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Global monetary policy surprises and their transmission to emerging market economies: an external VAR analysis

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Abstract

This paper analyzes how monetary policy surprises in the U.S. affects emerging market economies (EMs) focusing on the transmission through the real exchange rate (RER) and country spreads (EMBI). To do so, we disentangle U.S. interest rate movements between both a pure monetary policy shock and an information shock: while the former is constructed based on high-frequency movements of the interest rate around FOMC announcements, the latter builds from major macroeconomic releases. We quantify their relative impacts through an SVAR model with external instruments. The results suggest that a pure monetary policy shock produces a persistent appreciation of the RER in the U.S. coupled with an increase of the EMBI that induces contractionary effects in the real sector of EMs. In contrast, an information shock does not necessarily produce such contractionary effects in EMs. These results contribute to the literature in identifying the specific drivers behind each movement in Fed announcements and its transmission to EMs.

Resumen

Este trabajo analiza cómo las sorpresas de política monetaria en Estados Unidos afectan las economías emergentes (EMs). En particular, estudiando su transmisión a través del tipo de cambio real y riesgo país (EMBI). Para ello, separamos los movimientos de tasa de interés de Estados Unidos entre un shock monetario puro y un shock de información: mientras que el primero se construye en base a movimientos de alta frecuencia en torno a anuncios del FOMC, el segundo se construye en base a principales publicaciones económicas. Cuantificamos su impacto relativo a través de un modelo SVAR con instrumentos externos. Los resultados sugieren que un shock monetario puro conlleva una apreciación persistente del tipo de cambio real en EE.UU. en conjunto con un aumento del EMBI y efectos contractivos en el sector real de EMs. En cambio, un shock de información no necesariamente produce efectos negativos en EMs. Estos resultados contribuyen a la literatura a identificar los movimientos específicos detrás del movimiento de la Fed y su transmisión hacia EMs.

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1 Introduction

The spillovers of increases in the US monetary policy interest rate have important effects in emerging economies, with sizable consequences in the monetary and real sector (Dahlhaus and Vasishtha (2020), Pinchetti and Szczepaniak (2021) Fernández, Schmitt-Grohé, and Uribe (2017)). The evidence thus far has typically focused on the effect of a "general" shock to the US rate and their aggregate transmission to EMs, yet this approach provides an incomplete assessment on understanding the identification of both the specific driver behind the Fed announcement and the transmission to the global economy. Regarding the first factor, there could be several variables explaining the same "general shock" to the monetary policy, with heterogeneous effects depending on the driver to local and foreign economies. Based on a standard Taylor rule, this general shock to the US rate could be due to a shift in the Fed's reaction function or a pure monetary policy shock, implying global financial tightness, risk aversion, more uncertainty and negative effects to local and foreign economies. In contrast, interest rate increases associated with a booming economy, should have less of an impact on global financial assets given that negative spillovers from higher interest rates would be at least partially offset by positive spillovers from higher U.S. growth (Hoek, Kamin, and Yoldas (2022)). With respect to the second factor of identifying the transmission to the global economy, a strand of literature has focused only on specific areas, like mutual fund investments, capital flows, economic activity, among others, and does not consider the channels and effects of the true drivers behind the Fed announcement on leading indicators on EMs economic cycles, such as the EMBI or real exchange rate and consequently their impact in the real and monetary sector (Uribe and Yue (2006)). This acquires greater relevance for EMs, since there is still a puzzle between the real exchange rate and spread movements after FOMC announcements.

The objective of a "pure identification" of the driver behind de Fed announcement, that is, how to properly identify monetary policy shocks, has renewed interest in SVAR models with the use of high-frequency movements of variables in response to these announcements (Gertler and Karadi (2015), Jarociński and Karadi (2020)). However, the announcement could reveal both a "pure monetary policy shock" (related to the surprises in the market related to the private information of the central bank) and an information effect (related to exogenous information about the state of the economy) with mixed effects on other macroeconomic variables. In general terms the historical evidence suggests that the impact of a raise in the interest rate driven by a a booming economy has been different if the increase is related to an inflation shock (Hoek et al. (2022), Nunes, Ozdagli, and Tang (2022)).

The paper aims to analyze how monetary policy surprises in the US affects emerging market economies. In particular, by separating the information to the pure monetary policy component behind the Fed announcement, over the reaction of foreign financial variables, to finally analyze the effect in EMs real sector. To do so, we study how the market reacts to future interest rates in a small window after labor data releases (information shock) and the monetary policy decision (monetary policy shock) as in Nunes et al. (2022).

Using an external instrument VAR approach for the US and including an external block with EMs variables, two main results emerge. First, a monetary policy surprise related to a pure shock has contractionary and persistent effects in EMs. This result is in line with other studies which argue that after the pure shock there is an increase in global uncertainty, risk aversion, fears of recession and capital outflows from riskier to safe economies, with negative spillovers to EMs. Second, an information shock has less adverse effects on foreign economies, implying that when there is a global financial tightening related to the "good reasons" the effect in the spread and activity on EMs can be favourable.

