Commodity Price Shocks and Global Cycles: Monetary Policy Matters

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Modelling and Forecasting in Central Banking: Methods and Developments

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Motivation

Fluctuations in **commodity prices** and **interest rates** have long been recognized as very important for global economic developments, but our **knowledge of the nature of the relationships remains limited**

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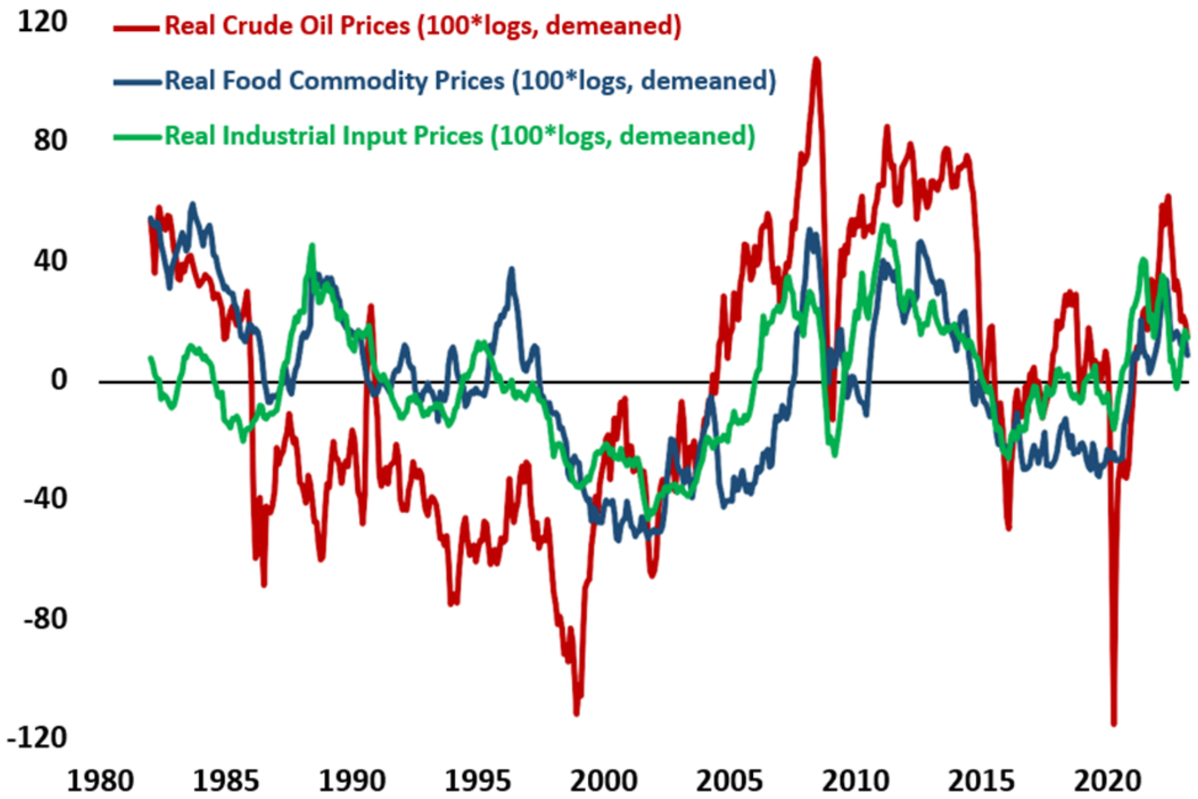

Fernández et al. (2017): combination of reduced form shocks affecting these three commodity explains one-third of output growth variance across countries (3x times as large as a single world price specification)

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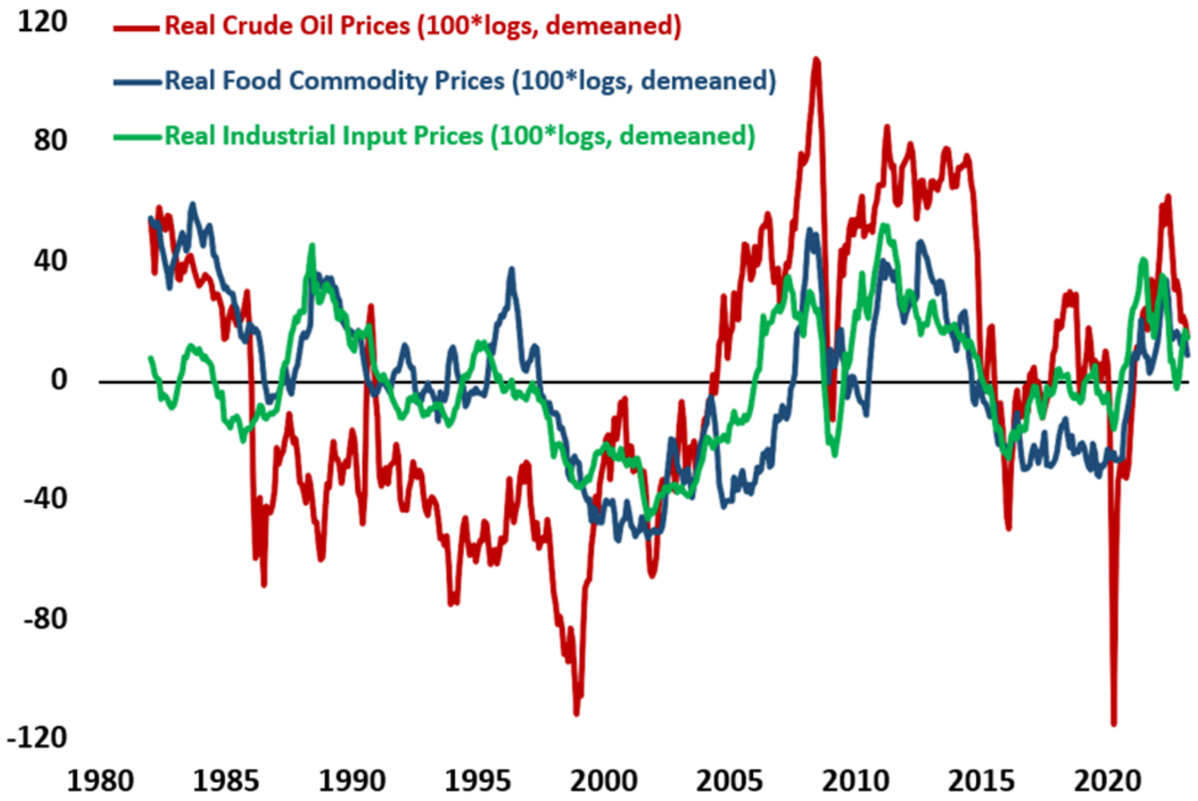

We examine the effects of shocks to

i) crude oil

ii) food commodities

iii) industrial input prices

in a SVAR model for the **global and US economy**, and the **role of monetary policy** in shaping the effects

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Contribution of the paper

Commodity shocks **explain a meaningful share of volatility** in world output (22%) and Global Financial Cycle (13%), comparable to contribution of exogenous monetary policy, Miranda-Agrippino and Rey (2021)

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Formal comparison of the effects and relevance between different types of commodities:

1. **Food shocks** (surprisingly) have the greatest impact on global cycles
2. **Oil shocks** matter, but to a more limited extent
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1. **Pro-cyclical policy reactions** amplify **food price shocks**
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Why asymmetric response?

Food price shocks resemble aggregate supply shocks, oil shocks more adverse aggregate demand shocks

↳ "fundamental" mechanisms in novel diff-in-diff approach on sectoral-level data

Empirial approach

Empirical approach

We estimate a 19-variables monthly **Bayesian structural VAR model** (12 lags; prior as in Giannone et al 2015) over sample period 1982-2019 that includes several global and US macroeconomic indicators

Global variables

- ✓ Real crude oil prices (USD)
- ✓ Real food commodity prices (USD)
- ✓ Real industrial input prices (USD)
- ✓ World output (OECD IP)
- ✓ Global Financial Cycle
- ✓ Global consumer prices (OECD)
- ✓ Global producer prices (OECD)

US variables

- ✓ 1-year interest rate
- ✓ USD effective exchange rate
- ✓ Industrial production
- ✓ CPI
- ✓ Core CPI
- ✓ Nominal wages
- ✓ Excess bond premium
- ✓ Term spread
- ✓ Financial uncertainty
- ✓ Housing starts
- ✓ Real house prices
- ✓ Inflation expectations

Identification

Combination of **external instrumental variables and sign restrictions** (Cesa-Bianchi and Sokol 2021)

