Federal Reserve Bank of Dallas

Online Appendix to Estimating Macroeconomic News and Surprise Shocks

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Online Appendix:
Estimating Macroeconomic News and Surprise Shocks*

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ABSTRACT

This appendix provides our data sources, a proof of orthogonality of the rotation matrix in the VAR, a description of the baseline and KS DSGE models, and additional estimation results.

*The views expressed in this paper are our own and do not necessarily reflect the views of the Federal Reserve Bank of Dallas or the Federal Reserve System.

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A Data Sources

We use the following time-series provided by Haver Analytics:

1. **Civilian Noninstitutional Population: 16 Years & Over**
   Not Seasonally Adjusted, Quarterly, Thousands (LN16N@USECON)
2. **Gross Domestic Product: Implicit Price Deflator**
   Seasonally Adjusted, Quarterly, 2012=100 (DGDP@USNA)
3. **Real Gross Domestic Product**
   Seasonally Adjusted, Quarterly, Billions of Chained 2012$ (GDPH@USECON)
4. **Real Personal Consumption Expenditures**
   Seasonally Adjusted, Quarterly, Billions of Chained 2012$ (CH@USECON))
5. **Real Private Fixed Investment**
   Seasonally Adjusted, Quarterly, Billions of Chained 2012$ (FH@USECON)
6. **Hours: Private Sector, Nonfarm Payrolls**
   Seasonally Adjusted, Quarterly, Billions of Hours (LHTPRIVA@USECON)
7. **Utilization-Adjusted Total Factor Productivity**
   Quarterly, Percent, Annual Rate (TFPMQ@USECON)
8. **Capital Share of Income**, Quarterly (TFPJQ@USECON)
9. **Effective Federal Funds Rate**
   Quarterly Average, Annual Percent (FFED@USECON)
10. **S&P 500 Stock Price Index**, Quarterly Average (SP500@USECON)
11. **Real Research and Development**
    Seasonally Adjusted, Quarterly, Billions of Chained 2012$ (FNPRH@USECON)
12. **Net Stock: Private Fixed Assets**, Annual, Billions of Dollars (EPT@CAPSTOCK)
13. **Net Stock: Durable Goods**, Annual, Billions of Dollars (EDT@CAPSTOCK)
14. **Depreciation: Private Fixed Assets**, Annual, Billions of Dollars (KPT@CAPSTOCK)
15. **Depreciation: Durable Goods**, Annual, Billions of Dollars (KDT@CAPSTOCK)

We also used the following data from other sources:

1. **Information & Communication Technologies Standards Index** from Baron and Schmidt (2019). Data is available at https://www.law.northwestern.edu/research-faculty/clbe/innovationeconomics/data/technologystandards.

2. **Patent-Based Innovation Index** from Cascaldi-Garcia and Vukotić (2022). This is a quarterly version of the Kogan et al. (2017) annual index, which is based on counts of patents where each patent is weighted by its impact on the firm's stock price. Data is available at https://sites.google.com/site/cascaldigarcia/research.
3. **U.S. Patent & Trade Office Patent Count** from Marco et al. (2015). This is a quarterly count of new patent applications, excluding those classified as "missing" and "not classified". See https://www.uspto.gov/ip-policy/economic-research/research-datasets/historical-patent-data-files.
4. **Macroeconomic Forecasts** from the Survey of Professional Forecasters (SPF). We use the one and four-quarter ahead mean predictions for the unemployment rate (UNEMP), the GDP deflator (PGDP), real non-residential fixed investment (RNRESIN), and corporate profits (CPROF). These are used to construct the exogenous patent-innovation series of Miranda-Agrippino et al. (2022) that controls for SPF forecasts but not for exogenous policy shocks. Details about the construction are in Section 2.2 of Miranda-Agrippino et al. (2022). For the SPF data, see https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/survey-of-professional-forecasters.

