

# Questioni di Economia e Finanza

(Occasional Papers)

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#### MACROECONOMIC NEWS, THE FINANCIAL CYCLE AND THE COMMODITY CYCLE: THE CHINESE FOOTPRINT

by Flavia Corneli\* Fabrizio Ferriani\* and Andrea Gazzani\*

#### Abstract

China has become a major player in the global economy. The analysis, based on a new and original database of Chinese macroeconomic surprises, shows the significant impact that these surprises have on equity markets worldwide, as well as on commodity prices, on the US nominal effective exchange rate and on the VIX Index. Finally, we establish that positive Chinese macroeconomic news is associated with the expansion of global trade and industrial production. Overall, we provide evidence of the growing role of the Chinese economy as a driving force for both the real and the financial global cycle.

#### JEL Classification: E44, F21, F40, G15.

**Keywords**: global financial cycle, China, macroeconomic announcements, international spillovers, commodity prices. **DOI**: 10.32057/0.QEF.2023.0772

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<sup>\*</sup> Bank of Italy, Directorate General for Economics, Statistics and Research.

# **1** Introduction<sup>1</sup>

Chinese economic developments receive broad attention as China is the second largest economy both in terms of GDP, with approximately 18.5% of world GDP at the end of 2022, and equity market, with roughly 10.5% of global market capitalization. Moreover, China has become the largest importer of several commodities (Dieppe et al., 2018). While a broad consensus has emerged that Chinese developments reverberate through the global economy, how to best gauge the spillovers from China to the rest of the world remains an open question also in relation to the non-trivial usability of Chinese macroeconomic data.

First, the mechanisms governing the Chinese economy and its institutional settings are very different from the ones of other economies like the US (e.g. Clayton et al., 2022, Brunnermeier et al., 2022, Bailliu et al., 2021, Barcelona et al., 2022); as Chinese authorities pursue policy targets through a range of fiscal and monetary instruments, this can make it difficult to precisely identify the specific policy tools being employed. Second, official Chinese statistics, in particular GDP, can be misleading. To overcome these issues Fernald et al. (2021) and Clark et al. (2017) propose alternative measures of the Chinese economic activity (see also Bailliu et al., 2019 for labor market conditions).

Due to these limitations, the literature has generally struggled to evaluate the international spillovers from the Chinese economy. Notable exceptions are Miranda-Agrippino et al. (2020), Sznajderska and Kapuściński (2020) and Barcelona et al. (2022). Miranda-Agrippino et al. (2020) show that the People's Bank of China's decisions propagate across borders through the real economy, primarily affecting international trade and commodity prices. Sznajderska and Kapuściński (2020) show that changes in the Chinese real GDP directly affect Asian trading partners. Barcelona et al. (2022) analyze the impact of the Chinese authorities' credit impulse to the domestic economy and the rest of the world through the real channel, in particular affecting world trade, industrial

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production and commodity prices. They find that the same credit impulse spills over to the financial system influencing primarily global credit and the global financial cycle as defined by Rey (2013).

In the present study we consider an alternative approach to gauge Chinese spillovers to the rest of the world; our methodology overcomes the non-trivial difficulties that researchers encounter when including Chinese macroeconomic data directly in their econometric analyses. We assess how Chinese real spillovers reverberate into global financial markets by exploiting measures of macroeconomic surprises at the daily frequency. We consider the ability of Chinese macro news to affect other countries' equity, commodity markets, the US dollar nominal effective exchange rate (US NEER) and the VIX considered as proxies of the global risk aversion (see Rey, 2013, Bruno et al., 2022 and Obstfeld and Zhou, 2023). We then replicate the analysis, cumulating our macroeconomic surprises over time to check the persistence of their impact at weekly and monthly frequency. Finally, we assess, by means of a Vector Autoregressive model (VAR) if these surprises are directly linked to world trade and global industrial production.

We consider in particular the release of a large set of Chinese macro news (including indicators of credit, inflation, production, consumption, and the external sector) in the period 2018 through the end of 2022, for which the provider Refinitiv collects the estimates of professional forecasters. We therefore build on the framework of Boehm and Kroner (2023) for the US to compute indicators of macroeconomic surprises that can be used to causally investigate the impact of the Chinese economy on international financial markets. The identification of macroeconomic news that we employ is robust to the critique on the use and interpretation of Chinese data as we remain agnostic on the impulse that generates the released data. We postulate, following Faust et al. (2007) and Boehm and Kroner (2023), that what moves markets and transmits across borders is the variation in the expectation about the state of the economy made by forecasters once they update their large set of information.