By including an information and pure monetary policy shock, it is possible to avoid contaminating the analysis with different types of drivers or a "general shock" behind the movement of the interest rate. In addition, the transmission channels towards the real and financial sector are studied in particular. This exploits the intuition that global financial tightness could have different effects on EMs depending on the specific origin of the shock. Although different authors have tried to quantify this phenomenon towards EMs, their methodologies present challenges when isolating the driver, generating a great dispersion in their results. Unlike previous research, this paper use external instruments to capture the main driver of the Fed announcement, and we analyze their impact on US and EMs through real and financial variables that are not commonly studied by the literature and play a key role to predict the economic cycle.

This paper is organized as follows. Section 2 highlights the importance of monetary policy surprises to EMs and explains the puzzles associated with global financial tightness. Section 3 discusses the methodology, construction of the instruments, and data. Section 4 reports the result of the impulses response and Section 5 discusses the key findings of this work.

2 Recent developments and lessons from the past

2.1 A general view and stylized facts

Fed announcements are events of great importance for emerging market economies. A significant episode was the Taper Tantrum in 2013, when Federal Reserve Chairman Ben Bernanke spoke about the possibility of the Central Bank reducing its bond purchases. This announcement had a strong negative effect on financial conditions in emerging markets economies, with strong movements in their exchange rates, spreads, stock prices and consequently affecting the real and monetary sector; to the extent that some countries seemed to be on the verge of a real balance-of-payments crisis (Neumeyer and Perri (2005), Akıncı (2013) and Maćkowiak (2007)). The event itself, as others announcements of the Fed help explain why the US monetary policy communication and market surprises issues have become more prominent in recent literature contributions and policy discussions (Cieslak and Schrimpf (2019), Rholes and Petersen (2021) and Rogers, Scotti, and Wright (2018)).

Spillovers from an increase in the Fed monetary policy interest rate in emerging economies occur, in general terms, through two main and related channels: risk aversion and the ex-

change rate. The first considers that, investors will take refuge in safe assets, to the detriment of riskier assets, generating movements in capital flows, and therefore, increasing EMs country spread. The evidence shows that the spread is then related to economic uncertainty, and is considered a leading indicator of the economic cycle Uribe and Yue (2006). The exchange rate channel considers that an appreciation of the dollar, caused by the increase in interest rates in the United States, would imply capital outflows from emerging economies, causing contractionary effects to the global economy. Although these channels feed back, local conditions or vulnerabilities could mitigate or accelerate the negative effects of tightening financial conditions.

Historical spillovers to emerging market economies from global financial tightening due to aggressive increases in the U.S monetary policy are presented in the **Annex**. Thus, two main stylized facts emerge with great importance to local and external economies. First, there is a puzzle between the movements of the real exchange rate and the fed fund rate. Despite the existence of aggressive interest rate cycles and although each cycle had its particularities, the episodes of 1988, 1994, 1999, 2004 and 2016 do not show a common pattern on the exchange rate in the next or previous months after the announcement, either a clear appreciation or depreciation (FIGURE 6). This phenomenon is well documented in the literature but with mixed effects depending on the driver that causes the increases in the monetary policy. Consequently, if we could isolate the driver associated to the increase of the fed fund rate and obtain a pure identification of the shock, a natural question would be if the monetary policy surprises produces a significant appreciation on the local currency.

Second, in Figure 7 looking at the 2004 and 2016 episodes, the spread (EMBI) of emerging market economies like Brazil, Colombia or Mexico shows a downside pattern. This could be counter intuitive since the spread reflect the uncertainty and the risk of an economy. This risk measure, widely used in the literature, corresponds to the difference in the average yield of the sovereign securities of the country compared to the yield of the US Treasury bond. This encompasses both the public and private sectors of a country. Thus, intuition indicates that an aggressive rate increase on the order of more than 100 base points should be reflected in riskier external economies, since in addition to experiencing capital outflows, they face a higher rate differential as a result of the external increase. Based on this, another natural question would be whether it is monetary policy surprises that generate an unexpected reaction in the market and are behind the increases in the spread in emerging economies. In addition, this phenomenon is accompanied by a slight increase in the VIX in the same month as the monetary policy announcement, although no clear pattern can be seen going forward. Thus, based on this puzzle mentioned above, the central hypothesis of this work is that monetary policy surprises could be explaining these movements. It means, aggressive monetary policy due to a pure monetary policy shock should reflect contractive effects on local and EMs. While, an increase in the monetary policy due to a booming economy should have less adverse effects.

