shows the forecast error variance decomposition for each financial variable at different horizons.

#### 3.2.3 Does heterogeneity across countries matter?

To understand whether the results from our spillover analysis are affected by heterogeneity across countries, we proceed by estimating local projection regressions on a country-by-country basis. We apply the Newey-West (1987) correction to the estimated standard errors in the individual regressions to account for serial correlation in the residuals. We also use the same scaling of impulse response function like in the panel set-up, namely impulse responses are scaled to reflect a shock that would shift (on impact) the US (non-energy) equity index by one percent.

To compare the impulse responses with the ones obtained in the panel framework, we report EME aggregate impulse response functions in Appendix G (minimum, median and maximum). Overall, the median impulse responses of financial variables across countries to the global shocks are very similar with our baseline results. The range of responses across countries is somewhat larger than the confidence bands reported by the panel model, which reflects some country heterogeneity. For example, while equity prices are found to respond significantly to global economic news shocks in both approaches, some countries could be affected up to three times more than others. The impact of contractionary oil supply shocks is found to be negative for equity prices, but the impact is significantly smaller in oil-exporting countries.

### 3.3 Sensitivity to different states of financial market volatility

Acute variations in financial markets are likely to affect the transmission of global (structural) shocks to EME financial conditions. Higher volatility (when the VIX is elevated) is likely to draw investors into a common phase of selling risky assets, potentially increasing the spillovers from global shocks to EME financial conditions. To investigate the sensitivity of our baseline results to this assumption we test the presence of threshold effects conditional on the VIX, by using the following panel-threshold model to recover the impulse responses of EME financial variables in (3) to global shocks:

$$\begin{aligned}\Delta Y_{i,t+h} = \alpha_{i,h} + (\sum_{j=1}^{p} \beta_{ij,h} \Delta Y_{i,t-1} + \phi_{i,h}\epsilon_t^s) I(VIX_t < \gamma) + \\ +(\sum_{j=1}^{p} \beta_{ij,h} \Delta Y_{i,t-1} + \phi_{i,h}\epsilon_t^s) I(VIX_t \geq \gamma) + v_{i,t+h}\end{aligned} \tag{4}$$

Where $I(\cdot)$ is the indicator function showing the regime identifer by the threshold variable, in our case, the VIX , being $<$ / $\geq$ the threshold level $\gamma$ . All other notations are similar to the baseline regression (3): $\Delta Y_{i,t-j}$ refers to changes in variable at period *t-j* in country *i*, *p* stands for the total numbers of lags of the depended variables, $\alpha_{i,h}$ is the fixed effect and $\phi_{i,h}$ is the estimated response of each financial variable at horizon h to a specific structural shock (e.g. $\epsilon_t^{Oil}$).

### TABLE 6: ESTIMATED THRESHOLD LEVELS FOR THE VIX

| Variable | Horizon | Structural shocks | | | |
|---|---|---|---|---|---|
| | | US Monetary | Oil Supply | Global Ec. News | US Ec. News |
| Stock prices | 0 | 23.8*** | 23.8*** | 22.5*** | 23.2*** |
| | 1 | 24.0*** | 23.2*** | 23.1* | 20.3*** |
| EMBI | 0 | 23.6*** | 15.6*** | 24.3*** | 14.5 |
| | 1 | 24.3 | 23.8*** | 19.1* | 24.3*** |
| NEER | 0 | 13.2 | 15.4*** | 12.5 | 16.6*** |
| | 1 | 12.3 | 22.6*** | 14.6 | 24.0** |
| Short-term rate | 0 | 23.4 | 24.3 | 21.5 | 17.5 |
| | 1 | 11.9* | 11.9 | 24.0 | 22.5 |
| Long-term rate | 0 | 21.8 | 17.7 | 21.9 | 16.7 |
| | 1 | 23.2 | 15.5 | 22.6* | 24.0 |
| Average (where significant) | | 23.6 | 20.8 | 22.6 | 21.7 |
| VIX Sample Mean | | 19.5 | | | |

We estimate equation 4 for each variable using the Hansen approach to search for the threshold level $\gamma$.[8] In principle, this procedure would deliver a different threshold for each variable and each horizon. Thus, in a preliminary step we estimate equation 4 with *h= 0* or *1* to search for the threshold level $\gamma$.

Table 6 summarises the estimated threshold and its significance. We finds that there are significant threshold effects for equity prices, EMBI sovereign spreads and, to a lesser extent, for the NEER. In terms of magnitude, the estimates shows that the threshold level is very close to the VIX sample mean of 19.5. This suggests that the transmission of global shocks to risky asset prices and currencies varies depending on the volatility states of the financial markets. To understand the importance of these non-linearities, we re-estimate impulse response functions for these financial variables and compute the forecast variance decomposition conditional on regimes of low/high volatility (as measured by whether the VIX is above or below its sample average).

In periods of high global financial market volatility (characterised by periods in which the VIX is elevated) we observe a much stronger impact of global shocks in affecting EME risky asset prices. Figure 4 shows the impulse response on impact of EME financial variables to global shocks in the two regimes. In times of heightened volatility, stock prices and EMBI sovereign spreads respond stronger to global shocks. The response of currencies to global shocks is somewhat more elevated, but overall reac-

[8]That selects the threshold with the lowest LR ratio and then bootstraps errors to check significance.

**FIGURE 4: RESPONSES OF EME FINANCIAL VARIABLES IN THE FIRST DAY**


Note: The chart shows the first day response of EME financial variables to global shocks conditional on the VIX regime, with 90% confidence interval based on Driscoll-Kray corrected standard errors. To provide some comparability across the different global shocks, the impulse responses are scaled to represent a shock that would shift (on impact) the US (non-energy) equity index by one percent.

tion remains milder. The sensitivity of EME equities and sovereign spreads oil supply shocks and to US monetary shocks also increases during high-volatility periods, but their relative importance remains below that of global economic news shocks. Our finding that global shocks affect local EME financial condition abruptly in periods of high volatility suggests that domestic policies could indeed face important difficulties to react timely and in an effective manner to counteract these shocks in turbulent periods (e.g. during the financial crisis). By contrast, in periods of financial market calm, our analysis indicates that the transmission of global shocks to EME financial conditions is more contained, providing more space for domestic policies to manage domestic financial cycles.

## 4 Conclusion

In this paper we provide a quantitative assessment of the relative importance of global structural shocks for changes in financial conditions across a sample of emerging market economies. We show that it is important to disentangle the source of shocks in global market fluctuations before analysing spillovers to EME financial conditions. Our paper, in part, confirms the exiting literature that global factors matter for EME financial conditions, but emphasises the fact that the transmission of global shocks is most important for risky asset prices across EME. In turn, the influence of global factors for EME interest rates and currencies appears much smaller. In addition, in contrast to the recent literature on the global financial cycle which has emphasised the prominent role of US monetary policy, we find that although US monetary shocks have some influence in shaping EME financial markets, the broader global environment (represented by economic news and oil shocks) plays a significantly stronger role.