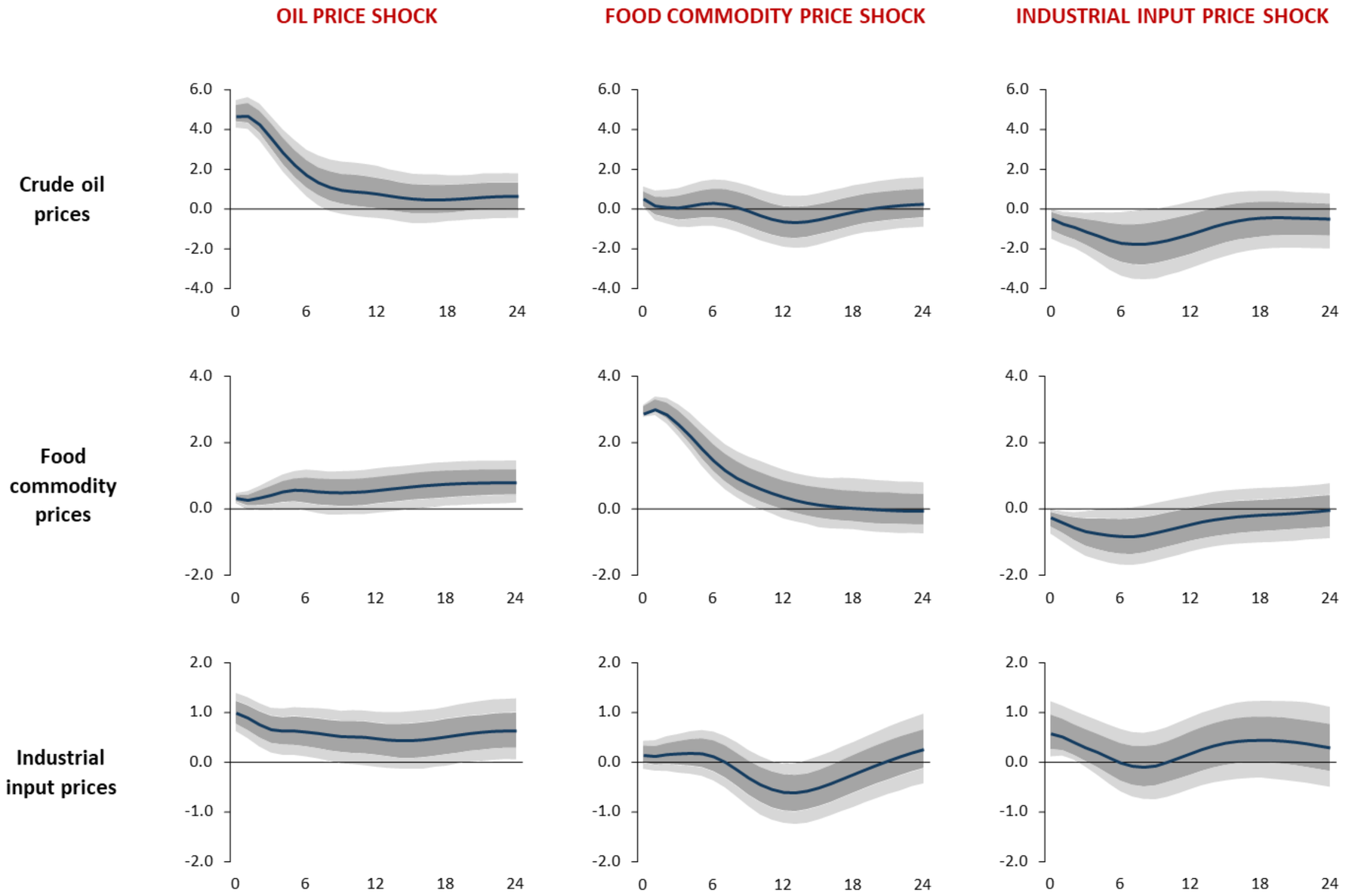
- **Oil price shocks:** high-frequency OPEC oil supply news shocks of Känzig (2021)
- **Food shocks:** global agricultural-weighted weather innovations of De Winne and Peersman (2021)
- **Industrial input shocks:** i) increase in industrial input prices, ii) increase in US and global consumer and producer prices, iii) decline in US and global output, and iv) decline of oil and food prices

As a benchmark (and for the counterfactuals), we also identify **monetary policy shocks** using the high-frequency instrument of Miranda-Agrippino and Ricco (2021)

First-stage F-statistics of all instruments are > 10

Results

Baseline results (unit variance shocks)



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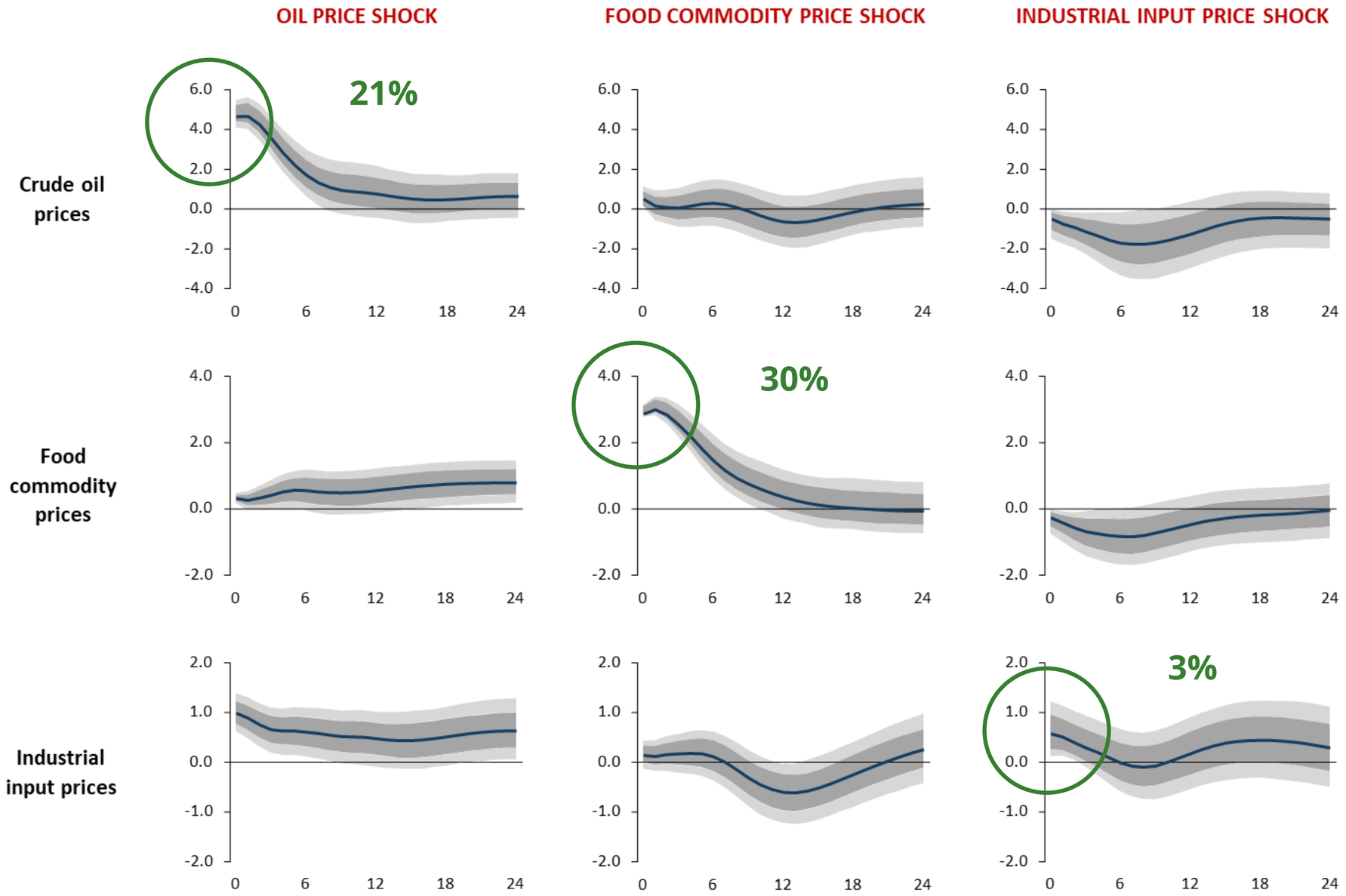
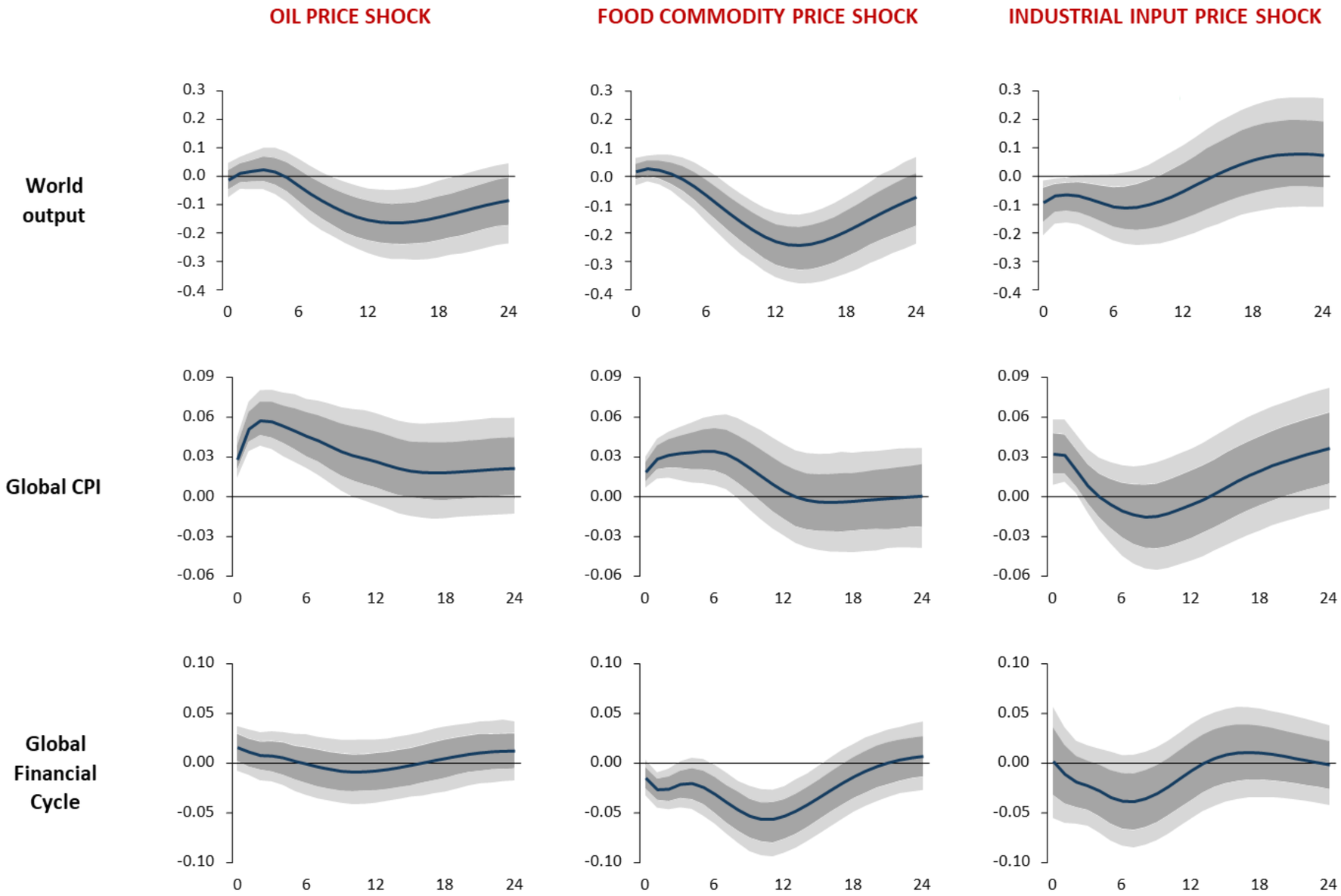