B ORTHOGONALITY CONDITIONS

Observe that either $\gamma_{n,2}\gamma_{n,3} > 0$ and $\gamma_{\ell,2}\gamma_{\ell,3} < 0$ or $\gamma_{n,2}\gamma_{n,3} < 0$ and $\gamma_{\ell,2}\gamma_{\ell,3} > 0$. Using (R1-1) and the solution for γ_s, $\gamma_{\ell,2}$, and $\gamma_{\ell,3}$ in Section 2.3 of the main text implies

$$\begin{aligned}
\gamma_{s,1}^2 + \gamma_{s,2}^2 + \gamma_{s,3}^2 &= 1 - \gamma_{n,1}^2 + (\gamma_{n,1}\gamma_{n,2}/\gamma_{s,1})^2 + (\gamma_{n,1}\gamma_{n,3}/\gamma_{s,1})^2 \\
&= 1 - \gamma_{n,1}^2 + (\gamma_{n,1}^2/\gamma_{s,1}^2)(\gamma_{n,2}^2 + \gamma_{n,3}^2) \\
&= 1 \\
\gamma_{\ell,2}^2 + \gamma_{\ell,3}^2 &= 1 - \gamma_{s,2}^2 - \gamma_{n,2}^2 + 1 - \gamma_{s,3}^2 - \gamma_{n,3}^2 \\
&= \gamma_{s,1}^2 + \gamma_{n,1}^2 \\
&= 1 \\
\gamma_{s,1}\gamma_{n,1} + \gamma_{s,2}\gamma_{n,2} + \gamma_{s,3}\gamma_{n,3} &= \gamma_{s,1}\gamma_{n,1} - \gamma_{n,1}\gamma_{n,2}^2/\gamma_{s,1} - \gamma_{n,1}\gamma_{n,3}^2/\gamma_{s,1} \\
&= \gamma_{s,1}\gamma_{n,1} - (\gamma_{n,2}^2 + \gamma_{n,3}^2)\gamma_{n,1}/\gamma_{s,1} \\
&= 0 \\
\gamma_{n,2}\gamma_{\ell,2} + \gamma_{n,3}\gamma_{\ell,3} &= \gamma_{n,2}(\pm\sqrt{1 - \gamma_{\ell,3}^2}) + \gamma_{n,3}(\pm\sqrt{1 - \gamma_{\ell,2}^2}) \\
&= \gamma_{n,2}(\pm\sqrt{\gamma_{s,3}^2 + \gamma_{n,3}^2}) + \gamma_{n,3}(\pm\sqrt{\gamma_{s,2}^2 + \gamma_{n,2}^2}) \\
&= \gamma_{n,2}(\pm\sqrt{(\gamma_{n,1}^2/\gamma_{s,1}^2 + 1)\gamma_{n,3}^2}) + \gamma_{n,3}(\pm\sqrt{(\gamma_{n,1}^2/\gamma_{s,1}^2 + 1)\gamma_{n,2}^2})
\end{aligned}$$

$$
\begin{aligned}
&= \gamma_{n,2}(\pm\sqrt{\gamma_{n,3}^2/\gamma_{s,1}^2}) + \gamma_{n,3}(\pm\sqrt{\gamma_{n,2}^2/\gamma_{s,1}^2}) \\
&= \begin{cases}
\frac{1}{\sqrt{\gamma_{s,1}^2}}\left(\gamma_{n,2}\sqrt{\gamma_{n,3}^2} + \gamma_{n,3}\sqrt{\gamma_{n,2}^2}\right) & \text{if } \gamma_{\ell,2} > 0 \text{ and } \gamma_{\ell,3} > 0 \\
\frac{1}{\sqrt{\gamma_{s,1}^2}}\left(-\gamma_{n,2}\sqrt{\gamma_{n,3}^2} - \gamma_{n,3}\sqrt{\gamma_{n,2}^2}\right) & \text{if } \gamma_{\ell,2} < 0 \text{ and } \gamma_{\ell,3} < 0 \\
\frac{1}{\sqrt{\gamma_{s,1}^2}}\left(-\gamma_{n,2}\sqrt{\gamma_{n,3}^2} + \gamma_{n,3}\sqrt{\gamma_{n,2}^2}\right) & \text{if } \gamma_{\ell,2} < 0 \text{ and } \gamma_{\ell,3} > 0 \\
\frac{1}{\sqrt{\gamma_{s,1}^2}}\left(\gamma_{n,2}\sqrt{\gamma_{n,3}^2} - \gamma_{n,3}\sqrt{\gamma_{n,2}^2}\right) & \text{if } \gamma_{\ell,2} > 0 \text{ and } \gamma_{\ell,3} < 0
\end{cases} \\
&= \begin{cases}
0 & \text{if } \gamma_{n,2}\gamma_{n,3} < 0 \\
0 & \text{if } \gamma_{n,2}\gamma_{n,3} < 0 \\
0 & \text{if } \gamma_{n,2}\gamma_{n,3} > 0 \\
0 & \text{if } \gamma_{n,2}\gamma_{n,3} > 0
\end{cases} \\
\gamma_{s,2}\gamma_{\ell,2} + \gamma_{s,3}\gamma_{\ell,3} &= (\gamma_{n,1}/\gamma_{s,1})(\gamma_{n,2}\gamma_{\ell,2} + \gamma_{n,3}\gamma_{\ell,3}) \\
&= 0 \\
\gamma_{s,2}\gamma_{s,3} + \gamma_{n,2}\gamma_{n,3} + \gamma_{\ell,2}\gamma_{\ell,3} &= (\gamma_{n,1}^2/\gamma_{s,1}^2 + 1)\gamma_{n,2}\gamma_{n,3} - (\gamma_{n,2}/\gamma_{n,3})\gamma_{\ell,2}^2 \\
&= \gamma_{n,2}\gamma_{n,3}/\gamma_{s,1}^2 - (\gamma_{n,2}/\gamma_{n,3})(\gamma_{n,3}^2/\gamma_{s,1}^2) \\
&= 0
\end{aligned}
$$

