The International Transmission of Chinese Monetary Policy and the Commodity Channel*

Fabrizio Ferriani† Andrea Gazzani‡

February 27, 2025

Abstract

Chinese monetary policy significantly affects global economic activity and inflation through a real transmission channel that primarily propagates via commodity prices. We gauge the inflationary spillovers from Chinese monetary policy to foreign economies and find that a sizable portion of those - 70% for advanced economies - is indeed directly transmitted via commodity prices due to their dependence on commodity imports. Furthermore, financing conditions in commodity-exporting emerging economies are also greatly affected by the commodity channel of Chinese monetary policy.

Keywords: China, monetary policy, commodity prices, spillovers, VARs.
JEL Codes: E52, E31, E32, F41, Q02, Q43.

*We are grateful to Jorgo Georgiadis, Silvia Miranda-Agrippino, Giovanni Ricco, Marco Taboga, Fabrizio Venditti and seminar participants at the Bank of Italy and Banque de France. The views expressed in this paper do not necessarily reflect those of the Bank of Italy or the ESCB.

†Bank of Italy fabrizio.ferriani@bancaditalia.it

‡Bank of Italy. andreagiovanni.gazzani@bancaditalia.it

1 Introduction

Despite the growing role played at the global level by its economy (almost 20% of global GDP), the international dimension of Chinese monetary policy is still a relatively underexplored subject.[1] Several factors hinder the enhancement of our knowledge in this field, such as the availability of high-quality Chinese official data (Fernald et al., 2021; Barcelona et al., 2022; Chen et al., 2024) and, even more crucially, the peculiar Chinese institutional monetary policy framework (Chen et al., 2018, 2023). In China, the quantity of money, rather than the interest rate, has been the only intermediate monetary policy tool until 2017. Moreover, the central bank (People's Bank of China, PBC hereafter) pursues the growth objective of the government and responds asymmetrically to deviations from growth targets, i.e. monetary policy interventions are stronger when actual growth is below target than when it is above.

In this paper, we investigate empirically the international spillovers from Chinese monetary policy shocks. We employ the monetary policy shocks identified in Chen et al. (2018, 2023) by taking into account the specific Chinese monetary policy framework. Our first key finding is that Chinese monetary policy exerts a significant influence on global economic activity and triggers a substantial response in commodity prices. Indeed, China is the major commodity consumer in the world (Figure 1). To understand those striking effects, we analyze the heterogeneous response of commodity prices at the granular level. The most affected commodities are industrial metals, raw materials, and energy inputs, while agricultural goods and precious metals are scarcely affected.

Coupling these results with the response of other domestic and international macro-financial variables, the second key finding of our paper is that the international effects of Chinese monetary policy are mainly driven by the real side of the economy rather than through a financial channel, as in the case of US monetary policy (Gertler and Karadi, 2015; Miranda-Agrippino and Rey, 2022). Several findings support this interpretation. First, the commodity-intensive infrastructure investment is more responsive than the aggregate GDP to monetary policy shocks (Chen et al., 2023). Second, the response of domestic and international macroeconomic variables is markedly delayed, with a similar pattern characterizing

[1] According to the IMF, the Chinese share of global GDP in PPP in 2024 was 19.05%.

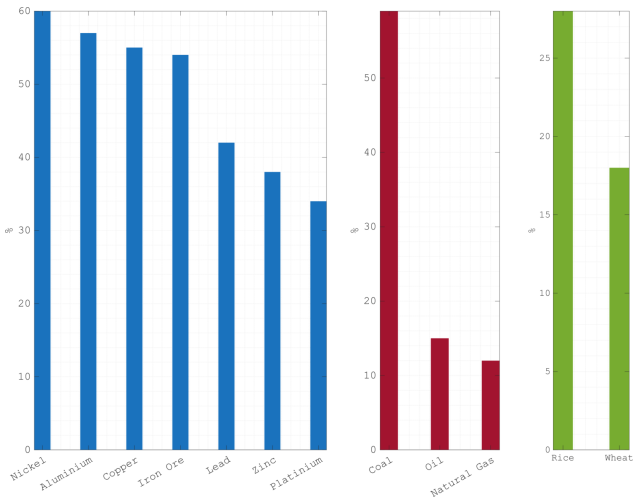


Figure 1: Share of Chinese commodity consumption over global consumption.

Note. Sources: Statistical Review of Energy, World Bank, IMF, LSEG.

commodity prices. Third, proxies for the global financial cycle (VIX, excess bond premium, dollar) and global interest rates react weakly and with a lag. Their dynamics appear to be endogenous to the deterioration of the real economy rather than the main transmission mechanism.

As commodity markets play a crucial role in the international propagation of Chinese monetary policy, the third contribution of our work consists of estimating the inflationary spillovers to G20 countries and quantifying the relevance of the commodity channel. While this channel plays a sizable role in general, it is crucial for advanced economies accounting for about 70% of PPI and energy CPI spillovers and 55% of headline CPI spillovers. The European big fours (France, Germany, Italy, and Spain) are directly and heavily affected due to their dependence on commodity imports. The other side of the coin concerns financing conditions in commodity-exporting emerging economies (EMEs), which are greatly affected by Chinese monetary policy. In this case, the commodity channel is also sizable (44%) and dependent on the weight of commodity exports over domestic GDP.

Related literature. Our paper contributes to three strands of the literature. First, we document the international spillovers of Chinese monetary policy by taking into account its peculiar institutional framework. Other works, such as Miranda-Agrippino et al. (2020) and Miranda-Agrippino and Rey (2022), have analyzed the international dimension of Chinese monetary policy. We complement their analyses that rely on monetary policy shocks identi-

fied via interest rate indicators and a standard-type Taylor rule. Conversely, we employ the monetary policy shocks from Chen et al. (2018, 2023) that is based on the quantity of money (the only intermediate target until 2017) and takes into account the growth target of the Chinese government in a non-linear setup. In particular, Chen et al. (2023) investigates the interaction between monetary and fiscal policies in China during the 2008 global financial crisis. They show that monetary policy stimulus exerts a sizable effect on infrastructure investment: more than half of the massive surge in infrastructure investment in 2009 was monetary-driven via cheaper financing conditions for regional governments. This domestic propagation mechanism also plays an essential role in international spillovers via commodity prices.

Second, the paper relates to the literature on the relationship between monetary policy and commodity prices (Anzuini et al., 2012; Degasperi et al., 2020; Castelnuovo et al., 2024). Our analysis complements the work in Miranda-Pinto et al. (2023) who investigate the response of commodity prices to US (and Euro area) monetary policy shocks and gauge the relevance of the commodity channel. They argue that monetary policy can affect commodity prices via *i)* a cost of carry channel, where fluctuations in interest rates impact the opportunity cost of storing commodities by altering discount rates; *ii)* a real economy channel, i.e., inducing changes in demand for commodities; *iii)* a liquidity and portfolio channel, i.e., influencing liquidity and trading in physical and derivative markets; *iv)* an exchange rate channel. The speed in the response of commodity prices to US monetary policy shocks corroborates a key role for the cost of carry (discounting) and forward-looking demand channel. Conversely, we show that Chinese monetary policy shocks affect commodity prices with a marked delay compatible with the time necessary to build up infrastructure investment, underscoring the pivotal role of the actual demand channel. Ider et al. (2024) focus on the Euro area monetary policy and find a strong effect on global commodity prices. We supplement these works by focusing on China, which plays a key role in commodity markets due to its size and the characteristics of its economy, where infrastructure investment serves as a major policy instrument. Hammoudeh et al. (2024) also investigate the effects of Chinese monetary policy on commodity prices. We depart from their analysis in four dimensions: i) we provide evidence that Chinese monetary policy — unlike that of the US and the Euro area, whose

impact on commodity prices is swift, underscoring a financial-type transmission — mainly transmits with a marked delay, consistent with a real-side transmission; ii) we emphasize the crucial role of infrastructure investment in shaping the nexus between Chinese monetary policy and commodity markets; iii) we employ monetary policy shocks that consider the specific Chinese institutional framework, rather than a standard Taylor rule; iv) we provide estimates of the Chinese monetary policy spillovers to foreign economies and quantify the relevance of the commodity channel for these impacts.

Third, the paper also links with the literature that investigates, in a broad sense, the international spillovers from China (see for instance Metelli and Natoli, 2017; Ahmed et al., 2019; Corneli et al., 2023; Gutierrez et al., 2024; Akinci et al., 2024). These spillovers are very difficult to gauge empirically due to the challenging task of disentangling Chinese-specific shocks from foreign and global ones. Employing Chinese monetary policy shocks offers a remedy for this issue. We show that, in terms of inflation, Chinese shocks affect broadly all economies. Crucially, our estimates suggest that the commodity price channel nearly entirely drives the inflationary spillovers to advanced economies; in its absence, those spillovers would be relatively small. Conversely, EMEs are generally more affected, but the commodity channel typically plays a smaller role, likely because EMEs are more directly integrated with the Chinese economy.

Structure of the paper. The paper is organized as follows. Section 2 illustrates the identification of monetary policy shocks, their aggregate effects, and the response of commodity prices. Section 3 delves into the international spillovers and assesses the contribution of the commodity channel via a counterfactual analysis. Section 4 describes a set of robustness exercises. Finally, Section 5 concludes.

2 Macroeconomic effects

This section illustrates the implications of monetary policy shocks. First, Section 2.1 describes the data employed in the analysis. Then, we illustrate the identification in Chen et al. (2018, 2023) (Section 2.2), the econometric framework (Section 2.3) and display the aggregate, domestic and international effects (Section 2.4). Finally, we underscore the impli-

cations for individual commodity prices (Section 2.6).

2.1 Data

We employ data from several sources. Monetary policy shocks and several Chinese economic aggregates are from Chen et al. (2018, 2023). Chinese GDP is from Barcelona et al. (2022). Additional Chinese and global variables are from LSEG. Commodity prices at the monthly frequency are from the World Bank *Pink Sheet* database; at the daily frequency, they are the spot or front-month futures contracts from LSEG. Information on inflation for a broad set of countries, including different measures of consumer and producer prices, comes from the work by Ha et al. (2023). Data on bilateral exports and imports of commodities are obtained from Trade Data Monitor (TDM). Further details are provided in Appendix.

2.2 Monetary policy shocks

Due to the institutional setting and the degree of development of financial markets in China, the high-frequency identification of monetary policy surprises (Gürkaynak et al., 2005; Gertler and Karadi, 2015) is not a particularly sound option to identify monetary disturbances for macroeconomic analysis (Das and Song, 2023). We employ instead the series of monetary policy shocks identified in Chen et al. (2023) that extends the framework already developed in Chen et al. (2018).

They estimate a non-linear equation for the intermediate target of Chinese monetary policy, i.e., M2 growth ($g_{m,t}$), as described in Eq.(1):

$$g_{m,t} = \gamma_0 + \gamma_m g_{m,t-1} + \gamma_\pi \left(\pi_{t-1} - \pi^*\right) + \gamma_{y,t} \left(g_{y,t-1} - g^*_{y,t-1}\right) + \sigma_m \varepsilon_{m,t}, \tag{1}$$

In each quarter, the PBC decides on the expansion of $g_{m,t}$ based on the distance between (lagged) output growth $g_{y,t-1}$ and the growth target (set by the State Council). Lagged inflation (π_{t-1}), in deviation from the target (π^*), can also affect monetary policy decisions but only as long as growth according to target is assured. Chen et al. (2023) estimate Eq.(1) via maximum likelihood allowing both the coefficient γ_y and the variance of the shocks σ_m

to vary according to the sign of $g_{y,t-1} - g_{y,t-1}$ as follows:

$$\textit{Non-linearity} \qquad \gamma_{y,t} = \begin{cases} \gamma_{y,a} & \text{if } g_{y,t-1} - g^*_{y,t-1} \geq 0 \\ \gamma_{y,b} & \text{if } g_{y,t-1} - g^*_{y,t-1} < 0 \end{cases}, \tag{2}$$

$$\textit{Heteroskedasticity} \quad \sigma_{m,t} = \begin{cases} \sigma_{m,a} & \text{if } g_{y,t-1} - g^*_{y,t-1} \geq 0 \\ \sigma_{m,b} & \text{if } g_{y,t-1} - g^*_{y,t-1} < 0 \end{cases}. \tag{3}$$

The estimation yields highly asymmetric coefficients in the two different states: $\gamma_{y,b}$ is about ten times as large as $\gamma_{y,a}$. The residuals from Eq.(1) is the monetary policy shock in the spirit of a Taylor (1993).

