INSTITUTO DE ECONOMÍA

DOCUMENTO de TRABAJO

577

2024

Chinese Macroeconomic Surprises and the Global Financial Cycle

C. Gutierrez, J. Turen y A. Vicondoa.

www.economia.uc.cl · ISSN (edición impresa) 0716-7334 · ISSN (edición electrónica) 0717-7593

Chinese Macroeconomic Surprises and the Global Financial Cycle *

Camila Gutierrez[†] Javier Turen[‡] Alejandro Vicondoa[§]

February 1, 2024

Abstract

We study the international spillover effects of a macroeconomic surprise in China. Using high-frequency data, we show that the surprise component of the release of macro data in China brings a sizeable and significant effect on asset prices and global risk, across different economies. We document that the dynamic effect of Chinese Macro surprises is both significant and persistent for a broad range of financial variables worldwide. When assessing the relative importance of Chinese surprises relative to other known drivers of the Global Financial Cycle, we show that while the Monetary Policy in the US still accounts for most of the reaction, our measure is equally relevant to account for the reaction of commodities and the EMBI.

JEL codes: E44, F21, F40, G15.
Keywords: Spillovers, Global Financial Cycle, China, High-frequency.

*For useful comments and suggestions, we thank Mauricio Calani, Miguel Fuentes, Ezequiel Garcia-Lembergman, Borja Larrain, Giovanni Ricco, Andres Sagner, and seminar participants at Banco Central de Chile and Pontificia Universidad Catolica de Chile. The views expressed herein are solely those of the authors and do not necessarily reflect the views of the Central Bank of Chile.

[†]Central Bank of Chile. Email: cgutierrezr@bcentral.cl

[‡]Instituto de Economía, Pontificia Universidad Católica de Chile. Email: jturen@uc.cl

[§]Instituto de Economía, Pontificia Universidad Católica de Chile. Email: alejandro.vicondoa@uc.cl

1 Introduction

Asset prices, capital flows, and credit growth display a strong comovement worldwide, a phenomenon that has been labeled as *the Global Financial Cycle* (GFC) (see, for example, Rey, 2013). The GFC has important implications for monetary policy and the design of macroprudential policies. Previous works have highlighted the role of US monetary policy (see, Miranda-Agrippino and Rey, 2021) and macroeconomic news releases in driving this cycle (see, Boehm and Kroner, 2023). However, little is known about *other* possible drivers of the GFC and their relative contribution to the GFC.

This paper studies the effects of Chinese macroeconomic surprises on the GFC. To do so, we construct a novel series of macroeconomic surprises, defined as the difference between the released value of different Chinese macroeconomic indicators and their expected values, immediately before the release. Through this surprise series, we study the implications of Chinese surprises on several financial variables and prices worldwide. First, we estimate the high-frequency effects of this series of surprises on asset prices and the VIX. We exploit the fact that Chinese macro surprises are released when stock markets are closed in Non-Asian economies, due to time zone differences. Through this natural setup, we get a cleaner identification framework to estimate the effect of such surprises on asset prices, which we measure as the difference between closing and opening prices when these indicators are released. Second, we estimate the dynamic effects of these surprises on a broader set of variables to fully quantify their effects and persistence and to better characterize the transmission patterns. Finally, we quantify the relative importance of our measure of Chinese macro surprises in explaining fluctuations in different relevant financial variables, relative to US monetary policy shocks and US macro news releases proposed by the literature.

We show that Chinese macro surprises induce a significant effect on asset prices upon impact which is synchronized across many economies worldwide. The fact that surprises coming from a large and important economy such as China bring significant responses in stock prices worldwide is a distinct feature of the GFC. Delving more deeply into the types of macro

news, we show that surprises about local and external activity are the main drivers of these effects. While positive news about local or external activity brings positive and significant reactions to international stock returns, this is not true for news related to internal prices or financial variables in China. The same feature is observed when we study the response of the VIX index. A positive surprise of either local or external activity brings a sizeable drop in the uncertainty index. The observed response of the VIX is relevant as it is argued that this index is a close proxy for the GFC (Rey, 2013). By assessing the reaction of stock returns at the country level to our measure, we document a strong degree of comovement across economies, where much of the responses (in terms of sign and magnitude) coincide. Therefore, we argue that our proposed surprise series acts as an important additional driver of asset price comovements worldwide.

Having stressed the immediate implications of our surprise series, we turn to studying its dynamic implications. Feeding our series into a Local Projection specification, we show that the estimated effects are persistent, and in some cases, they even build up in the first initial days. We complement and extend the previous analysis by including additional relevant variables such as the reaction of the nominal exchange rates, commodity prices, and the EMBI indices for different groups of economies. We find that the responses to Chinese surprises are both of a greater magnitude and persistence for Emerging rather than for Advanced economies. Surprises about the real activity have a significant positive effect on commodities prices which, together with the importance of China in world trade, can help reconcile the strong effects of macro surprises on Emerging Economies. In particular, macro surprises induce a significant and persistent decrease in the JP Morgan EMBI and an appreciation of the exchange rate relative to the US Dollar. These same patterns are not observed, however, for Advanced Economies.

Accounting for the relevance of Chinese macro surprises, we discuss that this measure is as important as other documented factors in driving the GFC. While the most sizeable response of stock returns and global risk comes from the US monetary policy, we argue that Chinese

surprises are *as relevant as* the US monetary policy for some commodity prices and the EMBI. The response of EMBI to a one standard deviation Chinese macro surprise is around 75% of the response to a one standard deviation US monetary policy surprise during the first month. Through the lens of our results, we interpret that the transmission mechanisms of Chinese surprises operate through both the Trade and commodity channels, rather than the financial channel. Hence, we interpret our proposed surprise measure as an important driver of the so-called *Global Trade and Commodity Cycle* coined by Miranda-Agrippino and Rey (2022).

Previous works have analyzed the determinants of the GFC. Miranda-Agrippino and Rey (2021) argues that US monetary policy is an important driver of the GFC, inducing strong effects on international capital flows and changes in global financial conditions. Boehm and Kroner (2023) find that releases of US macroeconomic news have a significant effect on asset prices worldwide. They define a US macroeconomic surprise as the difference between the realized value of a macroeconomic indicator and the forecast based on the information available before the release. They show that this surprise has strong effects on different asset prices within a tight window of their release. Our paper computes Chinese macroeconomic surprises following the methodology of Boehm and Kroner (2023) and compares both the responses of different financial variables to these surprises, as well as, the explanatory power of this series relative to the US ones and to US monetary policy shocks. We argue that a one-standard deviation Chinese macro surprise has a larger effect on stock prices than a comparable US macro surprise. These effects are asymmetric depending on the subset of countries that we focus on and on the variable. Moreover, our results are consistent with existing evidence in the sense that US monetary policy shocks still arise as the most prominent source of fluctuations in asset and commodity prices worldwide. We contribute to this literature by quantifying the relative relevance of each of these surprises in accounting for international price movements.

The GFC is also driven by shocks outside the US. Miranda-Agrippino et al. (2020) study

the spillovers of Chinese monetary policy shocks. While US monetary policy transmits worldwide mainly through asset prices, Chinese monetary policy transmits mainly through commodity prices and international trade. Miranda-Agrippino and Rey (2022) argue that Chinese monetary policy is an important driver of commodity prices. Sznajderska and Kapuściński (2020) show that a negative demand shock in China affects GDP of other economies. Barcelona et al. (2022) show that policy-induced changes in Chinese domestic credit affect both global financial conditions and global economic activity by affecting global risk sentiment. They show that this shock also has a significant effect on commodity prices. Corneli et al. (2023) estimate the effect of Chinese macroeconomic news on asset prices between 2018 and 2022. Our paper is closely related to this last paper, departing from it in important dimensions. First, our analysis covers a longer sample and does not include the COVID period, which may strongly influence the estimation and affect the transmission channels. Second, our paper not only estimates the effects of macroeconomic surprises but also computes its contribution relative to the US macroeconomic news and US monetary policy shocks. Third, we also focus on the different transmission channels of Chinese macroeconomic surprises.

The paper also contributes to analyzing the effects of macroeconomic announcements on macroeconomic variables. In line with our paper, Boyd et al. (2005) shows that the stock market significantly responds to the appearance of news about the unemployment rate. Building on the reaction to the news, the paper argues that the reaction also depends on the current state of the economy. Similarly, Faust et al. (2007) studies the response of the value of the dollar and the term structure of interest rates following scheduled macroeconomic announcements. These authors claim that positive news for the real activity in the US, leads to higher short and long-term interest rates along with a higher value of the dollar. We complement these findings by not only focusing on different types of news and variables but also by assessing the potential synchronization of the same news across economies.

The rest of the paper is organized as follows. Section 2 describes the series of Chinese

macroeconomic surprises. Section 3 displays the estimated high-frequency effects of the surprises on asset prices. Section 4 presents the estimated dynamic effects of the macro surprises of different types of asset prices. Section 5 quantifies the importance of the Chinese macro surprises relative to other drivers of the Global Financial Cycle. Finally Section **??** concludes.

2 Series of Chinese Macroeconomic Surprises

In order to estimate the effects of Chinese macroeconomic surprises on different asset prices we need to define the measure and the data used to compute the series of surprises.

2.1 Macro Surprises

Building on the empirical analysis by Boehm and Kroner (2023) for the US, we first define a measure of macroeconomic surprise in China $s^y_{CHI_t}$ as:

$$s^y_{CHI_t} = \frac{y_{CHI,t} - \mathbb{E}\left[y_{CHI,t} \mid \mathcal{I}_{t-\epsilon}\right]}{\hat{\sigma}^y_{CHI_t}} \tag{1}$$

Where $y_{CHI,t}$ is the final (published) value of a macroeconomic variable released in China and $\mathbb{E}\left[y_{CHI,t} \mid \mathcal{I}_{t-\epsilon}\right]$ is the median expectation for that variable of forecasters participating in the Bloomberg survey. The forecast corresponds to the latest average prediction using the information set $\mathcal{I}_{t-\epsilon}$.[1] In order to make the magnitude of the surprises comparable for different macroeconomic variables, we standardize each series and divide the unconditional standard deviation of the difference at time t, $\hat{\sigma}^y_{CHI_t}$.