Contribution to forecast error variances (2-year horizon)

Baseline results (unit variance shocks)



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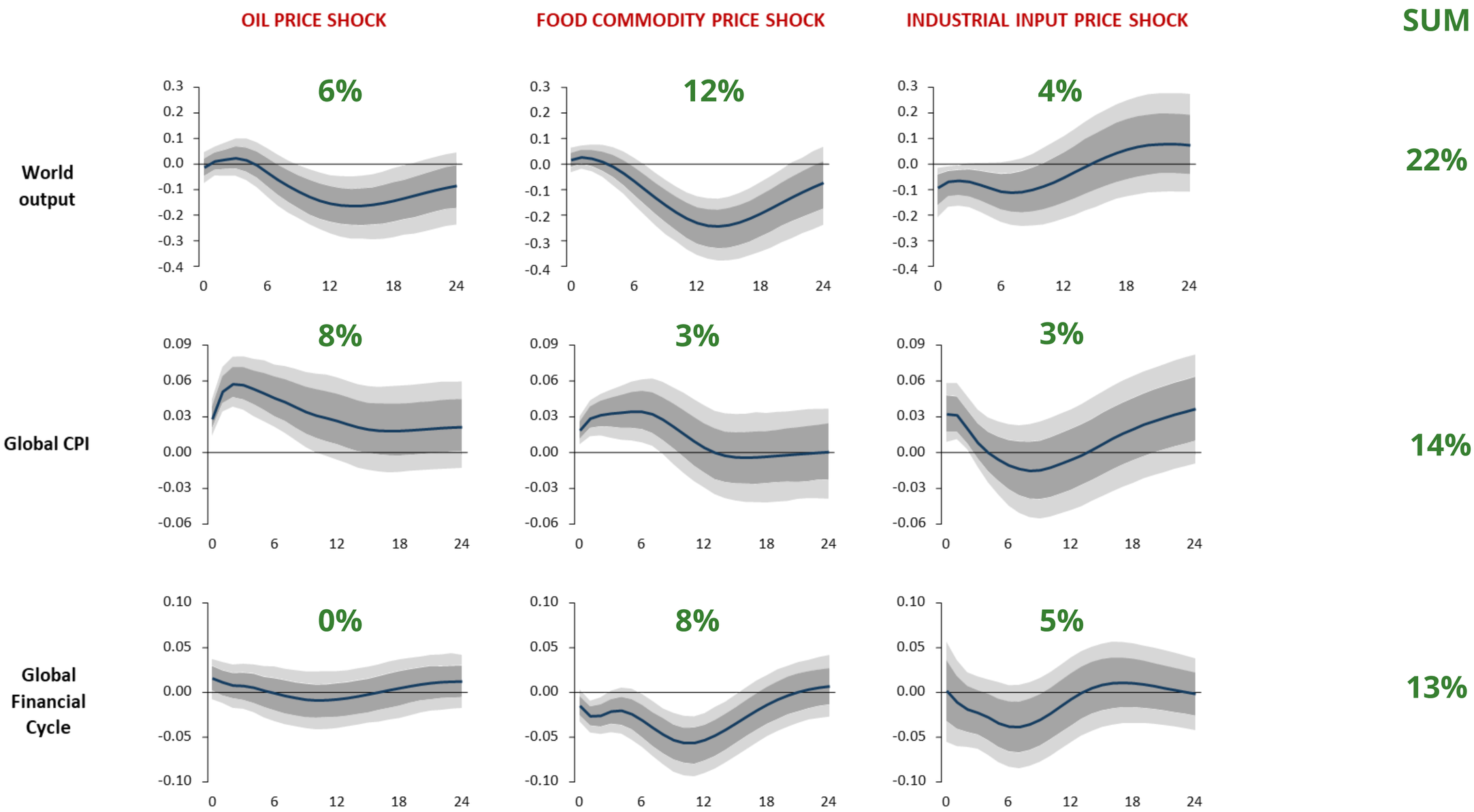

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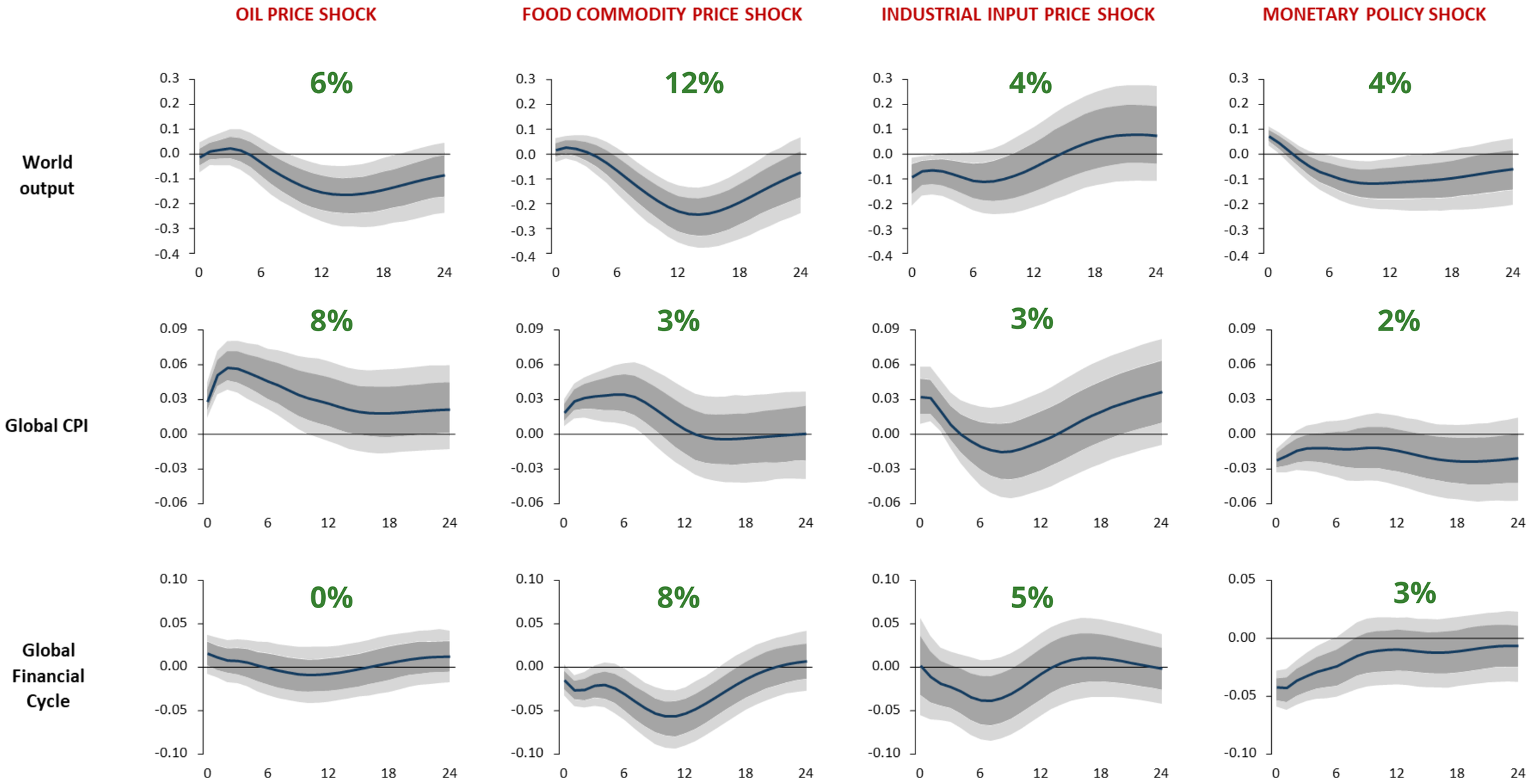