Correlation with other shocks. We examine the correlation between Chinese monetary policy shocks and other popular (US) shocks in the literature and do not diagnose any contamination (Table 1). The test implicitly suggests that foreign or global shocks are not spuriously captured in our preferred measure of Chinese monetary policy shocks.

	ρ	Pvalue	Obs.
Gertler and Karadi (2015) monetary	0.03	0.80	108
Baker et al. (2016) EPU	0.13	0.24	130
Bloom (2009) uncertainty	-0.01	0.90	148
Smets and Wouters (2007) monetary	-0.01	0.97	100
Romer and Romer (2010) fiscal	-0.15	0.40	112
Ramey (2011) fiscal	-0.16	0.29	124
Fisher and Peters (2010) fiscal	-0.24	0.14	116
Mertens and Ravn (2013) tax	-0.18	0.35	108
Smets and Wouters (2007) TFP	0.19	0.39	100
Basu et al. (2006) TFP	0.20	0.16	128
Basset et al. (2014) financial	-0.15	0.30	76
Barsky and Sims (2015) news	-0.06	0.76	111
Beaudry and Portier (2014) news	0.04	0.77	131

Table 1: Correlation with other shocks.
Note. Quarterly data, sample: 2000-2018.

2.3 Econometric Framework

Consider the standard VAR model:

$$\mathbf{y}_t = \mathbf{a} + \mathbf{A}_1\mathbf{y}_{t-1} + \cdots + \mathbf{A}_p\mathbf{y}_{t-p} + \mathbf{u}_t \tag{4}$$

where p is the lag order, $\mathbf{y}_t$ a $n \times 1$ vector of endogenous variables, $\mathbf{u}_t$ a $n \times 1$ vector of reduced-form innovations with covariance matrix $\text{Var}(\mathbf{u}_t) = \Sigma$, $\mathbf{a}$ is a $n \times 1$ vector of constants, and $\mathbf{A}_1, \ldots, \mathbf{A}_p$ are $n \times n$ matrices.

$\mathbf{u}_t$ is a linear combination of the structural shocks $\boldsymbol{\varepsilon}_t$ under invertibility, meaning

$$\mathbf{u}_t = \mathbf{B}\boldsymbol{\varepsilon}_t \tag{5}$$

$\text{Var}(\boldsymbol{\varepsilon_t}) = \boldsymbol{\Omega}$ is diagonal as the structural shocks are by construction uncorrelated. $\Sigma = \mathbf{B}\boldsymbol{\Omega}\mathbf{B}'$ is typically not diagonal as the reduced-form residuals are usually correlated.

We are interested in estimating the causal impact of a unique shock in the system, i.e., the Chinese monetary policy shock $\varepsilon_{1,t}$. This task implies recovering a single column $\mathbf{b}_1$ of the impact matrix $\mathbf{B}$.

Underlying the VAR identification via external instruments lies the assumption that the available instrument z_t satisfies:

$$\begin{aligned} \mathbb{E}[z_t \varepsilon_{1,t}] &= \alpha \neq 0 \qquad \textit{(relevance)} \\ \mathbb{E}[z_t \boldsymbol{\varepsilon}_{2:n,t}] &= \mathbf{0} \qquad \textit{(exogeneity)} \end{aligned} \tag{6}$$

where $\boldsymbol{\varepsilon}_{2:n,t}$ are the remaining structural shocks distinct from monetary policy. Then $\mathbf{b_1}$ is correctly estimated up to scale and sign as

$$\mathbf{b}_1 = \frac{\mathbb{E}[z_t \mathbf{u}_t]}{\mathbb{E}[z_t u_{1,t}]'} \tag{7}$$

Throughout the paper, our baseline estimation consistently employs the monetary policy shocks from Chen et al. (2018, 2023) to instrument the residual from the M2 equation of the VAR.[2] Nonetheless, we report in Section 4 that our main findings are unchanged if we use the series from Chen et al. (2023) as an internal instrument that does not require the (partial) invertibility assumption.

[2] Galvão (2023) follows a similar approach.

2.4 Domestic macroeconomic effects

Our empirical analysis starts by analyzing the domestic macroeconomic effects of Chinese monetary policy in a VAR model that includes (in logs) M2, real GDP, industrial production, CPI and infrastructure investment, and the renminbi. In terms of first-stage statistics, both the F-stat = 30.0 and the $R^2 = 0.35$ corroborate the strength of the instrument.

Figure 2 displays that a restrictive monetary policy shock, which is normalized as a drop by 1% in M2, negatively impacts real GDP, CPI, and infrastructure investment. Infrastructure investment is the most responsive variable (dropping by 3% after almost 3 years) consistently with the findings in Chen et al. (2023). Consumer prices are instead less elastic to monetary policy as they fall by 0.5% after 1 year. The renminbi instead appreciates as the quantity of money drops. The transmission of monetary policy to the economy appears markedly delayed, especially if compared to advanced economies, with the lower degree of financial development most likely playing an important role in this heterogeneity (Allen et al., 2017, Hu and Wang, 2022).[3]

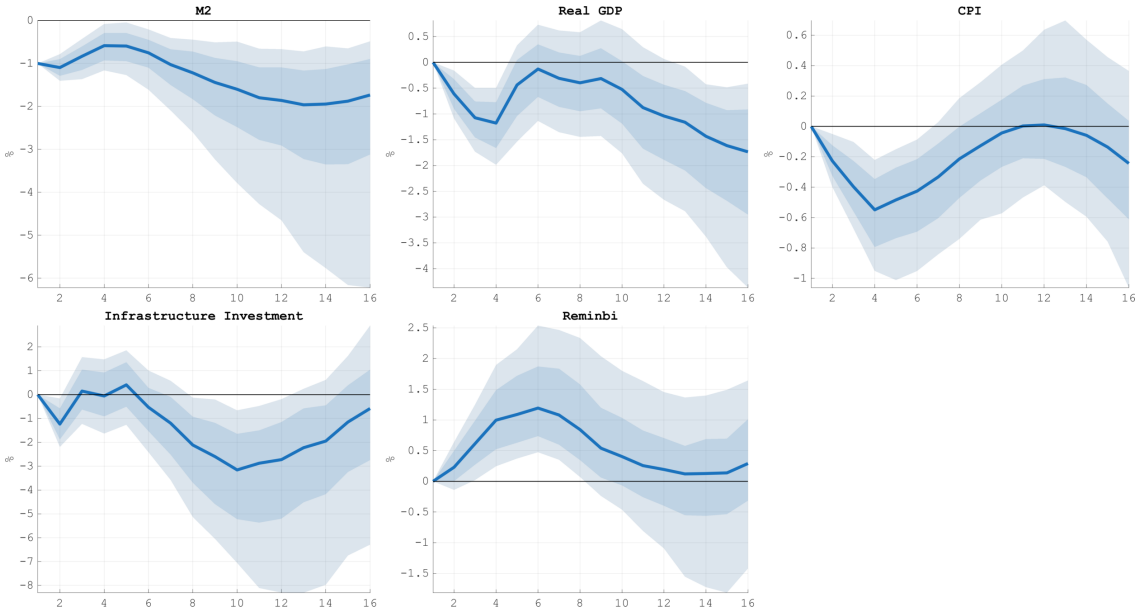


Figure 2: Domestic effects of Chinese monetary policy shocks.

Note. Quarterly data, sample: 2000-2018, point estimate and 68-90% confidence intervals from Proxy-SVAR identification

[3]This delay is reassuring as it shows that contamination by other fluctuations, to which the monetary authority might respond, is quite unlikely or quantitatively negligible.

2.5 Global Macroeconomic Effects

In this section, we analyze the global effects of Chinese monetary policy within a VAR model that includes Chinese M2, world industrial production, a commodity price index, the VIX, the Excess Bond Premium (EBP; Gilchrist and Zakrajšek, 2012), and the dollar. Figure 3 shows that the international propagation of Chinese monetary policy is delayed in line with the domestic effects. World industrial production declines, reaching a trough of almost 1.5% after six quarters. With a similar timing, commodity prices fall by a staggering 10%. This massive effect is likely due to the role of China as the world factory (Baldwin, 2024) and with the domestic propagation of Chinese monetary policy via commodity-intensive infrastructure investment (IMF, 2015). The dollar appreciates mirroring the deterioration of global economic conditions (Georgiadis et al., 2024). Popular measures of the global financial cycle, such as the VIX and the EBP, respond weakly and with a delay. This evidence complements the results in Miranda-Agrippino et al. (2020) and Miranda-Agrippino and Rey (2022), who also highlight a similar pattern by exploiting interest-based Chinese monetary policy shocks. The timing and size of the response appear more compatible with financial conditions enduring the deterioration of the real economy rather than being a direct transmission channel. This evidence marks a glaring heterogeneity with respect to the (international) transmission of US monetary policy, which propagates very rapidly and crucially via the financial channel (Gertler and Karadi, 2015; Miranda-Agrippino and Rey, 2020; Alessandri et al., 2023; Georgiadis et al., 2024). This heterogeneity is also pivotal for the relationship between monetary policies and commodity prices that we investigate next.

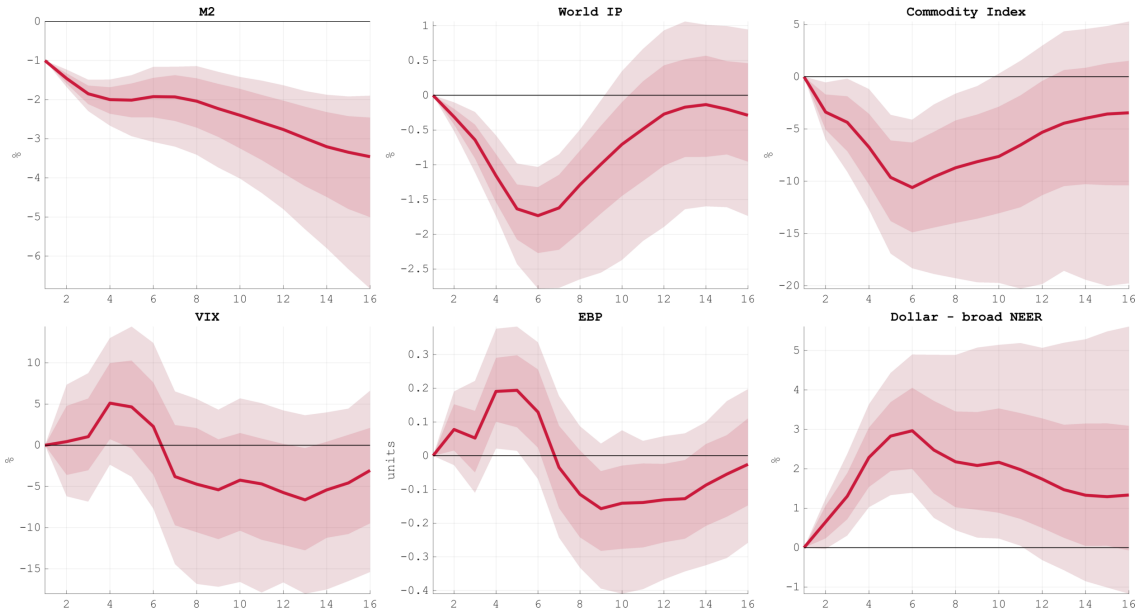


Figure 3: Global effects of Chinese monetary policy shocks.