[1]The notation reflects the latest forecast. The time window between the last prediction of Bloomberg participants and the final release of each variable is provided directly by Bloomberg.

2.2 The Bloomberg Survey

Information about the release values of macroeconomic series is extracted from the Economic Calendar Survey of Bloomberg for China.[2] For each variable, Bloomberg informs, the day and time when the variable will be published, each final value, and the median of expectations for each variable.

As expected, the level of awareness or attention to macro releases is not constant across agents or variables. Different variables are more or less tracked in real time depending on the agent's own preferences, relevance, or economic importance. To compute the series of macroeconomic surprises (1) we rely on Bloomberg's relevance classification of each variable. The subset of variables that concentrate the largest shares of search or hits are labeled as "highly relevant" by Bloomberg. Building on this group of variable we construct the surprise measure for the period 2010-2019. Table 1 displays the macro series used to construct the measure.

Table 1: Bloomberg's Most Relevant Macro Variables

Announcement	Frequency	Category	Observations	Release Time
GDP	Quarterly	Local activity	40	10:00
Industrial production	Monthly	Local activity	102	10:00
Retail sales	Monthly	Local activity	102	10:00
Exports	Monthly	External activity	120	11:00
Trade balance	Monthly	External activity	120	11:00
CPI	Monthly	Price	120	10:00
PPI	Monthly	Price	120	10:00
New Yuan Loans	Monthly	Financial sector	120	10:00
Money Supply M2	Monthly	Financial sector	120	10:00
Manufacturing PMI	Monthly	Surveys	60	09:30
Non-manufacturing PMI	Monthly	Surveys	60	09:30

Notes: Set of events classified as "highly relevant" by Bloomberg together with a classification based on the type of information they convey, the frequency of publication, and the number of events over the sample 2010-2019. The release time corresponds to the most frequent publication time, however, sometimes this time may vary.

The surprise series is defined as the daily average of the individual macro surprises

[2]The calendar is available on the Investing webpage.

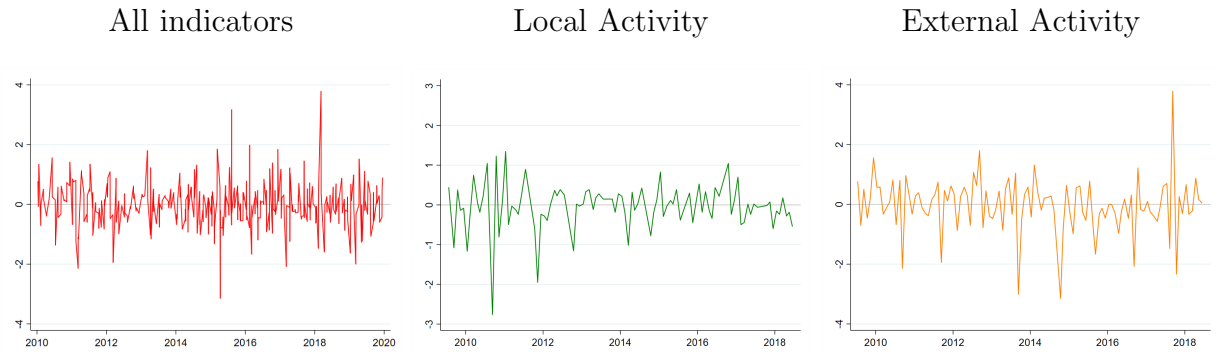
presented in Table 1, which are computed according to equation (1). Besides the aggregate surprise series, and since the importance of surprises could change depending on the type of indicator, we also classify the variables within different categories and construct subseries of macroeconomic surprises. In particular, we split variables into Real Activity, Local Activity, External, Prices, Financial and Surveys variables. The third column in Table 1 shows the assumed category of each series. For both the aggregate and the prices series, we adjust the sign of the surprise such that a higher-than-expected value of either CPI or PPI is interpreted as positive news, while a negative value is then interpreted as negative news.

2.3 The Series of Macro Surprises

The left panel of Figure 1 shows the series of China's aggregate surprises aggregate it at the monthly level.[3] As expected, the series is centered around zero without any serial correlation patterns. The standard deviation of the surprise series is non-negligible as it is equal to 0.78 basis points. The dynamics of the series reflect that throughout this time window, the released variable deviated significantly (either positively or negatively) from agents' expectations. Some of the spikes are driven by the fact that during a particular month, the release of a quarterly frequency variable was scheduled, e.g., Real GDP. Thus, in the case that the sign of the surprise of the less and more frequent variables coincide, the total effect is reinforced during that particular month.

[3]For comparability, we standardize each individual series of surprises before computing the aggregated series of macro surprises.

Figure 1: Time Series of Chinese Macro Surprises



Notes: The figure shows the series of macroeconomic surprises constructed for China. The series accounts for the linear combination of individual surprises. The series are adjusted so that a positive value means that the macro variable had a better-than-expected performance and the opposite for negative values.

The middle and right panels of Figure 1 also show the evolution of the news index for both the Local and External activity subseries. As with the aggregate case, the series exhibits a significant level of volatility. The distribution of the subseries of news, through their histograms, is presented in Figure A.1 in Appendix A.1

3 Effects of Macro News on Stock Prices

This Section introduces our main empirical strategy to study the effects of China's macro news on stock returns across different economies. We also estimate the effect of our constructed series on the VIX, a proxy of the Global Finacial Cycle, see Rey (2013). Afterward, we present some additional exercises to further validate our empirical strategy.

3.1 Empirical Specification

With the constructed series of surprises $S_{CHI,t}$, we estimate the following specification:

$$\Delta y_{i,t} = \alpha_i + \gamma S_{CHI,t} + \varepsilon_{i,t} \tag{2}$$

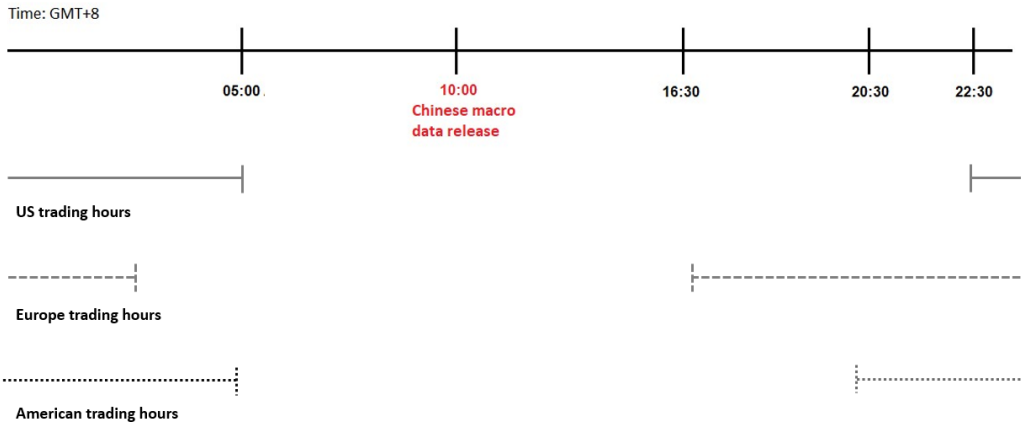
In our first set of results, $y_{i,t}$ is the stock index of country i at day t, and $\Delta y_{i,t}$ is the stock

return between the *closing* value the day before and the *opening* value the day after. We use the (log) daily change in stock prices expressed in US dollars corresponding to the MSCI indices for 28 countries. The specific list of countries is presented in Table A.1 in Appendix A.2. The variable $S_{CHI,t}$ is our macro surprise series for China.

3.2 Timing and Identification Assumption

To interpret the estimated γ as the causal effect, we rely on the different time zones between China and the trading times in the rest of the world. Figure 2 shows the timing of such trading differences. As shown in Table 1, at the time China releases the values of the outcomes (always during the morning and on average around 10 am), the European, the US, and Latin American stock markets are closed. Therefore, we are confident that this specific news was not part of the information set of agents abroad at the time their local stock markets were closing. Then, we can interpret the opening value of foreign stock returns as a response to this additional piece of news that appeared overnight. The identification assumption relies on the fact that the macro surprises $S_{CHI,t}$ reflect the non-systematic part of Chinese releases, and therefore, they are not correlated with $\varepsilon_{i,t}$.

Figure 2: Trading hour differences between countries



Notes: Timeline for the identification strategy. On average, China's statistics are officially published around 10 am local time. However, the release time can change between 9 and 11:30 am.

Under the aforementioned assumptions, the estimation of γ in (2) captures the causal effect of the information shock about China's cycle on the countries' stock prices. The identification approach also builds on the high-frequency design where we compare prices within this relatively short time window, where stock markets abroad were closed at the time the new information arrived.[4] Moreover, we expect the news shock to have an impact on the closing-opening variation only on the specific days when an actual release of information was made. In other words, we expect neither lagged nor forward values of the shock to have a significant impact on returns except for the publication day. We explicitly test for this below.

3.3 Effects on Open to Close Window

Using daily data around the macro surprises, we estimate equation (2) by OLS. Table 2 shows the results of such estimation with the news shock appearing right in between the closing-opening days. The first column shows the result for the surprise series constructed using all the macro variables, while the remaining columns use the subcategories of surprises. In the estimations, we focus only on the days with releases of Chinese macro indicators. According to the results, a macro news shock in China significantly affects stock returns in other economies. As documented in the first column, a positive, one standard deviation macro surprise in China brings an increase in stock returns of approximately 4.7 basis points. The magnitude of the response is, however, heterogeneous depending on the type of news that is released. News about the real activity (local and external macro variables) in China led to a rise in the response to 9.4 basis points. If we break this indicator into local and external activities, positive news about China's internal production or demand leads to a rise of almost 15 basis points in stock returns abroad, while good news about external variables

[4]This high-frequency identification strategy is currently very common to identify monetary policy surprises within very narrowly defined time windows, see Gertler and Karadi (2015), Nakamura and Steinsson (2018) and Jarociński and Karadi (2020). The strategy consists of studying the evolution of the price of future contracts within a thirty-minute window around a monetary policy announcement. This identification strategy has recently been extended to identify and construct other relevant measures, such as Oil price shocks, see Känzig (2021).

has a positive and significant impact of roughly 8 basis points.