2.2 Recent Evidence

This paper is part of the literature that investigates the international spillovers effects of the central bank communication, which is drawing more attention in the recent years. The seminal work that began to study this were Eichenbaum and Evans (1995), which employed a VAR model for investigating the effect of conventional monetary policy on exchange rates. Since the development of external macroeconomic instruments that captures the specific driver of the shock, like Stock and Watson (2012) and Mertens and Ravn (2013) the profession has begun to take advantage of these tools to get beyond the requirement for theory-based models. More recently, authors such as Dahlhaus and Vasishtha (2020), Ciminelli, Rogers, and Wu (2022) and Ca'Zorzi et al. (2020) combine high-frequency identification techniques around major macroeconomic events (like monetary policy meetings or announcements) to identify structural VAR models and capture the effect of conventional and unconventional policy shocks on domestic and foreign interest rates, as well as other economic and financial variables. In these models the details that matters, is not the monetary policy decision itself, but the new information about what the Fed is going to do in the future.

In this sense, this work also uses the methodology related to the communicational effects of central banks. Indeed, numerous authors such as Fernández et al. (2017) highlight the importance of the US monetary policy for emerging economies, partly explaining the fluctuations in the growth cycle as well as the financial effects. The literature generally documents that global spillovers not only have asymmetric effects on EMs, but also that their effects depend on the type of shock that causes the contractive cycle of monetary policy, and specifically, on whether the event generates a surprise in the market. If the monetary policy rate announcement is immediately accompanied by a significant reaction in the market, for example, through movements in rate futures, or expectations associated with the monetary path, it would cause more persistent effects towards emerging economies. In line with this phenomenon Nakamura and Steinsson (2018) demonstrate the tendency for analysts to change their growth projections higher in response to unforeseen increases in real yields, which are interpreted as proof of the information effect.

In particular, Ciminelli et al. (2022) analyze the international mutual fund investment and the effects of monetary policy surprises. Using partially least squares they obtain a pure shock and an informational shock, and found that an increase in the interest rate driven by a pure shock leads to a large and persistent outflows from EMs. On the other hand, increases in monetary policy driven by positive information about the current state of the economy do not cause outflows from EMs funds and produce reallocation of bond funds. Similarly, Iacoviello and Navarro (2019) elaborate on the impact of monetary policy on activity in AEs and EMs and found that emerging market economies experience larger declines than advance economies. Yet, a rise in the monetary policy rate could have different effects if the driver is related to growth or to pure monetary policy shock. Using a sign restriction identification, the results of Hoek et al. (2022), Pinchetti and Szczepaniak (2021) and Arteta, Kamin, Ruch, et al. (2022) suggest that tightness of financial conditions

due to increases in the US interest rate implies a significant depreciation of currencies in EMs, with large effects in CDS, bond yields, stock prices and in the real sector. Yet, higher US rates in response to expectations of stronger US growth have less adverse spillovers to EMs.

However, until now very few studies have used external instruments to quantify the specific drivers behind monetary policy hikes and their effects on foreign economies, moreover, so far, very few research has explored the puzzles mentioned above about the movements of the real exchange rate, the spread, and consequently the impact in the real sector.

This paper contributes to the literature by identifying the main driver of the Fed announcement and their mechanism to EMs, separating between an information and a pure monetary policy component related to the interest rate, and studying their impact to financial and real variables . Consequently, with the aforementioned literature, this work confirms the intuition that a surprise to the market related to inflation expectations, pure monetary policy shocks, or changing in perceptions of the Fed's reaction function are especially harmful to emerging market economies. However, if the increase in U.S interest rate is driven by an information shock, the impact to EMs could be more benign.

3 Methodology an data

3.1 Empirical model

The econometric framework is based on a VAR model with two external instruments to capture the surprises shocks. The assumption of an external instruments in a VAR is a variant of the methodology developed by Stock and Watson (2012) and Mertens and Ravn (2013). This approach exploits the intuition about information from a variable that is external to the VAR, but that is correlated with a particular shock of interest and uncorrelated with other shocks (the instrument). In this subsection, the procedure is described:

As in Gertler and Karadi (2015), consider Y_t a vector, A and C_j $\forall i \geq 1$ coefficient matrices and ϵ_t the shocks associated. Then, the structural form of the VAR model would be:

$$AY_t = \sum_{i=1}^{p} C_i Y_{t-i} + \epsilon_t \tag{1}$$

Where we include an external block corresponding to the EMs variables. Then, if we pre-multiply by A^{-1} the reduce form is obtained:

$$Y_t = \sum_{i=1}^{p} B_i Y_{t-i} + u_t \tag{2}$$

Where the residuals u_t contains both the information and pure monetary policy shock, and are mean zero with covariance matrix Ω=E$[u_t u_t]$. Let us consider the column a of A^{-1} which corresponds to the impact on each element of the structural policy shock ϵ_t^p (that includes the monetary policy shock and the information shock). Since we are interested in

the impulse response of the external instrument shocks, we need to estimate:

$$Y_t = \sum_{i=1}^{p} B_j Y_{i-j} + a_k^{-1} e_{k,t} \tag{3}$$

Where the first column of a_k are the parameters of interest that quantify the impact of the monetary policy shock and the information shock.