We document that domestic macro news affects a wide range of commodity indices. For instance, positive surprises in the industrial production or the manufacturing PMI, signaling an

expansion larger than previously expected, positively affect the commodity markets. We therefore confirm and add to previous findings in that Chinese macroeconomic news propagate through the real channel. Moreover, we also find that the same surprises move global equity prices, the defining components of the global financial cycle, the US NEER as well as the VIX considered as measures of global risk appetite.

Related Literature. Our work builds on and connects various topics in the literature. First, our study relates to the fast growing literature focusing on how China is able to shape the global economy. Arslanalp et al. (2016) show how trade and financial linkages between China and other Asian economies amplify the co-movements in financial markets. Ahmed et al. (2019) estimate that a Chinese slowdown has sizable global spillovers through real and financial linkages. Barcelona et al. (2022) find that a Chinese credit impulse affects not only the real economy but also the global financial cycle. Ahmed and Huo (2019) show that Chinese equity price dynamics spilled over to other Asian-Pacific equity markets during the Chinese stock market crash of 2015-2016. We confirm and expand on these findings showing that relevant surprises in the Chinese economy affect the global markets through the real and financial channels. We also point to the fact that recent de-globalization forces have not impaired the ability of China to drive global cycles. The focus on the linkage between the Chinese policy decisions and the commodity markets and international trade is shared with the work of Miranda-Agrippino et al. (2020), showing the monetary policy impact on the real cycle. This study also relates to our previous contribution (Antonelli et al., 2022) that concentrates on the ability of Chinese equity assets to affect other emerging markets through the inclusion of these activities in international benchmark indices (see also Dekker et al., 2021). Second, we employ an established framework on the analysis of high-frequency news on international financial markets to the Chinese case. Boehm and Kroner (2023) is the closest contribution; they study the effects of US macroeconomic surprises on a broad set of countries. Other studies, focusing on US data, analyse the impact of information updates from data release of public and private agents (eg. Bauer and Swanson, 2020). Third, we contribute to the literature that studies the drivers of global financial cycles. Rey (2013) uncovered

the co-movements of capital flows, asset prices, leverage and credit and their link to the VIX. Moreover, Miranda-Agrippino and Rey (2020) show that the US monetary policy causes these movements. Boehm and Kroner (2023) establish the US macroeconomic surprises as an additional driver. Miranda-Agrippino and Nenova (2022) add that, not only the Federal Reserve, but also the European Central Bank decisions trigger sizable reactions in the global activity and trade, as well as of global stock markets. Together with the aforementioned contributions, we show that China is emerging as a global player whose shocks propagate meaningfully and directly to the rest of the world (see also Sznajderska and Kapuściński, 2020 and Ahmed et al., 2019). Finally, this work relates to the growing literature analyzing the integration of China in the global financial markets (see Cortina et al., 2023 for a review). He et al. (2023) study capital inflows and outflows in the Chinese equity market through the Stock Connect channel showing that foreign investors' choices are affected by push and pull factors such as the US monetary policy and exchange rate risks. Cortina et al. (2023) show that Chinese firms connected to international markets experience increases in financial and investment activities and Ma et al. (2021) detail that this benefit comes from improved capital allocation between state-owned and private-owned enterprises; the theoretical contribution of Liu et al. (2021b) warns on negative effects on credit and investment from a rapid removal of capital controls. We find that Chinese as well as international equity markets are affected by domestic factors, in particular by Chinese macroeconomic surprises, while controlling for the US news.

### 2 Data

We build a novel dataset of Chinese macroeconomic news exploiting the information reported by Refinitiv. The sample ranges between 1 January 2018 to 31 December 2022, and consists of two main blocks of data. The first block includes financial series for equity, commodity markets, the VIX and the US NEER. We consider the main equity markets, proxied by the local equity benchmark indices, in advanced (AUS, GBR, JPN, EU-Eurostoxx, USA) and emerging market economies (BRA, CHN, CHL, HKG, IND, KOR, MEX, TUR, ZAF).<sup>2</sup> For commodities, we proxy market dynamics using the Brent oil price (front month futures contract), the Goldman Sachs (GS) commodity index for the global commodity market, as well as three GS subsectors indices relative to energy, industrial metals, and all metals. Then we also consider the VIX index and the US NEER as two market indicators of investors' risk aversion.