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# A SVAR Model Impulse Response Function

**FIGURE A.1: SVAR MODEL: IRF OF OIL PRICE CHANGES**

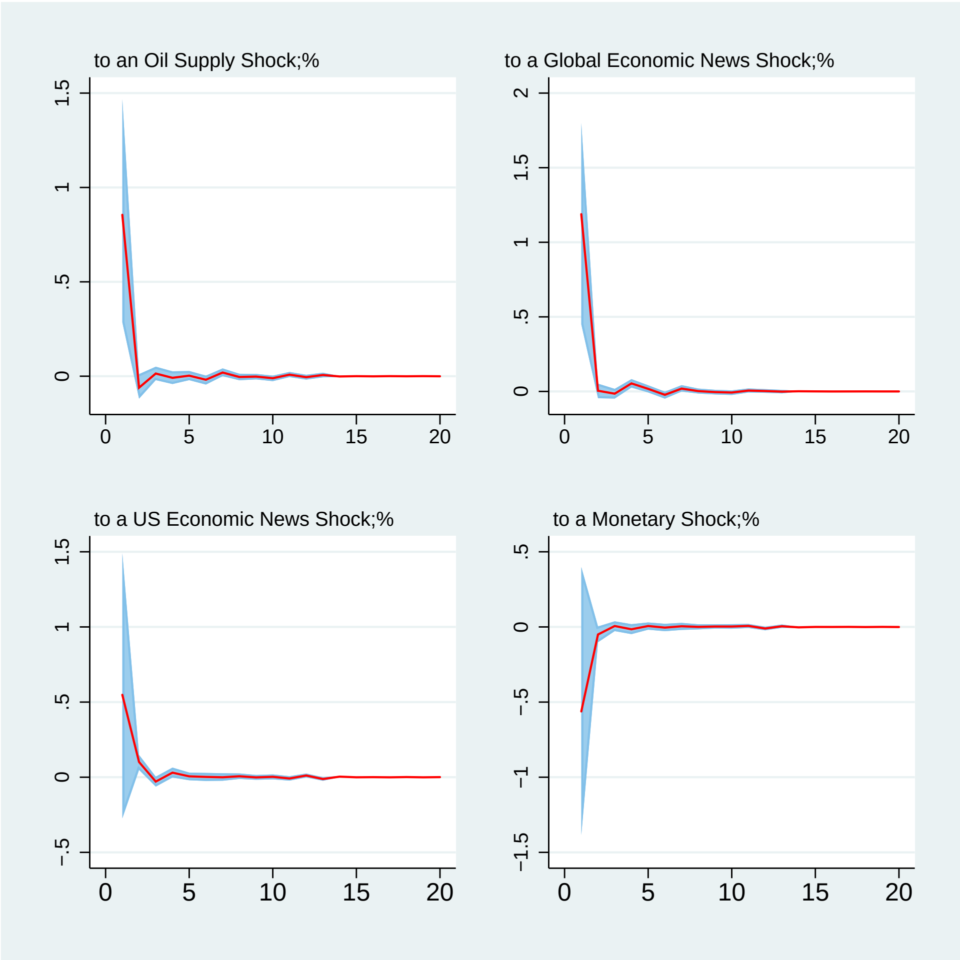


**FIGURE A.2: SVAR MODEL: IRF OF US VERSUS GLOBAL EQUITY PRICE