Note. Quarterly data, sample: 2000-2018, point estimate and 68-90% confidence intervals from Proxy-SVAR identification

2.6 Response of commodity prices

We have documented that the response of commodity prices is crucial for characterizing the international spillovers from Chinese monetary policy. In this section, we investigate this channel at a more granular level by employing a set of bivariate VARs that include Chinese M2, instrumented with the Chen et al. (2023) shocks, and the commodity price of interest. We standardize commodity prices to account for their heterogeneous volatility.[4] Our estimates suggest that Chinese monetary policy shocks elicit a substantial and widespread effect on commodity prices.

An interesting heterogeneity across commodities emerges from our estimates (Figure 4, panel a). *Metals*, *Raw Materials*, and *Energy* indexes are, in this order, the most responsive variables, whereas the *Food* and *Precious Metals* indexes are only marginally affected. The results at this intermediate level of aggregation are partly reminiscent of those in Miranda-Pinto et al. (2023) on the effects of US monetary policy.[5] However, an important difference

[4]Results are nonetheless similar if we avoid the standardization. See Figure A10.

[5]The responses highlight nonetheless important heterogeneity. For instance, precious metals are the second-to-last responsive category in our case. In Miranda-Pinto et al. (2023), their responsiveness is higher, in line with the financial propagation of US monetary policy.

characterizes US and Chinese monetary policy. In the US case, the cost of the carry (or discounting) channel is a crucial transmission channel as US monetary policy determines global discounting rates by influencing the opportunity cost of commodity storage. In contrast, we argue that Chinese monetary policy propagates via a direct real channel, and discounting does not play an important role. We show that, indeed, Chinese monetary policy affects only marginally and with a delay US yields (Figures A4-A5). The 10-year rate displays a negative short-lived response that would actually imply by itself a response of commodity prices in the opposite direction. This pattern appears to be compatible with the endogenous response of interest rates to macroeconomic development rather than being a direct propagation mechanism of Chinese monetary policy.

Moving to a more granular breakdown (Figure 4, panel b), industrial metals intensively used in infrastructural investment, such as iron and copper, are heavily affected by Chinese monetary policy. Oil and coal prices also respond markedly, whereas natural gas does so only marginally. The Asian benchmark for liquefied natural gas prices is way more elastic than the EU and US benchmarks. This result is sensible as the natural gas market is geographically segmented due to the high cost of inter-continental transportation (Emiliozzi et al., 2023). Notably, we also find that gold and food prices, such as wheat and rice, respond very mildly. All the evidence presented in this section - together with the delayed reaction of commodity prices (Figure A14) - suggests that Chinese monetary policy affects commodity prices via an actual (delayed) demand channel that is particularly strong due to the stimulus to energy and metal-intensive infrastructure investment. Conversely, US monetary policy transmits very quickly to commodity and asset prices via the financial channel.

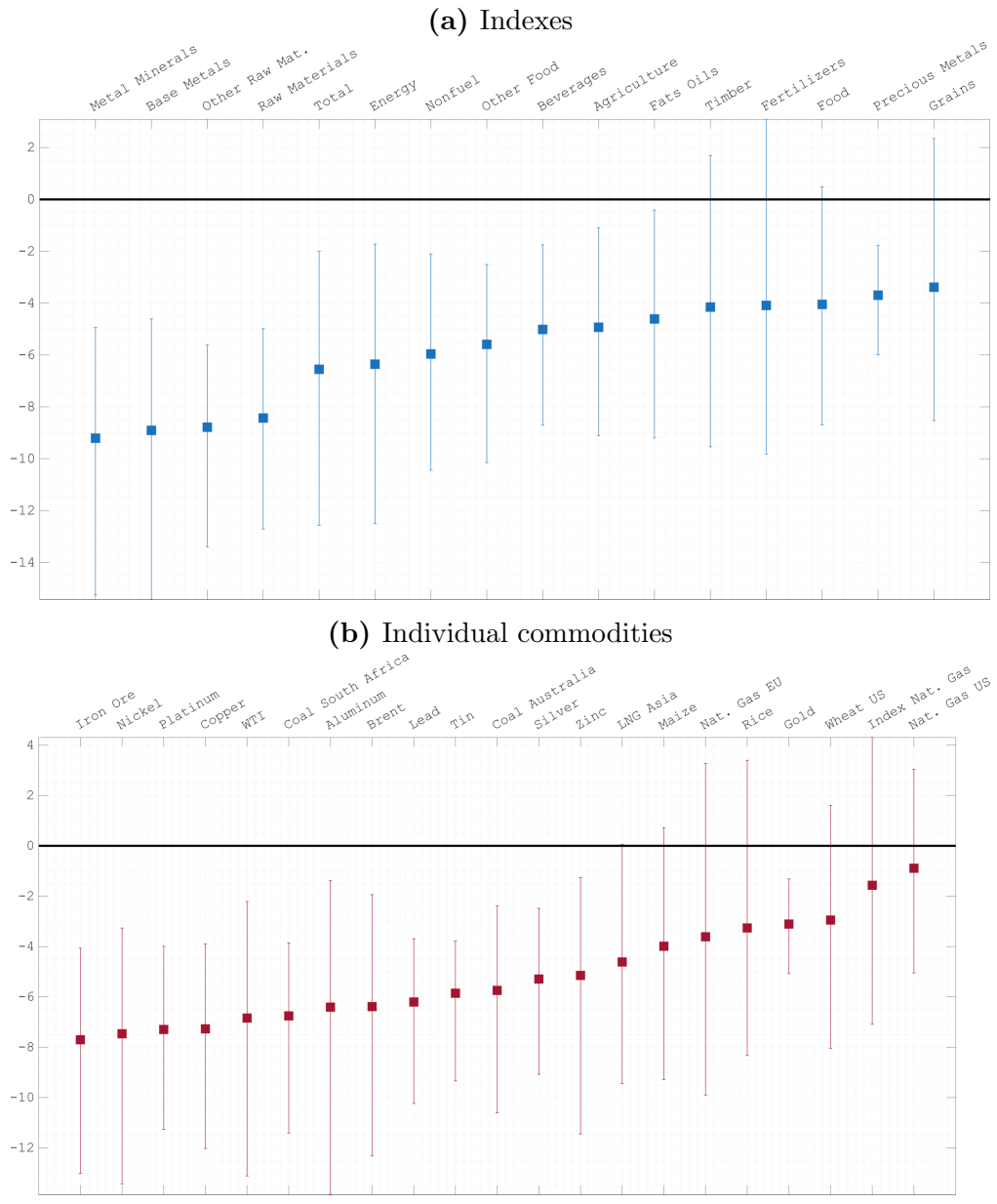


Figure 4: Response of commodity prices to Chinese monetary policy shocks.

Note. Quarterly data, sample: 2000-2018, median estimate, and 90% confidence intervals from proxy-SVAR identification. Total response of p^{com} over 16 quarters normalized by the response of M2.

3 Spillover analysis and the commodity price channel

From a policy perspective, there is a great interest in gauging the spillovers from Chinese economic developments to the rest of the global economy (some recent examples are Di Sano

et al., 2023; Akinci et al., 2024). However, this task is empirically challenging due to the difficulties in disentangling Chinese-specific shocks from foreign or global economic fluctuations. In our case, identifying Chinese monetary policy shocks offers a solution to this challenge. In this section, we analyze the country-level inflationary spillovers from Chinese monetary policy shocks and quantify the contribution of the commodity channel. Section 3.1 illustrates the econometric framework underlying the counterfactual analysis. Then, we move to the inflationary spillovers (Section 3.2) and to the implications for financing conditions in commodity-exporting EMEs (Section 3.3).

3.1 Econometric framework

The spillovers are computed according to the standard external instrument VAR framework described in Section 2.3. To gauge the relevance of the commodity channel, we compare the unconditional spillover to a counterfactual case in which commodity prices do not respond to Chinese monetary policy shocks. The exercise is carried out following Bernanke et al. (1997) and Miranda-Pinto et al. (2023). Eq.(8) formally depicts the counterfactual approach in a VAR that includes Chinese M2, commodity prices (p^{com}), and the target variables of interest. Both the impact matrix and the autoregressive coefficients are set to 0 to prevent any response of commodity prices to Chinese monetary policy. This approach is equivalent to shocking the system via a commodity-specific shock to offset the commodity price response to a Chinese monetary policy shock.

The target variables are the country-specific producer price indexes (PPI) and consumer price indexes (CPI). Finally, we also analyze the financing costs of commodity-exporting EMEs on international markets, which are proxied by the J.P. Morgan Emerging Markets Bond Index (EMBI) spread.

$$\begin{bmatrix} M2_t \\ p_t^{com} \\ target_t \end{bmatrix} = \sum_{j=1}^{p} \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} \\ 0 & 0 & 0 \\ a_{3,1} & a_{3,2} & a_{3,3} \end{bmatrix} \begin{bmatrix} M2_{t-j} \\ p_{t-j}^{com} \\ target_{t-j} \end{bmatrix} + \begin{bmatrix} b_{1,1} & b_{2,1} & b_{1,3} \\ 0 & b_{2,2} & b_{2,3} \\ b_{3,1} & b_{3,2} & b_{3,3} \end{bmatrix} \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix} \tag{8}$$

3.2 Inflationary effects

We focus on inflationary spillovers for which commodity prices can potentially play a large role by estimating a set of country-specific VARs. We employ the global database compiled by Ha et al. (2023) that provides extensive data coverage on consumer and producer prices. We focus on major countries (mainly G20 countries appended with other significant economies) whose data is available for the whole sample 2000-2018. To capture the heterogeneous role played by different types of commodities and the differential exposure of countries to them, we include an energy commodity index, a metals commodity index, and an agricultural commodity index. The VAR thus includes Chinese M2, the three commodity indexes, and a country-specific target variable (PPI in Figure 5, headline CPI in Figure 6, and energy CPI in Figure 7). The spillovers are measured as the peak responses of the variables over four years. The unconditional spillovers are denoted in blue, while the counterfactual spillovers without the commodity price response are in orange.

PPIs are more directly exposed to inflationary shocks than CPI as firms are affected and can then decide to pass through the increased prices to consumers or compress their margins. For this reason, the unconditional spillovers measured via PPI are structurally larger than those to CPI. Energy CPI spillovers are also sizable and comparable to PPI. Chinese monetary policy affects inflation across the board, but its effects are quite heterogeneous both across countries and price measures considered.

3.2.1 The Commodity Channel

The difference between unconditional and counterfactual spillovers yields the quantitative relevance of the commodity channel for the international transmission of Chinese monetary policy shocks. The channel is extremely meaningful for PPI, CPI, and energy CPI. We uncover a pronounced heterogeneity across advanced and emerging economies. For the PPI the commodity price channel explains 71% of the total spillover in the case of advanced economies, which are often commodity importers, while it is lower for EMEs (39%), which are often commodity exporters. A similar pattern characterizes headline CPI spillovers, although the channel is generally smaller than for PPI. The comparison between the estimates for headline and energy CPI is quite insightful. The commodity channel plays a similar role for

these two variables if evaluated across all economies (39%), but in the case of energy CPI, the heterogeneity between advanced (68%) and EMEs (18%) is unmistakable. EMEs are often exporters of fossil fuels, and firms and households in these countries can often employ energy inputs cheaply at subsidized prices. Conversely, advanced economies often import fossil fuels, and this dependence appears to amplify the commodity channel of Chinese monetary policy. This commodity channel is particularly important for European economies, which depend heavily on imported commodities. Considering the big four European countries (France, Germany, Italy, and Spain), we find that spillovers from Chinese monetary policy would be virtually null if the commodity channel were absent. This pattern is glaring for PPI, but holds also for headline and energy CPI.