since $\gamma_{s,1}^2 = 1 - \gamma_{n,1}^2 = \gamma_{n,2}^2 + \gamma_{n,3}^2$. Thus, (R1-1)-(R1-6) and (R2-1)-(R2-6) are satisfied, and there exists a Q that is orthogonal.

C Baseline DSGE Model

We detrend the model by writing trending variables in terms of TFP, $\tilde{x}_t \equiv x_t/z_t^{1/(1-\alpha)}$. The equilibrium system is given by

$$r_t^k = \alpha mc_t s_t g_t(\tilde{k}_{t-1}/n_t)^{\alpha-1} \tag{C.1}$$

$$\tilde{w}_t = (1-\alpha)mc_t s_t g_t^{-\alpha/(1-\alpha)}(\tilde{k}_{t-1}/n_t)^{\alpha} \tag{C.2}$$

$$\Delta_t^p \tilde{y}_t = s_t g_t^{-\alpha/(1-\alpha)}\tilde{k}_{t-1}^{\alpha} n_t^{1-\alpha} \tag{C.3}$$

$$\tilde{w}_t = \chi n_t^{\eta}\tilde{c}_t \tag{C.4}$$

$$1 = E_t[x_{t+1}r_t/\pi_{t+1}] \tag{C.5}$$

$$\tilde{c}_t + \tilde{\imath}_t = \tilde{y}_t \tag{C.6}$$

$$\tilde{k}_t = (1-\delta)\tilde{k}_{t-1}/g_{y,t} + \mu_t\tilde{\imath}_t \tag{C.7}$$

$$1/\mu_t = E_t[x_{t+1}(r_{t+1}^k + (1-\delta)/\mu_{t+1})] \tag{C.8}$$

$$p_{f,t} = \tfrac{\epsilon_p}{\epsilon_p - 1}(\tilde{f}_{1,t}/\tilde{f}_{2,t}) \tag{C.9}$$

$$\tilde{f}_{1,t} = mc_t\tilde{y}_t + \theta_p E_t[g_{y,t+1}x_{t+1}(\pi_{t+1}/\bar{\pi})^{\epsilon_p}\tilde{f}_{1,t+1}] \tag{C.10}$$

$$\tilde{f}_{2,t} = \tilde{y}_t + \theta_p E_t[g_{y,t+1}x_{t+1}(\pi_{t+1}/\bar{\pi})^{\epsilon_p-1}\tilde{f}_{2,t+1}] \tag{C.11}$$

$$\Delta^p_t = (1-\theta_p)p_{f,t}^{-\epsilon_p} + \theta_p(\pi_t/\bar{\pi})^{\epsilon_p}\Delta^p_{t-1} \tag{C.12}$$

$$1 = (1-\theta_p)p_{f,t}^{1-\epsilon_p} + \theta_p(\pi_t/\bar{\pi})^{\epsilon_p-1} \tag{C.13}$$

$$x_t = \beta\tilde{c}_{t-1}/(\tilde{c}_t g_{y,t}) \tag{C.14}$$

$$r_t = \bar{r}(\pi_t/\bar{\pi})^{\phi_\pi} \tag{C.15}$$

$$g_{y,t} = g_t^{1/(1-\alpha)} \tag{C.16}$$

$$\ln s_t = \rho_s \ln s_{t-1} + \sigma_s\varepsilon_{s,t} \tag{C.17}$$

$$\ln g_t = (1-\rho_g)\ln\bar{g} + \rho_g \ln g_{t-1} + \sigma_g\varepsilon_{g,t} \tag{C.18}$$

$$\ln \mu_t = \rho_\mu \ln \mu_{t-1} + \sigma_\mu\varepsilon_{\mu,t} \tag{C.19}$$