RATIO CHANGES**

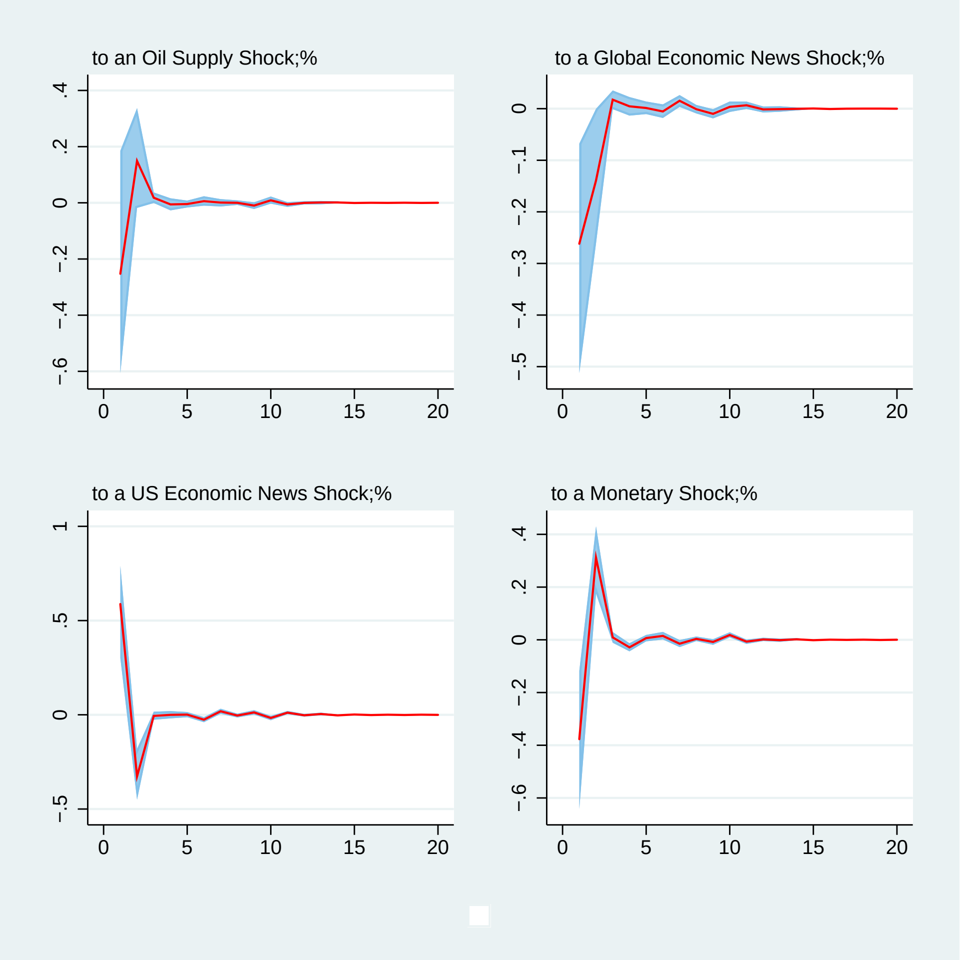


FIGURE A.3: SVAR MODEL: IRF OF US NON-ENERGY EQUITY PRICES CHANGES

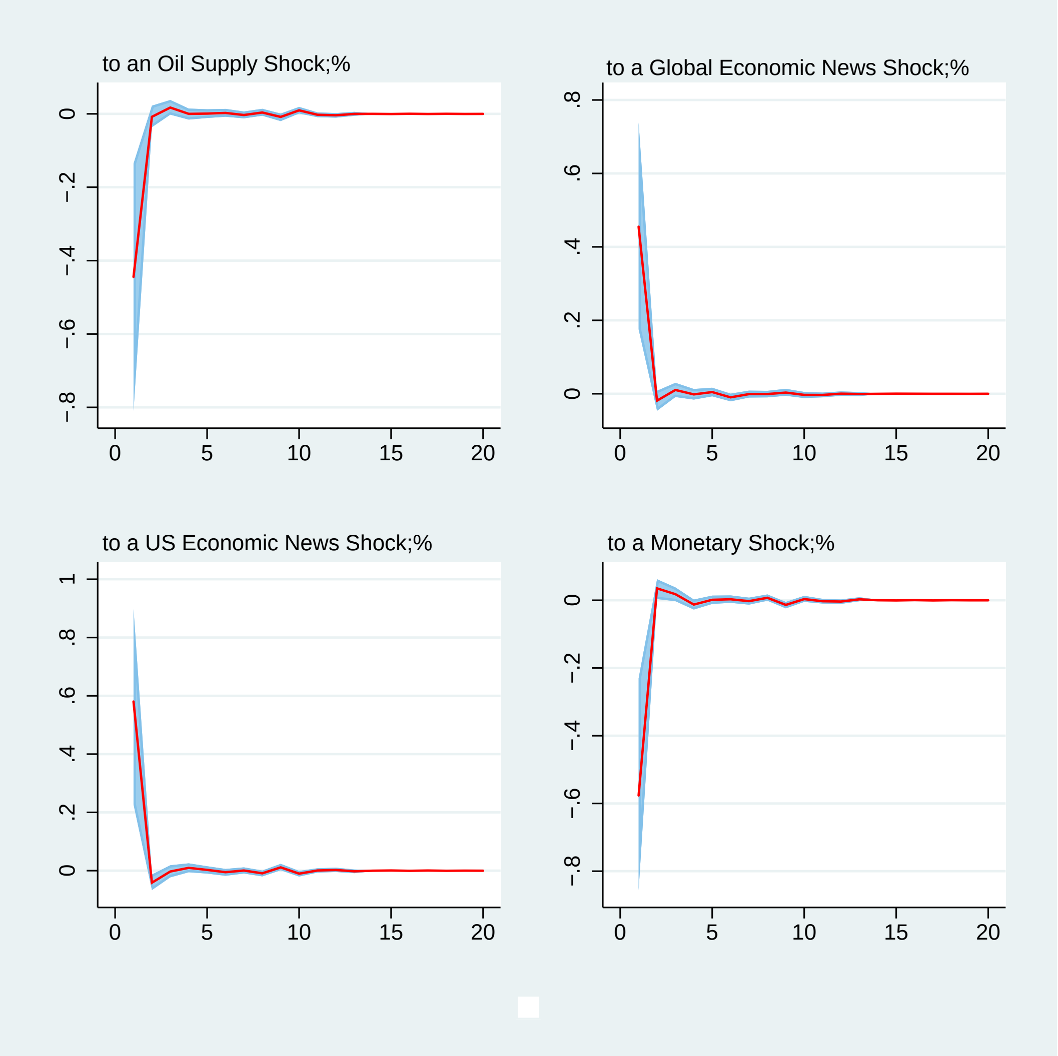
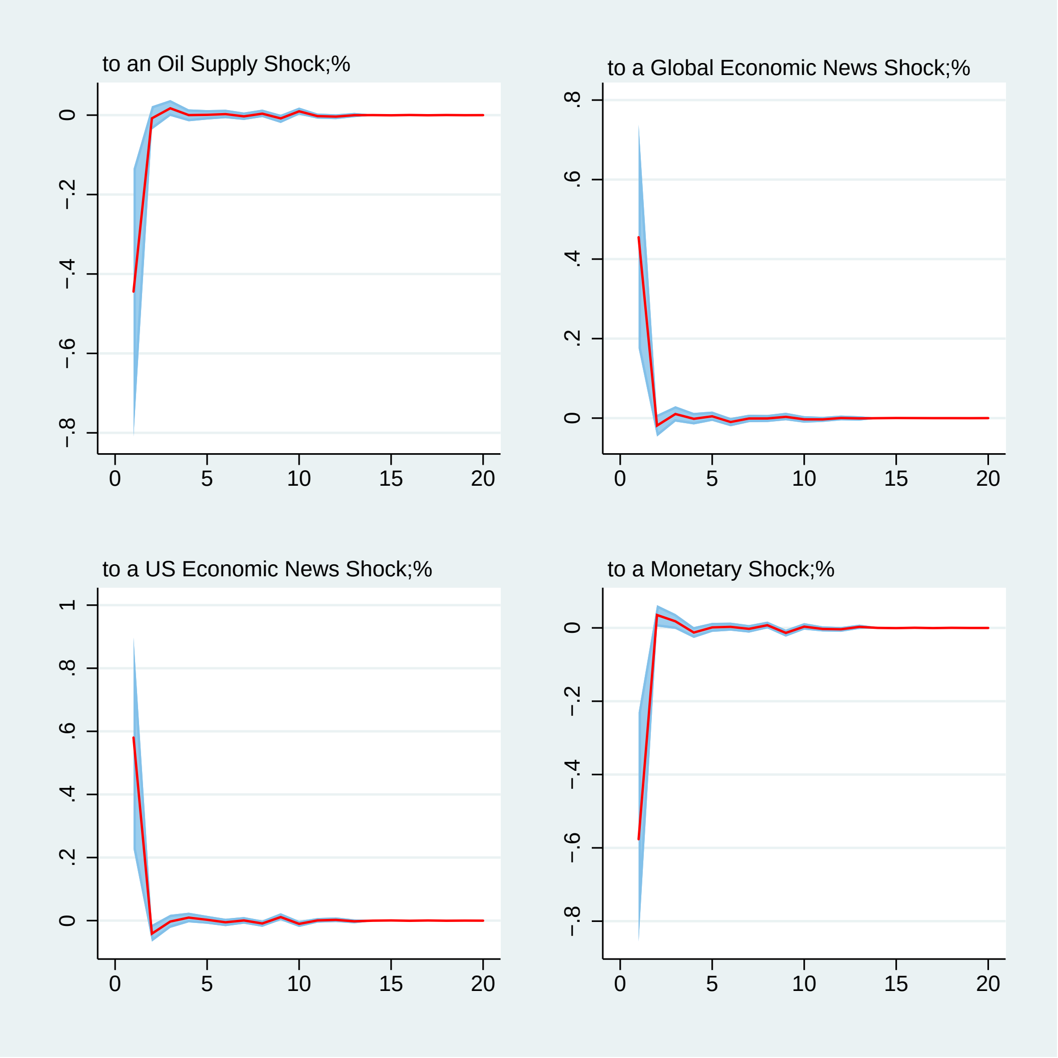
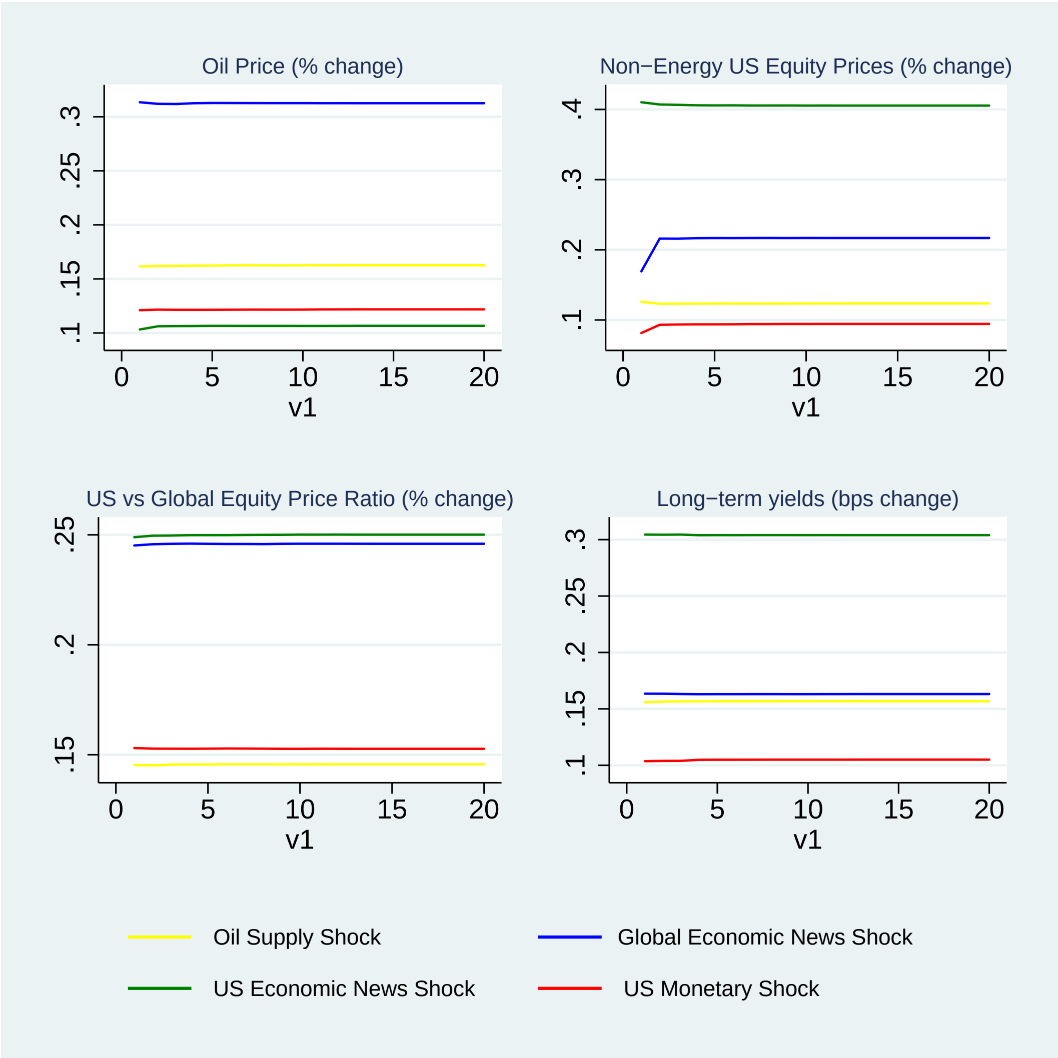