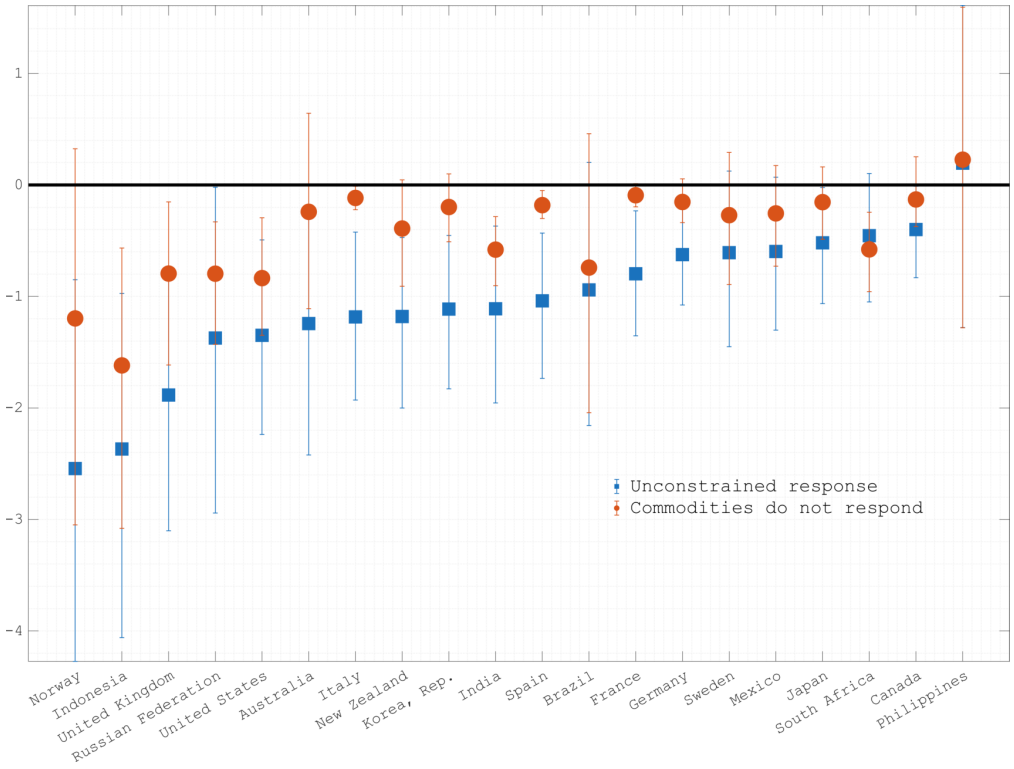


Figure 5: PPI spillovers from Chinese monetary policy shocks

Note. Spillovers to PPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

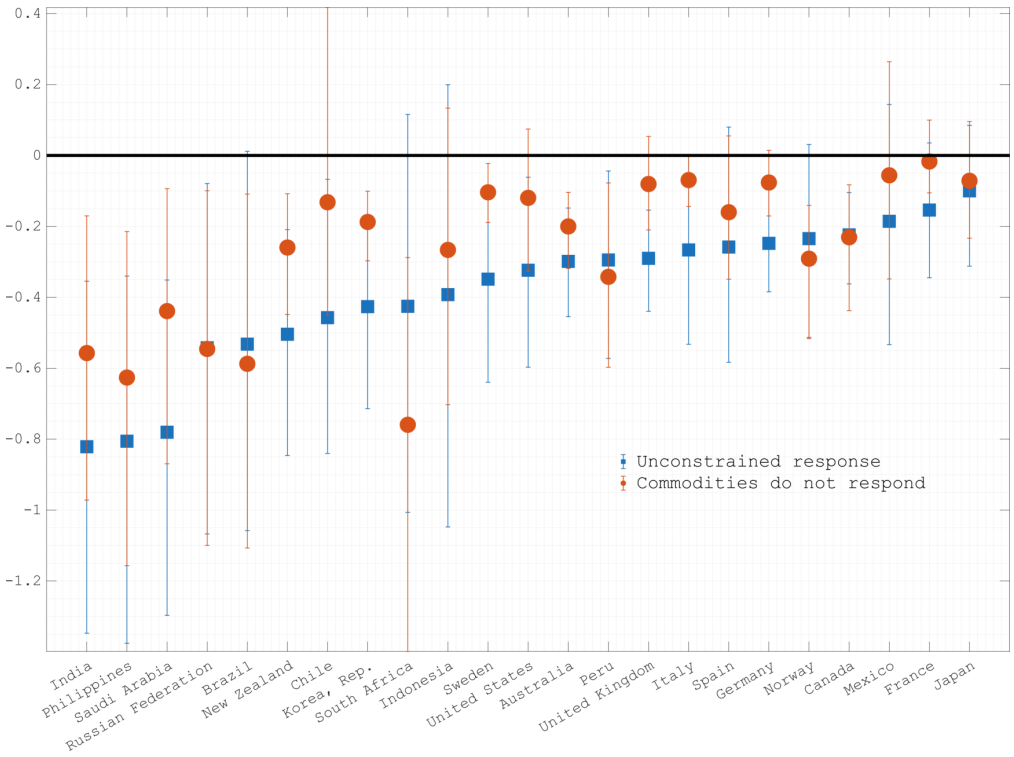


Figure 6: CPI spillovers from Chinese monetary policy shocks

Note. Spillovers to CPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

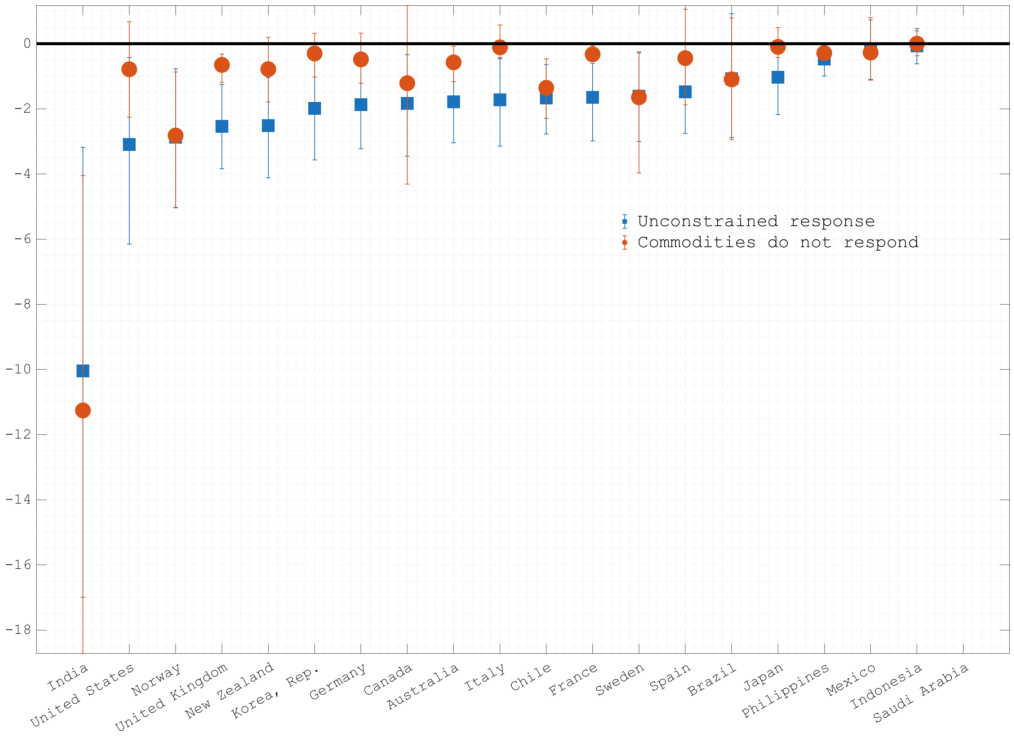


Figure 7: Energy CPI spillovers from Chinese monetary policy shocks

Note. Spillovers to CPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

	All countries	Advanced	EMDEs
PPI	51.6%	70.5%	39.3%
Headline CPI	39.5%	54.5%	36.6%
Energy CPI	39.1%	68.4%	18.7%

Table 2: Commodity price channel - summary

Note. Mean contribution of the commodity price channel to the spillovers generated by Chinese monetary policy shocks by variable and country group.

Commodity channel and commodity exposure. We further dig into the role played by the dependence on commodity imports for advanced economies. The commodity channel of Chinese monetary policy can affect foreign economies directly through fluctuations in the prices of imported commodities.[6] Additionally, varying commodity prices could transmit indirectly via second-round (general equilibrium) effects, for instance, within global value chains (Antràs and Chor, 2013). We correlate the relevance of the commodity channel of Chinese monetary policy with a measure of commodity dependence from abroad. We measure

[6]Table A1 reports the HS commodity codes used to compute country commodity exposure.

the latter as the ratio between the value of commodity imports out of GDP as the average over the sample 2000-2018.[7] This correlation indirectly estimates the relevance of the direct exposure mechanism described above. Figure 8 reports the results for PPI, headline, and energy CPI. The commodity exposure accounts for almost half of the overall commodity channel in the case of PPI, more than one-third for energy CPI, and more than one-fourth for headline CPI. Crucially, the correlation is most visible for the European big fours for all three variables.

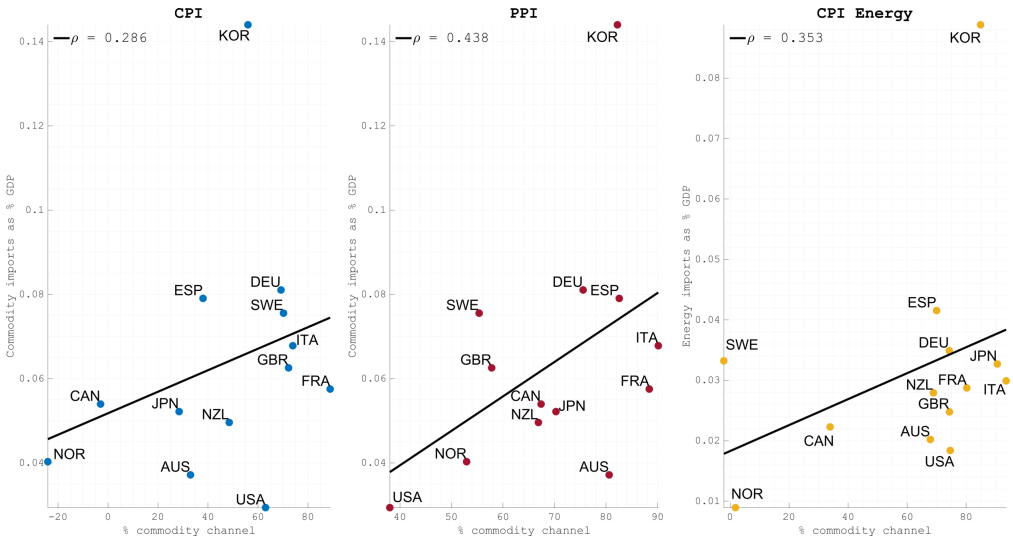


Figure 8: Commodity channel and commodity exposure

Note. Correlation between the commodity channel of Chinese monetary policy and commodity exposure from abroad.

3.3 Financing conditions in commodity-exporting EMEs

Finally, we analyze whether the commodity channel of Chinese monetary policy matters for financing conditions in EMEs. A wide literature emphasizes the role played by commodity terms of trade in determining financing conditions for commodity-exporting EMEs (see the recent contributions in Juvenal and Petrella, 2024; Gazzani et al., 2024). For this reason, we investigate whether the Chinese monetary policy shocks affect EMEs' financing conditions and assess the role of the commodity channel.

We measure EMEs' international financing conditions by employing the EMBI spread

[7]The data for the value of commodity imports come from Trade Data Monitor; for GDP from the World Bank.

and tracking the primary commodities exported by each country.[8] For each country, we include Chinese M2, instrumented with the monetary policy shocks, EMBI spread, and the price of the main commodities exported. The results in Figure 9 show that several EMEs are affected by Chinese monetary policy, and the transmission via commodity prices is key. For instance, Chile's EMBI spread rises (cumulatively) by about 150 basis points after a Chinese contractionary monetary policy shock. Notably, by shutting down the commodity channel (copper price), the response of EMBI spread becomes totally muted. Regarding the cross-sectional average, the commodity price channel explains about 44% of the total spillovers to EMEs' EMBI spreads. We assess whether the direct exposure to commodity exports as a percentage of domestic GDP matters for the size of the commodity channel of Chinese monetary policy. Figure 10 reports a large correlation between the two measures (0.72), suggesting that commodity exporters are directly hit by Chinese monetary policy transmitted via commodity prices.