The second block of data consists of macroeconomic surprises that are constructed using macroeconomic announcements extracted from the Refinitiv China economic monitor. For each series, we first subtract analysts' estimates provided by Refinitiv in its "SmartEstimate" from the released macroeconomic value;<sup>3</sup> then, we normalise the value of this difference by its standard deviation computed over the whole span of our sample. More precisely, for each macroeconomic series the standardized surprise  $\delta_{j,t}$  is defined as follows:

$$\delta_{j,t} = \frac{\psi_{j,t} - \psi_{j,t}^*}{\sigma_j} \tag{1}$$

where *j* is a specific macroeconomic variable (e.g. Industrial production, PPI...) whose value is announced on day *t*,  $\psi$  is its corresponding released value,  $\psi^*$  is the Refinitiv SmartEstimate, and  $\sigma_j$  is the surprise-specific standard deviation;  $\delta_{j,t}$  is conventionally equal to zero in all days where no macroeconomics news is released.

Our time span is characterized by intense events involving the Chinese economy not yet fully covered by other contributions: US-China trade tensions, the Covid-19 outbreak and its asynchronous recovery, the real estate turmoil, and the war in Ukraine. During this period, China also experienced several institutional transformations that have gradually, although still partially, opened up its capital markets and increased its integration in global financial markets (see for example Cortina et al., 2023, Liu et al., 2021a, Antonelli et al., 2022). To enhance the representativeness of our macroeconomic surprises we only focus on monthly macroeconomic announce-

<sup>&</sup>lt;sup>2</sup>We do not include Russia among emerging markets, because of major disruptions and insulation of its financial system following the invasion of Ukraine in February 2022.

<sup>&</sup>lt;sup>3</sup>Refinitiv SmartEstimate is essentially an estimate adjusted to put more weight on the more recent estimates and the more accurate analysts; our results are qualitatively similar if we alternatively focus on the unadjusted Reuters Poll.

Macroeconomic series	Financial markets	Commodity markets
PPI YY	Australia (AE, Com)	Commodity general index
CPI YY	Brazil (EME, Com)	All metals index
Caixin Manufacturing PMI	China (EME)	Industrial metals index
NBS Manufacturing PMI	Chile (EME, Com)	Energy index
Industrial output	EU-Eurostoxx (AE)	Oil price (Brent)
Urban investments	Hong Kong (EME)	
Retail sales	India (EME)	
New yuan loans	Japan (AE)	
Total social financing	Mexico (EME, Com)	
Trade balance	South Korea (EME)	
	South Africa (EME, Com)	
	Turkey (EME)	
	United Kingdom (AE)	
	United States (AE)	
	VIX	
	US NEER	

Table 1: Macroeconomic series, financial variables and commodity markets

The first column displays the list of macroeconomic series; the second column lists the financial variables (equity, volatility, exchange rate); the last column presents the series for the commodity markets. Countries are classified as follows: advanced economies (AE), emerging market economies (EME), commodity producers (Com).

ments whose relevance is classified as medium or high.<sup>4</sup> We winsorize the series of surprises at 2% on both tails to remove outliers mainly due to the inclusion of the Covid-19 period in our estimation sample. Table 1 reports the full list of macroeconomic series, the financial variables (equity, volatility and exchange rate), and the commodity markets. Figure 1 displays the time series of standardized surprises, which are generally centered on zero, with no evident signs of autocorrelation.

<sup>&</sup>lt;sup>4</sup>Refinitiv classifies the relevance of macroeconomic announcements into three categories - low, medium, and high - to reflect the relative importance of each series for the Chinese economy. In addition we also exclude: i) announcements with no classification in terms of relevance; ii) observations whose relevance is classified as high, but Refinitiv does not provide a SmartEstimate to compute the macroeconomic surprise (e.g. Caixin services PMI); iii) announcements that are part of the simultaneous release of strictly correlated data, which could generate some collinearity problems (e.g. CPI YY vs CPI MM, Total social financing vs M2 money supply).



#### Figure 1: Time series of standardized surprises

The graph displays the time series of standardized surprises for all macroeconomic series listed in Table 1. Missing data for some macroeconomic announcements are due to the absence of the Refinitiv SmartEstimate for some monthly releases.

## 3 Empirical analysis

We divide the empirical analysis into three subsections. First, we study the impact of macroeconomic surprises on the returns of international financial markets and on commodity prices at the daily frequency. Then, we replicate the analysis using data at a lower frequency, weekly and monthly. Finally, we conduct a VAR exercise where we evaluate the correlation of our series with the Chinese as well as global trade and industrial production.

