Global Footprints of Monetary Policies

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Abstract

We study the international transmission of the monetary policy of the two world's giants: China and the US. From East to West, the channels of global transmission differ markedly. US monetary policy shocks affect the global economy primarily through their effects on integrated financial markets, global asset prices, and capital flows. EMEs in particular see both a reduction in inflows and a surge in outflows when the market tide turns as a result of a US monetary contraction. Conversely, international trade, commodity prices and global value chains are the main channels through which Chinese monetary policy transmits worldwide. AEs with a strong manufacturing sector are particularly sensitive to these disturbances.

Keywords: Monetary Policy; Global Financial Cycle; International spillovers; US; China

JEL Classification: E44, E52, F33, F42

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Summary

Introduction The large and increasing interconnectedness of global real and financial markets, the emergence of Global Value Chains (GVC), and of a Global Financial Cycle (GFC, Rey, 2013), all provide fertile ground for international spillovers. In fact, the unprecedented intricacy of global networks generates potentially new dimensions for the international transmission of monetary policy shocks that go beyond the standard textbook trade channels primarily brought about by fluctuations in the exchange rate.

In a standard open economy environment a monetary tightening influences the current account in two ways. On the one hand, imports are affected by the contraction in domestic demand; on the other, the subsequent appreciation of the domestic currency makes exports more expensive, if one operates under a local currency pricing paradigm.[1] Foreign economies are affected by the local monetary policy shock only to the extent that their trade in goods and services depends on the local trade balance.

Miranda-Agrippino and Rey (2015) document a further channel for the international transmission of monetary policy that instead works through global financial markets. The synchronization of international financial markets epitomized by the GFC, together with the role of the dollar as the dominant currency of the international monetary system, consign a special role to US monetary policy as one of the drivers of the GFC itself (see also Jorda, Schularick, Taylor and Ward, 2018; Habib and Venditti, 2019). US monetary contractions are followed by a significant deleveraging of global financial intermediaries, a rise in aggregate risk aversion, a contraction in global asset prices and in global credit, a widening of corporate bond spreads, and a retrenchment in gross capital flows. The effects, estimated on the period 1980-2010 (or 1990-2010), are economically significant, and not confined only to countries that adopt an exchange rate peg.[2] Dées and Galesi (2019) confirm this result using a GVAR where trade-weights summarize the network

[1] Important distortions here arise when one introduces dominant currency pricing that arises from USD invoicing as documented in Gopinath, Boz, Casas, Díez, Gourinchas and Plagborg-Møller (2020).

[2] Miranda-Agrippino and Rey (2020) extend the analysis to the unconventional monetary policy that the Fed adopted starting in 2009. US monetary policy that operates mainly on the short end of the yield curve elicits effects on global financial variables that are very similar to those documented for the pre-ZLB sample. One notable exception is the VIX, whose role as barometer of global risk may have changed since the crisis (see also Avdjiev, Gambacorta, Goldberg and Schiaffi, 2017; Forbes and Warnock, 2019; Burcu, Lombardi, Mihaljek and Shin, 2020).

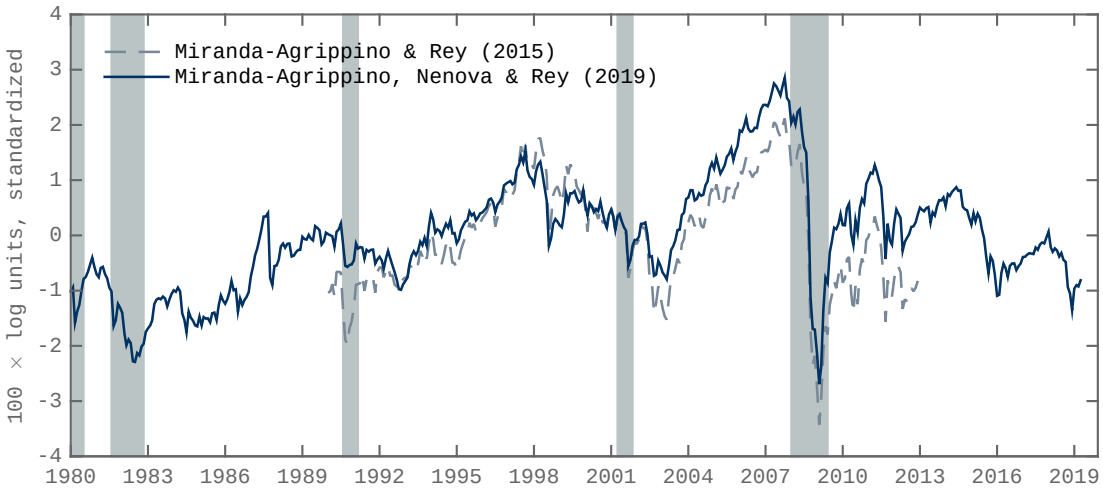
of cross-country interactions; US monetary policy shocks transmit across border almost irrespective of the exchange rate regime of the recipient country, and taking into account higher-order spillovers within the global trade network amplifies the transmission (see also Georgiadis, 2017).

But is the Federal Reserve the only giant capable of influencing global conditions through its policies?

In this paper we compare the global effects of US monetary policy with those elicited by surprise changes in the Chinese monetary policy stance. For the first time we are able to make use of a monetary policy index that summarizes the policy stance of the People's Bank of China, and can be regarded as the analog of the Federal Funds Rate (Xu and Jia, 2019). Postulating a standard Taylor-type rule for the Chinese monetary authority, and a delayed response for most of the global aggregates, we evaluate empirically how the world adjusts to a Chinese monetary policy shock.

Our estimates suggest that the monetary policies of the US and China have a sizeable impact on the global economy. However, the channels of transmissions of these spillovers differ. US shocks propagate predominantly through financial markets: financial conditions, risk indices, asset prices, private liquidity, and international capital flows all respond very significantly. Moreover, while tighter US monetary policy leads to a contraction of capital flows both in and out of the US, pointing to a general weakening of global financial activity, EMEs also suffer additional capital flights that contribute to increase their vulnerability. Conversely, global financial variables do not appear to be the primary transmission channel when one focuses instead on Chinese monetary policy shocks. In this case, it is the contraction of domestic demand and prices that drags down global activity. Commodity prices contract with some delay, but very significantly. Global asset prices are essentially insensitive for several months, after which they contract presumably as a result of the fall in commodity prices, and in global growth. Similarly, financial conditions significantly tighten for major commodity exporters, while they are largely unaffected at the global level. Commodity producers also experience capital flights and disinvestment. Global trade, and global growth as a consequence, contract. Through global value chains, these repercussions ripple all the way into Europe: German output, imports and exports all suffer severe contractions.

FIGURE 1: GLOBAL ASSET PRICES

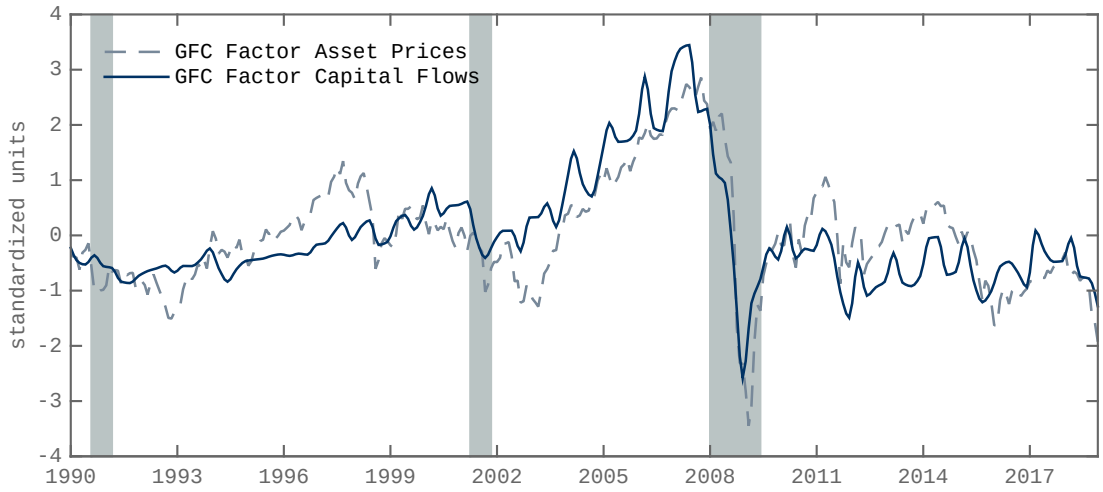


Note: Global factors in risky asset prices. Dashed line: factor in Miranda-Agrippino and Rey (2015). Solid line: update.