Table 1: Baseline DSGE model calibration at quarterly frequency.

Parameter	Value	Parameter	Value
Discount Factor (β)	0.995	Steady-State Hours ($\bar{n}$)	0.3333
Cost Share of Capital (α)	0.3343	Steady-State TFP Growth Rate ($\bar{g}$)	1.0026
Capital Depreciation Rate (δ)	0.025	TFP News Shock Persistence (ρ_g)	0.6
Frisch Labor Supply Elasticity ($1/\eta$)	0.5	TFP Surprise Shock Persistence (ρ_s)	0.8
Goods Elasticity of Substitution (ϵ_p)	11	MEI Shock Persistence (ρ_μ)	0.9
Calvo Price Stickiness (θ_p)	0.75	TFP News Shock SD (σ_g)	0.003
Taylor Rule Inflation Response (ϕ_π)	1.5	TFP Surprise Shock SD (σ_s)	0.007
Steady-State Inflation Rate ($\bar{\pi}$)	1.005	MEI Shock SD (σ_μ)	0.007

D KS DSGE MODEL

We detrend in the same way as our baseline model except $\tilde{\lambda}_t \equiv \lambda_t z_t^{1/(1-\alpha)}$, $\tilde{f}^w_{1,t} \equiv f^w_{1,t}/z_t^{(1+\epsilon_w)/(1-\alpha)}$, and $\tilde{f}^w_{2,t} \equiv f^w_{2,t}/z_t^{\epsilon_w/(1-\alpha)}$. The labor share $\omega_{\ell,t} = w_{\ell,t}l_{s,t}/y_t$. The equilibrium system is given by

$$r_{k,t} = \alpha mc_t s_t(\tilde{k}_{s,t}/l_{s,t})^{\alpha-1} \tag{D.1}$$

$$\tilde{w}_{\ell,t} = (1-\alpha)mc_t s_t(\tilde{k}_{s,t}/l_{s,t})^{\alpha} \tag{D.2}$$

$$\Delta^p_t\tilde{y}_t = s_t\tilde{k}_{s,t}^{\alpha}l_{s,t}^{1-\alpha} - \bar{F} \tag{D.3}$$

$$\tilde{\lambda}_t = (\tilde{c}_t - b\tilde{c}_{t-1}/g_{y,t})^{-1} - \beta b E_t[(\tilde{c}_{t+1}g_{y,t+1} - b\tilde{c}_t)^{-1}] \tag{D.4}$$

$$1 = E_t[x_{t+1}r_t/\pi_{t+1}] \tag{D.5}$$

$$r_{k,t} = \gamma_1 + \gamma_2(u_t - 1) \tag{D.6}$$

$$\theta\kappa_3 e_t^{\kappa_4-1} = \tilde{\lambda}_t\tilde{w}_t h_t \tag{D.7}$$

$$\theta\kappa_1 h_t^{\kappa_2-1} = \tilde{\lambda}_t \tilde{w}_t e_t \tag{D.8}$$

$$\begin{aligned}&\theta(\kappa_0 + (\kappa_1/\kappa_2)h_t^{\kappa_2} + (\kappa_3/\kappa_4)e_t^{\kappa_4})\\ &= \tilde{\lambda}_t \tilde{w}_t \left[e_t h_t - \tfrac{\psi}{2}(n_t/n_{t-1}-1)^2 - \psi(n_t/n_{t-1}-1)(n_t/n_{t-1})\right]\\ &+\beta\psi E_t[\tilde{\lambda}_{t+1}\tilde{w}_{t+1}(n_{t+1}/n_t-1)(n_{t+1}/n_t)^2]\end{aligned} \tag{D.9}$$