#### 3.1 Impact of Chinese macroannouncements at daily frequency

We estimate the impact of Chinese macroeconomics announcements using the following specification:

$$r_{i,t} = \alpha_0 + \sum_j \beta_j \delta_{j,t} + \gamma_0 FCI_t + \sum_k \theta_k \delta_{US,k,t} + \gamma_1 FCI_{US,t} + \gamma_2 Covid + m_t + \epsilon_{i,t}$$
(2)

where  $r_{i,t}$  is the (t) daily return on financial variables and commodity prices (i) listed in Table 1,  $\delta_{j,t}$  is the *j*-th standardized surprise, and FCI is a financial condition index for China. To purge out the impact of the global financial cycle and macroeconomics developments in the US we also include  $\delta_{US,k,t}$ , which are US standardized surprises<sup>5</sup>, and  $FCI_{US,t}$ , which is a financial condition index for the US. Finally, Covid is a dummy variable equal to 1 during the China Covid lockdown in 2020,<sup>6</sup>  $m_t$  are monthly fixed effects, and  $\epsilon$  is the error term.

**Equity markets.** Table 2 displays the impact of Chinese macroannouncements on the domestic and on the international equity markets. First of all, we notice that several macroeconomic surprises significantly affect equity returns; in particular, better than expected estimates of the Chinese industrial production, retail sales, trade balance and the NBS PMI index have a positive effect on equity prices, whereas the opposite holds for PPI. The remaining macroeconomic announcements are generally not statistically significant. Second, the impact is also quite sizable in economic terms. As an example, focusing on the specifications with all equity markets, a one standard deviation increase in macroeconomics surprises for industrial production is associated with an average increase of 101 basis points in stock market returns. This is generally the largest impact in economic terms, followed by the one of the NBS PMI index, trade balance, PPI, and retail sales. Third, we observe that the impact of Chinese macroeconomic releases is only limited to trade balance and industrial production data when we explicitly focus on the Chinese stock exchange (CSI300), but it gradually extends to other macroeconomic series when we replicate the

<sup>&</sup>lt;sup>5</sup>We include the monthly surprises analyzed in Boehm and Kroner (2023).

<sup>&</sup>lt;sup>6</sup>We conventionally assume the Covid lockdown period to coincide with restrictions imposed in Wuhan in 2020, i.e. from 23 January 2020 to 8 april 2020. Both FCI indices are computed accordingly to Ferriani and Gazzani (2022).

	Only	China &	All	Adv	EME	Comm.	Only
	China	H. Kong	markets	econom.	econom.	produc.	USA
CPI	12.30	9.30	5.84	10.75*	2.93	7.14	27.62*
	(0.88)	(0.85)	(1.50)	(1.95)	(0.56)	(1.04)	(1.83)
PPI	-18.70	-27.37**	-23.72***	-23.05***	-24.11***	-23.87***	-36.17***
	(-1.35)	(-2.27)	(-6.19)	(-4.59)	(-4.60)	(-3.53)	(-2.78)
Caixin PMI	-2.33	-7.86	-8.76	-2.46	-12.54*	-2.45	-20.83
	(-0.10)	(-0.50)	(-1.46)	(-0.23)	(-1.76)	(-0.26)	(-0.73)
NBS PMI	16.77	$40.82^{*}$	$41.80^{**}$	6.91	62.64***	48.35	-11.88
	(0.82)	(1.69)	(2.37)	(0.31)	(2.86)	(1.28)	(-0.40)
Indust. prod.	61.75***	63.04***	100.92***	93.74***	104.93***	136.91***	141.06***
	(3.97)	(6.26)	(7.05)	(4.67)	(5.47)	(5.70)	(4.42)
Urban invest.	14.88	7.50	8.96	1.06	13.75	23.52	11.38
	(0.67)	(0.47)	(1.24)	(0.14)	(1.30)	(1.43)	(0.58)
Retail sales	-8.48	-2.23	18.25**	19.79***	17.09	28.22*	39.07**
	(-0.40)	(-0.15)	(2.51)	(2.86)	(1.58)	(1.69)	(2.00)
New Yuan L.	9.38	-7.17	-5.09	-10.07	-2.24	-3.00	-6.37
	(0.50)	(-0.51)	(-1.03)	(-1.35)	(-0.35)	(-0.40)	(-0.27)
Total social fin.	-15.83	-2.08	-0.48	4.82	-2.97	-16.00	-15.23
	(-0.64)	(-0.13)	(-0.09)	(0.62)	(-0.39)	(-1.56)	(-0.65)
Trade balance	46.33**	41.76***	24.86***	25.94***	24.30***	15.37**	39.43*
	(2.21)	(2.58)	(5.05)	(3.42)	(3.78)	(2.06)	(1.79)
N	1181	2360	16808	6102	10706	6023	1213
$R^2$	0.03	0.03	0.04	0.05	0.04	0.06	0.11