We summarize fluctuations in global asset prices and capital flows through global factors. For asset prices, we extend the global factor of Miranda-Agrippino and Rey (2015) along two dimensions: time, with estimates now covering all the months between 1980:01-2019:04, and cross-section, by performing the extraction on a larger and richer set of price series that is updated to reflect compositional changes in global markets, particularly through the inclusion of Chinese stocks. We then conduct a thorough factor analysis of global capital flows. Here too we find evidence of a dominant common global component that, very interestingly, but perhaps not surprisingly, strongly correlates with the global factor in asset prices, providing further additional evidence of the potency of the GFC.

Global Factors for Asset Prices and Capital Flows Miranda-Agrippino and Rey (2015) document the presence of a unique common factor in global risky asset prices that captures a significant share of common variation in global markets. In a simple model of heterogeneous financial intermediaries, this factor is primarily a function of realized market variance, and of the aggregate degree of time-varying risk aversion in global markets. The factor indeed displayed a significant correlation with other independent risk indices such as the VIX and other measures of implied variance.

FIGURE 2: GLOBAL PRICES & CAPITAL FLOWS



Note: Dashed line: global factor in world risky asset prices. Solid line: global factor in world capital flows.

The factor was originally extracted from a set of monthly asset prices, all expressed in USD, up to 2010. Since then, the composition of global markets has changed, with Eastern markets gaining increasingly more visibility. In order to account for this, here we extend the analysis in two ways: (i) time, the new monthly factor covers the period from 1980:01 to 2019:04; (ii) cross-section, taking again as reference the components of the S&P Global index (https://us.spindices.com/indices/equity/sp-global-1200), we extract the factor from an updated sample that reflects this compositional changes, and includes more Chinese stocks. The methodology is the same as in Miranda-Agrippino and Rey (2015).

The old and new factors are plotted in Figure 1. Over the overlapping sample, the two factors are essentially the same. Since 2010, the factor picks up other important global events such as the struggle in European markets during the sovereign crisis; the global equity sell-off of the beginning of 2016, triggered by fears that the Chinese growth slowdown may have spiralled out of control, and by the dramatic plunge in oil prices; and the slowdown at the end of 2018, which the commentators attribute to the combined effect of the withdrawal of some monetary stimuli, and of the escalation in the US-China trade conflict.

Figure 2 compares the global factor in asset prices with a global factor in international capital flows. The correlation between the two is remarkable, and over 0.8. This serves

as additional evidence that international financial markets largely dance to the same tune. Our analysis complements that in Valente, Wincoop and Davis (2019) who also document important similarities between our asset prices factor and common factors in capital flows. Strikingly, they show that net flows as well as gross flows share a significant degree of common variation, that and the global factors they identify explain from 40% to half of their variance.[3,4]

The capital flow factor is extracted from a large cross-section of data that we take from the IMF statistics, and cover all types of both in- and outflows (foreign direct investments, portfolio equity and debt, banking) across all countries.[5] The data are quarterly at source, and we convert them to monthly via interpolation.[6] The interpolation is useful for the purpose of constructing a monthly capital flows factor that we can compare with that in asset prices. It is however inconsequential for what concerns the study of the response of capital flows to monetary policy shocks: estimating responses using interpolated data or with alternative data that are available at monthly frequency (distributed by CrossBorder Capital Ltd.) deliver essentially the same results. We report additional details on the factors in Appendix B.

Global Transmission of US Monetary Policy Shocks We set the stage by looking again at the global transmission of US monetary policy shocks. This serves us as a benchmark to then discuss the Chinese responses that follow.

We summarize the global landscape with the following variables: world production and world trade (from the CPB World Trade Monitor); world financial conditions and world private liquidity (from CrossBorder Capital Ltd.); the global factors in asset prices and capital flows; exchange rates and a commodity price index. Data definitions and sources are collected in Appendix A.

We report median responses and posterior credible sets at the 68% and 90% level to a

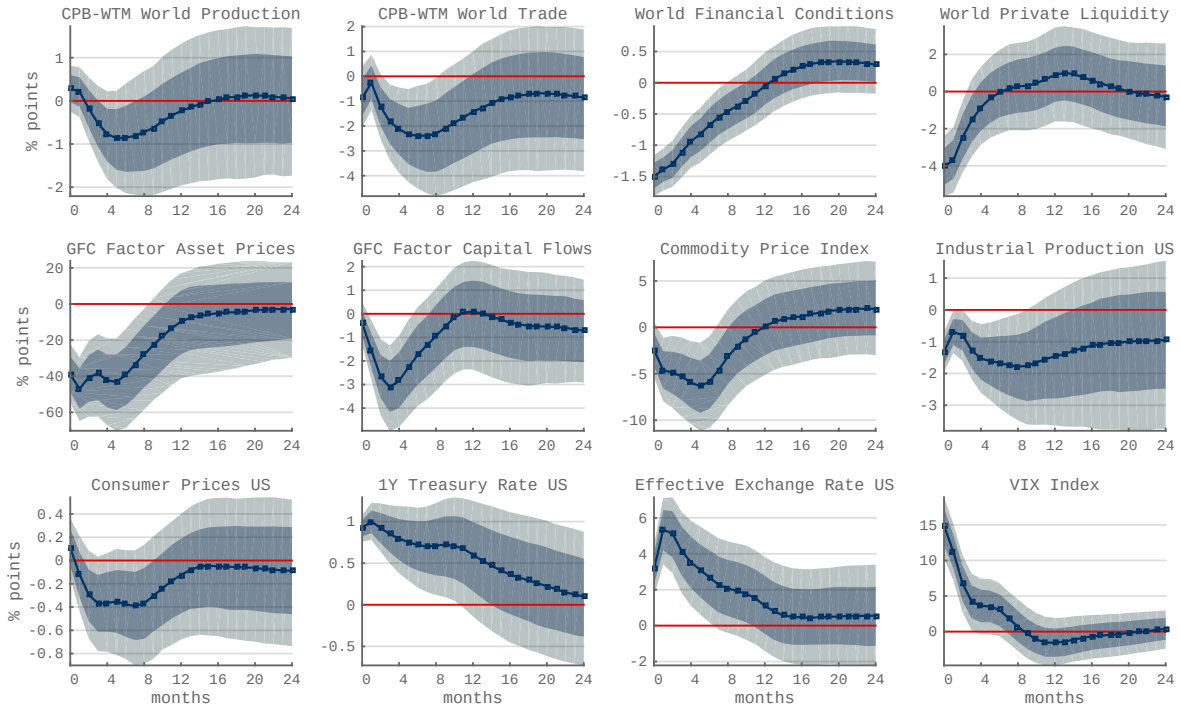
[3]The first global factor in Valente et al. (2019) comoves closely with the global factor in asset prices of Miranda-Agrippino and Rey (2015), while the second is linked to commodity (energy) prices.

[4]Barrot and Serven (2018) reach similar conclusions although they document some degree of heterogeneity between AEs and EMEs. Conversely, Cerutti, Claessens and Rose (2017) report more conservative estimates.

[5]The estimate of the common factor is robust to using inflows and outflows separately, and to different specifications of the factor model.

[6]We interpolate level data using a shape-preserving piecewise cubic interpolation. Matlab command: `y1 = interp1(t0,y0,t1,'pchip');`.