$$\tilde{k}_t = (1-\delta)\tilde{k}_{t-1}/g_{y,t} + \mu_t \tilde{\imath}_t \tag{D.10}$$

$$\mu_t q_t = 1 + \varphi(\Phi_t - \tilde{\delta}) \tag{D.11}$$

$$\begin{aligned}q_t = E_t[x_{t+1}(r_{k,t+1}u_{t+1} - \gamma_1(u_{t+1}-1) - \tfrac{\gamma_2}{2}(u_{t+1}-1)^2\\ -\tfrac{\varphi}{2}(\Phi_{t+1}-\tilde{\delta})^2 + \varphi(\Phi_{t+1}-\tilde{\delta})\Phi_{t+1} + (1-\delta)q_{t+1})]\end{aligned} \tag{D.12}$$

$$\Phi_t = \tilde{\imath}_t g_{y,t}/\tilde{k}_{t-1} \tag{D.13}$$

$$l_t = e_t h_t n_t \tag{D.14}$$

$$l_t = \Delta_t^w l_{s,t} \tag{D.15}$$

$$\tilde{k}_{s,t} = u_t \tilde{k}_{t-1}/g_{y,t} \tag{D.16}$$

$$x_t = \beta\tilde{\lambda}_t/(\tilde{\lambda}_{t-1}g_{y,t}) \tag{D.17}$$

$$\tilde{p}_t = \tfrac{\epsilon_p}{\epsilon_p-1}(\tilde{f}_{1,t}^p/\tilde{f}_{2,t}^p) \tag{D.18}$$

$$\tilde{f}_{1,t}^p = mc_t\tilde{y}_t + \theta_p E_t[x_{t+1}\pi_t^{-\epsilon_p\gamma_p}\bar{\pi}^{-\epsilon_p(1-\gamma_p)}\pi_{t+1}^{\epsilon_p}\tilde{f}_{1,t+1}^p g_{y,t+1}] \tag{D.19}$$

$$\tilde{f}_{2,t}^p = \tilde{y}_t + \theta_p E_t[x_{t+1}\pi_t^{(1-\epsilon_p)\gamma_p}\bar{\pi}^{(1-\epsilon_p)(1-\gamma_p)}\pi_{t+1}^{\epsilon_p-1}\tilde{f}_{2,t+1}^p g_{y,t+1}] \tag{D.20}$$

$$\Delta_t^p = (1-\theta_p)\tilde{p}_t^{-\epsilon_p} + \theta_p\pi_{t-1}^{-\epsilon_p\gamma_p}\bar{\pi}^{-\epsilon_p(1-\gamma_p)}\pi_t^{\epsilon_p}\Delta_{t-1}^p \tag{D.21}$$

$$1 = (1-\theta_p)\tilde{p}_t^{1-\epsilon_p} + \theta_p\pi_{t-1}^{(1-\epsilon_p)\gamma_p}\bar{\pi}^{(1-\epsilon_p)(1-\gamma_p)}\pi_t^{\epsilon_p-1} \tag{D.22}$$

$$\tilde{w}_{\ell,t}^* = \tfrac{\epsilon_w}{\epsilon_w-1}(\tilde{f}_{1,t}^w/\tilde{f}_{2,t}^w), \tag{D.23}$$

$$\tilde{f}_{1,t}^w = \tilde{w}_{\ell,t}^{\epsilon_w}\tilde{w}_t l_{s,t} + \theta_w\bar{g}_y E_t[x_{t+1}\pi_{t+1}^{\epsilon_w}\pi_t^{-\epsilon_w\gamma_w}\bar{\pi}^{-\epsilon_w(1-\gamma_w)}\tilde{f}_{1,t+1}^w(g_{y,t+1}/\bar{g}_y)^{1+\epsilon_w}] \tag{D.24}$$

$$\tilde{f}_{2,t}^w = \tilde{w}_{\ell,t}^{\epsilon_w} l_{s,t} + \theta_w\bar{g}_y E_t[x_{t+1}\pi_{t+1}^{\epsilon_w-1}\pi_t^{(1-\epsilon_w)\gamma_w}\bar{\pi}^{(1-\epsilon_w)(1-\gamma_w)}\tilde{f}_{2,t+1}^w(g_{y,t+1}/\bar{g}_y)^{\epsilon_w}] \tag{D.25}$$