Table 2: Effect of Chinese Macroeconomic Surprises on Stock Returns

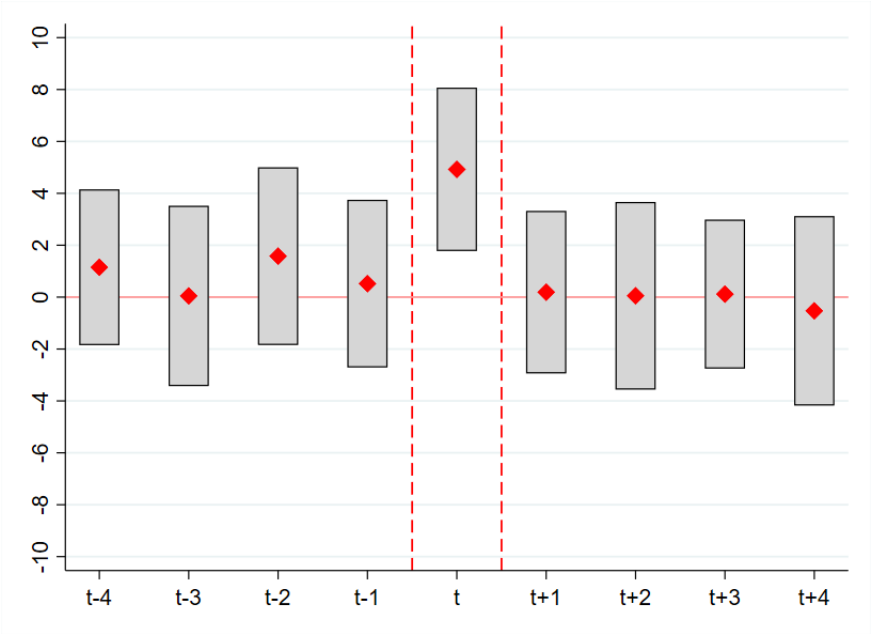
	Total	Real act.	Local act.	External act.	Prices	Financial	Surveys
$S^y_{Chi,t}$	4.67***	9.43***	14.86***	7.58***	-0.43	3.66	-0.25
	(1.61)	(2.33)	(3.81)	(2.68)	(3.71)	(3.26)	(2.77)
Obs.	11,816	6,076	2,856	3,332	3,360	3,360	1,680
R-squared	0.01	0.02	0.04	0.01	0.01	0.01	0.02

Notes: Estimated effect of different Chinese Macro Surprises (labeled in columns) on stock returns abroad using Equation 2. Each column denotes the effect of individual macro surprises on stock returns. Robust standard errors are in parentheses. In terms of notation, we label *** for p<0.01, ** for p<0.05 and * for p<0.1.

Surprises related to either aggregate price levels, financial variables, or Surveys in China do not significantly affect stock returns. Hence, it is not that any class of news in China brings effects abroad, but only the ones related to economic activity. This result is consistent with the findings of Corneli et al. (2023) for China surprises during the Covid period. Within the subclass of news about economic activity, local activity surprises arise as the most relevant ones in terms of the response of stock. We conjecture that this type of news affects prices the most as international markets anticipate possible spillover effects that a higher-than-expected activity in China will bring to the rest of the world. In the following Sections, we provide further evidence to support this interpretation.

Circling back to the effect of the overall measure of macro surprises, we provide further validation of the identification strategy given the timing of information. Figure 3 shows the coefficients when we estimate (2) but controlling for either leads or lags of the surprise series, $S^y_{Chi,t+h}$ with $h = -5, \ldots, 5$. As expected, the reaction is not significant on any day except for the actual day of the release when new information becomes available. The magnitude of the response is also in line with the findings of Boehm and Kroner (2023) for the US, using a thirty-minute window around the release of macro indicators.

Figure 3: Impact of Chinese Macro Surprise on Stock Returns (90% confidence intervals)



Notes: The figure shows the estimated parameter γ_i using equation (2) using the log (closing-opening) difference of Stock Returns in each of the countries in our sample. The t label means that the surprise is centered right in between the closing and opening days of the release. The other coefficients are computed by estimating the same specification but using up to four lags or forward values of the shock series.

Building on the heterogeneous effects of surprises classified within categories and to provide a broader comparison, we repeat the previous exercise but now using exclusively the stock return in China as the dependent variable. Due to the timing of the surprises, in this case, we focus on the difference between closing prices between the two consecutive days when the surprise appears. Table 3 presents the results. Interestingly, not only the magnitude of the responses is higher but also the type of surprises affect differently. While financial surprises matter for stock returns in the country (with a response of approximately 30 basis points), this is not true for indicators related to external activity. Aggregate prices, as in the previous specification, do not seem relevant as a driver of movements in the Chinese stock market. The relevance of news related to real activity in China remains a key driver of stock returns.

Table 3: Effect of Chinese Macro Surprises on Chinese Stock Returns

	Total	Real act.	Local act.	External act.	Prices	Financial	Surveys
$S^{y}_{Chi,t}$	28.30***	32.75**	51.61***	25.66	7.17	30.20**	4.94
	(10.48)	(13.08)	(18.25)	(15.95)	(15.73)	(12.84)	(12.59)
Obs.	362	217	102	119	120	120	60
R-squared	0.13	0.19	0.24	0.15	0.14	0.07	0.26

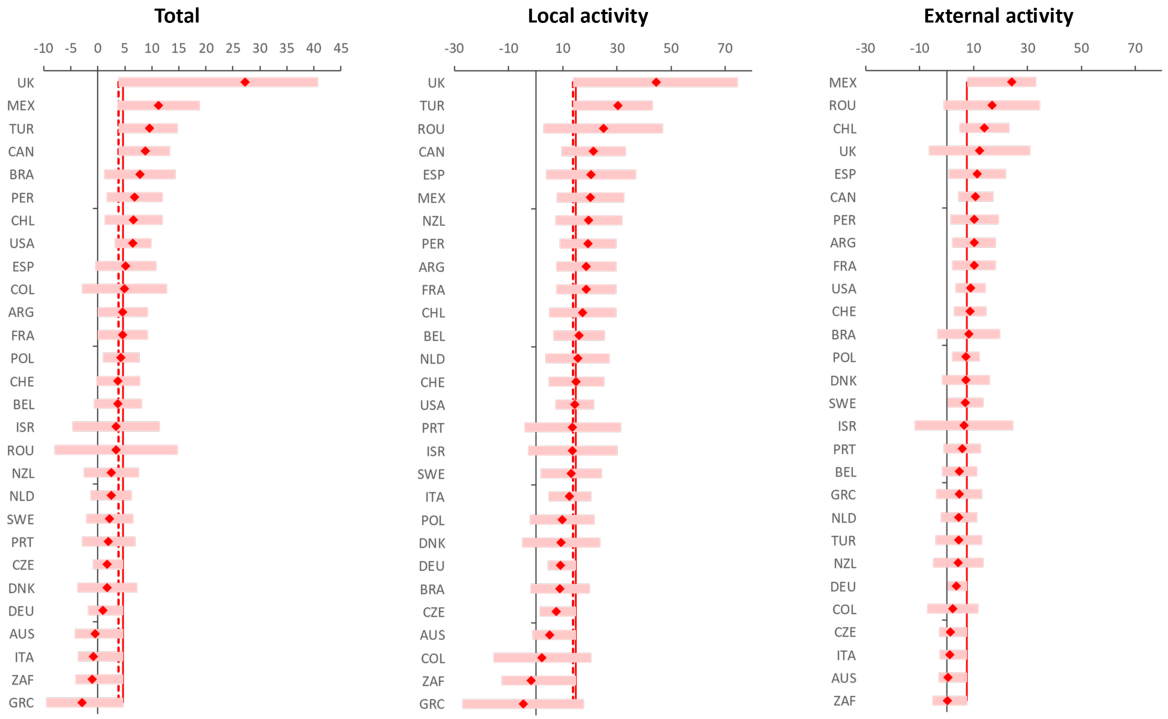
Notes: Estimated effect of different Chinese Macro Surprises (labeled in columns) on stock returns in China using Equation 2. Each column denotes the effect of individual macro surprises on local stock returns. Robust standard errors are in parentheses. In terms of notation, we label *** for p<0.01, ** for p<0.05 and * for p<0.1.

3.4 International Comovement of Asset Prices

One of the main features of the GFC is that it is characterized by "large common movements in asset prices, grows flows and leverage", (Rey, 2013). Miranda-Agrippino and Rey (2020) argue for the presence of co-movements in gross inflows across countries that are not aligned with countries' specific domestic conditions, while instead, they seem to arise from "center economies". Given the importance of China as a center economy, we can then test if the previous average estimates presented in Table 2 are synchronized across countries. Figure 4 shows the (closing - opening) response of stock returns to the China shock conditioning in each country of our sample. Following equation (2), the left panel of Figure 4 presents the estimated γ coefficient using the surprise series computed using all the indicators, while the middle and the right panel shows the results for the local and external activity subseries. Besides the point estimate, we add the confidence interval for each country and also the average effect denoted with a vertical continuous line.

Using the most aggregate measure, we notice that positive news in China leads to a positive and significant response of stock returns in only eleven out of the twenty-eight countries in our sample. While this result could suggest a negligible coordinated response

Figure 4: Impact of Chinese Macro Surprise on Stock Returns



Notes: The figure shows the estimated effect of Chinese Macro Surprises on stock returns for each country in our sample. We estimate Equation 2 for each country and plot the γ coefficient along with its 90% confidence intervals. The left panel corresponds to the estimation using the series of macro surprises constructed with all the indicators, while the middle and right panels use the local and external activity measures, respectively. The vertical red line in each graph shows the average effect across countries.

to China's macro news, and given our previous results, we acknowledge that this broad measure could mask countries' stock responses due to the bias induced by aggregating all sources of news. When we focus instead on local or external activity news shock, the expected coordinated response across countries arises more cleanly. News about the local activity in China leads to a significant and positive response in the stock market in 68% of the countries in our sample. This synchronized response is somehow more nuance for positive news about the external activity, bringing a positive reaction in only 42% of countries in the sample. Again, this evidence supports local activity macro surprises as the most relevant piece of information that is able to move stock prices abroad and in the same direction.