In order to identify the parameters, as in Gertler and Karadi (2015), Mertens and Ravn (2013), Lakdawala (2019) we need two key assumptions: a relevance and an exclusion condition. Let Z_t be a vector of instrumental variables and ϵ_t^{iv} a vector of shocks that only includes the monetary policy shock. To obtain a valid instrument set for shock-related instrumental variables, Z_t must be correlated with ϵ_t^{iv} (relevance condition) but orthogonal to any other structural shock (exclusion condition):

$$E(Z_t \epsilon_t^{iv}) = \lambda \tag{4}$$

$$E(Z_t \epsilon_t^{q}) = 0 \tag{5}$$

Where ϵ_t^q is a column vector that includes any other shock except the monetary policy one. Then, as we exclude days when labor data releases are coincident with FOMC announcements, to obtain the impulse response to the information shock, the procedure is the same and the standard as in the single shock case.

Other approaches used in the literature to identify this phenomenon have considered the use of sign restrictions on the effect on the variables caused by the shock (Pinchetti and Szczepaniak (2021), Hoek et al. (2022), Ciminelli et al. (2022)). However, there are two major disadvantages associated with this methodology when applied to this context and specific research question. First, a pure (information) monetary policy shock, which due to sign restrictions has negative (positive) effects on activity, may be due to a set of factors that generates the same phenomenon, including oil, foreign activity, or variables external to the model that are quantified in the shock. Second, depending on the vulnerabilities that the economy faces, an information shock that by construction has positive effects on the stock market would go against the literature associated with rate increases leading to increases in the discounted interest rate for future dividends, which would have negative effects on the stock market, even if this rate increase is for good reasons (Burger, Warnock, and Warnock (2017), Iacoviello and Navarro (2019)). The econometric framework of this paper is not based on these assumptions. Rather, assumes that the monetary policy shock does not occur beyond the FOMC announcement. As in Nunes et al. (2022) and Lakdawala (2019), this hypothesis allows us to use the changes in expected official rates measured close to the main macroeconomic events as an external tool for exogenous changes in the systematic component of monetary policy only. Then, this allows us to isolate the effect of FOMC information shocks from the effects of monetary shocks, both of which provide interest rate surprises around the FOMC announcement.

3.2 Identification method to extract monetary policy shocks

The first instrument is the change in the federal funds rate future, three months out (FF4) in a one day window around the FOMC announcement (monetary policy shock). As in Nunes et al. (2022) this instrument captures the change in the expected average banking system rate level over the third calendar month out from the day of the announcement, a horizon that typically also covers the following Central Bank meeting and thus captures near-term forward guidance (Gertler and Karadi (2015) Jarociński and Karadi (2020)). The second instrument is the same banking interest rate change (FF4) but calculated around the unemployment rate releases (information shock). In order to separate the information to the monetary policy shock, we exclude the days where the unemployment rate release coincide with Central Bank announcements. The idea behind these external instruments is that in a small window around FOMC announcement or labor data releases, there are unlikely to be other events that significantly affect the market expectations of future interest rates (Lakdawala (2019)). Equation 6 describes the construction of our instruments, where q_i corresponds to the pure monetary policy or information shock, "j is the day, and t is the month.

$$iv_t^{q_i} = FF4_j - FF4_{j-1} \tag{6}$$

Figure 1 provides the time series of external instrument surprises, where we observe clear episodes when the FOMC announcement or unemployment rate releases shocks the market expectations. For example, in 2005 and 2008 episodes our instruments fluctuated in the order of 20 basis points.

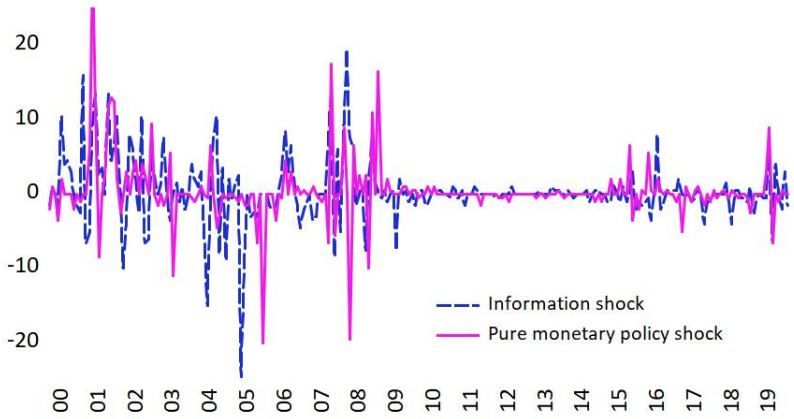

Figure 1: Historical instruments movements

Notes: The monetary policy and information shock are shown at monthly frequency (2000-2019) in basis points. The monetary policy shock corresponds to the change in federal funds rate future, three months out (FF4) in a one day window around the FOMC announcement. The information shock corresponds to the change in the federal funds rate future, three month out (FF4) in a one day window around unemployment rate releases

3.3 Data

This paper uses macroeconomic and financial variables between 2000 and 2019 at monthly frequency. The baseline model includes eight variables: fed fund rate (FFR), personal consumer expenditure (PCE), industrial production (IP), real exchange rate (RER), VIX, $S\&P$ 500 index, and for emerging market economies, the spread (EMBI) and industrial production(EMsIP), both of are power purchasing parity weighted. We use a VAR model with two lags and in natural logarithms of all variables except RER, VIX and spread. To maintain the assumption that monetary policy shocks do not enter into these labor market news interest rate surprises, we exclude the days where releases FOMC meetings and labor data coincide. The countries included in this research are Brazil, Colombia, Panama, Ecuador, Mexico, and Peru.