Table 2: Impact of Chinese macroeconomic surprises on international equity markets - Daily

Impact of Chinese macroeconomic surprises on international equity markets; impacts are expressed in basis points. Refer to Table 1 for the classification of countries in advanced economies, emerging market economies, and commodity producers. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include time fixed effects, US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

analysis for a broader set of countries. Although our framework does not allows to fully investigate the rationale of this finding, we could reasonably hypothesize that this result is driven by domestic market operators' higher knowledge of the China economy or by the relevant trading restrictions that Chinese authorities can enforce. Column 2 of Table 2 shows that the overall impact of Chinese macroeconomic surprises is possibly better captured by the joint dynamics of both Mainland China and Hong Kong stock exchanges, in light of the major financial interlinkages between these two financial centers. The remaining columns of Table 2 nevertheless shows that the causal link between the Chinese economy and equity asset prices does not limit to China but also

	All comm.	General	Ind. metals	Energy	Oil
	indices	index	index	index	price
СРІ	-0.97	3.29	-25.33	19.25	16.34
	(-0.10)	(0.19)	(-1.54)	(0.72)	(0.55)
PPI	-56.93***	-58.97***	-26.35**	-92.08***	-88.15***
	(-7.32)	(-4.57)	(-2.08)	(-4.91)	(-3.91)
Caixin PMI	15.38	-3.04	19.63	-25.12	69.14
	(0.82)	(-0.10)	(0.99)	(-0.50)	(1.02)
NBS PMI	54.93***	52.44	94.75***	62.08	38.25
	(2.88)	(1.62)	(6.76)	(1.08)	(0.61)
Indust. prod.	71.68***	68.41**	28.32***	107.37**	129.72***
	(2.82)	(2.27)	(3.59)	(2.14)	(2.60)
Urban investm.	17.93	17.70	31.44**	10.89	1.32
	(1.54)	(0.88)	(2.55)	(0.32)	(0.04)
Retail sales	-5.97	-12.08	-18.75	-1.20	8.47
	(-0.56)	(-0.57)	(-1.44)	(-0.04)	(0.28)
New Yuan Loans	-37.85***	-39.02*	-22.75	-60.89*	-57.26*
	(-3.27)	(-1.77)	(-1.36)	(-1.88)	(-1.74)
Total social financing	-22.69	-26.49	28.02	-59.86	-67.62
	(-1.55)	(-1.08)	(1.30)	(-1.31)	(-1.45)
Trade balance	-15.08	-8.98	-14.44	-13.45	-28.73
	(-1.34)	(-0.42)	(-0.62)	(-0.49)	(-0.89)
N	6077	1217	1175	1205	1267
	0.03	0.05	0.05	0.05	0.05

Table 3: Impact of Chinese macroeconomic surprises on commodity markets - Daily

Impact of Chinese macroeconomic surprises on commodity markets; impacts are expressed in basis points. The first column includes all commodity prices listed in the third column of Table 1, the second column only the commodity general index, the last column the index for industrial metals. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include time fixed effects, US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

extends to major international markets, comprising the United States that are traditionally considered the main originator of global financial spillovers rather than a recipient of other countries' spillovers. Lastly, the overall goodness-of-fit is relatively high and overall comparable to similar studies, such as Boehm and Kroner (2023).

**Commodities.** Table 3 presents the impact of Chinese macroeconomic surprises on commodity markets. In terms of statistical significance, the estimates are generally consistent with the ones reported in Table 2, although some differences emerge, as both trade balance and retail

sales are no more statistically significant. All macroeconomic surprises linked to industrial activity (NBS PMI, industrial output and urban investments) are generally associated with a positive impact on commodity prices, in particular for industrial metals, given the preeminence of China in terms of commodity demand. In a similar vein, the impact of macroeconomic surprises on energy and oil returns is also quite sizable; a one standard deviation increase in industrial production generates an increase in commodity returns in the range of 108-130 basis points. Finally, we also find the amount of new yuan loans to be negatively correlated with commodities returns, although the statistical significance of the estimates is sometimes low. We read this result as a negative reaction to the supply of funds the authorities put in place to stimulate the economy. Market operators perceive a larger-than-expected credit growth as a sign of monetary policy accommodation to be interpreted as Chinese authorities' response to a possible economic slowdown (e.g. Dieppe et al., 2018, Funke and Tsang, 2020, Cong et al., 2019). Nevertheless, this result should be taken with caution as its statistical significance is somewhat weak and varies across specifications; in turn, this could partially reflect the lack of scheduled monetary policy decisions in China, which muddles the proper identification of the monetary policy tools being employed.