3.5 Chinese Macro Surprises and the VIX

Building on our empirical specification, we repeat our estimation but now focus on what it is known for being a close proxy for the GFC: the VIX index (Rey, 2013). As this implied volatility index is constructed using the prices of the S&P500 index options, we can also compute its closing-opening differences. Therefore, we again rely on equation (2), but now we use the log difference of the VIX index between consecutive closing and opening values as the dependent variable. The results are shown in Table 4. After a positive, one standard deviation, news in China, the volatility index significantly decreases by approximately 26%. The effect for the local and external activity shocks is greater and roughly similar between them, with a significant drop of 45% and 48%, respectively. As in the stock returns, the evidence does not support any effect on prices, financial or surveys news in China. Consistent with our identification strategy, Figure 5 shows that the effect on the VIX becomes non-significant except for the day when the actual release of information appeared.

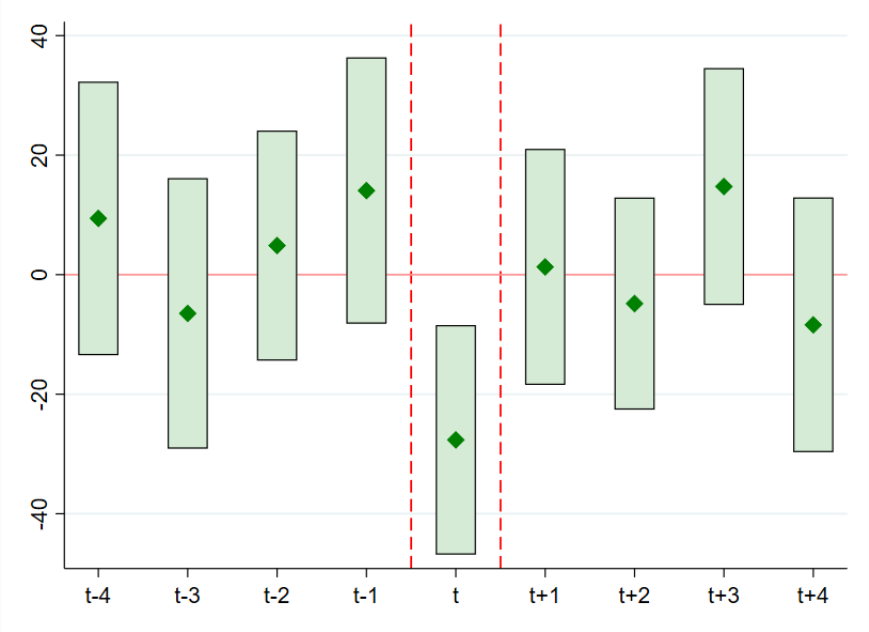
Table 4: Effect of Macro News in China on the VIX

	Total	Real act.	Local act.	External act.	Prices	Financial	Surveys
$S^{y}_{Chi,t}$	-26.01***	-47.54***	-44.93***	-48.63***	-7.85*	-6.23	-0.91
	(2.17)	(2.81)	(4.74)	(3.40)	(4.06)	(4.19)	(2.70)
Observations	11,501	5,980	2,805	3,286	3,300	3,289	1,565
R-squared	0.01	0.03	0.02	0.03	0.00	0.00	0.00

Notes: Estimated effect of different Chinese Macro Surprises (labeled in columns) on VIX using Equation 2. Each column denotes the effect of individual macro surprises on the log difference of the VIX index. Robust standard errors are in parentheses. In terms of notation, we label *** for p<0.01, ** for p<0.05 and * for p<0.1.

The results again support the fact that unexpected movements in big, centered, and highly connected economies, such as China, indeed bring global consequences through their implications on the CFG.

Figure 5: Impact of China's Macro Surprise on VIX (90% confidence intervals)



Notes: The figure shows the estimated parameter γ_i using equation (2) using the log (closing-opening) difference of the VIX index. The t label means that the surprise is centered right in between the closing and opening days of the release. The other coefficients are computed by estimating the same specification but using up to four lags or forward values of the shock series.

4 Dynamic Effects of Chinese Macro Surprises

The previous section analyzes the effects of the identified macroeconomic surprises on the same day of the announcement. We now extend the analysis to estimate the persistence of the macroeconomic surprises on different variables. We estimate the dynamic response of different variables through the change with respect to the previous day, using local projections (see, for example, Jordà, 2005). We do not rely on the closing-opening time window as before, mostly to explore the effect of the Macro surprises on additional variables where we cannot exploit the time frame as cleanly. Still, we focus on daily responses to assess the responses in high frequency.

4.1 Empirical Specification

We estimate the following panel local projection specification on a daily frequency:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{i,h} + \sum_{j=0}^{J} \beta_{j,h} * S^{k}_{CHI,t-j} + \sum_{j=2}^{5} \omega_{j,h} * y_{t-j} + \sum_{j=1}^{5} \psi_{j,h} * X_{t-j} + \epsilon_{i,j,t} \qquad (3)$$

where h $= 0, 1, \ldots, 20$ accounts for working days after the shock. The horizon goes up to 20 working days to capture the cumulative effects after approximately one month. The dependent variable $y_{i,t+h} - y_{i,t-1}$ denotes the cumulative difference of the variable of interest y between the day before the surprise $(t-1)$ and h days after $(t+h)$, where in both cases we consider the closing value for that day.

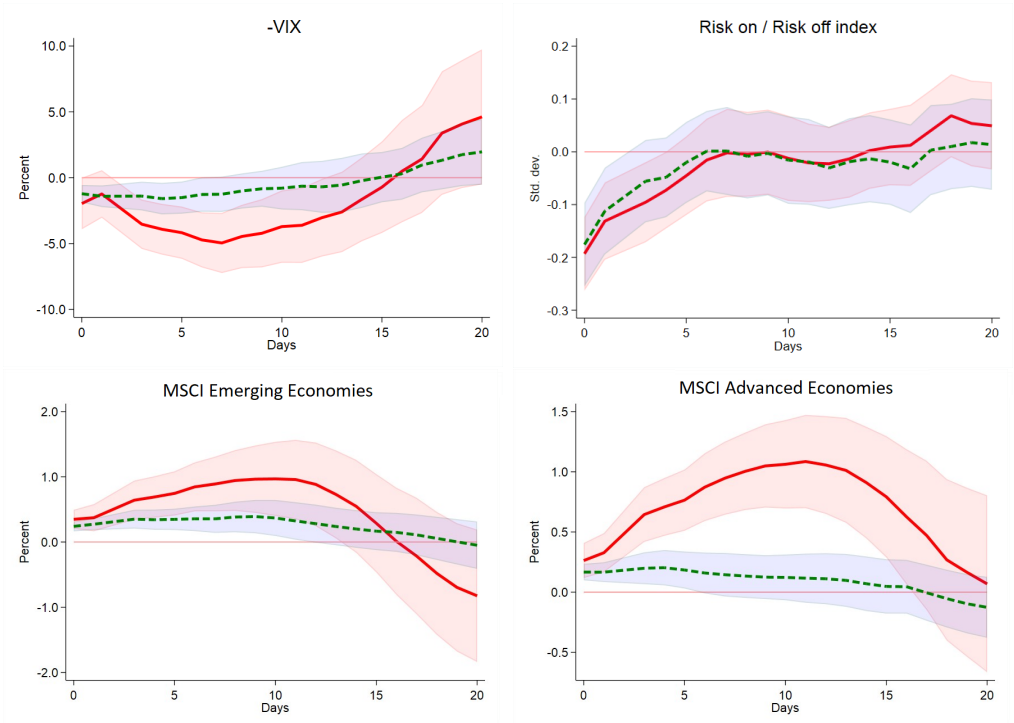
The vector X includes different financial variables as further controls, such as the VIX, the U.S. Dollar index, and commodity price indices, along with the series of macro surprises in the US. Given the aforementioned relevance of the local and the external activity news in China, we focus on these two types of macroeconomic surprises exclusively in equation (3). Hence, we estimate separate specifications using $S^{k}_{CHI,t-j}$ where $k = \{\text{local activity}, \text{external activity}\}$ surprises. The closing-closing time window that we use in this Section leads us to interpret the results cautiously. However, we conjecture that the estimated effect **upon impact** $(t = 0)$ for both Stock prices and the VIX is roughly similar relative to the previously estimated coefficients. Otherwise, it would indicate that there is a bias in the estimation due to the presence of other factors that are simultaneously and systematically hitting the economies during the same days when China published its macro variables.

4.2 Stock Prices and VIX

Considering the comovement across countries presented in Figure 4, we focus on the response of MSCI for Advanced and Emerging Economies along with the response and comovement at the country-specific level. We also compute the dynamic response for the VIX and the Risk off- Risk on (RORO) indices. Figure 6 plots the cumulative responses of these variables

to a one standard deviation surprise in local activity (red solid line) relative to an external activity surprise (green dashed line).