4 Results

In this section, we present the results to fed fund rate external instruments shocks, which are divided in two topics. First, the aggregate results are presented estimating the domestic and foreign spillovers of monetary policy surprises. Second, we present a robustness test of our instruments, using a sign restriction identification, which is an alternative methodology commonly used by the literature.

4.1 Spillovers of US monetary policy surprises to emerging market economies

The next two figures shows the impulse response over three years of personal consumer expenditure, industrial production, real exchange rate, VIX, S&P500, spread and industrial production of emerging market economies to a 10 b.p. pure Fed monetary policy shock and an information shock. We measure the dynamic response in the other variables in percentage points and the dotted lines denote 68% confidence intervals which are based on robust standard errors following Mertens and Ravn (2013) and Nakamura and Steinsson (2018). Also, to check that our instruments are relevant, we present the first stage F statistic, which indicates that if the value is lower than 10, we are in the presence of a weak instrument (Stock, Wright, and Yogo (2002)).

As shown in Figure 2, the effect of a 10 b.p. pure Fed monetary policy shock on PCE and IP on the local economy is considerable over five months, which is well documented by the profession and is consistent with the tightness of the Federal Reserve. This surprise shock decreases US inflation and industrial production in 0.03 and 0.1 p.p. respectively, returning to their pre-shock levels after about 24 months in the case of IP. More interesting and related to the puzzles mentioned in section 2, the real exchange rate suffers an appreciation of 0.5 p.p. that is accompanied by a considerable increase in the global uncertainty in the order of 0.6 p.p., implying that the stock market is also hit by the surprise of the Fed, with a drop of 1 p.p. approximately. In other words, if the increase in the fed fund rate is given by a pure monetary shock, we observe a negative impact on activity, accompanied

by an increase in global uncertainty associated with fears of recession and investors taking refuge in the dollar, implying outflows from more riskier countries to safe ones. Consequently, for emerging market economies, we obtain a large and important increase in the spread (1 p.p.) that is accompanied by a contraction in the real sector (0.2 p.p.) returning to their pre-shock levels after 5 months. Furthermore, the dynamic response is statistically significant for at least the first five months.

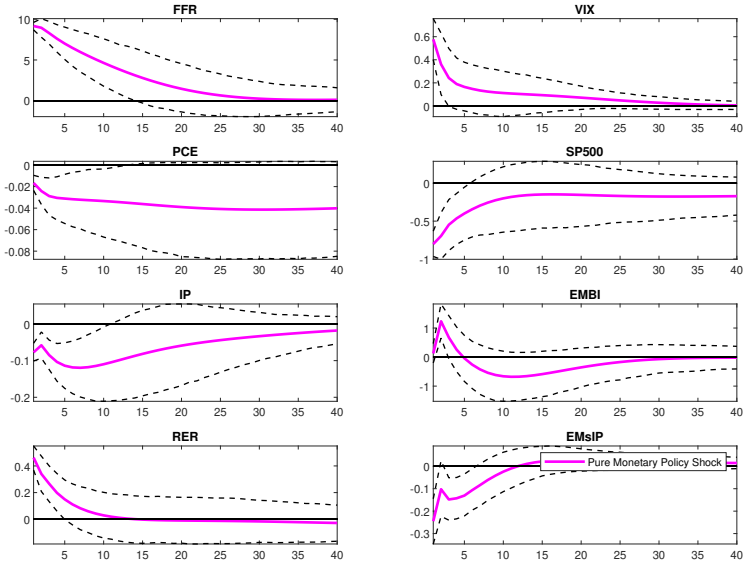

Figure 2: Pure monetary policy shock
(First stage F stats: 24.22)

Notes: The impulse response shows a 10 basis points increase in the fed fund rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to personal consumer expenditure, industrial production and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread and EMs industrial production. All variables are expressed in p.p except the fed fund rate. VAR sample includes 2000-2019.

On the other hand, the information shock that reveals new information about the current state of the economy implies less adverse effects to the local economy and EMs (Figure 3). In this case, the PCE does not move much on impact and is not significant, while IP has the same negative impact than in the previous shock but with less persistence. The less adverse effect in the real sector is also reflected in a lower global uncertainty, as the Fed take account upward revisions to the macroeconomic outlook jointly with the optimism of the stock market more than offset the effects of the appreciation of the USD (with a slightly lower increase than in the previous case of the order of 0.4 p.p). The VIX exhibit a drop of 0.4 p.p, while the S&P 500 shows an increase of 0.2 p.p over five months. For EMs this also implies lower adverse effects on the spread and in the real sector. Contrary with the monetary policy shock, where the spread increases, in this case the information shock implies a decrease of 1 p.p after five months. Moreover, the EMs industrial production shows not

only a minor drop (0.1 p.p) but also less persistence.