[8]The EMBI spread measures the risk premium investors demand for holding debt from EMEs and is defined as the difference between the yield paid by EME's government bonds and those offered by the U.S. Treasury bills. Countries for which the EMBI spread is unavailable are excluded from the analysis. For the commodity exported by each country, our primary source of information is Cárcamo-Díaz (2019).

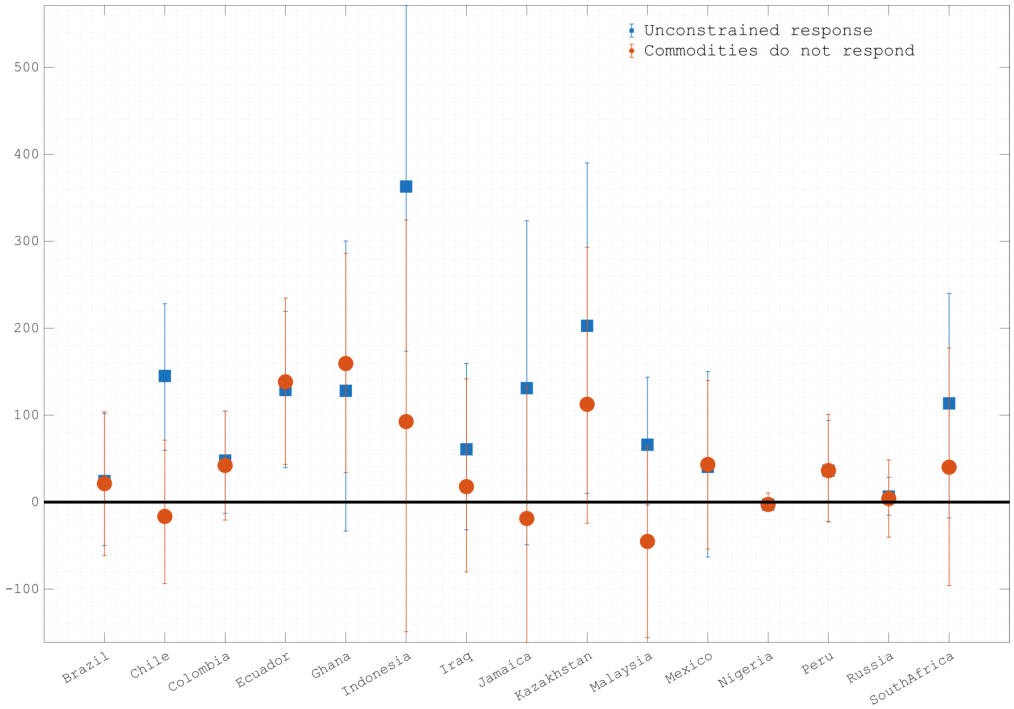


Figure 9: Effect of Chinese monetary policy shocks on EMEs financing cost

Note. Spillovers to EMBI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

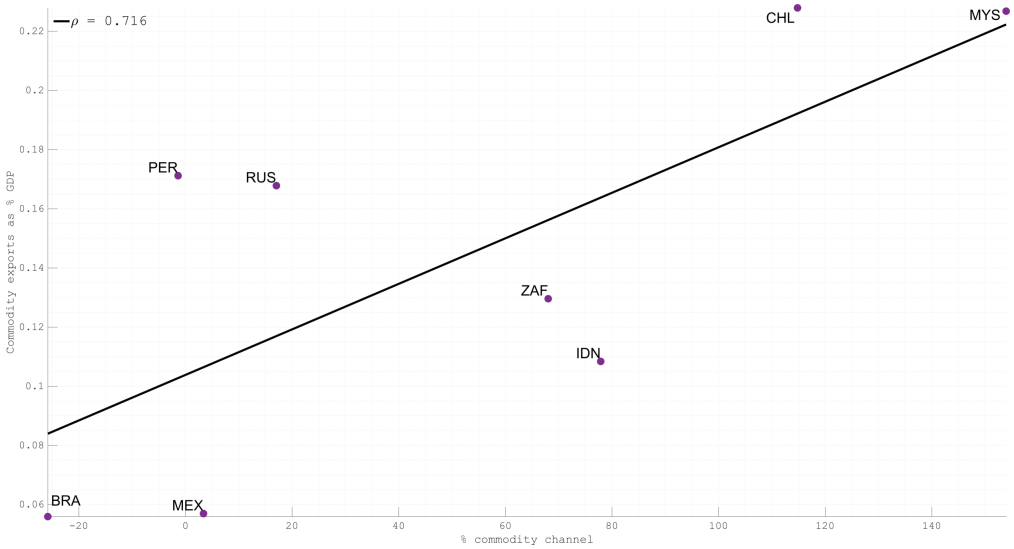


Figure 10: Commodity channel and commodity exposure

Note. Correlation between the commodity channel of Chinese monetary policy and commodity exports out of GDP.

4 Robustness exercises

The findings in our analysis are robust to several perturbations of the baseline empirical specification.

Internal instrument identification. Our findings are broadly unchanged if we identify the dynamic effects by including the Chen et al. (2023) series of monetary policy shocks as an internal instrument in our VAR (Plagborg-Møller and Wolf, 2021). This procedure allows us to relax the assumption of (partial) invertibility (Miranda-Agrippino and Ricco, 2023) necessary to employ the series of monetary policy shocks as an external instrument. Exploiting monetary policy shocks as an internal instrument amounts to including the series as an endogenous variable in the VAR (instead of Chinese M2), ordered first in a Cholesky decomposition or recursive ordering identification. Although our estimates display lower precision in this case, in line with the findings in Li et al. (2024), the results on both the domestic (Figure A1) and global effects (Figure A2) of Chinese monetary policy are very similar to the baseline.

Alternative specification of macro-financial VARs. The macroeconomic implications of Chinese monetary policy are consistent across several alternative specifications of the domestic and global VARs. First, we include world trade instead of world industrial production and observe that the former responds even more than the latter, in line with the role of China as a global manufacturing center (Figure A3). Second, we include measures of US interest rate and find a weak and delayed response to Chinese monetary policy shocks, suggesting that changes in global discounting rates are not a key propagation mechanism (Figure A4-A5). Specifically, the response of the 1-year rate is flat and not statistically significant. The 10-year rate displays a negative short-lived response that would actually imply by itself a response of commodity prices opposite to the one observed. Third, similar results hold if we use the commodity factor by Delle Chiaie et al. (2022) instead of a commodity index (Figure A6). Finally, we document the effects on world inflation. Although constructing such a measure is challenging, we employ the Ha et al. (2023) to build a measure of (trimmed) mean global inflation at the quarterly frequency. Results confirm that Chinese monetary policy affects consumer prices at the world level (Figure A7), in line with the country-level

responses estimated in Section 3.

High-frequency monetary policy shocks. Our results are similar using the Chinese monetary policy shocks identified in Das and Song (2023). This series provides us with the advantage of being available at a daily frequency, although it is based on interest rate changes around an announcement window. In the case of the Chinese monetary policy setting, this yields a more noisy and arguably less reliable series than the quarterly one employed in the baseline. Results in Figure A8-A9 show nonetheless that the responses of commodity prices and EMBI spread are qualitatively similar to our baseline and strongly delayed, ruling out that these features are an artifact of the quarterly frequency of our analysis.

Alternative measuring. The estimated effects of Chinese monetary policy on commodity prices are similar if we do not normalize commodity prices as in our baseline (Figure A10). Similarly, in our benchmark strategy, we did not normalize the prices of sample countries. By construction, the normalization does not alter the relevance of the commodity channel but can affect the overall spillovers. If we estimate the inflationary spillovers on normalized price levels (Figures A11-A13), the spillovers to some countries with more stable price levels (such as Japan and European countries) increase relative to other countries.

5 Conclusions

This paper documents that Chinese monetary policy generates sizable spillovers to the global economy driven by a real channel - contrary to US monetary policy that transmits via a financial channel - which affects massively commodity prices. This type of propagation is consistent with the stimulus to highly energy- and metal-intensive infrastructure investment highlighted in previous works. Indeed, industrial metals, raw materials, and energy inputs are the most elastic commodities to Chinese monetary policy, whereas precious metals and agricultural goods are only mildly responsive. Motivated by these findings, we estimate inflationary spillovers to foreign economies, and we find that they are widespread. The commodity channel of Chinese monetary policy plays a key role for advanced economies, especially the European big fours, which are directly and heavily affected due to their dependence on commodity imports. The other side of the coin is the effect of Chinese monetary policy on

EMEs' financing conditions, which is also directly triggered by the reliance of their economies on commodity exports. Policymakers should therefore consider the response of commodity prices when assessing the global effects of Chinese economic developments.

References

Ahmed, S., R. Correa, D. A. Dias, N. Gornemann, J. Hoek, A. Jain, E. X. Liu, and A. Wong (2019): "Global spillovers of a China hard landing," *International Finance Discussion Paper*.

Akinci, O., H. L. Clark, J. B. Dawson, M. Higgins, S. Miranda-Agrippino, R. Nallamotu, and E. Nourbash (2024): "What Happens to US Activity and Inflation if China's Property Sector Leads to a Crisis?" Tech. rep., Federal Reserve Bank of New York.

Alessandri, P., F. Venditti, and Ò. Jordà (2023): "Decomposing the monetary policy multiplier," *Bank of Italy Temi di Discussione (Working Paper) No*, 1422.

Allen, F., J. ian, and X. Gu (2017): "An overview of China's financial system," *Annual Review of Financial Economics*, 9, 191–231.

Antràs, P. and D. Chor (2013): "Organizing the global value chain," *Econometrica*, 81, 2127–2204.

Anzuini, A., M. J. Lombardi, and P. Pagano (2012): "The Impact of Monetary Policy Shocks on Commodity Prices," *International Journal of Central Banking, Forthcoming*.

Baldwin, R. (2024): "China is the World's Sole Manufacturing Superpower: A Line Sketch of the Rise," *CEPR Publication. Link: https://cepr. org/voxeu/columns/china-worlds-sole-manufacturing-superpower-line-sketch-rise*.

Barcelona, W., D. Cascaldi-Garcia, J. Hoek, and E. Van Leemput (2022): "What happens in China does not stay in China," *International Finance Discussion Paper*.

Bernanke, B. S., M. Gertler, M. Watson, C. A. Sims, and B. M. Friedman (1997): "Systematic monetary policy and the effects of oil price shocks," *Brookings papers on economic activity*, 1997, 91–157.

Cárcamo-Díaz, R. (2019): *Commodity dependence: a twenty-year perspective*, United Nations Publications.

Castelnuovo, E., L. Mori, and G. Peersman (2024): "Commodity Price Shocks and Global Cycles: Monetary Policy Matters," .

Chen, K., H. Gao, P. Higgins, D. F. Waggoner, and T. Zha (2023): "Monetary Stimulus amidst the Infrastructure Investment Spree: Evidence from China's Loan-Level Data," *The Journal of Finance*, 78, 1147–1204.

Chen, K., P. Higgins, and T. Zha (2024): "Constructing quarterly Chinese time series usable for macroeconomic analysis," *Journal of International Money and Finance*, 143, 103052.

Chen, K., J. Ren, and T. Zha (2018): "The nexus of monetary policy and shadow banking in China," *American Economic Review*, 108, 3891–3936.

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

Das, S. and W. Song (2023): "Monetary policy transmission and policy coordination in China," *China Economic Review*, 82, 102032.

Degasperi, R., S. Hong, and G. Ricco (2020): "The global transmission of us monetary policy," .

Delle Chiaie, S., L. Ferrara, and D. Giannone (2022): "Common factors of commodity prices," *Journal of Applied Econometrics*, 37, 461–476.

Di Sano, M., G. Pongetti, T. Schuler, and S. G. Toh (2023): "Spillovers to the euro area from recent negative inflation in China," *Economic Bulletin Boxes*, 7.