FIGURE 3: RESPONSES TO US MP SHOCK: #1



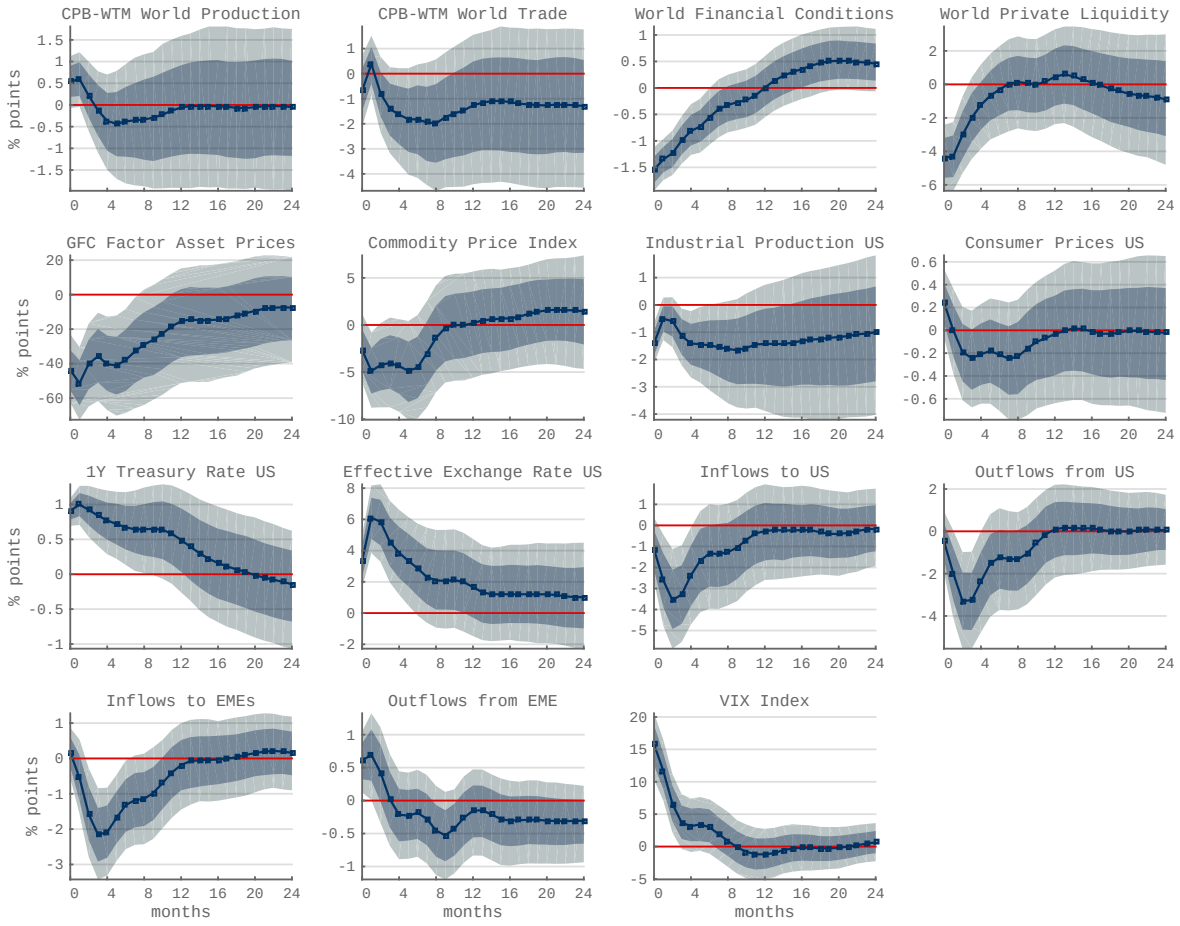
Note: Median IRFs with 68% and 90% posterior credible sets. BVAR(12). 1991:01-2018:12.

monetary policy shock identified using high-frequency movements in the price of Federal Funds Futures around FOMC announcements as external instrument (Stock and Watson, 2018). The IRFs are normalized such that the impact response of the policy rate (1-year rate) is equal to 100 bps. The VAR is estimated at monthly frequency over the sample 1991:01-2018:12 with 12 lags and standard macroeconomic priors (Giannone, Lenza and Primiceri, 2015).

Results are in Figures 3 and 4. Figure 3 largely replicates findings in Miranda-Agrippino and Rey (2015); following a US monetary policy tightening global financial conditions deteriorate materially. Private liquidity, measured as net credit generated by all credit providers, contracts. Global asset prices and global capital flows, summarized by the two factors, contract on impact, and the VIX spikes up. Global growth does not seem to be materially affected, while world trade contracts slightly at medium horizons. All this against a backdrop of cooling domestic conditions, with prices and production sliding. The US dollar appreciates (see also Degasperi, Hong and Ricco, 2019).

In Figure 4 we further explore the response of capital flows. We replace the global

FIGURE 4: RESPONSES TO US MP SHOCK: #2

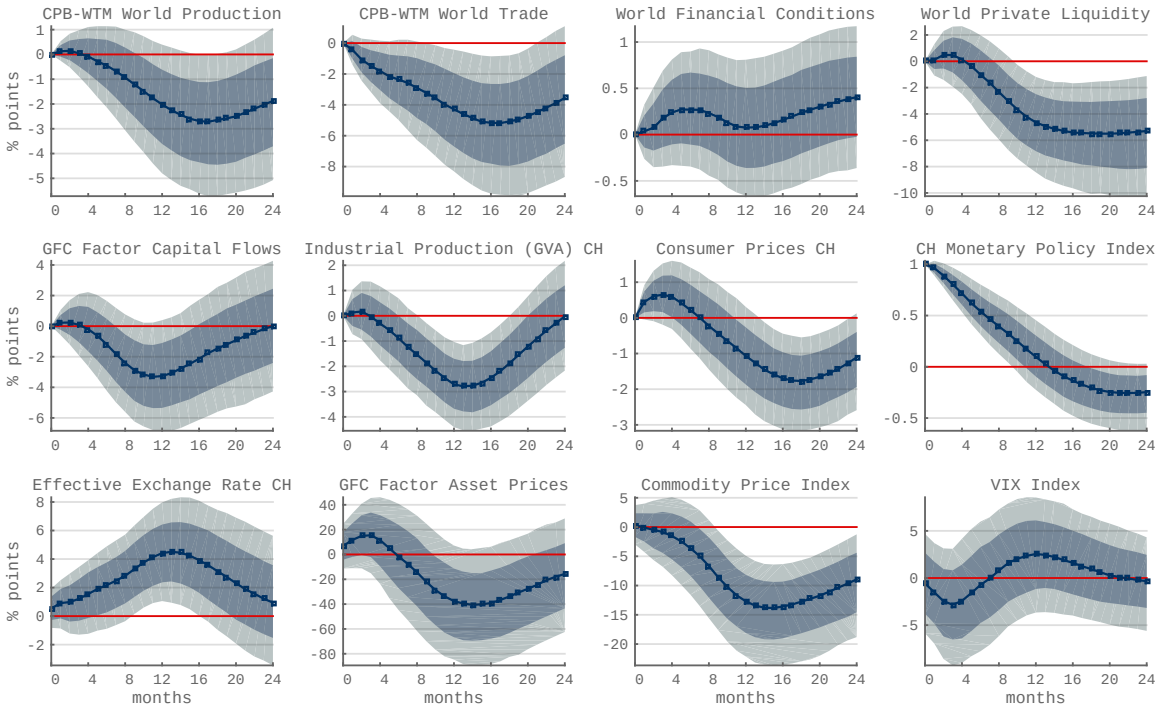


Note: Median IRFs with 68% and 90% posterior credible sets. BVAR(12). 1991:01-2018:12.

factor with four variables: capital flows in and out of the US; and capital flows in and out of EMEs. We note here that US inflows and outflows move largely in tandem, pointing to a general weakening of financial activity. This is not the case for EMEs, which are hit by a double whammy of less inflows and capital flights. This added vulnerability of EMEs to US monetary policy has been noted on several occasions, and culminated with the Taper Tantrum episode of 2013, when hints that the monetary stimulus may eventually be withdrawn threw investors into a mild panic that quickly transformed into excess volatility and sell-off, particularly in EMEs.

Global Transmission of Chinese Monetary Policy Shocks Particularly in recent years, the analysis of the conduct of monetary policy of the People's Bank of China has