US NEER and VIX. Table 4 displays the impact of Chinese macroeconomic series on the US NEER (with a positive variation associated with a US\$ appreciation against its major trading partners' currencies) and the VIX. As both the US dollar and the VIX are generally considered as barometers of investors' risk aversion in global financial markets, the aim of this table is to assess whether the sentiment towards the Chinese economy is reflected in flight-to-safety price pressures. We overall find some evidence in this regard, most of our estimates being consistent with the economic rationale and the results shown above. In particular, larger than expected inflation surprises are associated with both a dollar appreciation and an increase in the VIX, whereas the opposite holds for positive PMI index outlook (in the official specification), industrial production, retail sales, and trade balance. The impact of industrial production on the VIX is particularly sizable, with a one standard deviation increase associated to a reduction of around 2.5 points in the VIX index. Contrary to our prior, we obtain that an increase in the Caixin PMI has a negative

	US NEER	VIX index
СРІ	6.21**	-0.36
	(2.15)	(-1.53)
PPI	7.53***	0.42***
	(2.59)	(2.54)
Caixin PMI	11.21***	0.27
	(2.63)	(0.77)
NBS PMI	-1.79	-1.62***
	(-0.21)	(-2.99)
Indust. prod.	-11.56***	-2.59***
	(-3.32)	(-3.73)
Urban investm.	-0.42	-0.41
	(-0.13)	(-1.12)
Retail sales	-7.46**	-0.61
	(-2.15)	(-1.58)
New Yuan Loans	0.80	-0.33
	(0.20)	(-0.84)
Total social financing	-2.47	0.16
	(-0.46)	(0.45)
Trade balance	<b>-9.5</b> 1***	-0.78**
	(-2.92)	(-2.34)
N	1206	1212
$R^2$	0.07	0.14

Table 4: Impact of Chinese macroeconomic surprises on risk aversion - Daily

Impact of Chinese macroeconomic surprises on the US NEER and the VIX; impacts are expressed in basis points for the US NEER and index points for the VIX. A positive US NEER return is associated with a US\$ appreciation. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include time fixed effects, US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

impact on risk aversion, which may be driven by the bottlenecks that characterized the recovery from the Covid pandemic and that lead to difficult interpretation of the changes in some components of the PMI indices.

### 3.2 Impact of Chinese macroannouncements at lower frequencies

In this subsection, we study the impact of China macroeconomic news at lower frequencies. To this purpose, we first construct a weekly and a monthly aggregate surprise index for each asset

	Only China	China & H. Kong	All markets	Adv. econom.	EME econom.	Comm. produc.	Only USA
Weekly surp.	-8.15	-7.96	19.10***	23.38***	16.80***	26.60***	31.86*
	(-0.73)	(-0.97)	(4.11)	(3.02)	(2.92)	(3.13)	(1.89)
Weekly surp. (t-1)	17.11	24.95***	28.24***	24.09***	30.69***	34.23***	17.44
	(1.58)	(2.98)	(5.03)	(3.38)	(3.96)	(2.92)	(1.25)
N	256	514	3610	1290	2320	1290	258
$R^2$	0.15	0.16	0.17	0.20	0.16	0.19	0.22

Table 5: Impact of Chinese macroeconomic surprises on international equity markets - Weekly

Impact of Chinese macroeconomic surprises on international equity markets; impacts are expressed in basis points. Refer to Table 1 for the classification of countries in advanced economies, emerging market economies, and commodity producers. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

Table 6: Impact of Chinese macroeconomic surprises on international equity markets - Monthly

	Only China	China & H Kong	All	Adv.	EME	Comm.	Only USA
Monthly surn		12 75	-4.02	_11.62		_2 27	_10.23
Wonting surp.	(-0.21)	(0.63)	- <del>1</del> .02 (_0.57)	(-1.18)	(-0.11)	(-0.22)	(-0.42)
Monthly surn (t-1)	9.07	(0.03)	(-0.57) 36 51***	(-1.10) 30 55***	(-0.11) 30 38***	(-0.22)	(-0.42)
Wonting Surp. (t-1)	(0.38)	(0.87)	(1.13)	(2.73)	(3.50)	(3.10)	(1.27)
	(0.30)	(0.07)	(4.43)	(2.73)	(3.30)	(3.10)	(1.27)
Ν	58	116	812	290	522	290	58
$R^2$	0.06	0.07	0.17	0.23	0.15	0.21	0.25