Emiliozzi, S., F. Ferriani, and A. G. Gazzani (2023): "The European energy crisis and the consequences for the global natural gas market," *Bank of Italy Occasional paper*.

Fernald, J. G., E. Hsu, and M. M. Spiegel (2021): "Reprint: Is China fudging its GDP figures? Evidence from trading partner data," *Journal of International Money and Finance*, 114, 102406.

Galvão, A. B. (2023): "Dynamic Macroeconomic Effects of Monetary Policy in China," *Available at SSRN 4650375*.

Gazzani, A. G., V. Herrera, and A. Vicondoa (2024): "The Asymmetric Effects of Commodity Price Shocks in Emerging Economies," *Available at SSRN 4731194*.

Georgiadis, G., G. J. Müller, and B. Schumann (2024): "Global risk and the dollar," *Journal of Monetary Economics*, 144, 103549.

Gertler, M. and P. Karadi (2015): "Monetary Policy Surprises, Credit Costs, and Economic Activity," *American Economic Journal: Macroeconomics*, 7, 44–76.

Gilchrist, S. and E. Zakrajšek (2012): "Credit spreads and business cycle fluctuations," *American economic review*, 102, 1692–1720.

Gürkaynak, R. S., B. Sack, and E. T. Swansonc (2005): "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking*.

Gutierrez, C., J. Turen, and A. Vicondoa (2024): "Chinese Macroeconomic Surprises and the Global Financial Cycle," Tech. rep.

Ha, J., M. A. Kose, and F. Ohnsorge (2023): "One-stop source: A global database of inflation," *Journal of International Money and Finance*, 137, 102896.

Hammoudeh, S., D. K. Nguyen, and R. M. Sousa (2024): "China's monetary policy framework and global commodity prices," *Energy Economics*, 107767.

Hu, G. X. and J. Wang (2022): "A review of China's financial markets," *Annual Review of Financial Economics*, 14, 465–507.

Ider, G., A. Kriwoluzky, F. Kurcz, and B. Schumann (2024): "Friend, Not Foe-Energy Prices and European Monetary Policy," .

IMF (2015): "Chapter 2," *World Economic Outlook*.

Juvenal, L. and I. Petrella (2024): "Unveiling the dance of commodity prices and the global financial cycle," *Journal of International Economics*, 150, 103913.

Li, D., M. Plagborg-Møller, and C. K. Wolf (2024): "Local projections vs. vars: Lessons from thousands of dgps," *Journal of Econometrics*, 105722.

Metelli, L. and F. Natoli (2017): "The effect of a Chinese slowdown on inflation in the euro area and the United States," *Economic Modelling*, 62, 16–22.

Miranda-Agrippino, S., T. Nenova, and H. Rey (2020): "Global footprints of monetary policy," Tech. rep.

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

——— (2022): "The global financial cycle," in *Handbook of international economics*, Elsevier, vol. 6, 1–43.

Miranda-Agrippino, S. and G. Ricco (2023): "Identification with external instruments in structural VARs," *Journal of Monetary Economics*, 135, 1–19.

Miranda-Pinto, J., A. Pescatori, E. Prifti, and G. Verduzco-Bustos (2023): "Monetary Policy Transmission through Commodity Prices," Tech. rep., International Monetary Fund.

Plagborg-Møller, M. and C. K. Wolf (2021): "Local projections and VARs estimate the same impulse responses," *Econometrica*, 89, 955–980.

Taylor, J. B. (1993): "Discretion versus policy rules in practice," *Carnegie-Rochester Conference Series on Public Policy*, 39, 195–214.

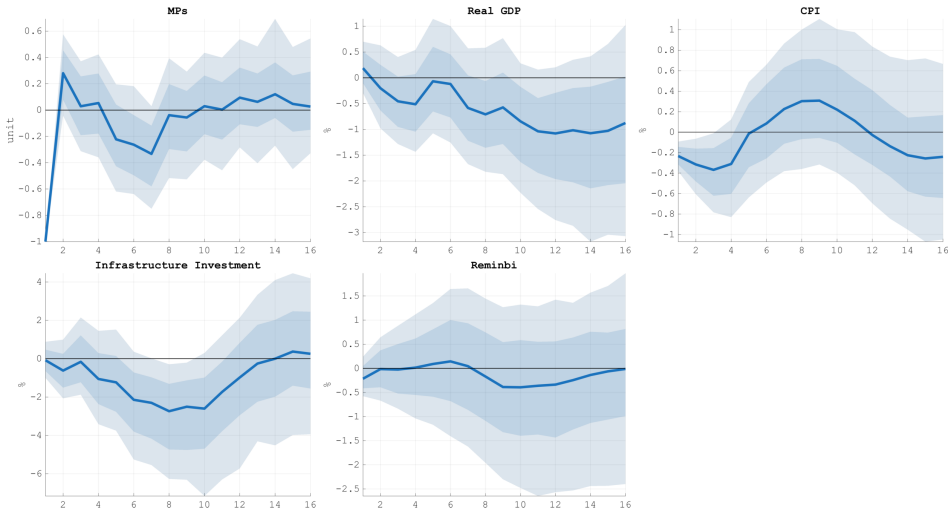


Figure A1: Domestic effects of Chinese monetary policy - internal instruments identification

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

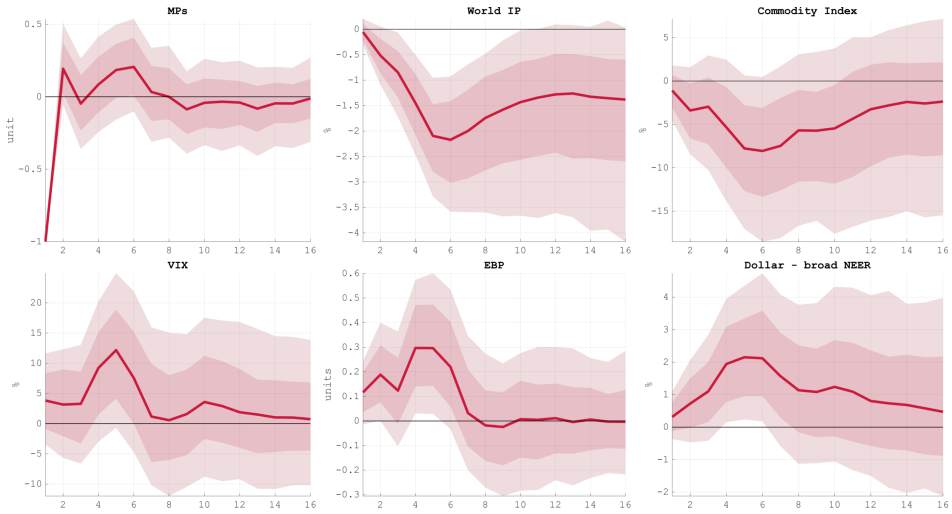


Figure A2: Global effects of Chinese monetary policy - internal instruments identification