FIGURE A.4: SVAR MODEL: IRF OF 10Y YIELDS CHANGES



# B SVAR Model Variance Decomposition

FIGURE B.5: SVAR MODEL: VARIANCE DECOMPOSITION

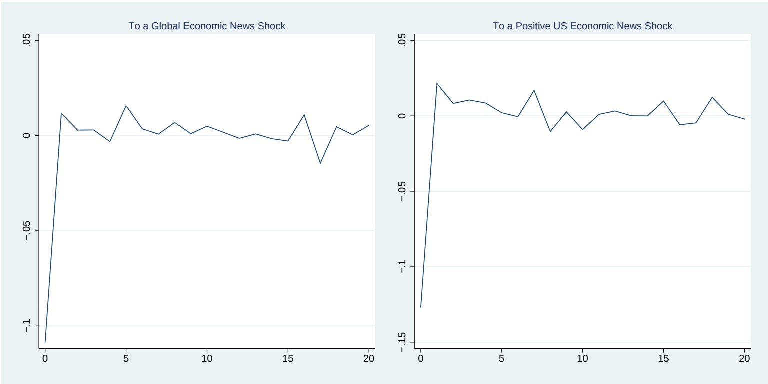


# C VIX and Economic News

We have estimated the response of uncertanty/risk aversion proxied by the VIX to both US and Global Economic News shocks using the local projection method (see main text on the methodology).

We find a negative contemporaneous (in the same day) response of VIX to these structural shocks, which highlights the strong negative correlation between these series. That suggests that indeed our economic news shocks could incorporate changes in uncertainty or risk aversion. We keep this broader interpretation of our economic news shocks as a caveat.

FIGURE C.6: LP: IMPULSE RESPONSE FUNCTION OF VIX



# D Derivation of the Variance Decomposition in the LP Method

We calculate the variance decomposition directly from the information provided by the local projection estimates. Given information at t-1, for a variable $\Delta y_{i,t+h}$ , the forecast error $f_{i,t+h|t-1}$ is:

$$f_{i,t+h|t-1} = \Delta y_{i,t+h} - E(\Delta y_{i,t+h|I_{t-1}}) \tag{A.1}$$

Where $\Delta y_{i,t+h|I_{t-1}}$ is the prediction of $\Delta y_{i,t+h}$ given the information set $I_{t-1}$. The forecast error variance decomposition (FEVD) decomposes the variance of the unpredicted change of the Y variable h periods ahead into contributions from the shocks that occurred between period t and period t+h. Following Gorodnichenko and Lee [2017], we can decompose the forecast error into the contributions of a particular global shock $\epsilon_t^s$ (which represents one of the four shocks estimated in stage one of our estimation) and other sources of variation $u_{i,t+h|t-1}$:

$$f_{i,t+h|t-1} = \phi_0 \epsilon_{t+h}^s + \phi_1 \epsilon_{t+h-1}^s + ...\phi_h \epsilon_{t+h-1}^s + u_{i,t+h|t-1} \tag{A.2}$$

Then, the contribution of the global shock ($GS_{i,h}$) to the forecast error variance for variable $\delta y$, country i at horizon h is can be computed as follows:

$$GS_{i,h} = \sum_{j=0}^{h} \phi_{i,h}^2 Var(\epsilon_{t,i}) \tag{A.3}$$

To compute the total forecast variance we substitute the LP model below in A.1.

$$\Delta y_{i,t+h} = \alpha_{i,h} + \sum_{j=1}^{p} \beta_{ij,h} \Delta y_{i,t-j} + \phi_{i,h} \epsilon_t^s + v_{i,t+h}$$