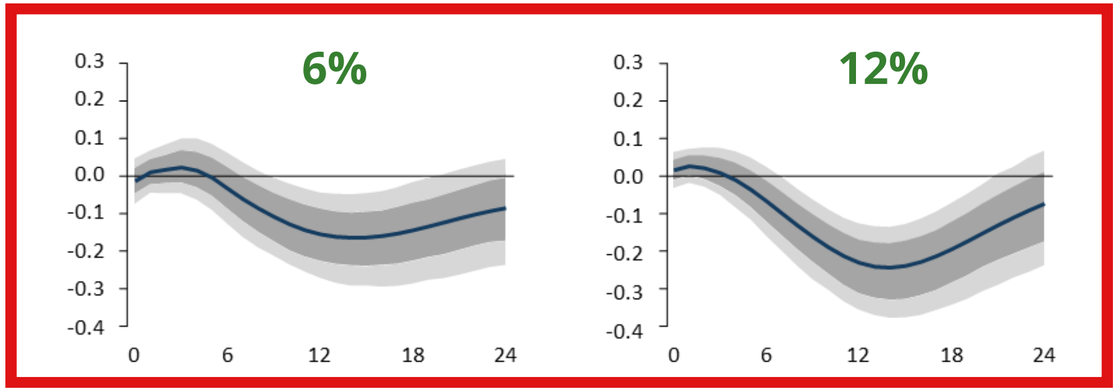
Baseline results (unit variance shocks)

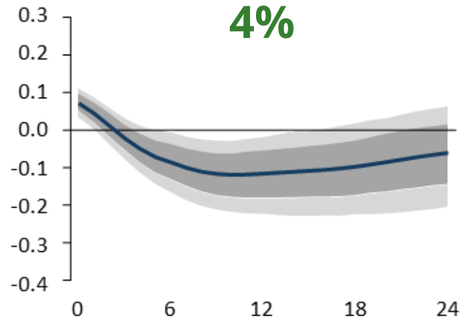
OIL PRICE SHOCK

FOOD COMMODITY PRICE SHOCK

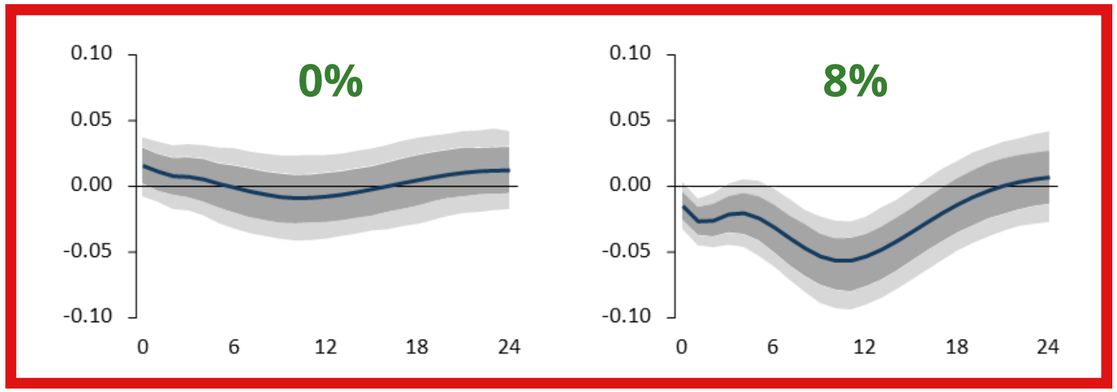
MONETARY POLICY SHOCK

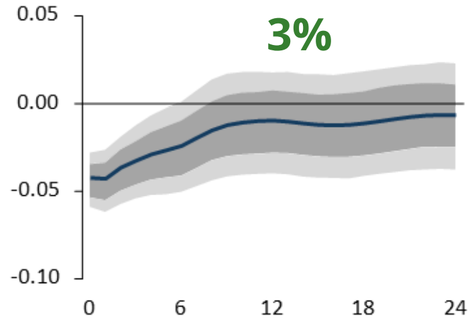
World output





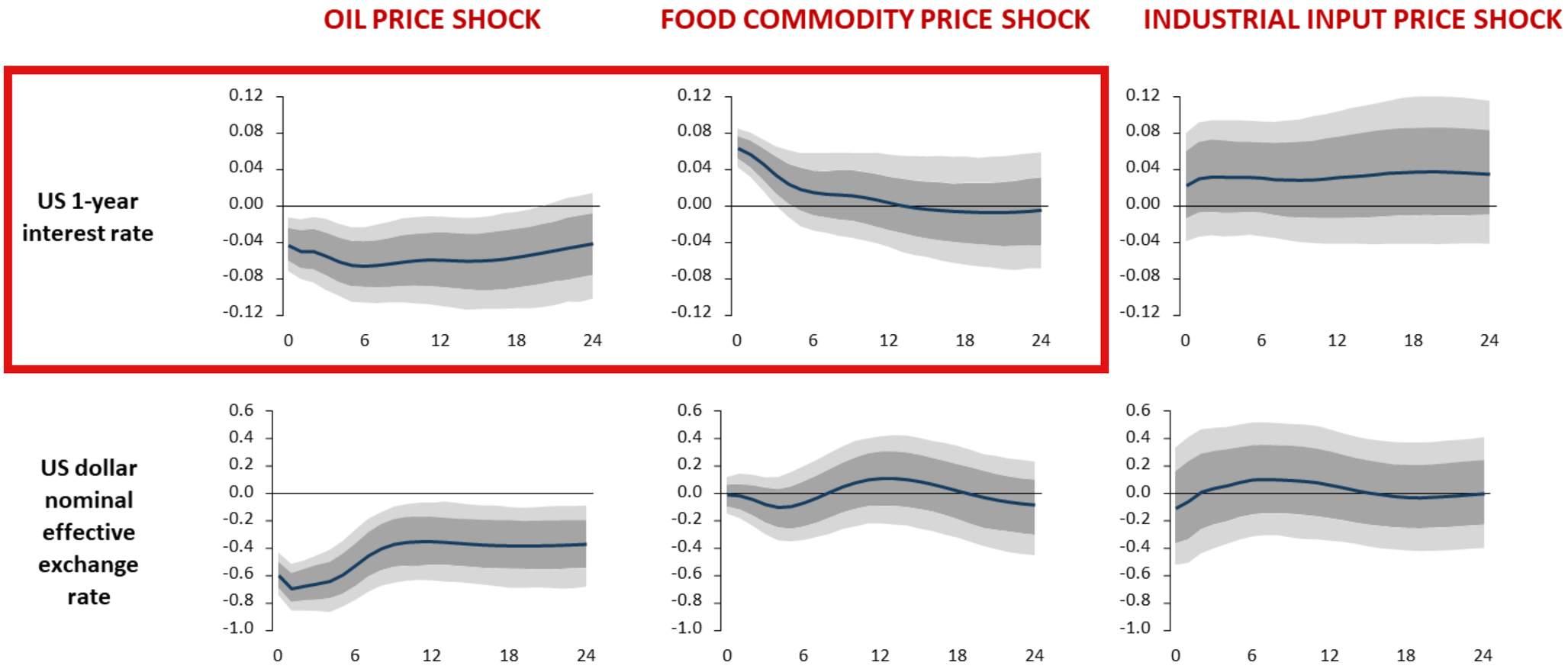
Global Financial Cycle





The role of systematic monetary policy

Opposite monetary policy response to oil versus food price shocks



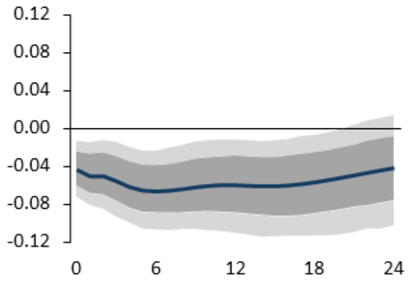
Interest rate decline after oil shocks is robust to several perturbations of the model and has also been shown in other papers (Kilian & Lewis 2011; Peersman & Van Robays 2009; Barnichon & Mesters 2023, Degasperi 2021), **but changes sign** when financial variables are omitted (e.g., Känzig 2021; Gagliardone & Gertler 2023).