Figure 6: Impact of Chinese Macro Surprises on Risk and Stock Prices



Notes: Impulse Response Functions of CBOE Volatility Index (VIX), MSCI Advanced Economies, MSCI Emerging Economies and the Risk-off - Risk on index to a one standard deviation surprise in local activity (solid line in red) and external activity (dashed line in green). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

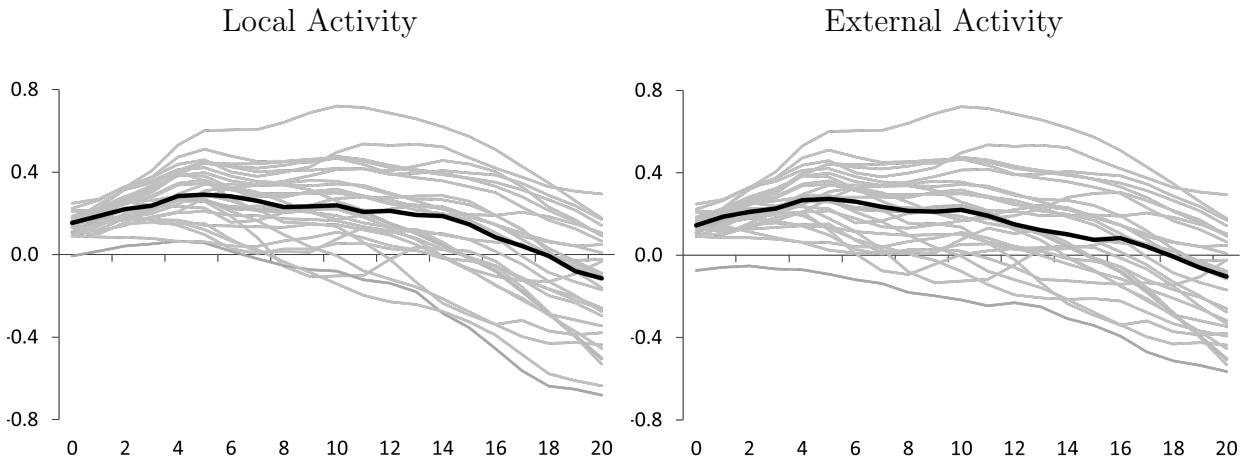
Consistent with the evidence for the closing-opening time window, and as shown by the left panel of Figure 6, the closing difference between consecutive days exhibits a drop in the uncertainty index in response to both types of macroeconomic surprises. Nevertheless, both the magnitude and the persistence of the response are much greater for the local activity surprise. While the response to a surprise in external activity dies out after six working days, the response to a surprise in local activity lasts up to approximately 12 days. The difference in the responses becomes more notorious when we look at stock markets in Advanced and Emerging economies, as shown by the middle and right panels of Figure 6. For advanced economics, a positive local activity surprise induces a persistent effect on the

stock market, which lasts approximately 18 days, with a peak of a 1% increase after 10 days. The response to the external shock is, on the other hand, more short-lived, with a positive effect that vanishes after 5 days. For Emerging economies, while the responses are similar, the differences are less extreme. The response of these two variables, together with the VIX, confirms that Chinese macroeconomic surprises induce a change in the risk-taking behavior of investors that affects asset prices worldwide. This is confirmed by the response of the RORO index, interpreted as a proxy for Global Risk Apettite.[5] As noticed, the index drops after the surprise shock reflecting risk-on behavior and therefore, a rebalancing of international portfolios towards riskier investments and countries as a consequence of the uprising conditions in China.

Circling back to the two groups of countries, and independently of the type of shock, the sign and size of the effects coincide even several days after the surprise, which again sheds light on the presence of a persistent comovement across economies after the same shock. To highlight this we compute the IRFs but at the country level, which is shown in Figure 7. The shock triggers a coordinated response, both in terms of magnitude and sign, across countries in our sample. Given the dispersion of responses, and abstracting from the confidence intervals, the surprise to the Chinese Local Activity seems to produce a higher level of comovement across countries, emerging as one of the key drivers in asset price volatility across the globe. In fact, the first principal component of all the individual IRFs to a local activity surprise explains 74% of the total variability, while the principal component to an external surprise accounts for 60% the variance.

[5]The RORO index aims to capture different natures of global risk while recognizing that risk comes from distinct variables and affects investors differently. The index incorporates risk signals from the assets market in the US and the Euro Area. The representation of risk appetite is based on four categories: advanced economy credit risk, equity market volatility, liquidity, and currency. See Chari et al. (2023) for further details about the construction of the index and applications.

Figure 7: Country level response of Chinese Macro surprises on stock prices



Note: Impulse Response Functions of the stock returns at the country level to one standard deviation surprise in local activity (left panel) and external activity (right panel). Each country is represented by a gray line while the solid black line marks the median response. The horizontal axis denotes days after the surprise. To ease the exposition we do not include the country-level confidence intervals.

The observed delayed response of stock prices, at country and aggregate levels, calls for further attention. In fact, the maximum level of the response is attained approximately 10 days after the surprise appears. This delayed effect is consistent with the findings of Corneli et al. (2023) for Chinese surprises during the Covid period. As argued by Duffie (2010), different factors can help explain the observed dynamics of prices after shocks. First, the slowness in capital movements could be driven by imperfect attention. Search costs, information delays, or investors' inattentiveness to these new pieces of information can make the stock reactions more sluggish. Second, institutional impediments, such as regulations or trading frictions can also contribute to the slow-moving response.[6]

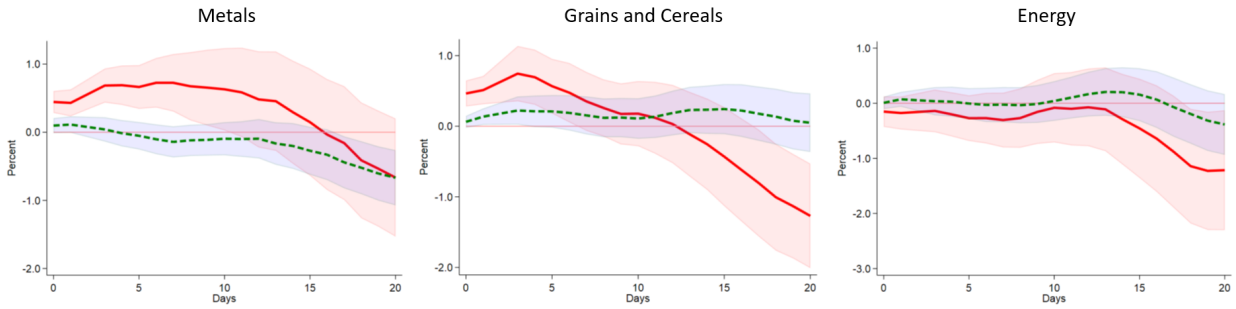
4.3 Commodity Prices and Exchange Rates

Given the relevance of the country, Chinese macroeconomic surprises may also affect exchange rates and commodity prices. These two variables are traded outside the time windows

[6]In fact, using examples of supply or demand shocks Duffie (2010) studies the slow movement of asset price dynamics after such disturbances. He argues that a model with "inattentive investors" can help to reconcile the price dynamics when capital moves slowly.

considered in Section 3 and are important prices that receive substantial attention. We therefore focus on the response of different commodity prices. Figure 8 displays the impulse response functions of these prices to a one standard deviation macroeconomic surprise in China.

Figure 8: IRF of Commodities prices to a Chinese Macroeconomic Surprise



Note: Impulse Response Functions of the price of Metals (left panel), Grains and Cereals (middle panel) and Energy (right panel) to a one standard deviation surprise in local activity (solid line in red) and external activity (dashed line in green). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

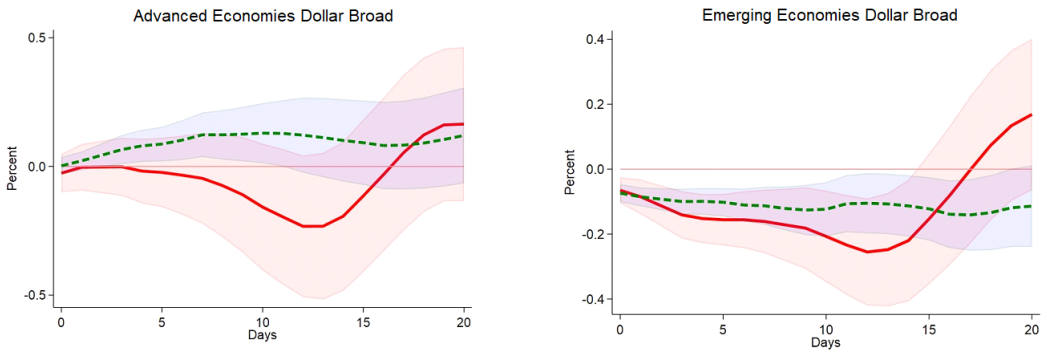
Energy and metal prices increased by around 0.2 percent in response to the release of a Chinese macroeconomic surprise, and the effects lasted for around ten working days. These effects are quantitatively similar to the response of stock prices and can be linked with the strong role of China in the demand for these goods. Interestingly, Chinese macroeconomic surprises do not induce a significant effect on Energy prices. The response may be masking the reaction of demand and supply of energy in response to the news. It may be also explained by the lower importance of China in the world demand for these inputs relative to the demand for the other types of commodities.[7]

Commodity price responses are tightly linked with exchange rates. For example, Chen et al. (2010) shows that exchange rates of commodity exporters forecast movements in commodity prices. We then focus on the response of exchange rates to the Chinese macroeconomic surprises. The US Dollar index measures the relative nominal value of the US dollar to other

[7]China's share of global demand for metals—such as iron ore, copper, and nickel—has increased from about 3 percent in the mid-1990s to about 40 in 2015.

world currencies. Figure 9 shows the dynamic response of the trade-weighted US dollar index, the US Dollar Broad, in both Advanced and Emerging economies to a one standard deviation macroeconomic surprise in China.

Figure 9: Impact of Chinese Macro Surprises on the US Dollar Broad Index



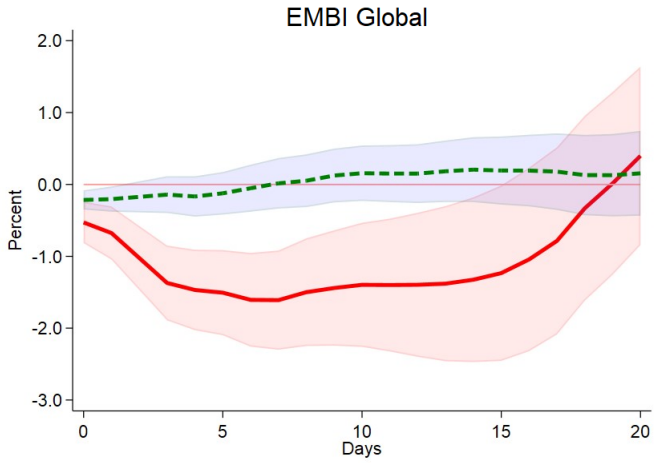
Notes: Impulse Response Functions of the Dollar Brado Index in Advanced (left panel) and Emerging (right panel) Economies to a one standard deviation surprise in local activity (solid line in red) and external activity (dashed line in green). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

Clearly, there are some marked differences between groups of economies. While the response of the dollar index after a surprise in economic activity in China is non-significant for advanced economies the effect is strongly negative and persistent across Emerging economies. Good news in China about real activity leads the US Dollar to depreciate relative to currencies of Emerging economies, whose exports are on average more commodity intensive. These differences become more notorious when we look instead at the response of the two groups of countries to an external activity shock news, the green dashed line in Figure 9. Positive trade news in China brings a drop in the index (i.e. a depreciation of the US Dollar) in Emerging economies while causing a rise (i.e. an appreciation of the US Dollar) across advanced economies. Being the US dollar the international trade currency, positive external surprises in China may reflect that the world economy is performing better than expected. As dicussed, such a positive sentiment coincides with the drop in the RORO index shown in Figure 6, which leads agents to undertake more risky investments inducing an appreciation of Emerging currencies relative to advanced economies.