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

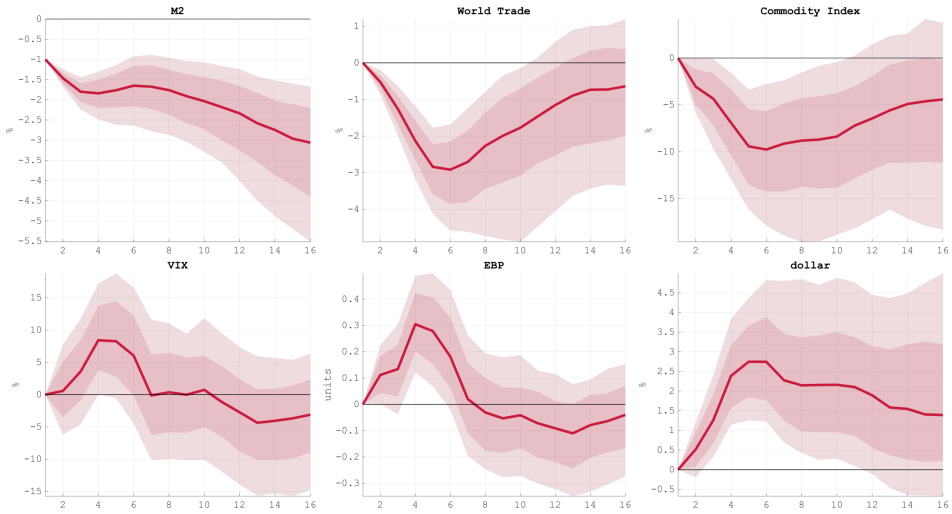


Figure A3: Global effects of Chinese monetary policy - world trade

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

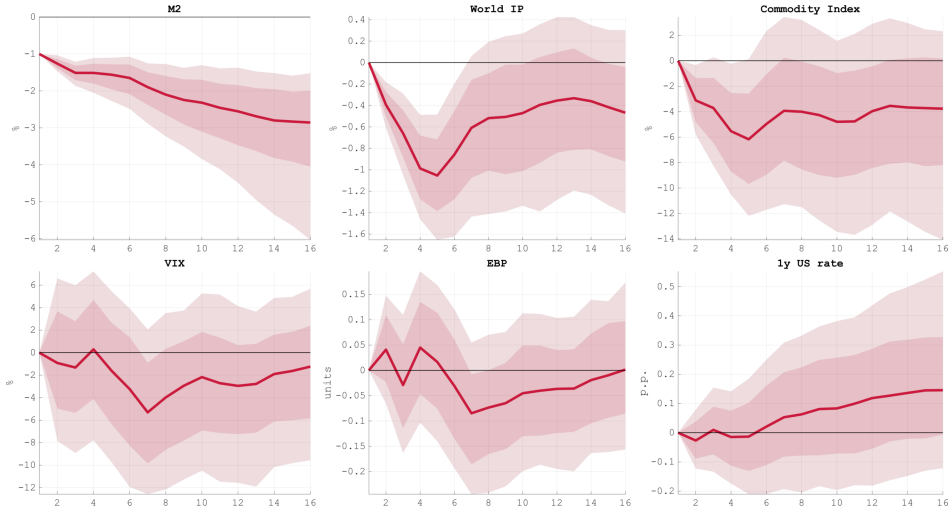


Figure A4: Global effects of Chinese monetary policy - 1y US rate

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

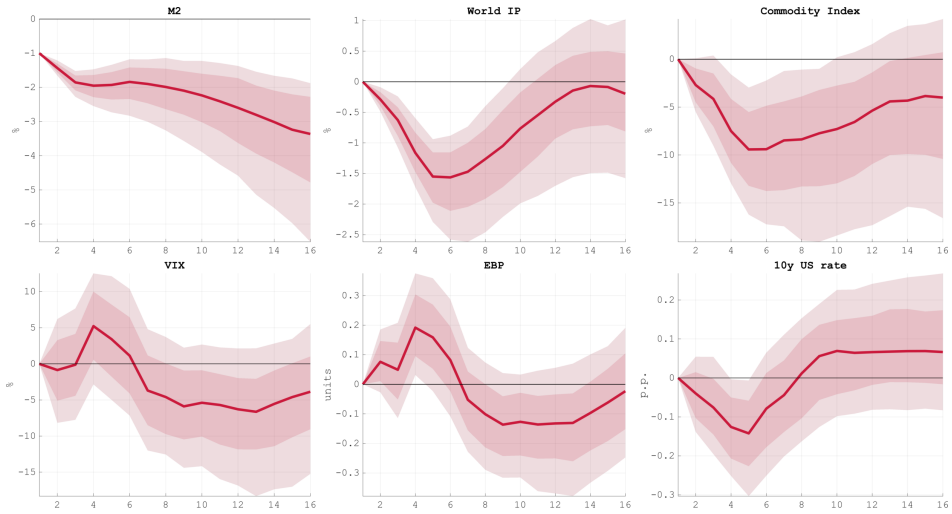


Figure A5: Global effects of Chinese monetary policy - 10y US rate

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

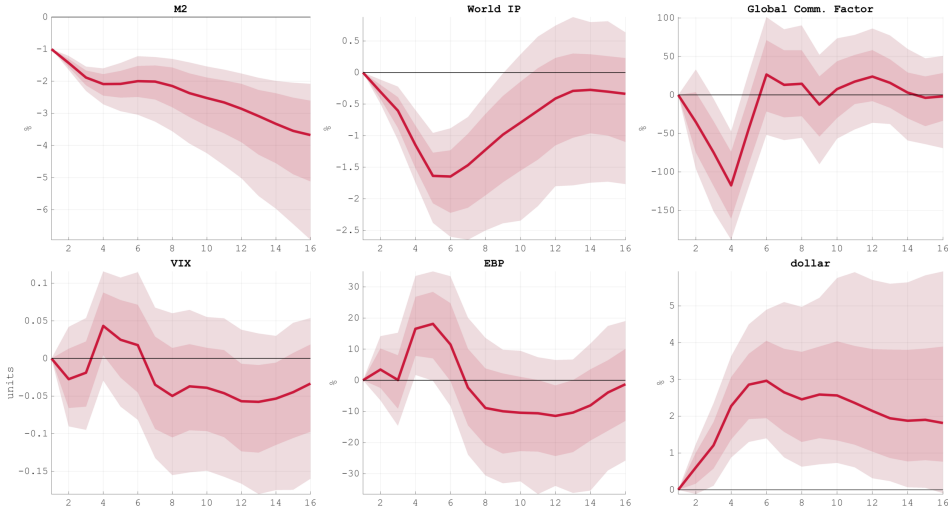


Figure A6: Global effects of Chinese monetary policy - commodity factor

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

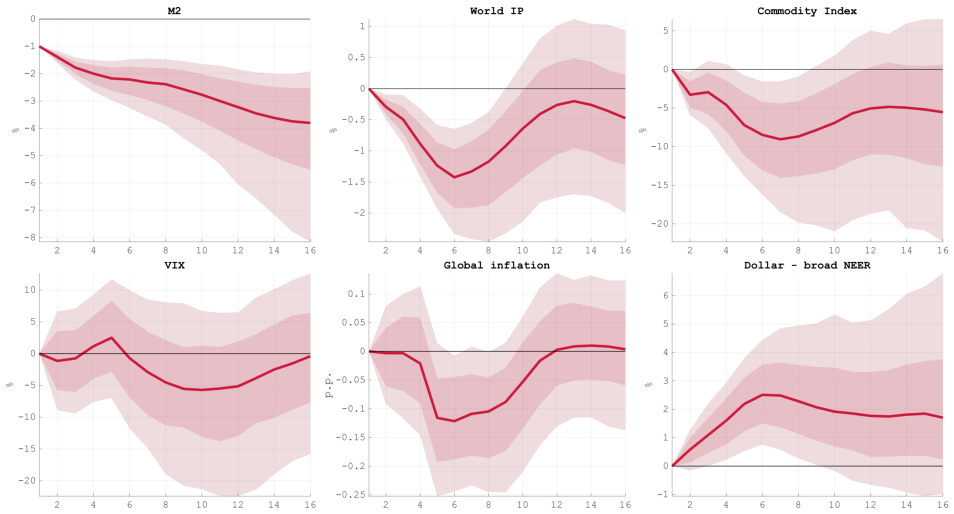


Figure A7: Global effects of Chinese monetary policy - including global inflation

Note. Quarterly data, sample: 2000-2018, 68-90% confidence intervals

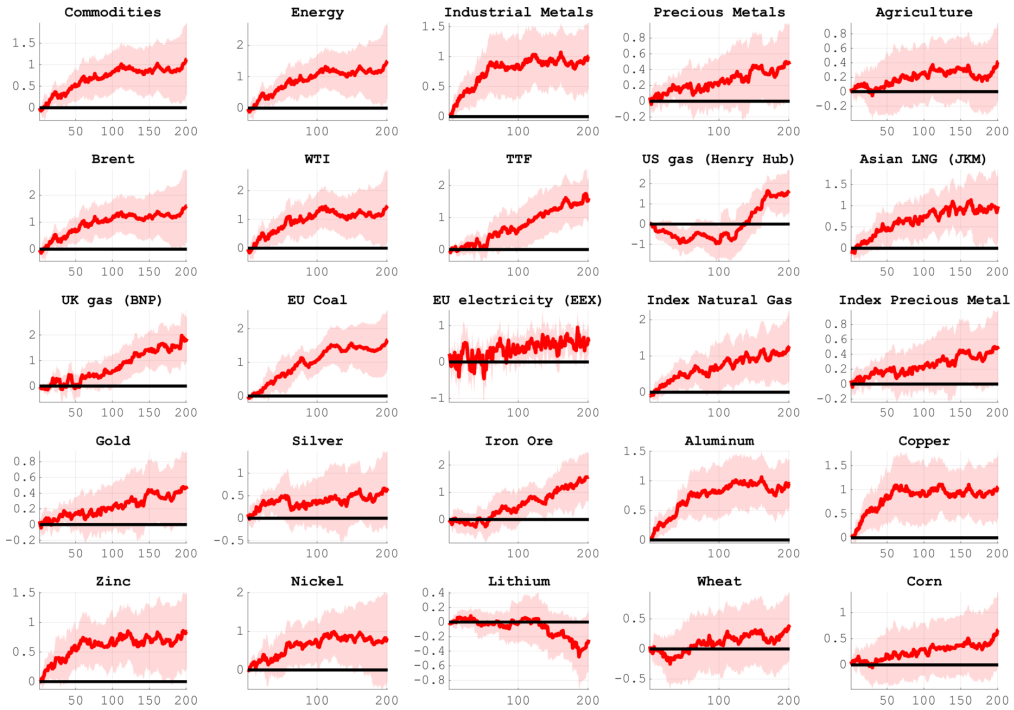


Figure A8: Daily response of commodity prices

Note. Daily data, sample: 2006-2019, 90% confidence intervals.

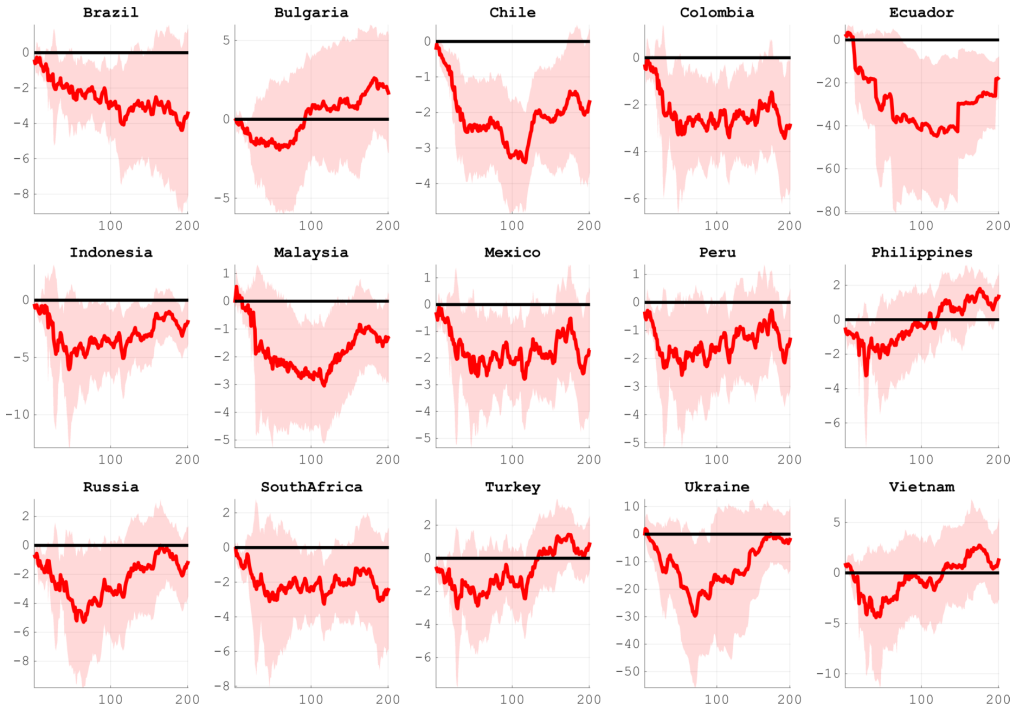


Figure A9: Daily response of EMBI

Note. Daily data, sample: 2006-2019, 90% confidence intervals.

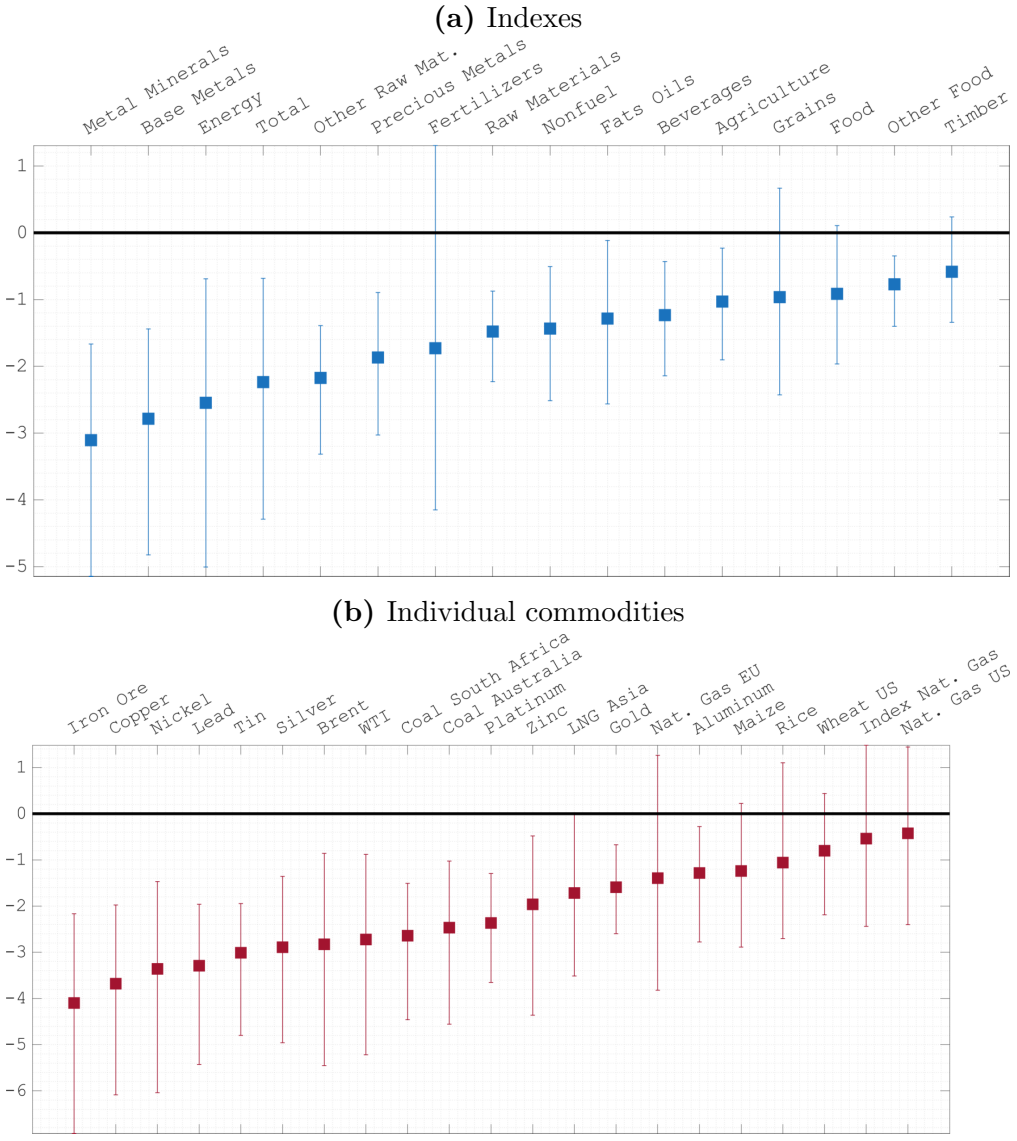


Figure A10: Response of commodity prices to Chinese monetary policy shocks.