Mori & Peersman (2024): pervasive non-fundamentalness in oil-market VARs absent financial variables!

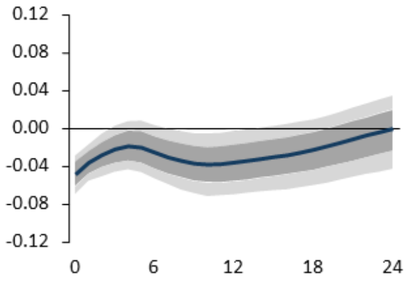
Monetary policy responses in other major economies

OIL PRICE SHOCK

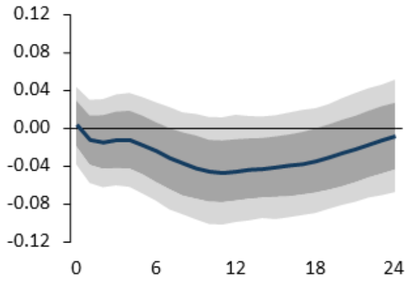
United States



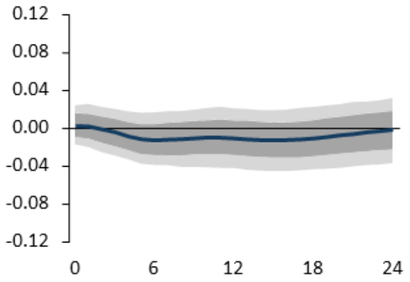
Advanced countries (excl. US)



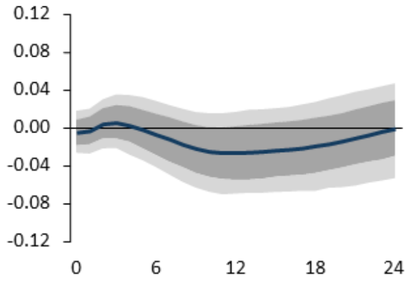
Canada



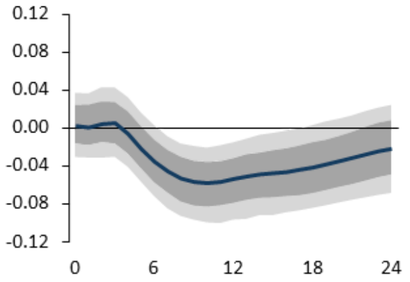
Japan



Euro area

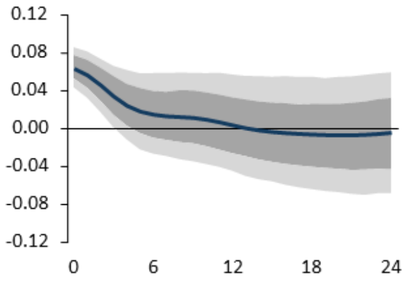


United Kingdom



FOOD COMMODITY PRICE SHOCK

United States



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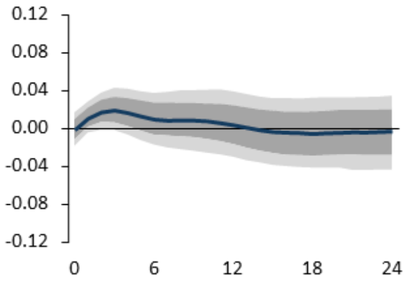

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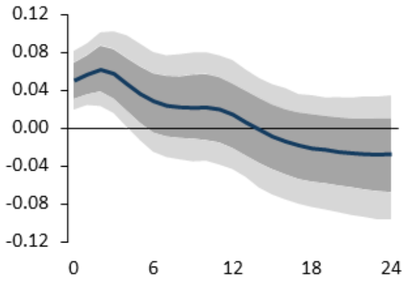

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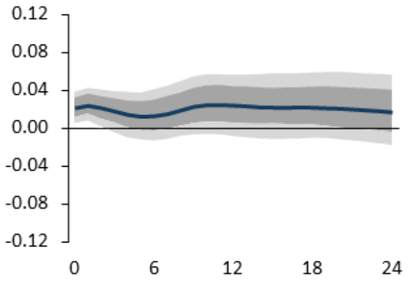

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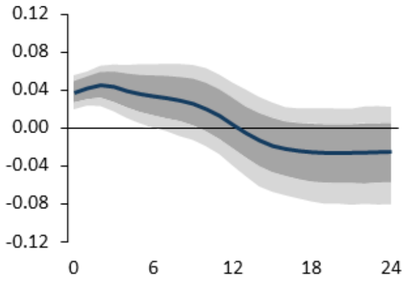

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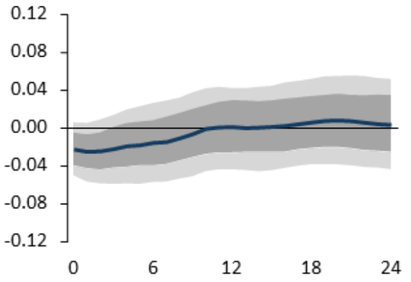
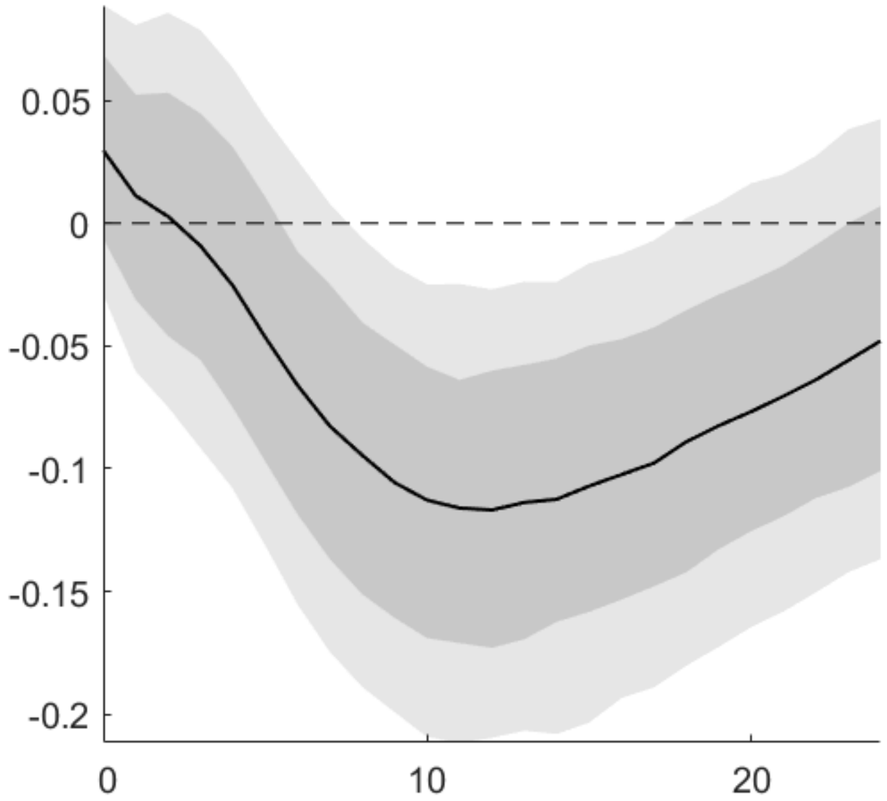
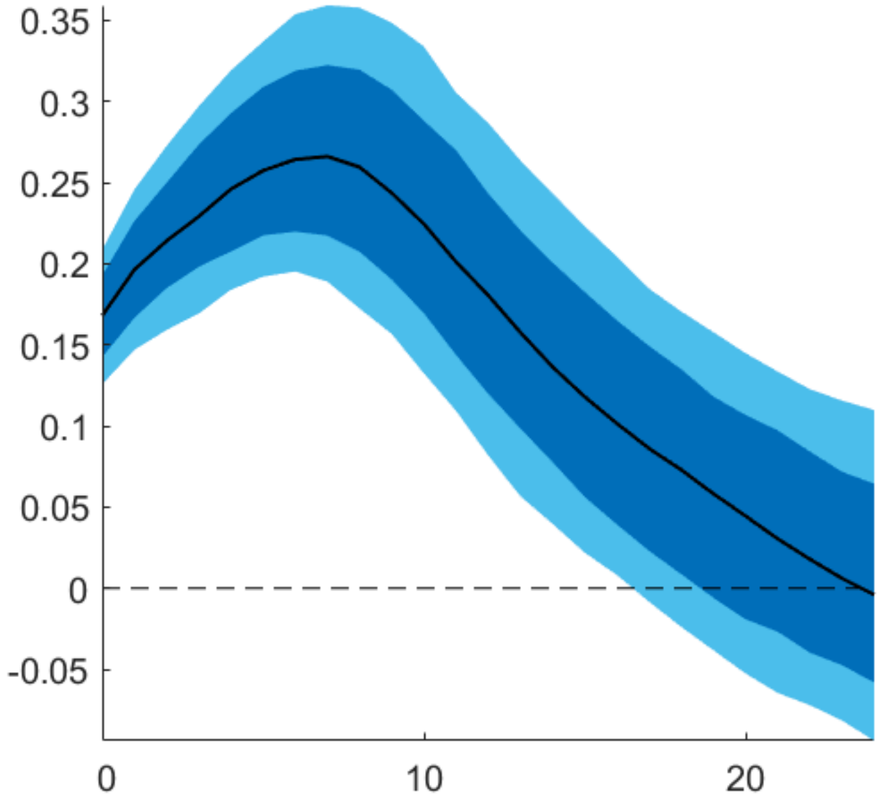