4.4 Credit Markets

Building on previous results, we focus on credit markets for Emerging economies which display stronger fluctuations. Initially, we focus on the response of the JP Morgan Emerging Market Bond Index, the EMBI Global. This index is a weighted average of sovereign bonds spreads issued in US Dollar relative to US Treasuries of the same maturity. First we focus on the EMBI Global index, which is a weighted average of individual EMBIs. Figure 10 displays the estimated impulse response to a one standard deviation Chinese macroeconomic surprise.

Figure 10: Impact of China's Macro surprises on EMBI



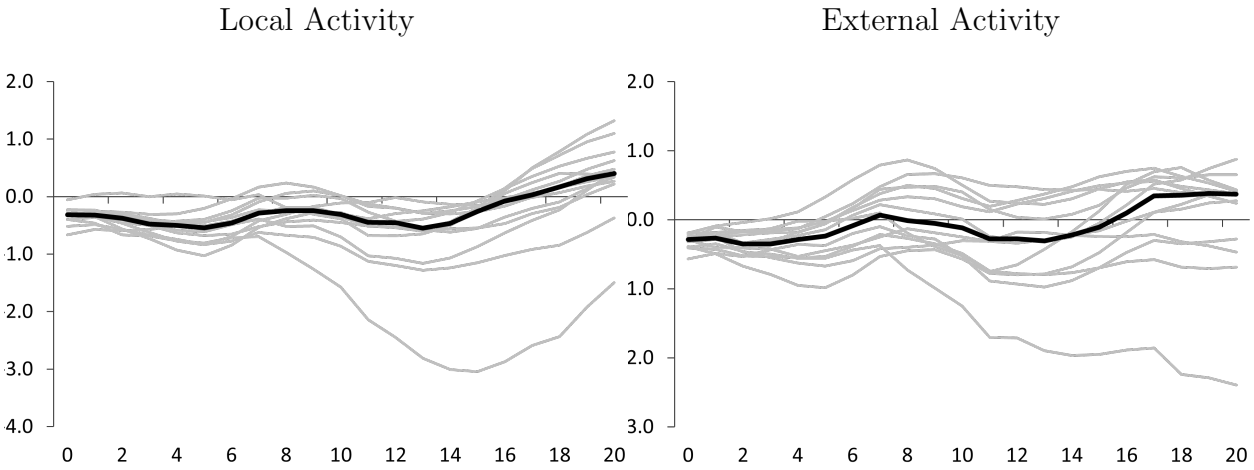
Notes: Impulse Response Functions of the EMBI to a one standard deviation surprise in local activity (solid line in red) and external activity (dashed line in green). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

Positive surprises in local activity induce a persistent decline in sovereign spread of around one percentage point in EMBI Global. This effect last lasts approximately 15 days. Alternatively, positive surprises in external activity induce a milder and transitory effect on the EMBI Global. The EMBI reflects the probability of default of Emerging Economies and also the risk premia associated to these bonds. Thus, this differential response to both types of surprises can be linked with the responses of commodity prices and with the response of the VIX, which is a proxy for global risk. Existing evidence has documented that interest rates in Emerging economies are correlated with commodity prices (see, for example, Fernández

et al., 2018). Considering that local activity surprises induce a stronger effect in commodity prices exported by Emerging economies, this may contribute to explain why the response to external activity surprises is milder. A surprise in local economic activity also induces a stronger effect on the VIX. This stronger effect may also contribute to explain the stronger response of EMBI to a surprise in economic activity.

As the Global Financial Cycle is characterized by a comovement of asset price and credit worlwide, we study the EMBI responses but at the country level. Figure 11 shows that the Chinese surprise also brings a coordinated response (both in sign and magnitude) across the countries in our sample for the EMBI indices. While the first principal component of the impulse responses to a surprise in local activity accounts for 67% of the total variability, the principal component of the responses to an external surprise explains 55%. Thus, we also observe a higher comovement due to local activity relative to external activity, consistent with the stronger comovement also observed in stock prices. This differences in the comovement can be also linked to the stronger change in global (common) conditions like commodity prices and global risk.

Figure 11: Country level responses of EMBI to Chinese Macro surprises

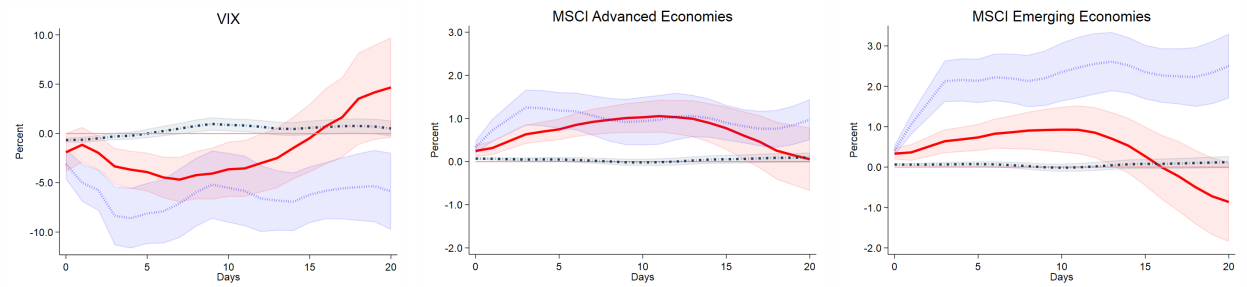


Note: Impulse Response Functions of the EMBI at the country level to a one standard deviation surprise in local activity (left panel) and external activity (right panel). Each country is represented by a gray line while the solid black line marks the median response. The horizontal axis denotes days after the surprise. To ease the exposition we do not include the country-level confidence intervals.

5 Relative Relevance of Chinese Macro Surprises

Having supported that Chinese macro surprises move asset prices worldwide, we now turn to compare its impact relative to other key surprise variables documented by the literature. Miranda-Agrippino and Rey (2020) and Boehm and Kroner (2023) show that US monetary policy and US economic news, respectively, are drivers of the GFC. To compare the responses to these types of shocks, we build on the previous Section and re-estimate equation (3), but now for each of these shocks separately. We use the series of US monetary policy surprises computed by Nakamura and Steinsson (2018) and we compute the series of US economic news following Boehm and Kroner (2023). The results for different variables are shown below. In each Figure, the light blue dotted line represents the response of the different variables to a MP surprise in the US. The blue dashed line is the response to the Macro news in the US, while the red solid line shows the response to our series of Activity surprises in China.[8] The results for the VIX and stock prices both in Advanced and Emerging economies are shown in Figure 12.

Figure 12: IRF of VIX and Stock Prices to Different Surprises



Notes: Impulse Response Functions of the Stock Prices in Advanced Economies (left panel) and Emerging Economies (right panel)to a one standard deviation surprise in local activity (solid line in red), US monetary policy shocks (blue dotted lines), and US economic news (green dashed lines). The responses are computed using the estimated equation 3. The horizontal axis denotes the days after the surprise. Shaded areas denote 90% confidence intervals.

As noted, US monetary policy shocks induce the largest and most persistent response of the VIX and stock prices abroad. The effects are consistently significant throughout

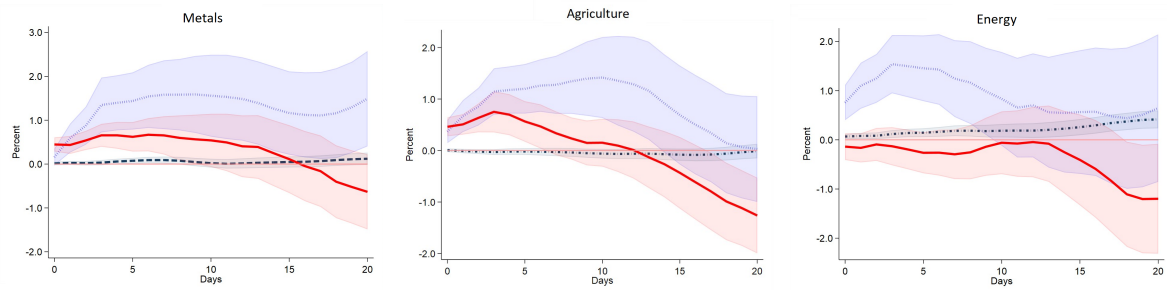
[8]For the Monetary policy shock, we change the sign of the response so the response is interpreted as the effect of a one standard deviation unanticipated reduction in the monetary policy rate.

the estimated 20 working days horizon. The relative importance of monetary policy in the US is consistent with Miranda-Agrippino and Rey (2020) and Miranda-Agrippino and Rey (2022), who argue that changes in this variable induce comovements in international financial variables. The response to the US monetary policy shock is consistently higher for Emerging economies, with an average accumulated response of approximately 2.5 percent relative to the average 1 percent reaction for advanced economies. While good macro news in the US brings a positive and significant reaction in both groups of economies neither the magnitude of the response nor its persistence is as large as the effect of positive surprises in China about the real economy. While the effect of US news washes away after three and five working days for Advanced and Emerging economies respectively, the effect of the Chinese surprises lasts for roughly 15 days in both groups of countries. This reinforces the fact that global markets interpret the Chinese surprise on local activity as positive news about global economic activity.