We obtain:

$$f_{i,t+h|t-1} = \phi_{i,h} \epsilon_t^s + v_{i,t+h}$$

Since the shocks are not corellated, taking the variance of the above expresion, gives:

$$Var(f_{i,t+h|t-1}) = Var(\epsilon_t^s)\phi_{i,h}^2 + Var(v_{i,t+h}) \tag{A.4}$$

Thus, the contribution of the global (structural) shock at period h can be computed as follows:

$$FEVD_{i,h} = \frac{Var(\epsilon_{t,i}^s) * \sum_{h=1}^{20} \phi_{i,h}^2}{Var(\epsilon_{t,i}^s) * \phi_{i,h}^2 + Var(v_{i,t+h})}$$

The iterative estimation of the LP provides the estimates of $\phi_{i,h}$ allowing us to calculate the contribution of the global shocks to the overall forecast error variance. The $Var(\epsilon_{t,i}^s)$ is the sample variance of the estimated structural shock $\hat{\sigma}^2(\epsilon_{t,i}^s)$. For the total variance we replace $Var(v_{i,t+h})$ with the sample variance of the residuals in the LP equation $\hat{\sigma}^2(v_{i,t+h})$

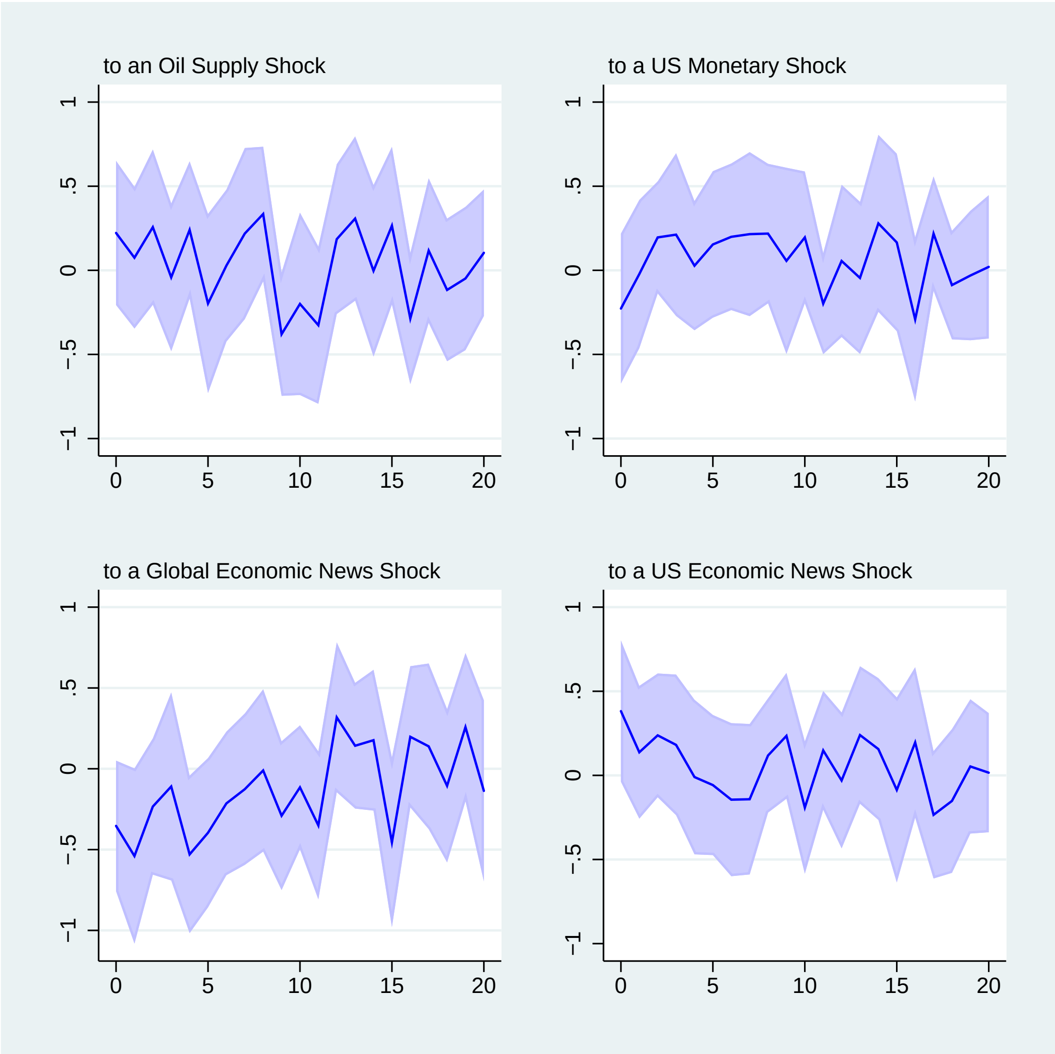
$$FEVD_{i,h} = \frac{\hat{\sigma}^2(\epsilon_{t,i}^s) * \sum_{h=1}^{20} \phi_{i,h}^2}{\sigma^2(\hat{\epsilon}_{t,i}) * \phi_{i,h}^2 + \hat{\sigma}^2(v_{i,t+h})}$$