Monetary policy response in South Africa

Interest rate to adverse oil shock



Interest rate to adverse food shock



*Data: Interest Rates: 3-Month Interbank Rate - Total for South Africa (Fred)

Does systematic monetary policy matter?

Counterfactual monetary policy analysis

Question of interest: what if, when commodity price shocks hit, the Fed does not do anything?

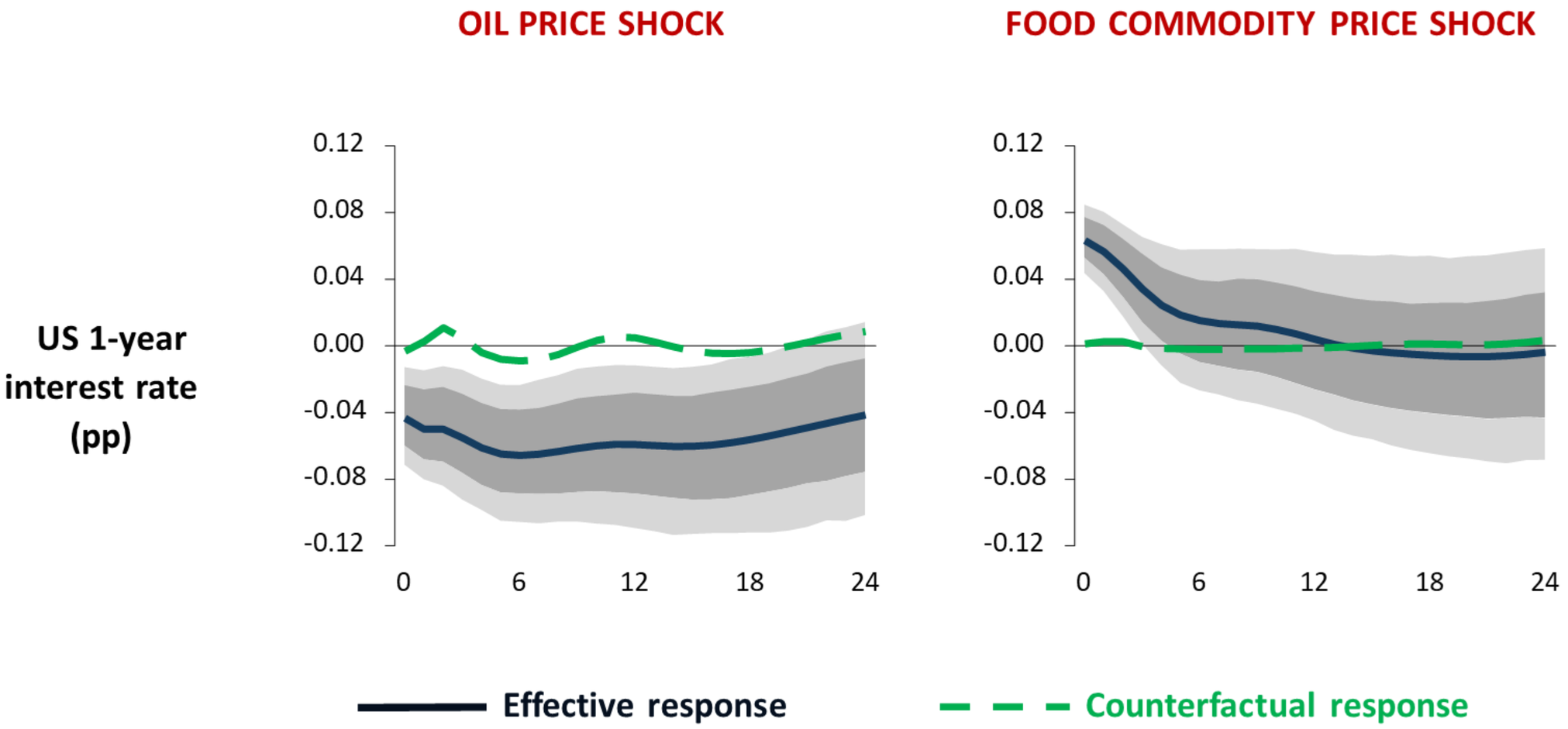
Conventional approach (Sims & Zha 2006): generate a sequence of monetary policy shocks thatcompletely offset the impact of the shocks on the policy rate

McKay & Wolf (2023): the persistence of a counterfactual path could still trigger expectational effects related to future policy that may undermine the VAR's forecast accuracy

Impose **multiple distinct policy shocks simultaneously at date 0 only** to approximate the counterfactual scenario. Accordingly, the counterfactual policy is also ex ante enforced in private-sector expectations

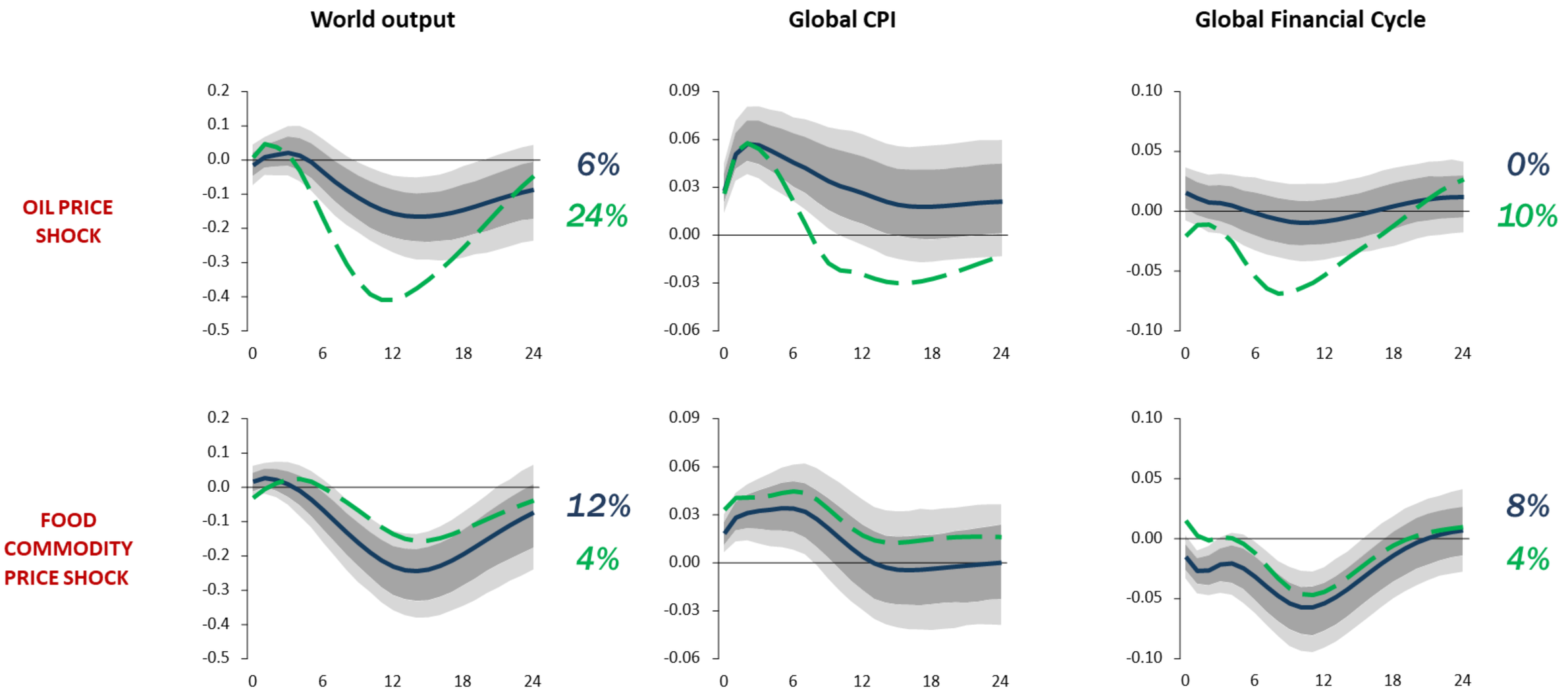
We subject the VAR at date 0 simultaneously to a **Miranda-Agrippino & Ricco (2021)** and **Bu et al. (2021)** (unconventional) monetary policy shock that jointly generates the "best fit" of the counterfactual path