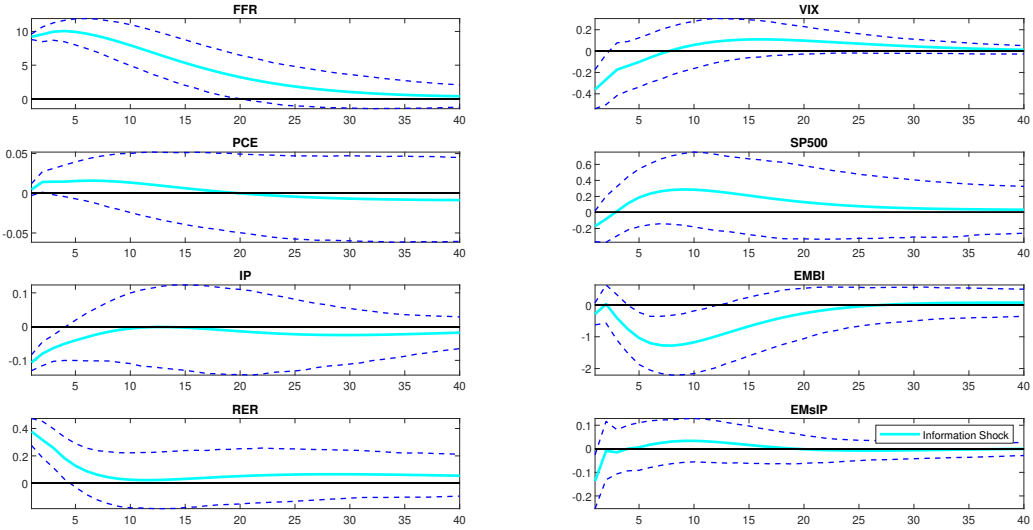

Figure 3: Information shock
(First stage F stats: 18.80)

Notes: The impulse response shows a 10 basis points increase in the fed fund rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to fed fund rate, personal consumer expenditure, industrial production and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread and EMs industrial production. All variables are expressed in p.p except the fed fund rate. VAR sample includes 2000-2019.

Taking both shocks together, our results indicates that the fed fund rate increases has mixed effects depending on the driver, especially for EMs. A pure monetary policy shock has negative effects on the local economy and particularly, on EMs. In contrast, if the interest rate is associated with an upward revision to the macroeconomic outlook given the new information about the current state of the economy, investors increase the risk appetite of the market towards riskier assets, implying outflows of capital flows to other economies, and consequently, showing less adverse effects given the financial tightness, which are less persistent than the pure monetary policy shock. This findings suggest that the main driver of the effect to foreign economies is the risk aversion and exchange rate channel, and our results are generally supported by Jarociński and Karadi (2020), Pinchetti and Szczepaniak (2021) and Ciminelli et al. (2022) who also explain that both shocks can have opposite effects on global risk appetite. However, these mixed shocks effects for EMs could be amplified depending on their macroeconomic fundamentals. Some studies document that global monetary policy spillovers would have heterogeneous effects depending on the local conditions and vulnerabilities that the economy faces. EMs that exhibit a high fiscal debt, lending problems, high inflation, currency problems, among others, are more exposed to US monetary policy spillovers. Yet, countries with solid fundamentals exhibit less adverse effects (Akıncı (2013), Iacoviello and Navarro (2019)).

4.2 Robustness using Sign Restriction methodology

In this subsection, employing a sign restriction identification commonly used to analyze the spillovers of global financial tightness, the main results are compared. In order to achieve that, in the Annex are postulated some restrictions that will be taken to simulate the pure monetary policy shock and the information shock. The main identifying assumption is that a pure monetary policy shock impacts negatively in the real sector and inflation, which is accompanied by an increase in the global uncertainty and a drop in the S&P Index. While an information shock, that as discussed above is associated with an upward revision to the current state of the economy, also implies a negative impact on the real sector but an increase in inflation that is associated with better economic prospects, jointly with a drop in global uncertainty and a greater appetite for risk. As we are interested on the dynamic response to EMs, for both shock cases, we are agnostic about the impact on RER, EMBI and EMsIP, and we assume that the sign restriction effect is exclusively for one month. Given the fact that this paper uses exclusively high-frequency movements of the interest rate to capture the specific driver of the shock, the sign restriction methodology will capture this shock but in a broader sense.