FIGURE 5: RESPONSES TO CHINESE MP SHOCK: #1

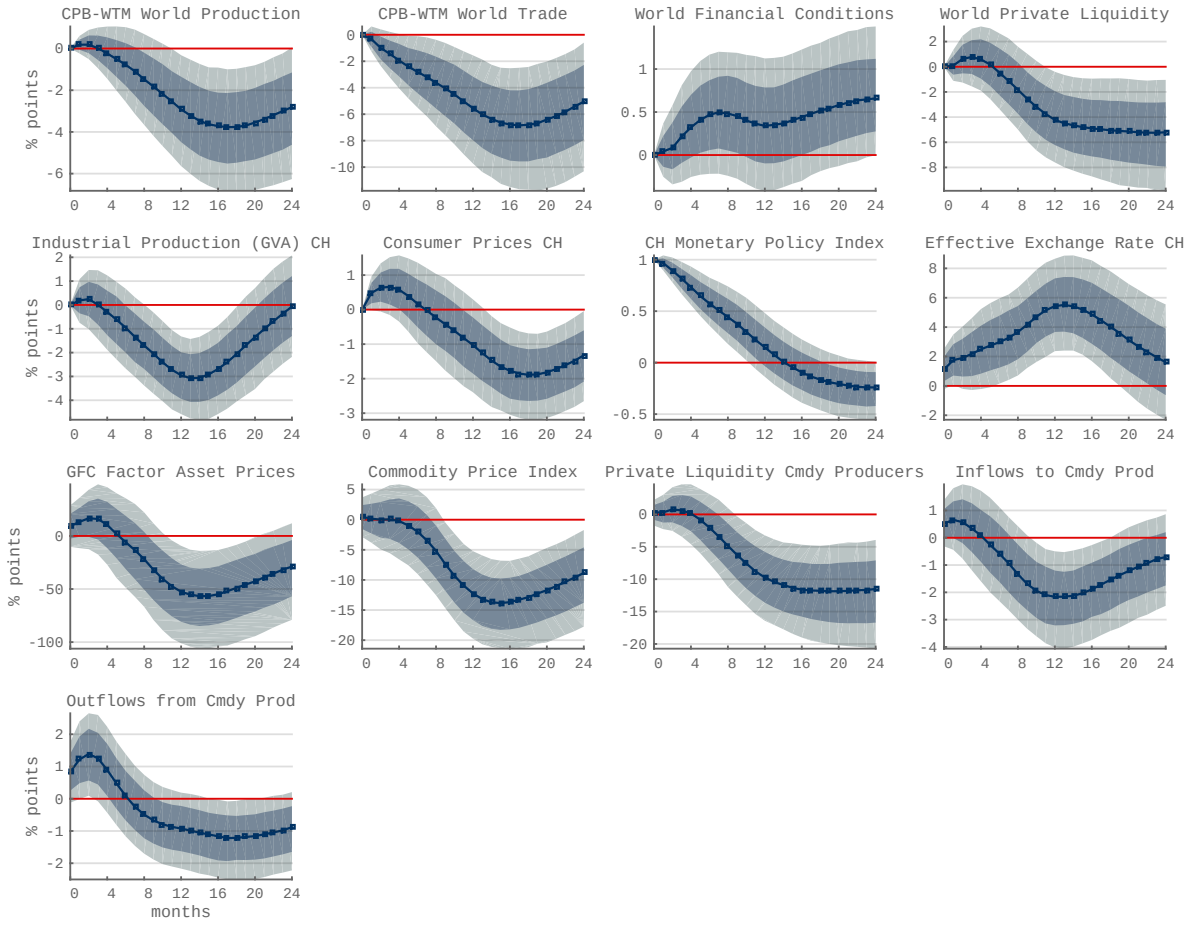


Note: Median IRFs with 68% and 90% posterior credible sets. BVAR(12). 1999:01-2018:12.

gained increasing attention (see e.g. Jones and Bowman, 2019). The objective of the prudent monetary policy of the Chinese monetary authority, initiated in 1989, is that of maintaining prices and the value of the Renminbi stable, while contributing to and promoting economic growth (Zhou, 2015). Over the years, the policy has moved from being predominantly quantity-based to interest-rate-based (Chen, Chen and Gerlach, 2011; Kim and Chen, 2019). And much like for other major central banks, communication has become increasingly important and studied (McMahon, Schipke and Li, 2018).

To measure the Chinese monetary policy stance, we make use of the monetary policy indicator constructed in Xu and Jia (2019) to summarize information in a variety of interest rates. We identify Chinese monetary policy shocks by postulating a Taylor-type rule for the monetary authority, as an innovation of the monetary policy index in a recursively identified VAR. Together with domestic prices and output, we assume that world variables do not react within a month. The VARs are monthly, estimated with 12 lags from 1999:01 to 2018:12, and IRFs are normalized to yield a 1% increase in the monetary policy index on impact. The sample standard deviation of the index is 0.5. The

FIGURE 6: RESPONSES TO CHINESE MP SHOCK: #2

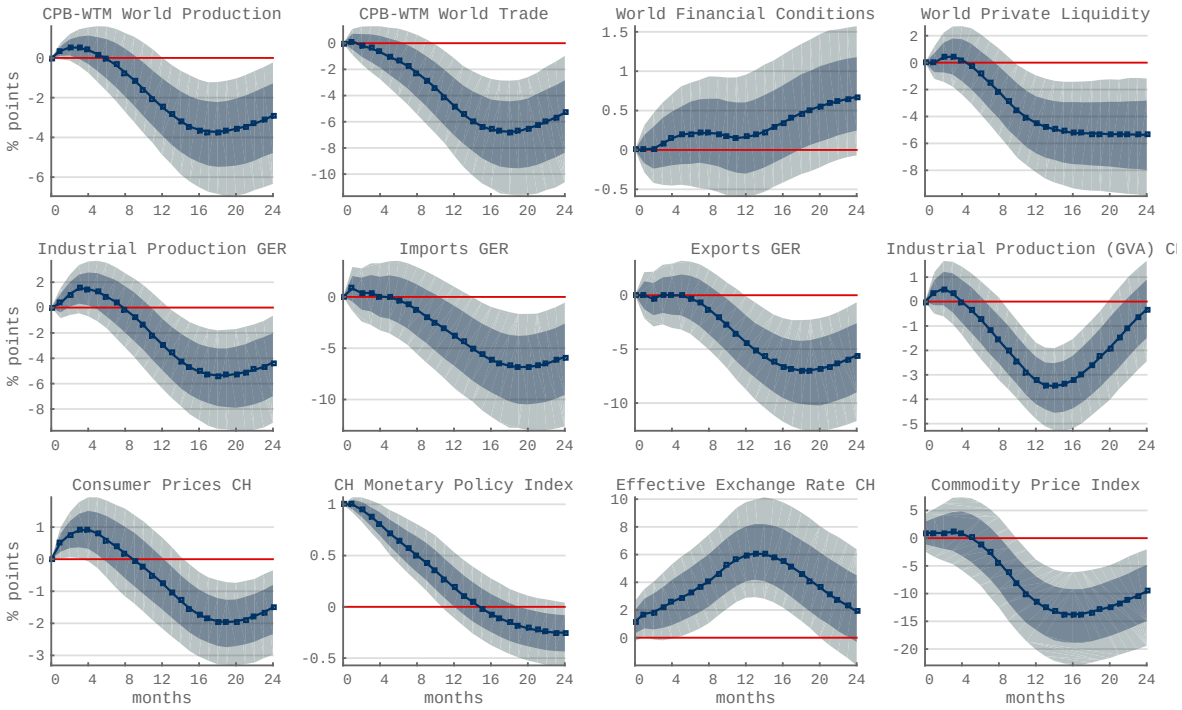


Note: Median IRFs with 68% and 90% posterior credible sets. BVAR(12). 1999:01-2018:12.

normalization can thus be thought of as a two standard deviations shock, hence quite large.

Figure 5 evaluates the global effects of Chinese monetary policy shocks against the same set of global variables of Figure 3. Following the shock, the monetary policy indicator monotonically returns to trend after about 15 months. Chinese production, measured as gross value added, declines with delay, reaching a peak negative response after one year. Similar dynamics characterize the price adjustment and the reaction of the RMB. Prices eventually decline, while the currency slowly appreciates. The domestic response is very much in line with the standard textbook transmission mechanism documented for other countries, apart from the slow exchange rate adjustment. The channels of global

FIGURE 7: RESPONSES TO CHINESE MP SHOCK: #3



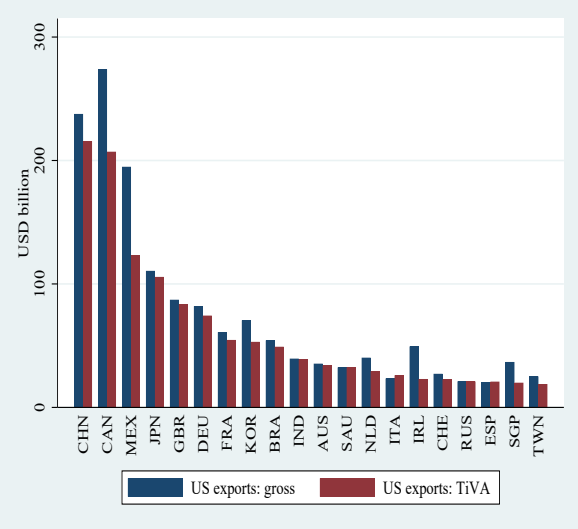
Note: Median IRFs with 68% and 90% posterior credible sets. BVAR(12). 1999:01-2018:12.

transmission are instead very different from those documented for the US. Global financial variables are largely unaffected: world financial conditions, the VIX, and the global factors in asset prices and capital flows do not respond in any significant way, at least at short-medium horizons. Conversely, world production slows down, presumably dragged by the contraction in Chinese domestic demand that in turn pulls down world trade and commodity prices. World private liquidity eventually declines, potentially a result of the slowdown in global growth. The sluggish response of the exchange may potentially hold the key for the difference in the global spillovers of the Chinese monetary policy shocks relative to the US ones, and deserves further investigation (see also Richmond, 2019).