Counterfactual monetary policy analysis

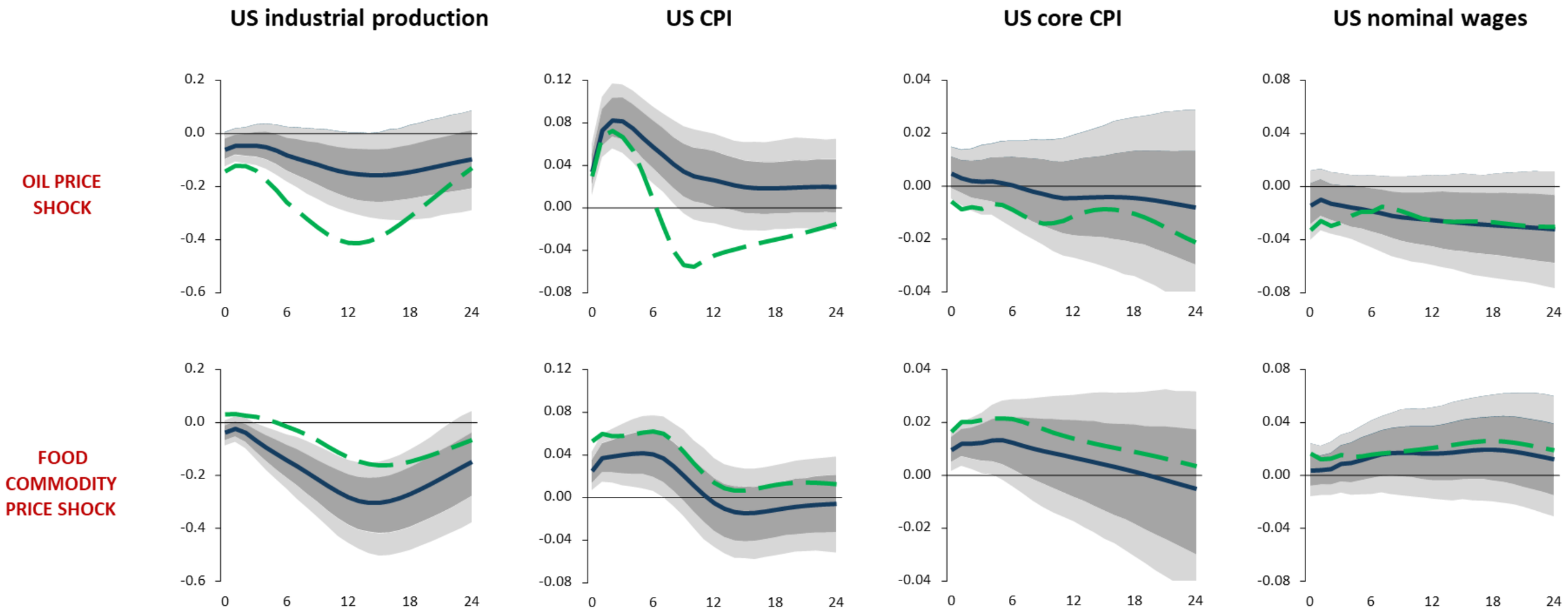


What happens in the counterfactual world?

Counterfactual results



Why does the Fed react differently to oil versus food shocks?



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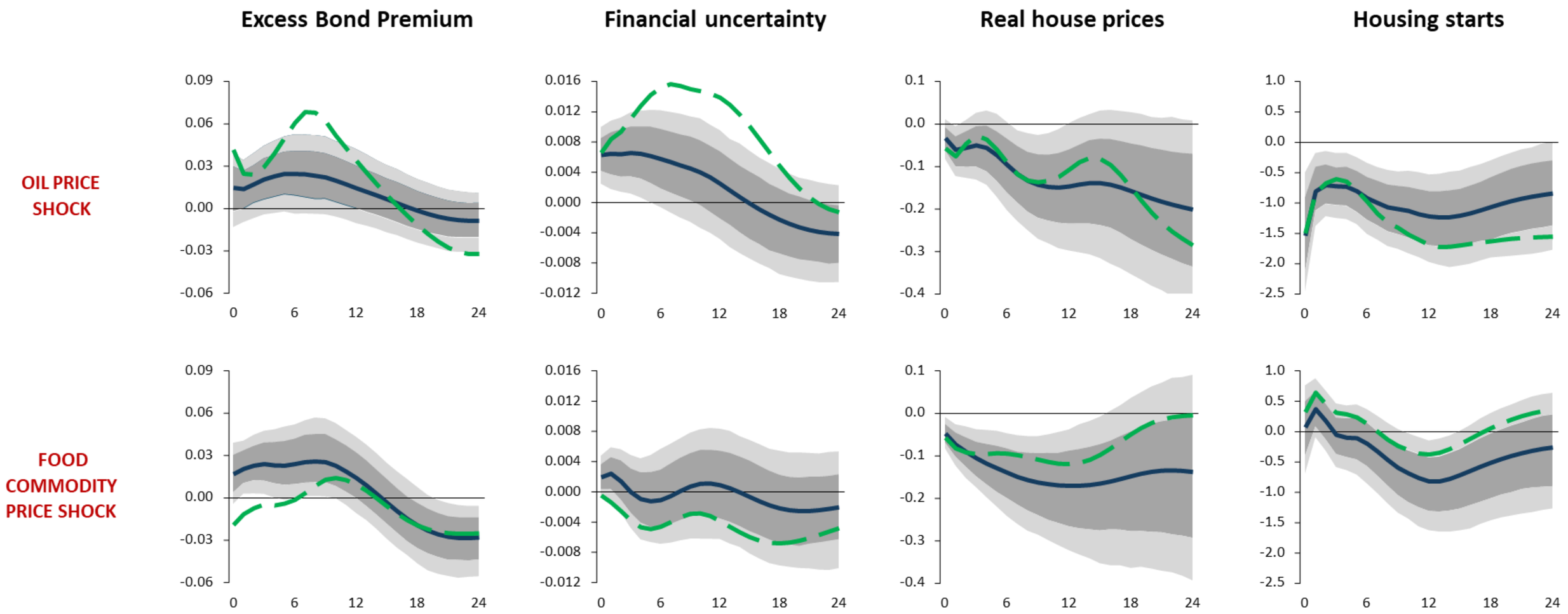

A comparison of the "fundamental" transmission mechanisms

Several studies conclude that **energy price shocks are primarily demand shocks** for the US economy through a decline in spending on goods and services other than energy (e.g., Hamilton 2009; Edelstein and Kilian 2009; HANK models), **but why is this not/less the case for food commodity price shocks?**

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- Effects of changes in discretionary income and precautionary savings should be similar for both shocks
- Fall in consumption of **goods and services that are complementary in use with energy**, such as motor vehicles, could magnify the impact on economic activity (e.g., Hamilton 1988)
- **Postponement of irreversible purchases** of consumer durables and investment due to uncertainty about future energy prices, such as motor vehicles and construction (e.g., Bernanke 1983)
- **Reallocation effects,** Davis and Haltiwanger (2001)

A comparison of the "fundamental" transmission mechanisms

For all **components of US industrial production and sectoral employment,** we estimate:

1. Actual effects of oil and food commodity price shocks

2. The counterfactual effects (i.e., in absence of a monetary policy response)

3. Diff-in-diff counterfactual: $\left(IRF^{oil}_{component}/IRF^{food}_{component}\right)/\left(IRF^{oil}_{aggregate}/IRF^{food}_{aggregate}\right)$

value greater than one implies a relatively stronger impact of oil price shocks

Counterfactual effects on components of US industrial production

	Actual (own peak)		Counterfactual (own peak)			Weight	Weighted CF (overall peak)	
	Oil	Food	Oil	Food	D-D		Oil	Food
Final products: consumer goods	**-0.14**	**-0.25**	**-0.29**	**-0.17**	**1.00**	**100%**	**-0.286**	**-0.175**
Foods and tobacco	-0.04	-0.18	-0.06	-0.24	0.17	33%	-0.013	-0.020
Other nondurable consumer goods	-0.09	-0.34	-0.23	-0.31	0.45	27%	-0.061	-0.084
Consumer energy products	0.00	-0.06	-0.38	-0.04	5.92	15%	0.012	-0.005
Automotive products	-0.71	-0.71	-1.65	-0.36	2.80	12%	-0.152	-0.040
Other durable consumer goods	-0.29	-0.40	-0.54	-0.19	1.74	14%	-0.071	-0.026

A D-D value greater (smaller) than one implies a relatively stronger impact of oil (food) price shocks

D-D values are also >>1 for industry groups “primary metal”, “machinery”, “plastic & rubber products” and “nonmetallic mineral products”, which are major inputs for motor vehicles and construction

Counterfactual effects on components of US employment

	Actual (own peak)		Counterfactual (own peak)			Energy share	Weight	Weighted CF (overall peak)	
	Oil	Food	Oil	Food	D-D			Oil	Food
Total Nonfarm Employment	**-0.10**	**-0.10**	**-0.16**	**-0.06**	**1.00**		**100%**	**-0.158**	**-0.061**
Government	-0.01	-0.04	0.01	-0.05	-0.09		16%	0.003	-0.004
Manufacturing	-0.17	-0.18	-0.24	-0.15	0.65	0.02	12%	-0.030	-0.018
Construction	-0.40	-0.25	-0.53	-0.14	1.48	0.02	5%	-0.024	-0.007
Mining & Logging	0.02	-0.11	-0.35	-0.05	2.54	0.04	1%	-0.002	0.000
Wholesale Trade	-0.13	-0.11	-0.18	-0.08	0.81	0.01	4%	-0.008	-0.004
Retail Trade	-0.12	-0.10	-0.25	-0.05	1.87	0.02	11%	-0.028	-0.006
Transportation & Warehousing	-0.11	-0.12	-0.18	-0.04	1.54	0.09	3%	-0.005	-0.001
Utilities	-0.10	-0.12	-0.11	-0.10	0.41	0.13	1%	0.000	0.000
Information	-0.21	-0.77	-0.16	-0.77	0.08	0.01	2%	-0.004	-0.005
Financial Activities	-0.10	-0.09	-0.03	-0.11	0.10	0.01	6%	0.000	-0.007
Professional & Business Services	-0.18	-0.13	-0.23	-0.10	0.86	0.01	12%	-0.028	-0.011
Leisure & Hospitality	-0.07	-0.06	-0.23	0.00	73.55	0.02	9%	-0.021	0.000
Other Services	-0.04	-0.09	-0.10	-0.05	0.81	0.01	4%	-0.004	-0.001
Private Education & Health Services	-0.02	-0.02	-0.05	0.00	>>> 1	0.01	13%	-0.006	0.003

Conclusions

A meaningful share of the **volatility in world output and the Global Financial Cycle** can be attributed to exogenous commodity price shocks

The exact contribution **crucially depends on the monetary policy response**

- Food price shocks have the greatest impact, but this is largely due to a pro-cyclical policy response
- A counter-cyclical policy response substantially mitigates the impact of oil price shocks

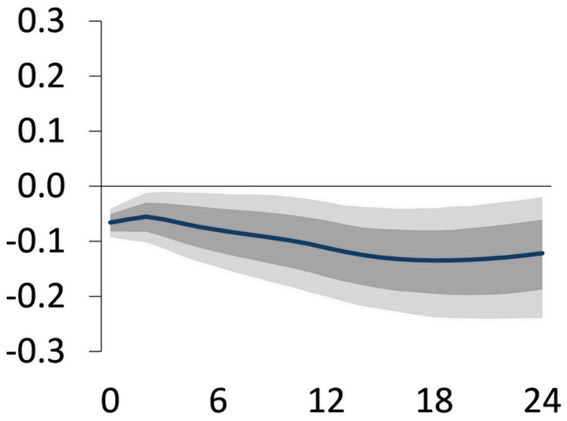
The **asymmetric monetary policy response explained by the pass-through of the shocks:** food price shocks trasmit as cost-push shocks, while oil shocks resemble adverse demand shocks, particularly in the motor vehicles and housing market, that are amplified through financial frictions

Fluctuations in **industrial input prices are almost entirely demand-driven** responses to other shocks

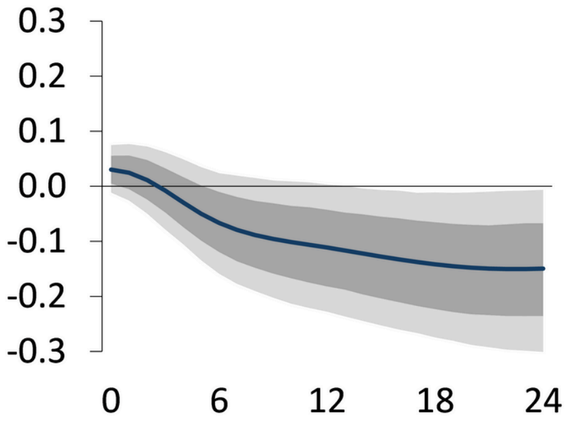
Thank you!

Oil shocks and US monetary policy response

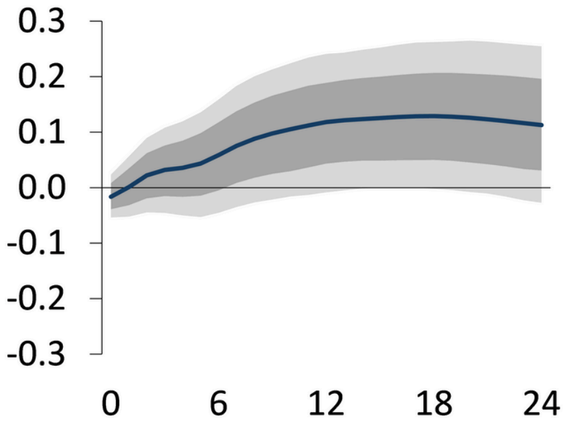
BH oil supply shocks



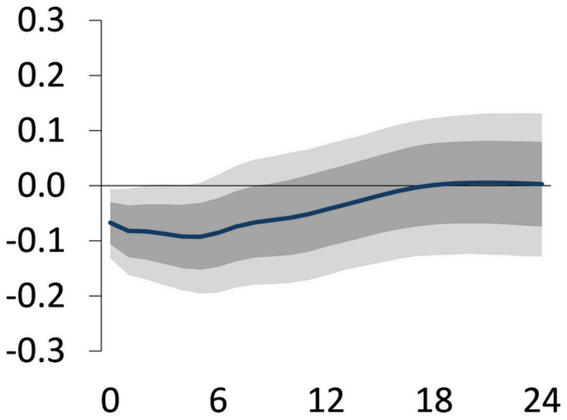
(shadow) Federal Funds Rate



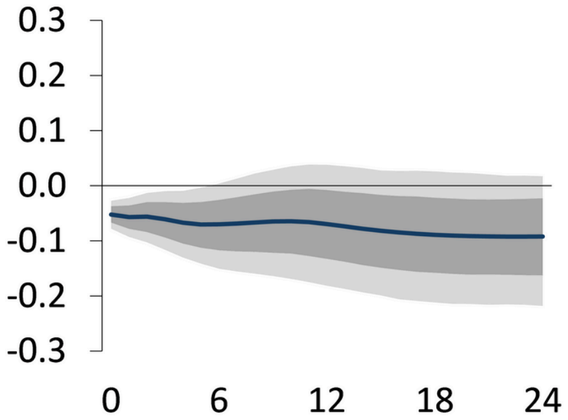
Känzig VAR: 1974-2017



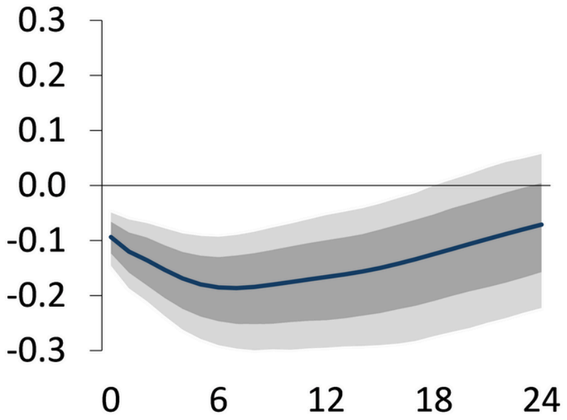
Känzig VAR + US variables: 1974-2017



Känzig VAR: 1982-2017



Känzig VAR + US variables: 1982-2017



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