Another important effect of Chinese macro surprises, that we document, is on some commodity prices. Figure 13 displays the responses of commodity prices to the three surprises. Unlike the previous cases where the effects of US monetary policy surprises were significantly larger and more persistent, Chinese macro surprises induce a comparable effect to US monetary policy surprises for grains and cereals (middle panel) and also for metals (left panel). The relative importance of Chinese macro surprises in driving the responses of commodities, along with the previous evidence on the dollar broad for EMEs, can be linked to the second fact of gross capital flows identified by Miranda-Agrippino and Rey (2022). In particular, they show that Chinese monetary policy is a driver of the *Global Trade and Financial Cycle*. The importance of Chinese macro surprises in driving commodity prices complements their results on Chinese monetary policy. The *Global Trade and Financial Cycle* is tightly linked with capital flows (Miranda-Agrippino and Rey, 2022), affecting credit markets in Emerging economies (Fernandez and Vicondoa, 2023).

The differences between the two groups of countries become more stringent when we

Figure 13: IRF of Commodity Prices to Different Surprises



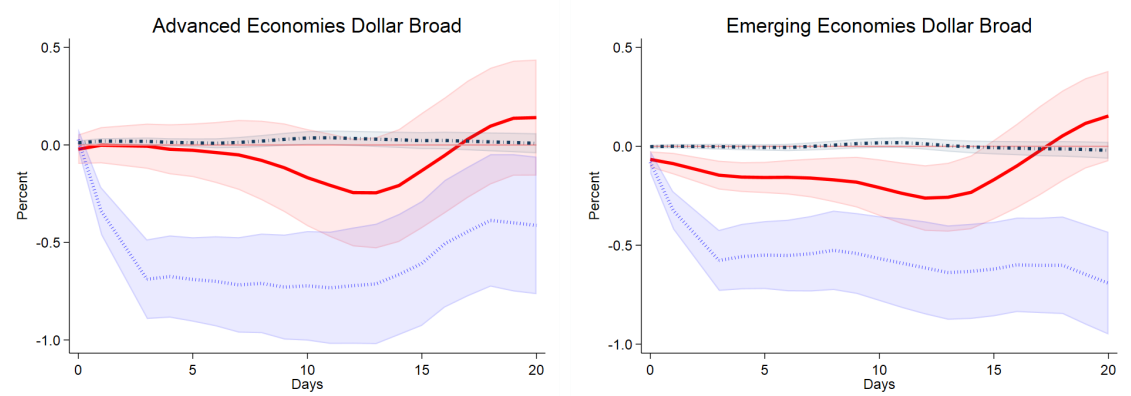
Note: Impulse Response Functions of the Metals (left panel), Grains and Cereals (middle panel), and Energy prices (right panel) to a one standard deviation surprise in local activity (solid line in red), US monetary policy shocks (blue dotted lines), and US economic news (green dashed lines). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

study the response of the Dollar Broad index. This is shown in Figure 14. As expected, an unexpected drop in the US monetary policy rate appreciates the dollar broad index due to the mismatch between the US and global rates. The appreciation and persistence of the effect are also similar across both groups of countries. Interestingly, the effects of the two macro surprise series are very different. While the effect of US macro news is negligible for Advanced and Emerging economies, a positive macro surprise in China appreciates the dollar only for Emerging economies. We conjecture that this effect is driven by the relative importance of commodity exports from Emerging economies to China, particularly in metals and grains and cereals, and also by the higher share of commodities in the export bundle of these economies. Emerging economies such as South Korea, Vietnam, Russia, Brazil, Saudi Arabia, Indonesia, and Chile are among the top countries from which China imports goods. A higher-than-expected demand in China can be interpreted as a potential increase in imports from these countries, which appreciate the local currency relative to the US dollar. Additionally, exchange rates are tightly linked with commodity prices for commodity exporters (see, for example, Chen et al., 2010).

Fluctuations in commodity prices and global risk may be reflected in credit spreads, particularly in EMEs. Figure 15 displays the response of the EMBI and the Risk on/Risk off index to the three surprises. The responses of EMBI and the RoRo index to US

monetary policy and Chinese macro surprises are fairly comparable. Both surprises induce a decline in the RoRo index which implies that investors are willing to take more risk, in line with the previous response of the VIX. This risk on effect together with the strong increase in commodity prices in response to US monetary policy and Chinese macro surprises explains the decline in sovereign spreads, proxied by EMBI. While Chinese macro surprises induce similar effects on risk-taking and on credit markets relative to the US monetary policy surprises, US macroeconomic news does not induce a significant effect on risk-taking behavior.

Figure 14: IRF of the US Dollar Broad Index to Different Surprises

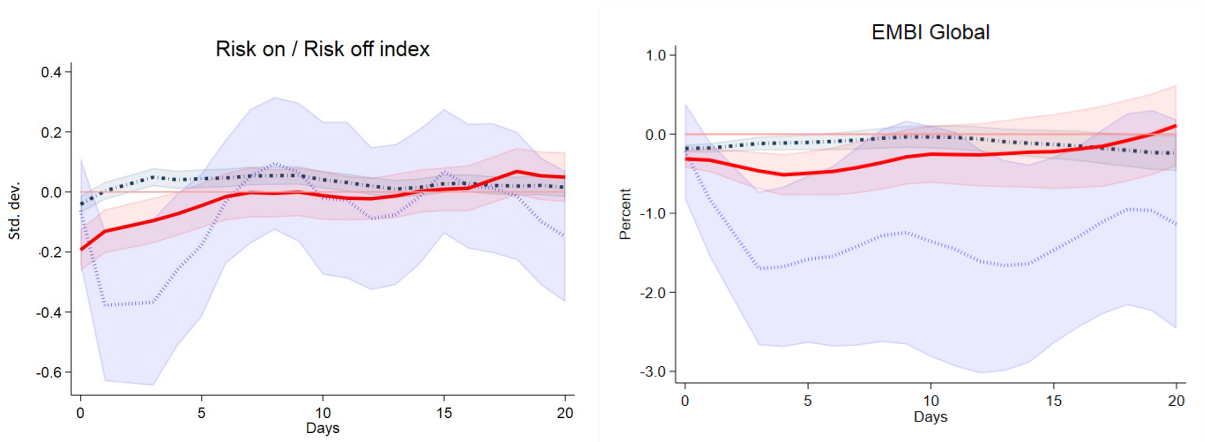


Note: Impulse Response Functions of the US Dollar Broad Index in Advanced Economies (left panel) and in Emerging Economies (right panel) to a one standard deviation surprise in local activity (solid line in red), US monetary policy shocks (blue dotted lines), and US economic news (green dashed lines). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

To summarize the comparison between the different types of surprises, we compute the conditional variance of each of our variables explained by the Chinese Macro surprise relative to the conditional variance of the same variable but conditioning on the US monetary policy shock. To perform this, we compute the squared cumulative impulse response to each shock at the 20th horizon. By doing so, we can assess the relative importance of each shock after approximately one month. The results for these ratios are shown in Table 5.

As noted, relative to the US Monetary Policy Shock the ratios of conditional variances are always less than one, meaning that a higher share of the overall variance in the responses is

Figure 15: IRF of RoRo index and EMBI to Different Surprises



Notes: Impulse Response Functions of the Risk off - Risk on index to a one standard (left panel) and the EMBI Global (right panel) to a one standard deviation surprise in local activity (solid line in red), US monetary policy shocks (blue dotted lines), and US economic news (green dashed lines). The responses are computed using the estimated equation 3. Horizontal axis denotes days after the surprise. Shaded areas denote 90% confidence intervals.

Table 5: Relative Importance of Chinese Macroeconomic Surprises

	Relative to US MP
VIX	0.26
MSCI-Advanced	0.59
MSCI-Emerging	0.10
RoRo Index	0.19
Grains and Cereals	0.37
Metals	0.17
Energy	0.23
Dollar Broad - Advanced	0.04
Dollar Broad - Emerging	0.09
EMBI	0.75

Note. Conditional Variance of each variable explained by the Chinese macro surprise relative to the conditional variance of the same variable explained by US monetary policy surprises (left column). The variance is calculated over 20 days ahead, which corresponds approximately to one month.

explained by the US shock. However, as discussed above, the variability of the EMBI, stock returns in advanced economies, and Grains and Cereleas coming from the Chinese surprise shock seems as relevant as the variability coming from the US FED. This again, reinforces the importance of this country as one of the key drivers of the CFG.

6 Conclusions

We study the relevance of Macro surprises in China in affecting financial indicators in other countries. We construct a novel series of Macro surprises in China relying on the forecast error of different variables, computed around the publication date of such variables. Through the prediction error, we aim to capture the non-systematic component of releases in China. Given the different closing-opening time zones in stock markets, we show that Macro surprises in China bring significant effects on both the VIX index and stock returns in different countries. In fact, a positive surprise in China about either real macro or trade indicators increases stock returns along with bringing a significant drop in global uncertainty. The dynamic responses support these findings while highlighting the significant responses of commodity prices, the US dollar, and credit markets.

Through our novel measure of macro surprises in China, we study the relative importance of our measure with respect to other surprise series that have been proven relevant to explaining movements in international stock prices. Consistent with existing literature, we show that Monetary surprises in the US arise as the factor that brings the greatest reaction in different variables abroad. However, we argue that our measure arises as the second most important factor in causing such movements, especially by affecting variables in Emerging economies.

Our results provide further evidence of how surprises coming from large and important economies can indeed propagate and transmit to other economies through financial markets. This is important as it suggests an additional mechanism by which non-US shocks originating abroad can bring consequences on local prices and could help policy-makers anticipate and react promptly to such unexpected forces. Moreover, and as our results suggest, such surprises bring non-negligible reactions across different economies, which also challenges the policy reaction as it needs to take into account the possible amplification effects of such disturbances. We see this paper as a step forward towards getting a better understanding of the sources of macro shocks that can bring significant worldwide consequences.

References

Barcelona, W., D. Cascaldi-Garcia, J. Hoek, and E. Van Leemput (2022): "What Happens in China Does not Stay in China," International Finance Discussion Papers 1360, Board of Governors of the Federal Reserve System.