Impact of Chinese macroeconomic surprises on international equity markets; impacts are expressed in basis points. Refer to Table 1 for the classification of countries in advanced economies, emerging market economies, and commodity producers. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

category defined as the time average of all the surprises employed in Section 3.1.<sup>7</sup> We then esti-

mate the following specification as the empirical counterpart of Equation 2 at lower frequencies:

<sup>&</sup>lt;sup>7</sup>For each asset category the index is constructed using the surprises whose coefficients are statistically significant at least at the 95% using the following specifications: all equity markets, all commodity indexes, NEER, VIX. To obtain a measure that can be interpreted as expansionary, we flip the sign of the CPI and PPI surprises that exert a negative impact on equity prices, contrary to all other surprises.

	All comm. indices	General index	Ind. metals index	Energy index	Oil price
Weekly index	29.93	23.32	-25.82*	67.08	99.94*
-	(1.46)	(0.84)	(-1.77)	(1.30)	(1.69)
Weekly index (t-1)	57.59***	47.53**	26.55**	97.13*	82.55
	(3.13)	(1.99)	(2.16)	(1.87)	(1.58)
Ν	1290	258	258	258	258
$R^2$	0.09	0.20	0.09	0.14	0.13

Table 7: Impact of Chinese macroeconomic surprises on commodity markets - Weekly

Impact of Chinese macroeconomic surprises on commodity markets; impacts are expressed in basis points. The first column includes all commodity prices listed in the third column of Table 1, the second column only the commodity general index, the last column the index for industrial metals. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

$$r_{i,t} = \alpha_0 + \sum_{j=0}^{1} \beta_j index_{t-j} + \gamma_0 FCI_t + \sum_{j=0}^{1} \theta_j index_{US,k,t} + \gamma_1 Covid + \delta_{US,k,t} + \gamma_3 FCI_{US,t} + \epsilon_{i,t}$$
(3)

where *t* is now either a weekly or monthly frequency, *index* represents the aggregate Chinese surprise index for which we explicitly include one lag to account for possible serial dependency in the impact of macroeconomic announcements, and FCI is the time average of the Chinese financial condition index; similar definitions apply to the US case.

At the weekly frequency, we document a strong positive reaction of equity returns to positive Chinese macro news, with an effect that is also quite persistent, see Table 5. Depending on the model specification, the cumulated impact of a one standard deviation increase in the weekly index in t and t-1 could sum up to around 61 basis points. The sole exception is the Chinese market where we again find a statistically significant impact only when the estimate is performed jointly with Hong Kong. Notably, we also observe a sizable increase in the explanatory power of the regression, as the  $R^2$  is up to three-four times the corresponding figures for daily estimates. The monthly estimates are reported in Table 6 where we generally find that only an increase in

	All comm. indices	General index	Ind. metals index	Energy index	Oil price
Monthly index	-26.86	-16.67	-33.96	-27.85	-33.35
	(-1.63)	(-0.56)	(-1.43)	(-0.57)	(-0.66)
Monthly index (t-1)	54.56*	48.96	2.70	97.57	108.11
	(1.89)	(1.21)	(0.11)	(1.37)	(1.46)
N	290	58	58	58	58
R^2	0.28	0.40	0.23	0.40	0.39

Table 8: Impact of Chinese macroeconomic surprises on commodity markets - Monthly

Impact of Chinese macroeconomic surprises on commodity markets; impacts are expressed in basis points. The first column includes all commodity prices listed in the third column of Table 1, the second column only the commodity general index, the last column the index for industrial metals. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

the lagged surprise index results in positive equity returns, with an impact that is again higher for the subsample of commodity producers. The effect on China is not statistically significant even when assessed jointly with Hong Kong, suggesting that the impact of positive macro surprises is mainly transmitted to international financial markets.

Tables 7 and 8 respectively present the impact on the commodity markets at the weekly and monthly frequency. In general, all commodity indices considered are affected by macroeconomic surprises at weekly frequency, although with some lag, while most of the estimates are not statistically significant at the monthly frequency. Finally, Tables 9 and 10 replicate the analysis at the lower frequency for the US NEER and the VIX index. All in all, we find limited evidence of an impact at lower frequencies, especially for the VIX index where the response is statistically significant only for the contemporaneous value of the weekly index, whereas the US NEER exhibits a lagged response to positive macroeconomic surprises at both the weekly and monthly frequency.