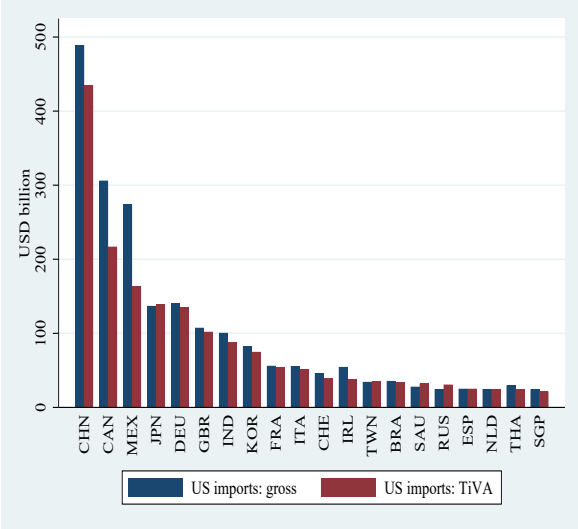
The effects that fluctuations in the Chinese economy elicit on global quantities seems to go mainly through commodity prices, and the compression of global demand. We explore this further in Figures 6 and 7. In Figure 6 we look more in detail at how commodity producers react to the shock. Financial conditions tighten significantly for this pool of countries; in particular, they witness both a contraction in inflows and a surge of capital outflows. Hence, an important channel of the international transmission of Chinese

monetary shocks seems to reside in its large relative weight in world production. Weak Chinese demand has the potential to disrupt global production because of the crucial role it plays in the global markets for both raw materials, and intermediate production goods. As a consequence, AEs whose economy is particularly reliant on manufacturing production, and that operate across multiple GVCs, may be particularly sensitive to these types of disturbances. In Figure 7 we look in particular at the case of Germany. Our results show that German imports and exports both contract significantly, with consequential detrimental effects on production.

Mapping US and China's global links To better understand why the channels we observe in the international transmission of US and Chinese monetary policy shocks are so different, we compare the international trade and financial links of the two countries. Figure 8 plots the top 20 US export destinations and import source countries by trade in value added[7] as well as the respective partners' gross trade[8] with the US. China is clearly the most important US trade partner – especially, when it comes to US imports.



Export value, USD billion



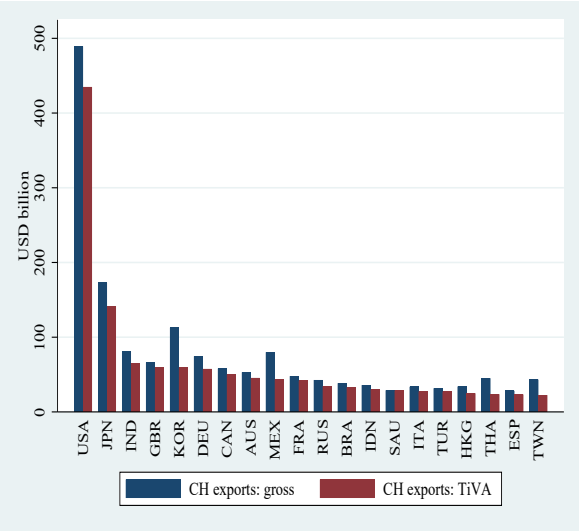
Import value, USD billion

FIGURE 8: TOP 20 US EXPORT DESTINATIONS AND IMPORT SOURCES BY VALUE ADDED IN FOREIGN FINAL DEMAND (VERSUS GROSS EXPORTS AND IMPORTS)

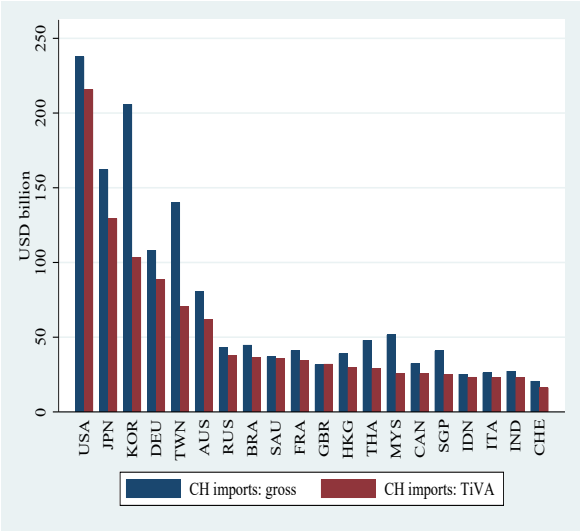
[7]We plot the closest value added equivalent to gross exports and imports – the value added by the exporter in the importer's final demand and vice versa. The data on annual value added trade is from the OECD's Trade in Value Added (TiVA).

[8]Data on bilateral gross trade is from the IMF's Direction of Trade Statistics (DOTS).

The US, in turn, is by far the most important market for Chinese exports as shown in the left-hand panel of Figure 9. Chinese imports are somewhat more diversified. Despite these differences in trade concentration, what is striking from comparing Figures 8 and 9 is that US and China appear as almost equals in the global trade network.



Export value, USD billion

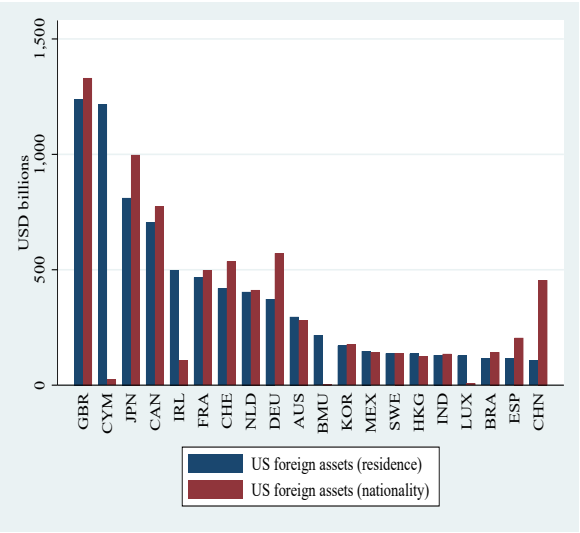


Import value, USD billion

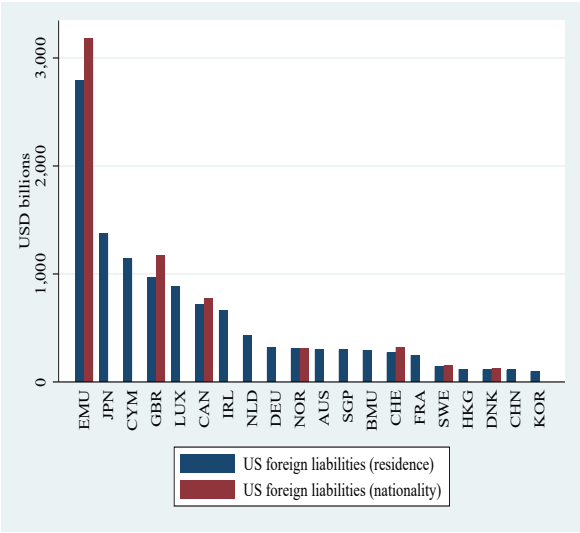
FIGURE 9: TOP 20 CHINA EXPORT DESTINATIONS AND IMPORT SOURCES BY VALUE ADDED IN FOREIGN FINAL DEMAND (VERSUS GROSS EXPORTS AND IMPORTS)

Next, we compare the geographic distribution of foreign portfolio assets and liabilities of the two countries. Here too we use two alternative measures in order to ensure mismeasurement issues are not clouding our judgement. Figure 10 plots the top counterparties of US foreign portfolio assets (on the left-hand side and liabilities). The blue bars are based on direct exposures reported on a residency basis to the IMF's Coordinated Portfolio Investment Survey (CPIS). Since a large share of international investment is routed through offshore financial centres, we also plot estimates of these exposures on a nationality basis[9] from Coppola et al. (2020), where available. The equivalent data (albeit only available for a more limited number of bilateral exposures) is plotted in Figure 11.