Boehm, C. E. and T. N. Kroner (2023): "The US, Economic News, and the Global Financial Cycle," Working Papers 30994, National Bureau of Economic Research.

Boyd, J. H., J. Hu, and R. Jagannathan (2005): "The stock market's reaction to unemployment news: Why bad news is usually good for stocks," *The Journal of Finance*, 60, 649–672.

Chari, A., K. D. Stedman, and C. Lundblad (2023): "Risk-On Risk-Off: A Multifaceted Approach to Measuring Global Investor Risk Aversion," Tech. rep., National Bureau of Economic Research.

Chen, Y.-C., K. Rogoff, and B. Rossi (2010): "Can Exchange Rates Forecast Commodity Prices?" *Quarterly Journal of Economics*, 125, 1145–1194, © Copyright Elsevier Science. Posted with permission of Elsevier Science. One copy may be printed for individual use only.

Corneli, F., F. Ferriani, and A. Gazzani (2023): "Macroeconomic news, the financial cycle and the commodity cycle: The Chinese footprint," *Economics Letters*, 231, 111269.

Duffie, D. (2010): "Presidential address: Asset price dynamics with slow-moving capital," *The Journal of finance*, 65, 1237–1267.

Faust, J., J. H. Rogers, S.-Y. B. Wang, and J. H. Wright (2007): "The high-frequency response of exchange rates and interest rates to macroeconomic announcements," *Journal of Monetary Economics*, 54, 1051–1068.

Fernández, A., A. González, and D. Rodriguez (2018): "Sharing a ride on the commodities roller coaster: Common factors in business cycles of emerging economies," *Journal of International Economics*, 111, 99–121.

Fernandez, A. and A. Vicondoa (2023): "Capital Flows to Emerging Markets: Disentangling Quantities from Prices," Tech. rep.

Gertler, M. and P. Karadi (2015): "Monetary policy surprises, credit costs, and economic activity," *American Economic Journal: Macroeconomics*, 7, 44–76.

Jarociński, M. and P. Karadi (2020): "Deconstructing monetary policy surprises—the role of information shocks," *American Economic Journal: Macroeconomics*, 12, 1–43.

Jordà, (2005): "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 95, 161–182.

Känzig, D. R. (2021): "The macroeconomic effects of oil supply news: Evidence from OPEC announcements," *American Economic Review*, 111, 1092–1125.

Miranda-Agrippino, S., T. Nenova, and H. Rey (2020): "Global Footprints of Monetary Policies," Discussion Paper n. 2020-04 2004, Centre for Macroeconomics.

Miranda-Agrippino, S. and H. Rey (2020): "US monetary policy and the global financial cycle," *The Review of Economic Studies*, 87, 2754–2776.

——— (2021): "The Global Financial Cycle," Working Paper 29327, National Bureau of Economic Research.

——— (2022): "Chapter 1 - The Global Financial CycleWe are grateful to the editors, to Şebnem Kalemli-Özcan and Livio Stracca (discussants) and to other participants at the International Macroeconomic Handbook Conference for helpful comments and discussions. Rey is grateful to the ERC for funding (Advanced Grant 695722)." in *Handbook of*

International Economics: International Macroeconomics, Volume 6, ed. by G. Gopinath, E. Helpman, and K. Rogoff, Elsevier, vol. 6 of *Handbook of International Economics*, 1–43.

Nakamura, E. and J. Steinsson (2018): "High-frequency identification of monetary non-neutrality: the information effect," *The Quarterly Journal of Economics*, 133, 1283–1330.

Rey, H. (2013): "Dilemma not trilemma: the global cycle and monetary policy independence," *Proceedings - Economic Policy Symposium - Jackson Hole*.

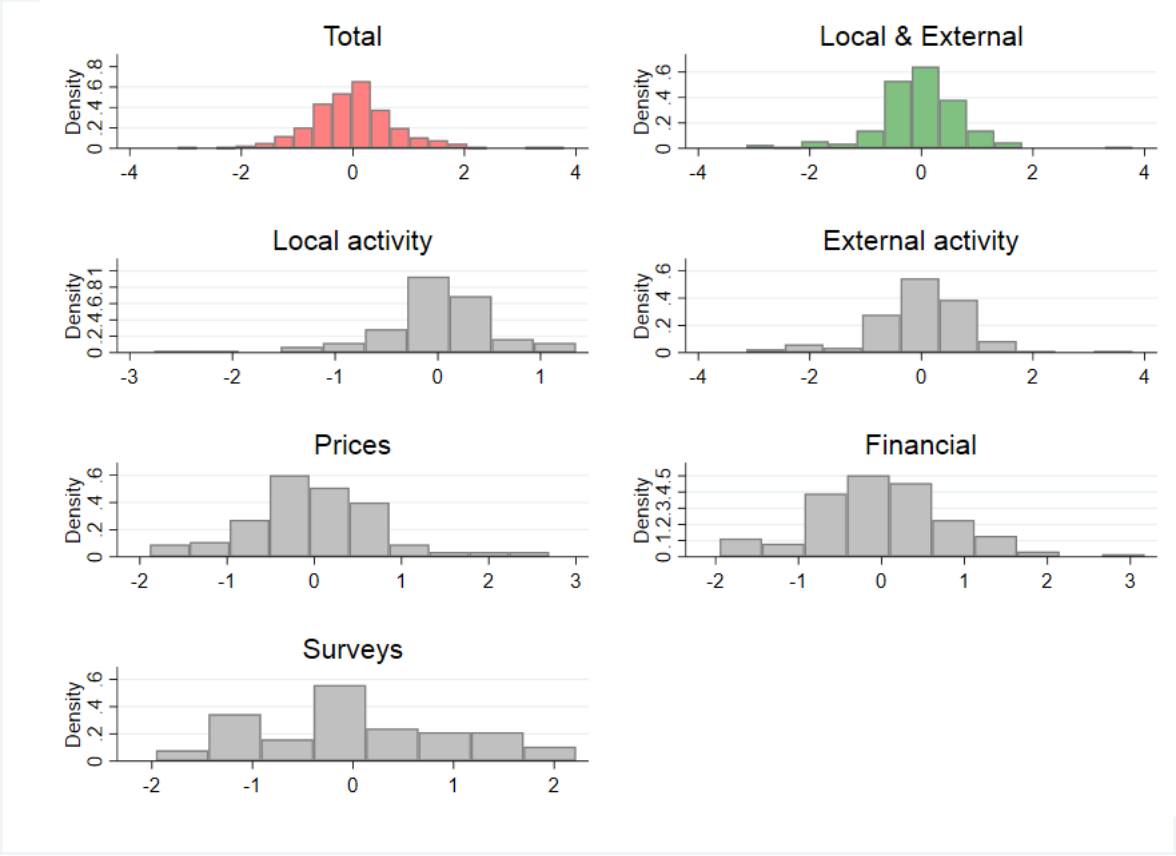
Sznajderska, A. and M. Kapuściński (2020): "Macroeconomic spillover effects of the Chinese economy," *Review of International Economics*, 28, 992–1019.

A Data Appendix

A.1 Chinese Macroeconomic Surprises

In this Section, we show the distribution of each subseries of surprises for China. This is present in Figure A.1 below. In all cases, and particularly for the local and external activity series, the shock distribution resembles a normal distribution where positive and negative surprises are equally distributed.

Figure A.1: Time Series of macro surprises in China



Notes: The figure shows the series of macroeconomic surprises constructed for China. The series accounts for the linear combination of individual surprises. The series are adjusted so that a positive value means that the macro variable had a better-than-expected performance and the opposite for negative values.

A.2 Sample

Table A.1 displays all the countries used in our empirical exercises. As noticed, the countries cover both Advanced and Emerging economies. In all cases, we collect stock price data to construct the opening-closing specification

Table A.1: Countries included in the Sample

Country	Ticker	Country	Ticker
Argentina	ARG	Mexico	MEX
Austria	AUT	Netherlands	NLD
Belgium	BEL	New Zealand	NZL
Brazil	BRA	Peru	PER
Canada	CAN	Poland	POL
Chile	CHL	Portugal	PRT
Colombia	COL	Romania	ROU
Czechia	CZE	South Africa	ZAF
Denmark	DNK	Spain	ESP
France	FRA	Sweden	SWE
Germany	DEU	Switzerland	CHE
Greece	GRC	Turkey	TUR
Israel	ISR	United Kingdom	GBR
Italy	ITA	USA	USA

Notes: The table shows the list of countries included in the empirical analysis. All the country-specific data was collected from Investing.

B Additional Results

B.1 Sign and Magnitude Interactions - Results

Table A.2: Effects of surprises on stock returns depending on the sign of news

	Total	Real act.	Local act.	External act.	Prices	Financial	Surveys
$S_{CHI,t}$ * Positive	3.36	7.59	11.19	5.33	2.94	6.06	-0.32
	(-2.72)	(-4.62)	(-10.25)	(-5.51)	(-5.33)	(-6.41)	(-5.58)
$S_{CHI,t}$ * Negative	-6.17*	-10.75***	-17.12***	-9.28*	4.54	-1.05	0.16
	(-3.23)	(-3.86)	(-4.28)	(-4.95)	(-7.39)	(-5.97)	(-5.99)
Observations	11,816	6,076	2,856	3,332	3,360	3,360	1,680
R-squared	0.01	0.02	0.04	0.01	0.01	0.01	0.02

Table A.3: Effects of surprises on stock returns depending on the magnitude of news

	Total	Real act.	Local act.	External act.	Prices	Financial	Surveys
$S_{CHI,t}$ * High	5.54*	11.66***	9.09	7.23	-16.51**	5.29	2.29
	(-3.22)	(-4.47)	(-9.06)	(-6.1)	(-7.27)	(-5.46)	(-3.62)
$S_{CHI,t}$ * Average	4.17**	8.20***	17.00***	7.75***	8.72***	2.42	-4.32
	(-1.72)	(-2.56)	(-3.87)	(-2.69)	(-2.42)	(-3.93)	(-3.79)
Observations	11,816	6,076	2,856	3,332	3,360	3,360	1,680
R-squared	0.01	0.02	0.04	0.01	0.03	0.01	0.03