#### 3.3 VAR exercise

We evaluate the dynamic correlation between our series of Chinese surprises and the real economy by means of a Bayesian VAR model. We order the index constructed by aggregating surprises

	US NEER	VIX index
Weekly index	-0.87	-0.61***
	(-0.62)	(-3.75)
Weekly index (t-1)	-5.63**	-0.22
	(-2.01)	(-1.25)
N	252	258
<i>R</i> <sup>2</sup>	0.17	0.26

Table 9: Impact of Chinese macroeconomic surprises on exchange rates - Weekly

Impact of Chinese macroeconomic surprises on the US NEER and the VIX; impacts are expressed in basis points for the US NEER and index points for the VIX. A positive exchange return is associated with a US\$ appreciation. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

Table 10: Impact of Chinese macroeconomic surprises on exchange rates - Monthly

	US NEER	VIX index
Monthly index	-3.87	-0.12
	(-0.63)	(-0.55)
Monthly index (t-1)	-11.09**	-0.35
	(-2.07)	(-1.26)
Ν	57	58
<i>R</i> <sup>2</sup>	0.21	0.30

Impact of Chinese macroeconomic surprises on the US NEER and the VIX; impacts are expressed in basis points for the US NEER and index points for the VIX. A positive exchange return is associated with a US\$ appreciation. \*, \*\*, and \*\*\* denote significance at, respectively, the 10%, 5% and 1% level. All models include US macroeconomic surprises, an index of financial conditions for China and the US, and a dummy for the Covid period. Robust t-statistics in parentheses.

at the monthly frequency defined in Section 3.2 as the first variable in a Cholesky identification (internal instrument) to compute impulse response functions of global industrial production and trade that exclude China. Consequently, the impulse responses provide a measure of spillovers from the Chinese economy to the rest of the world. The endogenous variable enters in growth rates and the VAR is estimated over the sample 2018-2022 employing a Minnesota prior with two

lags. The VAR, which jointly models our index  $s_t$  and the endogenous variables  $y_t$ , is denoted by

$$\begin{bmatrix} s_t \\ y_t \end{bmatrix} = A(L) \begin{bmatrix} s_{t-1} \\ y_{t-1} \end{bmatrix} + B \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^y \\ \varepsilon_t^y \end{bmatrix} \quad L = 0, 1$$
(4)

where A(L) is the polynomial in the lag operator that contains two lags. B is the impact matrix that is designed such that the surprise index can affect contemporaneously the endogenous variables in the VAR, whereas the remaining VAR residuals do not impact instantaneously, but (potentially) only with a lag, on the surprise index. We tackle the enormous volatility generated by the pandemic shock as in Lenza and Primiceri (2020) by rescaling the size of the residuals during the Covid outburst. The hyper-parameters of the prior and the scaling factor for the Covid shock are jointly determined by maximizing the marginal data density.



Figure 2: **BVAR - IRFs to an aggregate surprise shock** 

Note. The Bayesian VAR is estimated on data 2018 - 2022 with two lags under flat (Jeffreys') prior. The plot report median (blue solid line) together with 68% (blue shaded areas) and 90% (light blue shaded areas) credible sets.

The Impulse Response Functions (IRFs) in Figure 2 show that a positive macroeconomic Chinese surprise is associated with an expansion in global (excluding China) industrial production and international trade growth. In response to a one standard deviation shock to our Chinese surprise index, global industrial production and trade increase by about 0.45 percentage points. The shock is propagated gradually albeit characterized by a notable persistence Notably, our estimates are statistically significant despite the very short-sample that we employ due to data availability reasons. Thus, the role of Chinese surprises is not confined to financial markets but is also meaningful from a macroeconomic perspective.

## 4 Final Remarks

This paper contributes to the literature on the growing Chinese footprint in the international markets. We compile a novel dataset of Chinese macroeconomic surprises that allow us to study the spillovers from the Chinese economy to the rest of the world without making direct use of official macroeconomic data that is often of difficult interpretation. We provide evidence that macroeconomic news releases in China immediately reverberate through the rest of the world with significant and persistent impacts on the equity indices of the main advanced and emerging economies, on the commodity prices and on the global risk aversion. We moreover show that positive Chinese macroeconomic surprises are associated with increased global trade and production. Our analysis suggests that the role of the Chinese economy is increasing and international financial markets immediately price its macroeconomic developments.

Further research is needed to estimate and compare the impact of the different drivers of the global cycles. We, however, believe that our contribution is a first step toward understanding the Chinese role in international markets; it moreover opens the way to a further characterization of the channels through which the Chinese footprint propagates to the rest of the world: the real dimension, in particular trade and commodity markets, as well as the financial side, through financial intermediaries' response to Chinese macroeconomic news shaping global valuations of assets and risk.

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