[9]The construction of these nationality-based exposures shifts affiliated companies' security holdings and issuances to their parent companies or the country where most of the firm's economic activity is based. This reduces substantially the portfolio assets and liabilities of offshore financial centres such as the Cayman Islands, Bermuda and Luxembourg, compared to the residence-based statistics (see Figures 10 and 11).

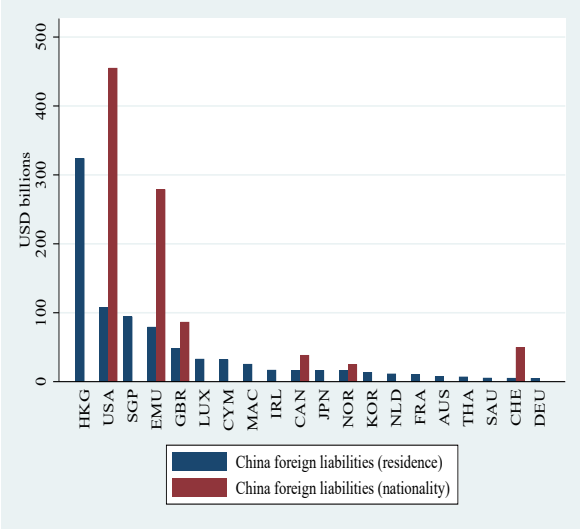


US foreign assets

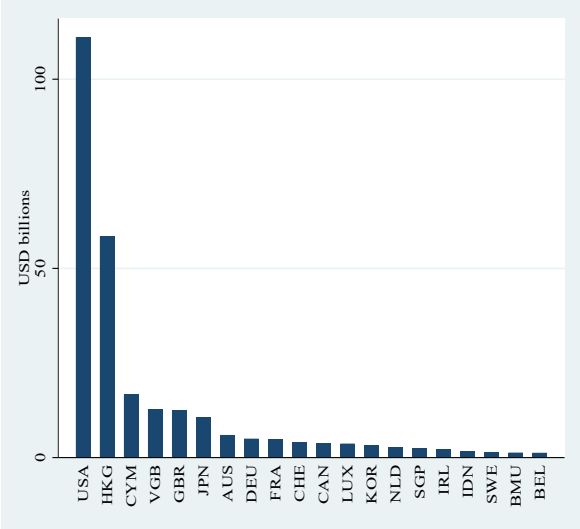


US foreign liabilities

FIGURE 10: TOP 20 US FOREIGN PORTFOLIO ASSET AND LIABILITY EXPOSURES (BY RESIDENCE VS NATIONALITY)



China foreign liabilities



China foreign assets (residence basis)

FIGURE 11: TOP 20 CHINA FOREIGN PORTFOLIO LIABILITY EXPOSURES (BY RESIDENCE VS NATIONALITY)

The US has large exposures to the UK, EMU countries, Japan and Canada, regardless of the measure we use to assess the assets and liabilities. Much of its portfolio investment (both outward and inward) is routed through the Cayman Islands. China, on the other

hand, is also linked to the key Asian financial centres such as Hong Kong and Singapore. Unsurprisingly given the persistently positive Chinese trade balances and capital controls on portfolio inflows, Chinese foreign assets are several times larger than its portfolio liabilities. But in terms of overall magnitude both Chinese portfolio assets and liabilities pale in comparison with US international financial links.

To better visualize the position of the US and China in the global trade and financial networks, we show the network graphs associated with bilateral exposures through gross exports (Figure 12) and residence-based international portfolio assets (Figure 13).[10] The network edges are weighted and directed based on either exports or total portfolio assets, so that source node is the exporter/investor country and target node is the importer/security issuer country. The node size and edge weight are scaled by the average weighted degree of each node, i.e. average of it's total direct exports and imports or foreign assets and liabilities (out-degrees and in-degrees in the networks terminology).

Figure 12 starkly reveals that the US and China are not only equals in the global trade network. The two giants are also highly interdependent and together form the largest community identified in the network[11]. The second-largest community is formed primarily of European countries and coloured in grey. The network graph provides useful intuition as to why our VAR results suggest US and Chinese monetary policy shocks have comparable impacts on world economic activity.

The portfolio investment network in Figure 13 could not paint a more different picture of the world. The US and its portfolio links to financial centres such as the UK, Cayman Islands and Ireland clearly dominates the world of investment. A small community including China, Hong Kong and Macao (coloured in cyan) is barely visible. The Chinese influence through portfolio investment is incompatible with the US and even negligible

[10] We base the network charts on exports rather than imports data since these are usually considered to be subject to less misreporting. Similarly, CPIS reporters are only required to submit foreign asset information and only sometimes report liabilities on a voluntarily and less consistent basis.

[11] The network layout is chosen using the Fruchterman-Reingold algorithm, while the detection of modular communities (nodes in the same colour) relies on the algorithm developed by Blondel et al. (2008).

compared to the most financially-developed European economies (which form a separate community coloured in grey). It is no surprise then that our estimated impulse responses of global financial variables following a Chinese monetary policy shock are insignificant on impact and only begin reacting once the real economy spillovers take hold.

Conclusions We compare the global transmission of the monetary policy of the two world's giants: the US and China. We find that both have a significant global footprint, but that they operate through fundamentally different channels.

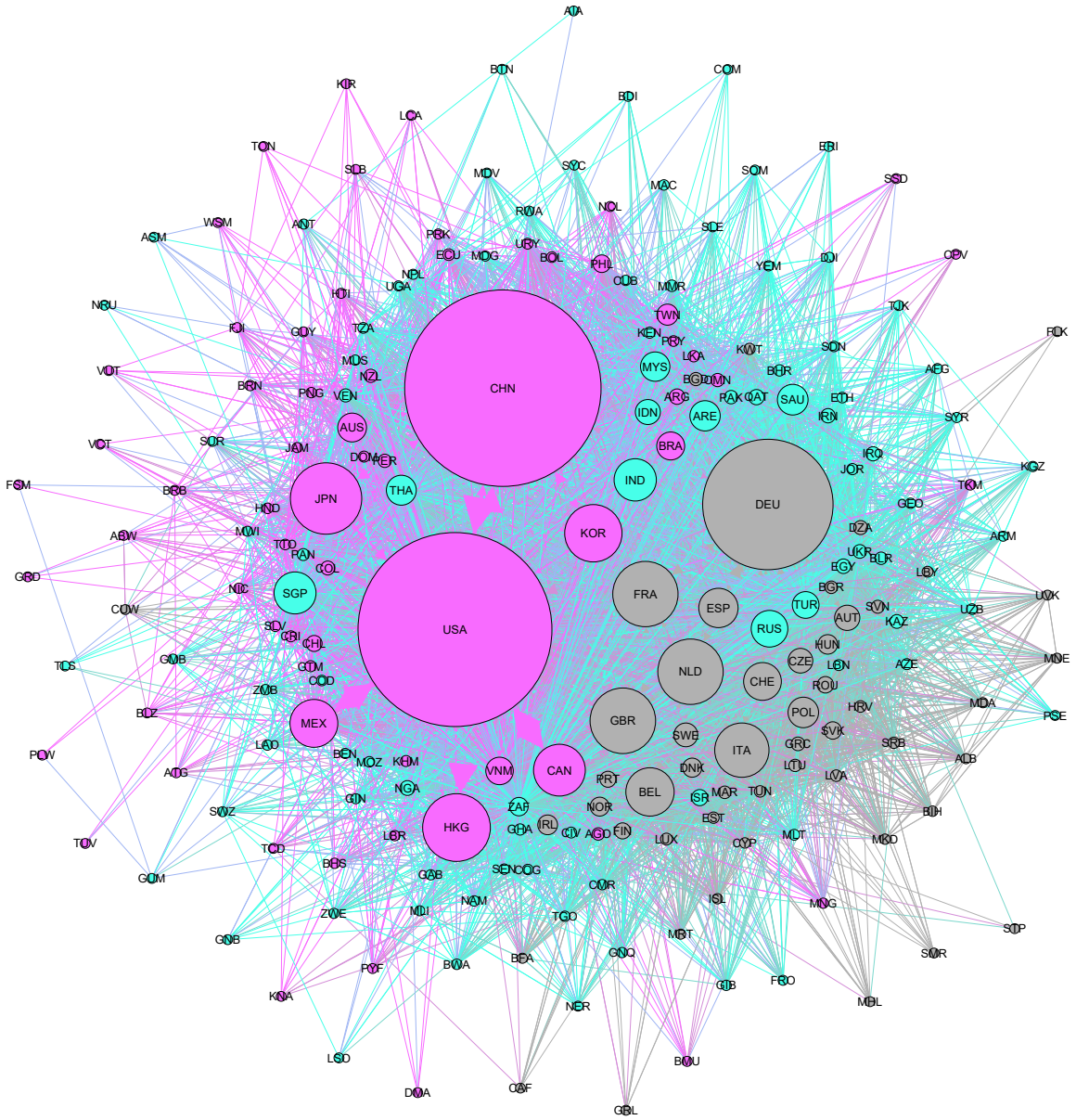


FIGURE 12: Exports network as of 2015. The size of nodes is proportional to their weighted degree (average of all bilateral imports and exports). The thickness of arrows is proportional to the magnitude of bilateral exports. Three communities of nodes are detected and presented in different colours.