# E Local projections: Panel

FIGURE E.7: LP METHOD: IRF EQUITY PRICES

## Figure E.8: LP Method: IRF EMBI

**FIGURE E.9: LP METHOD: IRF SHORT-TERM INTEREST RATE**

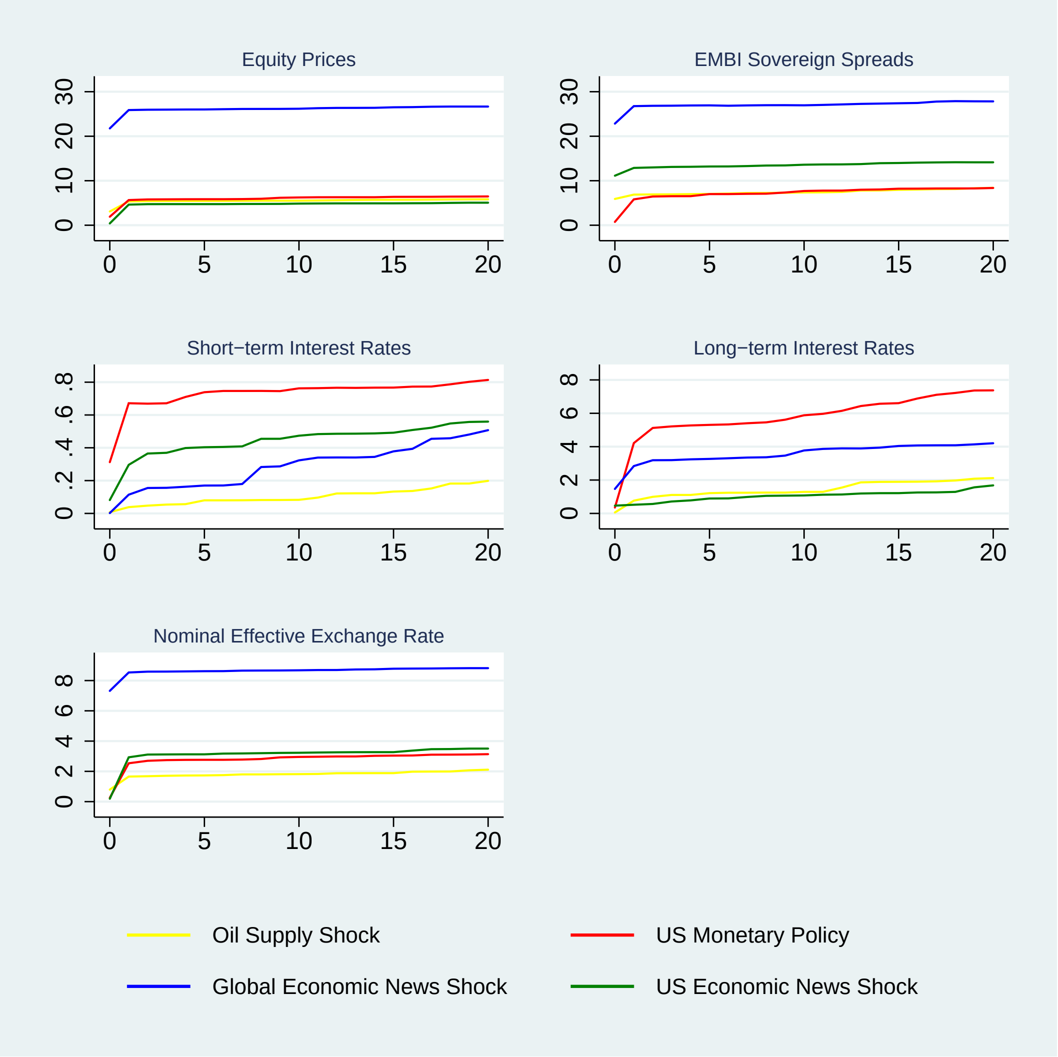


### FIGURE E.10: LP METHOD: IRF LONG-TERM INTEREST RATES

## Figure E.11: LP Method: IRF NEER

# F Local projections Variance Decomposition

FIGURE F.12: LP METHOD: VARIANCE DECOMPOSITION



# G Local Projection: Country by Country vs Panel Estimation

FIGURE G.13: LP METHOD: IRF EQUITY PRICES

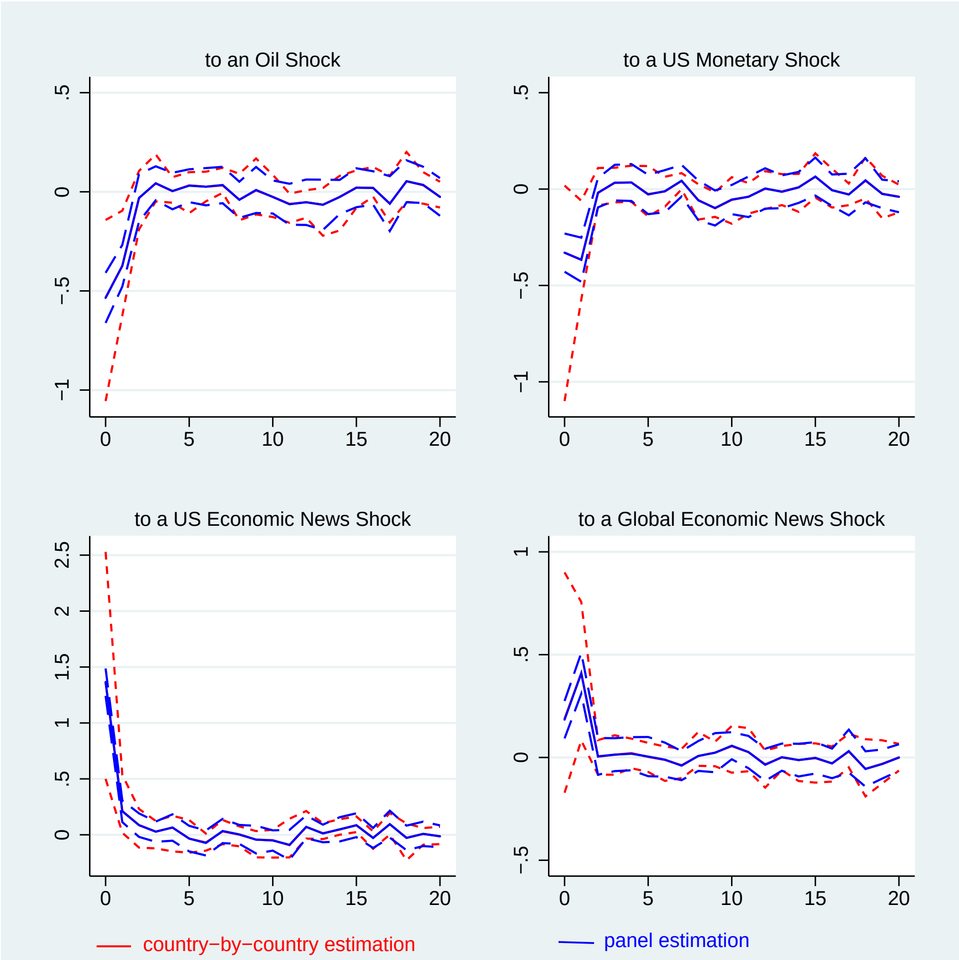
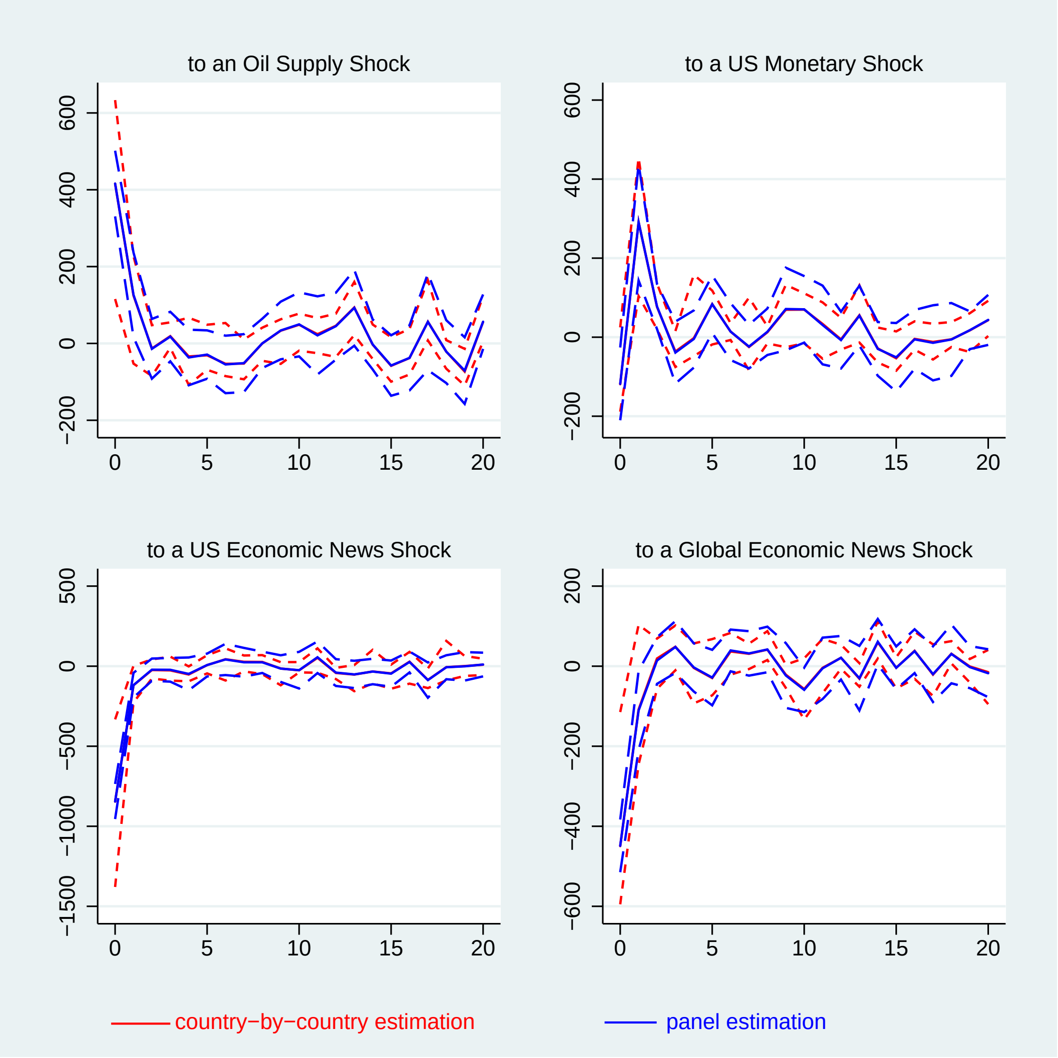