In both cases, the results were not substantially different with the narrative described in the previous subsection. Figure 4 exhibist a 10 b.p. increase in the fed fund rate associated with a pure monetary policy shock. Looking at the restricted variables we obtain a decrease in activity and inflation in the order of 0.2 p.p. and 0.5 p.p respectively over five months. Global uncertainty increases by 2 p.p as the stock market decreases by 3 p.p over the same horizon. More importantly, the non sign restricted variables shows a similar pattern as the external instrument identification with an appreciation of the RER, an increase in the spread and a decrease of EMsIP (1 p.p., 7 p.p. and 0.8 p.p correspondingly).

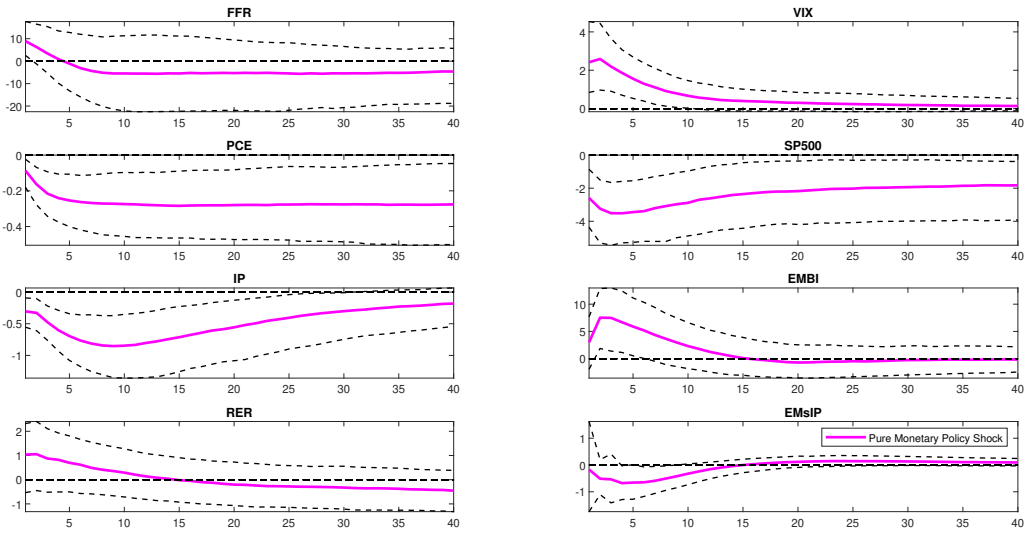

Figure 4: Pure monetary policy shock using SR identification

Notes: The impulse response shows a 10 basis points increase in the fed fund rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to fed fund rate, personal consumer expenditure, industrial production and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread and EMs industrial production. All variables are expressed in p.p except the fed fund rate. VAR sample includes 2000-2019.

In regard to the information shock case, an increase in US rates has favourable effects on the restricted variables, although with little significance (Figure 5). Since the increase is associated with a booming economy, inflation and activity growth by 0.2 p.p, while the global uncertainty decreases by 2 p.p and the stock market exhibits a 2 p.p increase. The Dollar has no major movements, but the favourable global conditions implies a decrease in the EMs risk as the spread falls by 5 p.p and activity increases by 0.5 p.p

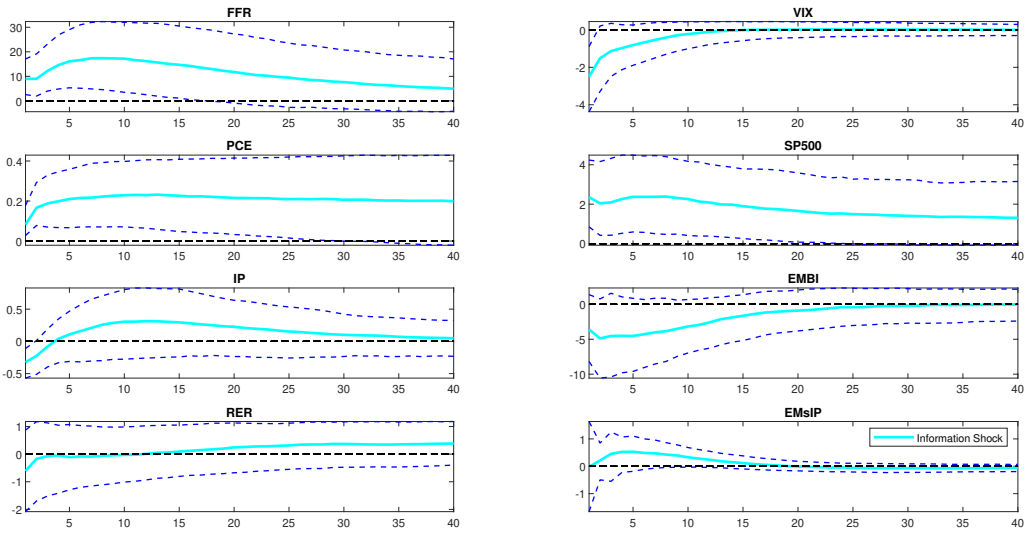

Figure 5: Information shock using SR identification

Notes: The impulse response shows a 10 basis points increase in the fed fund rate associated with an information shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to fed fund rate, personal consumer expenditure, industrial production and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread and EMs industrial production. All variables are expressed in p.p except the fed fund rate. VAR sample includes 2000-2019.