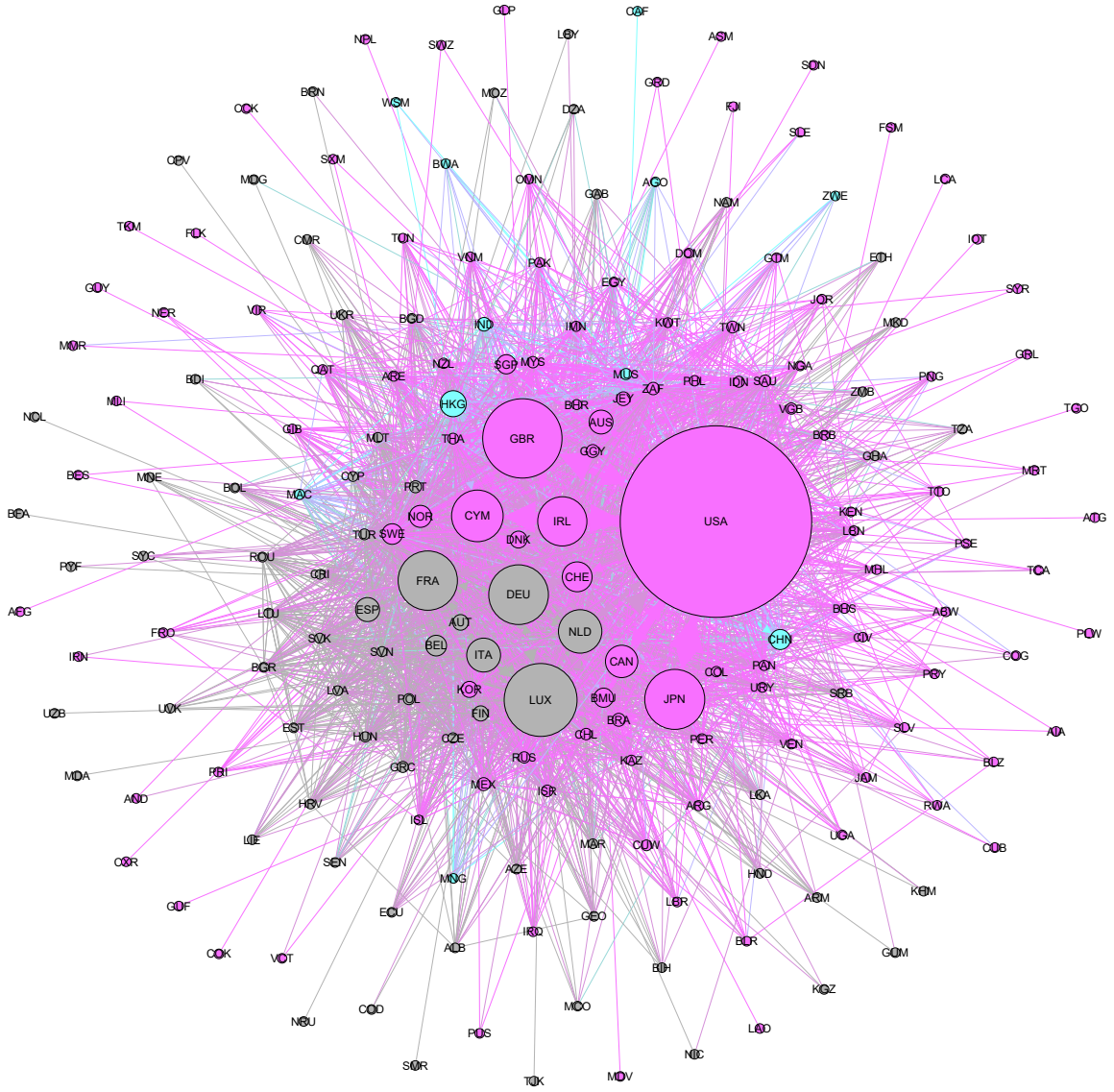


FIGURE 13: Portfolio investments network as of 2015 (based on official IMF CPIS statistics). The size of nodes is proportional to their weighted degree (average of all bilateral assets and liabilities). The thickness of arrows is proportional to the magnitude of bilateral portfolio assets. Three communities of nodes are detected and presented in different colours.

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A Data Appendix

Table A.1: Data Series in Bayesian VARs

Code	Variable	Source
WORLDIP	World Production, Merges Old and New Data, Base Year 2010=100, Prod. Weights	CPB-Wolrd Trade Monitor + Own Calc.
WORLDTRADE	World Total Merchandise Trade, Volume Index, Merges Old and New Data	CPB-Wolrd Trade Monitor + Own Calc.
WORLDFCI	World Financial Conditions, Diffusion Index	CrossBorder Capital
WORLDPLIQ	World Private Liquidity, Stock, USD	CrossBorder Capital
INDPRO	US Industrial Production Index, Index 2012=100, SA	St Louis Fed FRED Database
CPIAUCSL	US Consumer Price Index for All Urban Consumers: All Items, Index 1982-1984=100, SA	St Louis Fed FRED Database
GS1	US 1-Year Treasury Constant Maturity Rate, Percent, NSA	St Louis Fed FRED Database
GERINDPRO	Production of Total Industry in Germany, Index 2015=100, Monthly, SA	St Louis Fed FRED Database
GERIMP	Imports: Value Goods for Germany, National currency Billions, Monthly Level, SA	St Louis Fed FRED Database
GEREXP	Exports: Value Goods for Germany, National currency Billions, Monthly Level, SA	St Louis Fed FRED Database
CHINDPRO	China Real Gross Value Added (Industrial Production), NSA, year-on-year % change	China National Bureau of Statistics
CHCPI	China Consumer Price Index, Not SA, year-on-year percentage change	China National Bureau of Statistics
CHMPI	Chinese Monetary Policy Index	Xu and Jia (2019)
USDEER	United States Real Effective ExhangeRate, Narrow Index	Bank for International Settlements
RMBEER	China Real Effective ExhangeRate, Broad Index	Bank for International Settlements
CRBPI	Commodity Research Bureau Price Index, Spot Prices, End of Month	Datastream
GFCFAC	Common Factor in Risky Asset Prices, 2019 Vintage, Standardized	Own Calculations
VIX	CBOE Volatility Index, Annualized Percentage Points, NSA	Datastream
CAPFGF	Global Factor Capital Flows, All Flows Types, Inflows and Outflows, Interp.	IFS, BOPS, WEO + Own Calculations
OUTFEME	Outflows from Emerging Markets, Percentage of GDP, All Flows Types, Interp.	IFS, BOPS, WEO + Own Calculations
INFLEME	Inflows to Emerging Markets, Percentage of GDP, All Flows Types, Interpolated	IFS, BOPS, WEO + Own Calculations
OUTFCMDY	Outflows from Major Commodity Producers, Percentage of GDP, All Flows Types, Interp.	IFS, BOPS, WEO + Own Calculations
INFLCMDY	Inflows to Major Commodity Producers, Percentage of GDP, All Flows Types, Interpolated	IFS, BOPS, WEO + Own Calculations
OUTFUS	Outflows from US, Percentage of GDP, All Flows Types, Interpolated	IFS, BOPS, WEO + Own Calculations
INFLUS	Inflows to US, Percentage of GDP, All Flows Types, Interpolated	IFS, BOPS, WEO + Own Calculations
PLIQCMDY	Private Liquidity Major Commodity Producers, Stock, USD	CrossBorder Capital

B Appendix on Global Financial Factors

We estimate global factors in (i) asset prices and (ii) international capital flows using a dynamic factor model first applied to asset prices in Miranda-Agrippino and Rey (2015). Tables B.1 and B.2 describe the underlying series that are used in the estimation of these factors.