FIGURE G.14: LP METHOD: IRF EMBI



## FIGURE G.15: LP METHOD: IRF SHORT-TERM INTEREST RATE

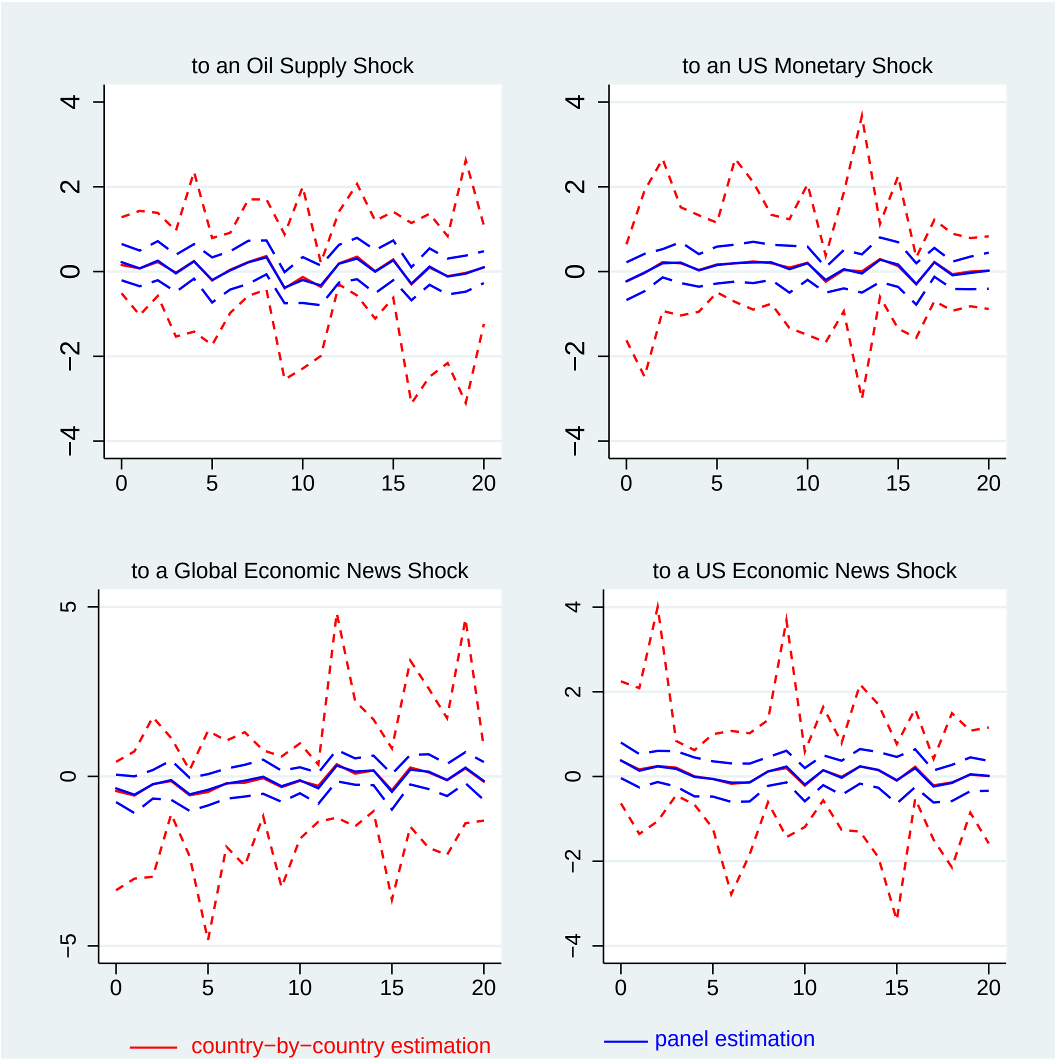
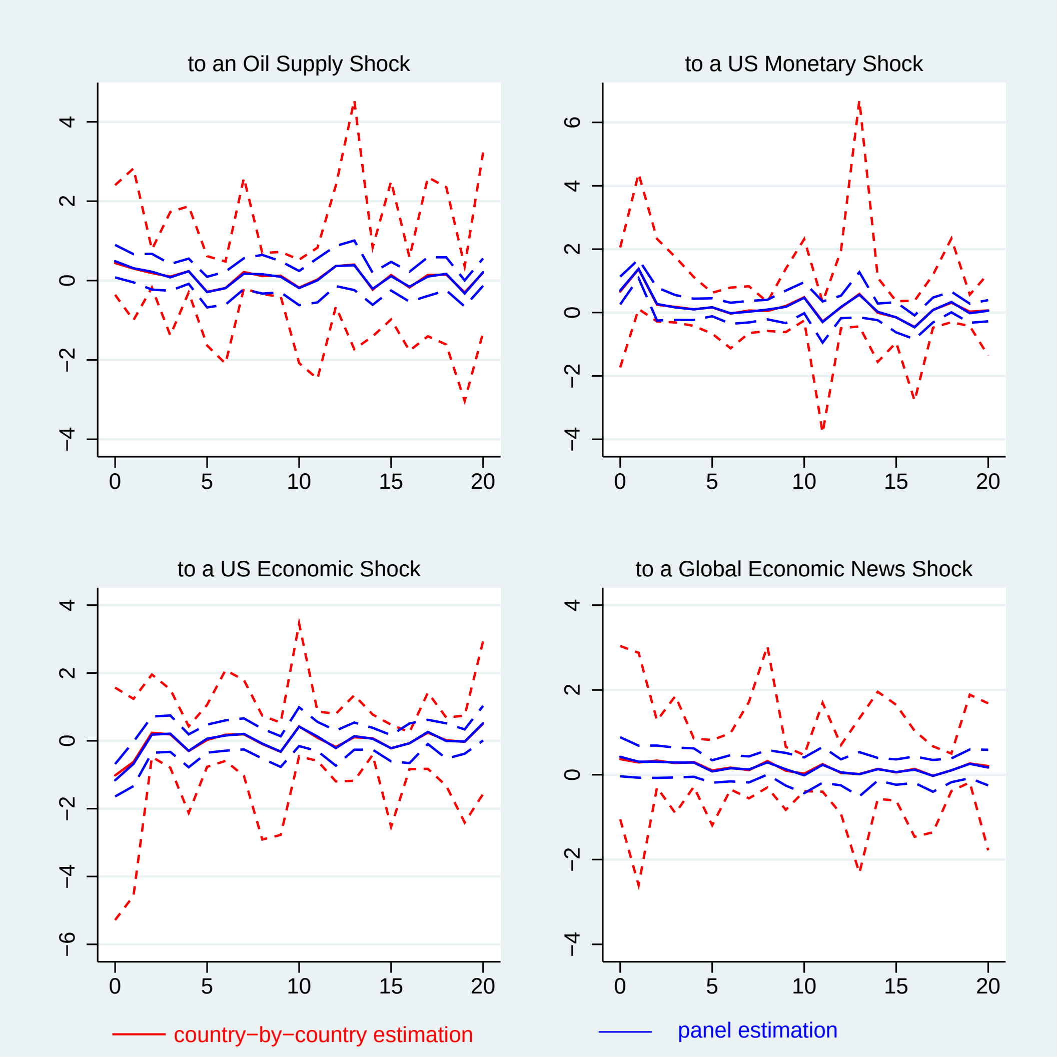
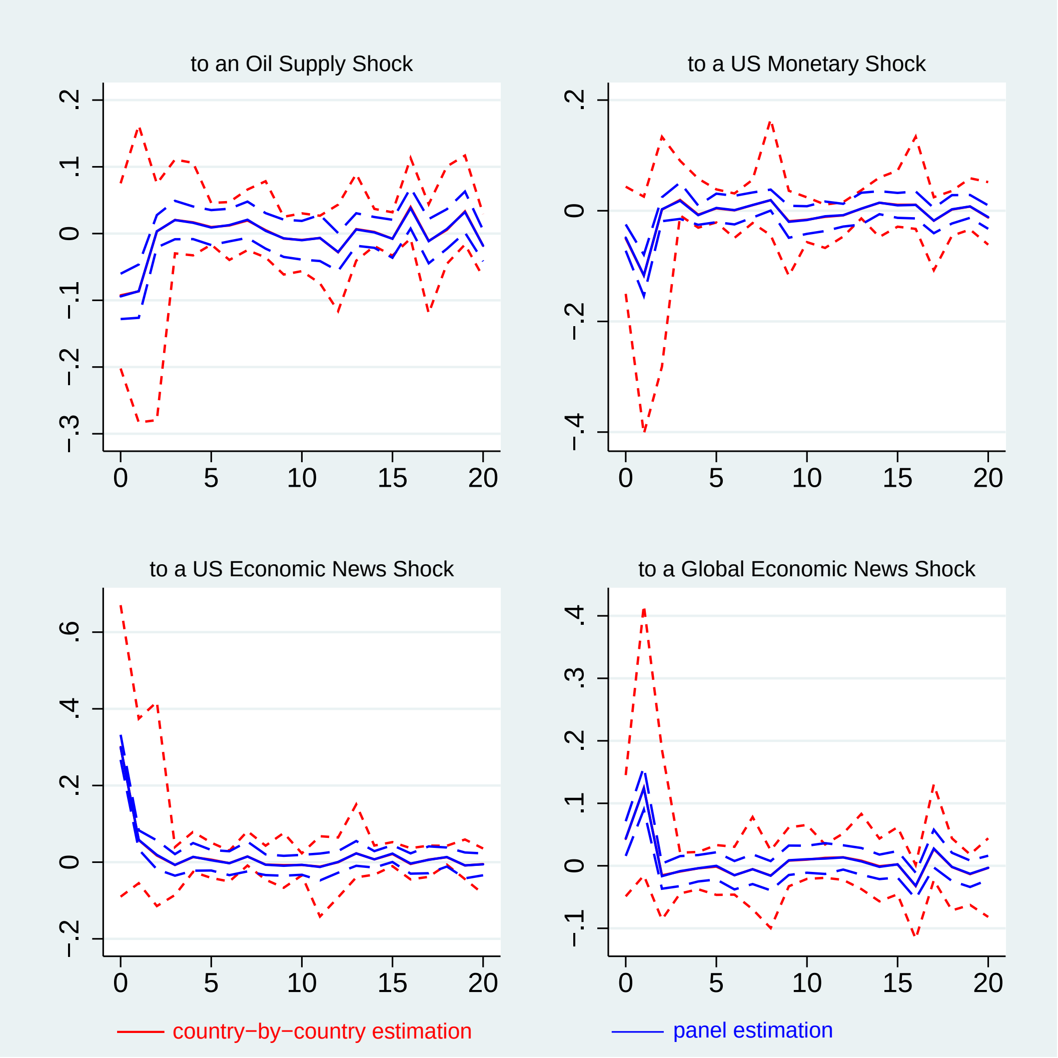


**FIGURE G.16: LP METHOD: IRF LONG-TERM INTEREST RATES**



## FIGURE G.17: LP METHOD: IRF NEER



**Acknowledgements**

We thank Chloe Larkou for excellent research assistance. We also thank Alexandra Tobova and Ignacio Hernando Castellet for their discussions held at the EMG-ECBWorkshop on International Capital Flows (London, 2018) and at the ESCB Emerging Markets Workshop (Finland, May 2018). We are grateful for the feedback received at the 5th Annual Conference of the International Association for Applied Econometrics (Montreal, Jun. 2018).

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PDF ISBN 978-92-899-3544-9 ISSN 1725-2806 doi:10.2866/419470 QB-AR-19-063-EN-N