This robustness test confirms the finding that pure monetary policy shocks cause an appreciation of the local currency with contractionary effects on emerging market economies. However, an information shock could be a good news to foreign economies. Also, it should be noted that using this approach some effects are amplified, since given the identification, many variables could be explaining the same phenomenon.

5 Conclusion

Fed announcements are events of great importance for emerging market economies, leading to significant movements in real and financial variables. Accordingly, understanding the true drivers behind the US interest rates movements is an important issue to follow for policymakers when US monetary policy spillovers are quantified towards foreign economies.

This paper shed light on the relative importance of the specific drivers behind FOMC announcements and their spillovers to EMs, highlighting its heterogeneous effects both in the domestic and foreign economies. To do so, we separate the US interest rate movements between a pure monetary policy shock and an information shock based on high-frequency movements of the interest rate related to the monetary policy decision (pure monetary policy shock) and major macroeconomic releases (information shock). Using a proxy-SVAR we obtain that when the US interest rate is driven by a pure monetary policy shock, it has

a contractive effect on the US, increasing global uncertainty, and consequently a depreciation in EMs currencies, as well as a higher spread and lower activity. Yet, if the increase is given by an information shock, this not necessarily means bad news for emerging market economies.

These findings seek to respond the puzzles related to the aggressive effects of interest rate Fed movements and their transmission to foreign economies, such the RER movements or EMs leading indicators that anticipate the economic cycle. Our analysis confirms the intuition that a surprise to the market related to inflation expectations, pure monetary policy shocks, or changing in perceptions of the Fed's reaction function are especially harmful to emerging market economies. However, if the Fed fund rate increase is driven by an upward revision to the macroeconomic outlook, the impact to EMs could be more benign.

Yet, future research is to be done, since local conditions and vulnerabilities that the foreign economies face could amplified the effects of global financial tightness. From this stance, countries that exhibit high inflation, high fiscal debt, currency problems, among other factors should be more harmed after US monetary policy surprises. Also, central bank's macroprudential tools and the forward guidance effect, not included as an external instrument in this work, would play a key role in quantifying the transmission mechanisms towards EMs. Overall, our results point to the need to understand the true drivers behind US interest rate movements, so that both structural and semi-structural policymaker models incorporate these transmission mechanisms to better understand their effects on foreign economies.

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6 Annex: figures and tables

Figure 6: Fed tightening cycle effect on interest rates and real exchange rate

Notes: Fed tightening cycle between 12 and 8 months after the announcement. Solid lines represent the difference of the variable of interest and the period that Fed cycle tightening starts (t). Variables included: Fed fund rate, 2 and 10 year treasury and real exchange rate. Interest rates and real exchange rate are measured in b.p. and p.p. respectively.

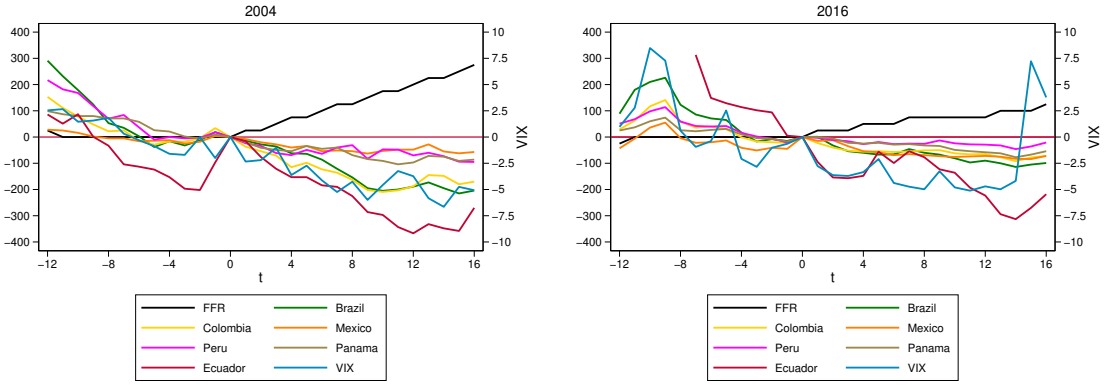

Figure 7: Fed tightening cycle effect on interest rates , VIX and EMs spread

Notes: Fed tightening cycle between 12 and 8 months after the announcement. Solid lines represent the difference of the variable of interest and the period that Fed cycle tightening starts (t). Variables included: Fed fund rate, VIX index and EMBI. Fed fund rate, EMBI and VIX are measured in b.p. and p.p. respectively.

Table 1: Sign Restriction Identification for one period

	Pure MP Shock	Information Shock
FFR	positive	positive
PCE	negative	positive
IP	negative	negative
RER	?	?
VIX	positive	negative
SP500	negative	positive
EMBI	?	?
EMsIP	?	?

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