The first factors extracted respectively from all asset prices and all capital flows are plotted in Figure 2 in the main text. There is a high correlation between the asset price and capital flow factors despite the fact that the underlying datasets used in their construction do not overlap.

Table B.4 reports the share of the variance in underlying asset price and capital flow series that the first two factors explain. For the capital flows factor, we also report the relevant statistics for the second and third factors (the equivalent statistics) as well as the correlation between the global asset price and capital flow factors.

Table B.1: Asset price data for global factor in asset prices

Asset Class	Index Universe	Details
Equity	S&P Global 1200	Full set of total return index constituents as of May 2019. For index construction see https://us.spindices.com/indices/equity/sp-global-1200.
Commodities	Datastream	Prices of 126 different commodities including oil, gas, agricultural commodities, mining, non-precious metals.
Bonds	iBoxx	Total returns on 80 corporate bond indices for Euro and Sterling markets.
	FTSE	Total returns on 150 corporate bond indices from the WorldBIG, EuroBIG, USBIG index series.

Capital flow aggregates used in the main analysis are constructed as follows:

Advanced economies: Indicated by "AE" in final column of Table B.2. We rely on the IMF classification of advanced economies as of end-2018.

Emerging economies: Indicated by "EME" in final column of Table B.2. We rely on the IMF classification of emerging and developing economies as of end-2018.

Commodity producers: Australia, Brazil, Canada, Chile, Colombia, Indonesia, Kazakhstan, Malaysia, Mongolia, New Zealand, Norway, Russia, Saudi Arabia, South Africa, Venezuela. Country grouping is based on that used by CrossBorder Capital for their regional liquidity and financial conditions indices.

Oil producers: Azerbaijan, Colombia, Kazakhstan, Norway, Russia, Saudi Arabia, Venezuela. Classified according to the average net exports of fuel over 1995–2018 from UNCTAD trade statistics by product groups.

Table B.2: Country and instrument list for global factor in capital flows

country	FDI	PE	PD	OTH	AE or EME?
Albania	✓			✓	EME
Argentina	✓	✓	✓	✓	EME
Armenia	✓	✓	✓	✓	EME
Australia	✓	✓	✓	✓	AE
Austria	✓	✓	✓	✓	AE
Azerbaijan	✓			✓	EME
Bangladesh	✓			✓	EME
Belarus	✓			✓	EME
Belgium	✓	✓	✓	✓	AE
Bosnia and Herzegovina	✓			✓	EME
Brazil	✓	✓	✓	✓	EME
Bulgaria	✓	✓	✓	✓	EME
Canada	✓	✓	✓	✓	AE
Chile	✓	✓	✓	✓	EME
China	✓			✓	EME
Colombia	✓			✓	EME
Costa Rica	✓	✓	✓	✓	EME
Croatia	✓	✓	✓	✓	EME
Cyprus	✓	✓	✓	✓	AE
Czech Republic	✓	✓	✓	✓	AE
Denmark	✓	✓	✓	✓	AE
Ecuador	✓			✓	EME
El Salvador	✓			✓	EME
Estonia	✓	✓	✓	✓	AE
Finland	✓	✓	✓	✓	AE
France	✓	✓	✓	✓	AE
Georgia	✓			✓	EME
Germany	✓	✓	✓	✓	AE
Greece	✓	✓	✓	✓	AE
Guatemala	✓			✓	EME
Hong Kong	✓	✓	✓	✓	AE
Hungary	✓	✓	✓	✓	EME
Iceland	✓	✓	✓	✓	AE
India	✓			✓	EME
Indonesia	✓	✓	✓	✓	EME
Ireland	✓	✓	✓	✓	AE
Israel	✓	✓	✓	✓	AE
Italy	✓	✓	✓	✓	AE
Japan	✓	✓	✓	✓	AE
Jordan	✓			✓	EME
Kazakhstan	✓	✓	✓	✓	EME
Korea	✓	✓	✓	✓	AE

TABLE B.3: Country and instrument list for global factor in capital flows (CONTINUED)

COUNTRY	FDI	PE	PD	OTH	AE or EME?
LATVIA	✓	✓	✓	✓	AE
LEBANON	✓	✓	✓	✓	EME
LITHUANIA	✓	✓	✓	✓	AE
LUXEMBOURG	✓	✓	✓	✓	AE
MALAYSIA	✓	✓	✓	✓	EME
MALTA	✓	✓	✓	✓	AE
MAURITIUS	✓			✓	EME
MEXICO	✓	✓	✓	✓	EME
MONGOLIA	✓			✓	EME
MONTENEGRO	✓			✓	EME
MOROCCO	✓			✓	EME
NAMIBIA	✓	✓	✓	✓	EME
NETHERLANDS	✓	✓	✓	✓	AE
NEW ZEALAND	✓	✓	✓	✓	AE
N. MACEDONIA	✓	✓	✓	✓	EME
NORWAY	✓	✓	✓	✓	AE
PAKISTAN	✓			✓	EME
PANAMA	✓			✓	EME
PERU	✓	✓	✓	✓	EME
PHILIPPINES	✓	✓	✓	✓	EME
POLAND	✓	✓	✓	✓	EME
PORTUGAL	✓	✓	✓	✓	AE
RUSSIA	✓	✓	✓	✓	EME
SAUDI ARABIA	✓			✓	EME
SERBIA	✓	✓	✓	✓	EME
SINGAPORE	✓			✓	AE
SLOVAK REP.	✓	✓	✓	✓	AE
SLOVENIA	✓	✓	✓	✓	AE
SOUTH AFRICA	✓	✓	✓	✓	EME
SPAIN	✓	✓	✓	✓	AE
SRI LANKA	✓			✓	EME
SWEDEN	✓			✓	AE
SWITZERLAND	✓	✓	✓	✓	AE
THAILAND	✓	✓	✓	✓	EME
TURKEY	✓			✓	EME
UNITED KINGDOM	✓	✓	✓	✓	AE
UNITED STATES	✓	✓	✓	✓	AE
URUGUAY	✓			✓	EME
VENEZUELA	✓	✓	✓	✓	EME

Note: FDI stands for foreign direct investment flows, PE stands for portfolio equity investment flows, PD stands for portfolio debt investment flows, and OTH stands for other investment flows. AE is short for Advanced Economy; EME is short for Emerging Market Economy. We include both in- and outflows for the respective countries and instrument.

Table B.4: Global factors in asset prices and capital flows

Factor	% Covariance Matrix	% Spectral Density	IC_p1	IC_p2	IC_p3	Onatski Test
GFCFAC	21.5%	24.1%	-0.184	-0.183	-0.189	0.049
CFFGU1	7.8%	20.7%	-0.042	-0.040	-0.049	0.041
CFFGU2	5.1%	14.5%	-0.051	-0.047	-0.065	0.007
CFFGU3	4.4%	12.0%	-0.055	-0.049	-0.076	0.988

Note: The first column of the table shows the % of variance explained by the eigenvalue corresponding to each factor of the covariance matrix of the respective data (either asset prices or capital flows). The second reports the % of variance explained by the same eigenvalue of the spectral density matrix of the data. The following three columns report the value of the IC_p criteria in Bai and Ng (2002) and the last shows the p-value for the Onatski (2009) test where the null of $r-1$ common factors is tested against the alternative of r common factors.

Table B.5: Correlations between global factors in asset prices and capital flows and key financial & economic variables

	GFCFAC	CFFGU1	CFFGU2	CFFGU3
GFCFAC	1.00			
CFFGU1	0.81	1.00		
CFFGU2	0.19	0.02	1.00	
CFFGU3	-0.06	-0.04	0.03	1.00
VIX	-0.28	-0.20	-0.24	-0.48
USDEER	-0.30	-0.04	-0.15	0.38
GS2	0.17	0.21	-0.62	-0.07
GS10	0.05	0.09	-0.66	-0.15
WORLDFCI	-0.50	-0.43	-0.21	0.17
WORLDPLIQ	0.09	0.00	0.83	0.08
CRBPI	0.19	-0.08	0.92	0.04
OILP	0.28	0.15	0.82	-0.08
WORLDIP	0.09	0.05	0.77	0.18
WORLDTRADE	0.16	0.14	0.73	0.12
SHIPPING	0.25	0.26	0.26	0.25

Note: For variable definitions see Table A.1 in Appendix A. The correlation coefficients above relate to the full sample period of the capital flow factors (1990-2018) or the longest possible sub-period for which the covariates are available.