Note. Quarterly data, sample: 2000-2018, point estimate and 90% confidence intervals from Proxy-SVAR identification. Total response of p^{com} *over 16 quarters normalized by the response of M2.*

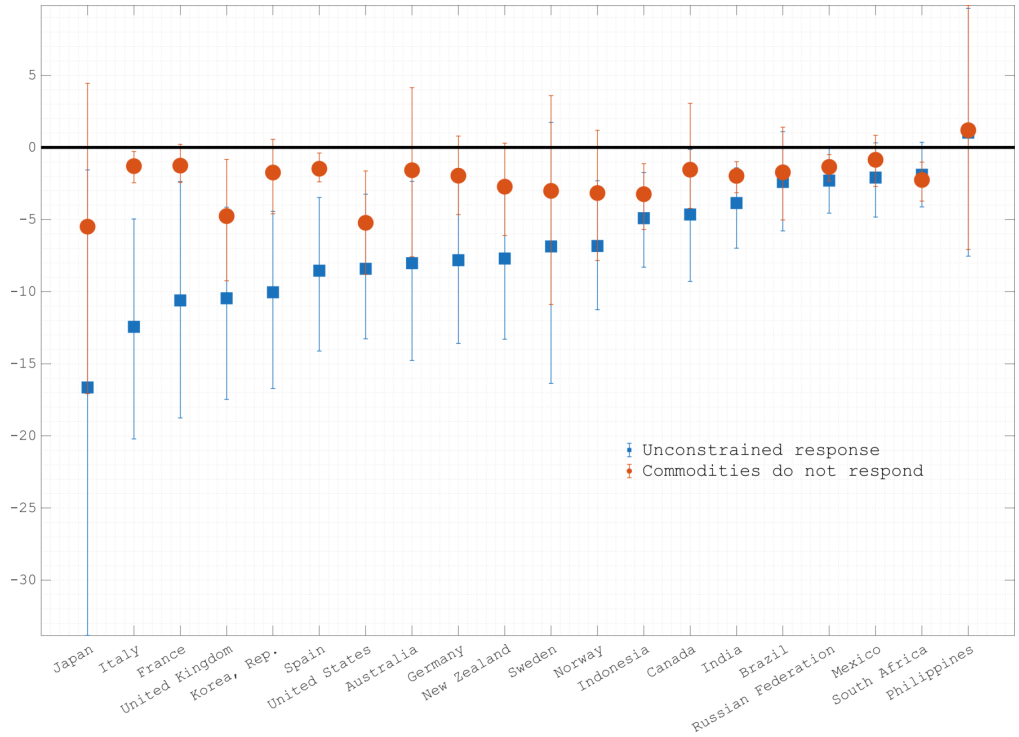


Figure A11: PPI (normalized) spillovers from Chinese monetary policy shocks

Note. Spillovers to PPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

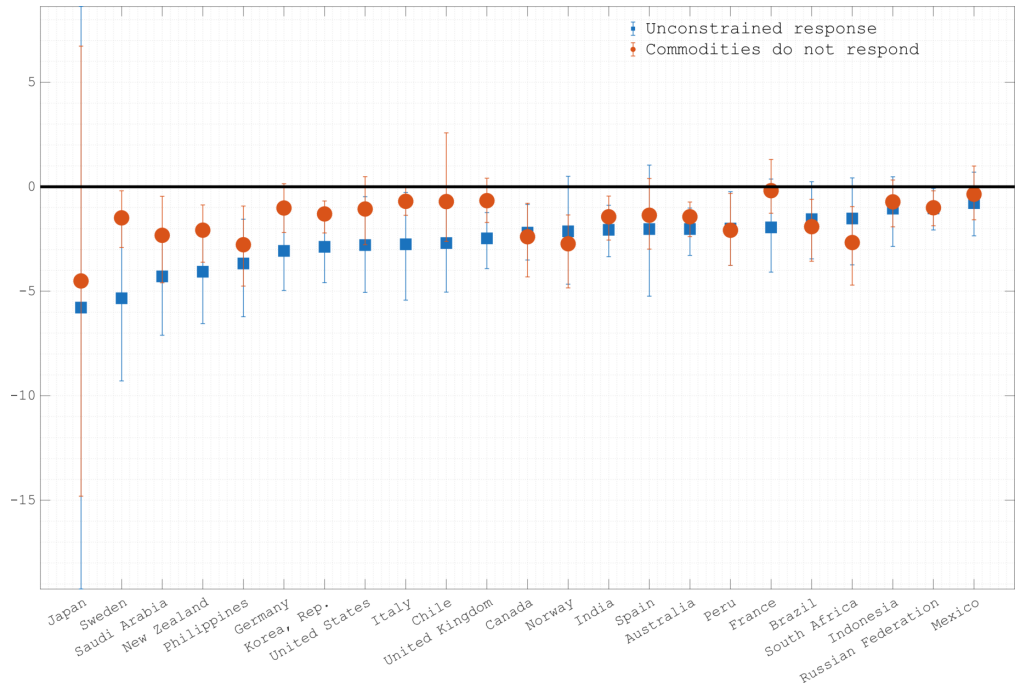


Figure A12: CPI (normalized) spillovers from Chinese monetary policy shocks

Note. Spillovers to CPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

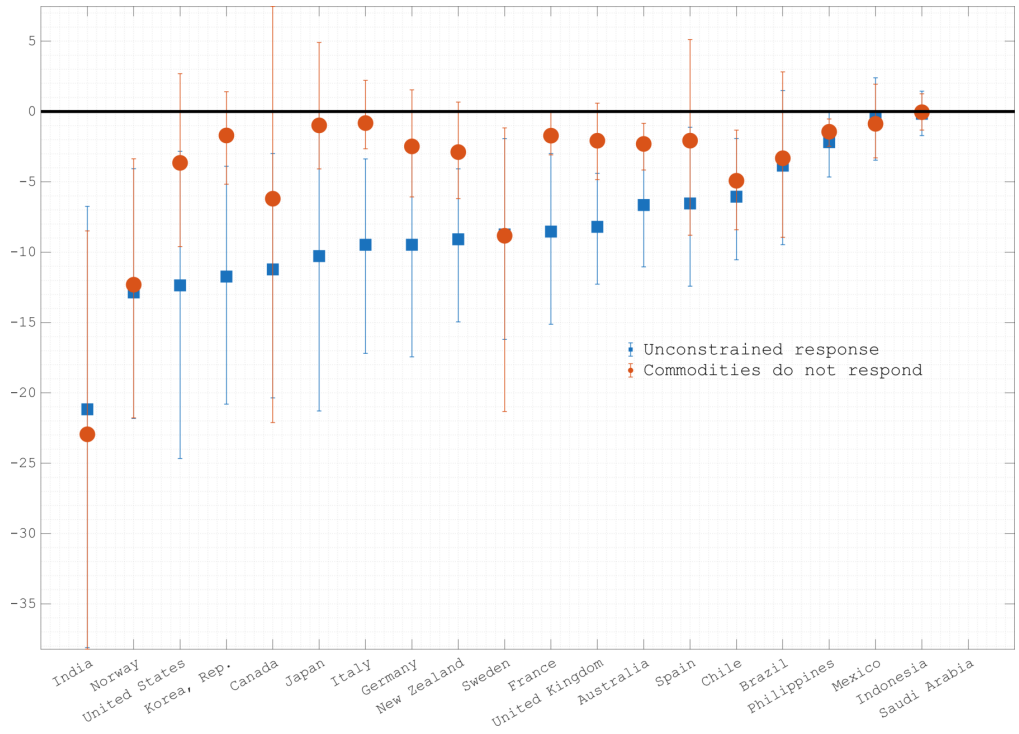


Figure A13: Energy CPI (normalized) spillovers from Chinese monetary policy shocks

Note. Spillovers to CPI of foreign economies (peak response over 16 quarters). Blue: commodity channel active. Orange: commodity channel shut-down. Quarterly data, sample: 2000-2018, 90% confidence intervals

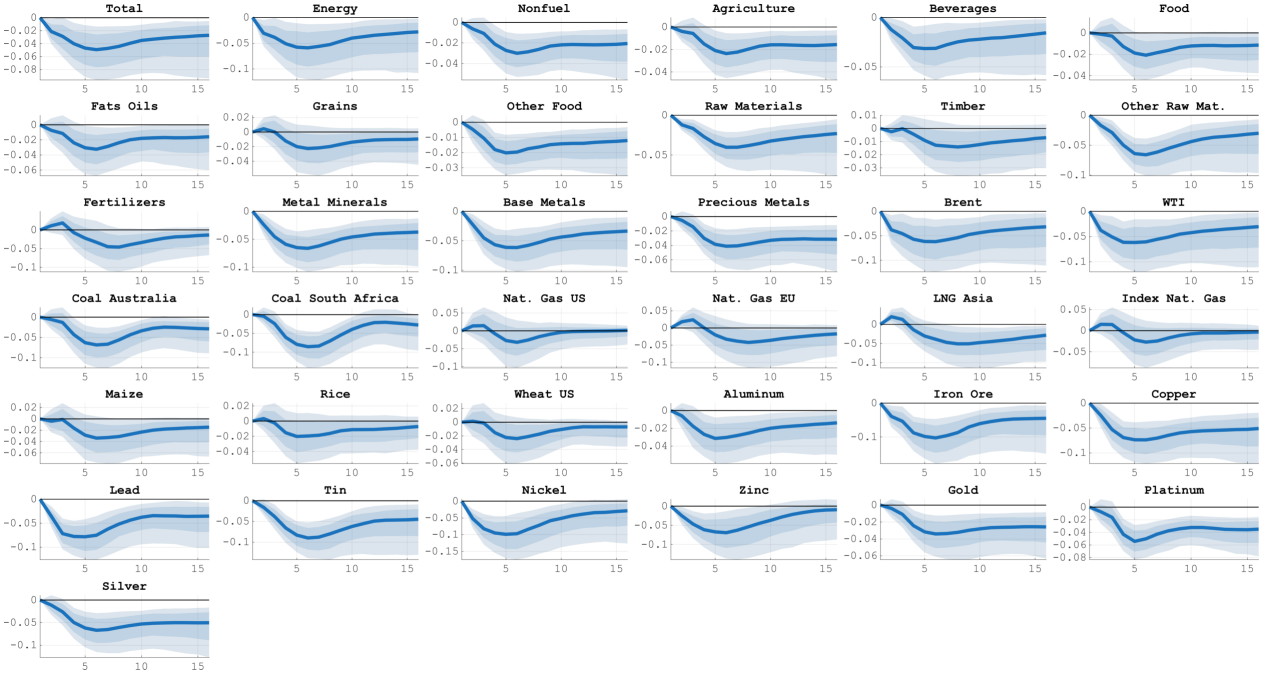


Figure A14: IRFs of individual commodities

Code	Description
0102	Bovine animals; live
0103	Swine; live
0104	Sheep and goats; live
0105	Poultry; live,
02	Meat and edible meat offal
03	Fish and crustaceans, molluscs and other aquatic invertebrates
09	Coffee, tea, mate and spices
10	Cereals
12	Oil seeds and oleaginous fruits
13	Lac; gums, resins and other vegetable saps and extracts
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
2401	Tobacco, unmanufactured; tobacco refuse
26	Ores, slag and ash
27	Mineral fuels, mineral oils and products of their distillation;
31	Fertilizers
4001	Natural rubber
4401	Fuel wood
5001	Silk-worm cocoons suitable for reeling
5002	Raw silk
5101	Wool, not carded or combed
5201	Cotton; not carded or combed
7106	Silver; unwrought or in semi-manufactured forms, or in powder form
7108	Gold; unwrought or in semi-manufactured forms, or in powder form
7110	Platinum; unwrought or in semi-manufactured forms, or in powder form
72	Iron and steel
73	Iron or steel articles
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin and articles thereof

Table A1: List of HS commodity codes

Note. List of commodity items used to compute commodity exposure. Full description of each HS code available upon request.