$$\Delta_t^w = (1-\theta_w)\left(\frac{\tilde{w}_{\ell,t}^*}{\tilde{w}_{\ell,t}}\right)^{-\epsilon_w} + \theta_w\pi_{t-1}^{-\epsilon_w\gamma_w}\bar{\pi}^{-\epsilon_w(1-\gamma_w)}\pi_t^{\epsilon_w}\left(\frac{\tilde{w}_{\ell,t-1}\bar{g}_y}{\tilde{w}_{\ell,t}g_{y,t}}\right)^{-\epsilon_w}\Delta_{t-1}^w \tag{D.26}$$

$$\tilde{w}_{\ell,t}^{1-\epsilon_w} = (1-\theta_w)(\tilde{w}_{\ell,t}^*)^{1-\epsilon_w} + \theta_w\pi_{t-1}^{\gamma_w(1-\epsilon_w)}\bar{\pi}^{(1-\gamma_w)(1-\epsilon_w)}\pi_t^{\epsilon_w-1}\left(\frac{\tilde{w}_{\ell,t-1}\bar{g}_y}{g_{y,t}}\right)^{1-\epsilon_w} \tag{D.27}$$

$$r_t = r_{t-1}^{\rho_r}(\bar{r}(\pi_t/\bar{\pi})^{\phi_\pi}(\tilde{y}_t g_{y,t}/(\tilde{y}_{t-1}\bar{g}_y))^{\phi_y})^{1-\rho_r}\exp(\sigma_r\varepsilon_{r,t}) \tag{D.28}$$

$$\begin{aligned}\tilde{c}_t + \tilde{\imath}_t + \tfrac{\psi}{2}(n_t/n_{t-1}-1)^2\tilde{w}_t n_t + \tfrac{\varphi}{2}(\Phi_t-\tilde{\delta})^2\tilde{k}_{t-1}/g_{y,t}\\ +(\gamma_1(u_t-1) + \tfrac{\gamma_2}{2}(u_t-1)^2)\tilde{k}_{t-1}/g_{y,t} = \tilde{y}_t\end{aligned} \tag{D.29}$$

$$g_{y,t} = g_t^{1/(1-\alpha)} \tag{D.30}$$

$$\ln s_t = \rho_s \ln s_{t-1} + \sigma_s\varepsilon_{s,t} \tag{D.31}$$

$$\ln g_t = (1-\rho_g)\ln g + \rho_g \ln g_{t-1} + \sigma_g\varepsilon_{g,t} \tag{D.32}$$

$$\ln\mu_t = \rho_\mu \ln\mu_{t-1} + \sigma_\mu\varepsilon_{\mu,t} \tag{D.33}$$

Table 2: KS DSGE model parameterization at quarterly frequency.

Parameter	Value	Parameter	Value
Discount Factor (β)	0.99	Taylor Rule Inflation Response (ϕ_π)	1.5
Cost Share of Capital (α)	0.3333	Taylor Rule Output Response (ϕ_y)	0.5
Capital Depreciation Rate (δ)	0.025	Taylor Rule Smoothing (ρ_r)	0.8
Utilization Function Curvature (γ_2)	0.01	Steady-State Inflation Rate ($\bar{\pi}$)	1
Internal Habit Persistence (b)	0.8	Steady-State Employment Share ($\bar{n}$)	3/5
Capital Adjustment Cost (φ)	2	Steady-State Labor Preference ($\bar{G}$)	1/3
Employment Adjustment Cost (ψ)	2	Steady-State Effort ($\bar{e}$)	5
Frisch Elasticity of Hours (η)	1	Steady-State Hours ($\bar{h}$)	1/3
Elasticity of Effort to Hours (ϵ_{eh})	4	Steady-State Output Growth Rate ($\bar{g}_y$)	1.0026
Goods Elasticity of Substitution (ϵ_p)	11	TFP News Shock Persistence (ρ_g)	0.7
Labor Elasticity of Substitution (ϵ_w)	11	TFP Surprise Shock Persistence (ρ_s)	0.9
Calvo Price Stickiness (θ_p)	0.75	MEI Shock Persistence (ρ_μ)	0.8
Calvo Wage Stickiness (θ_w)	0.9	TFP News Shock SD (σ_g)	0.002125
Price Indexation (γ_p)	0	TFP Surprise Shock SD (σ_s)	0.000425
Wage Indexation (γ_w)	1	MEI Shock SD (σ_μ)	0.00425

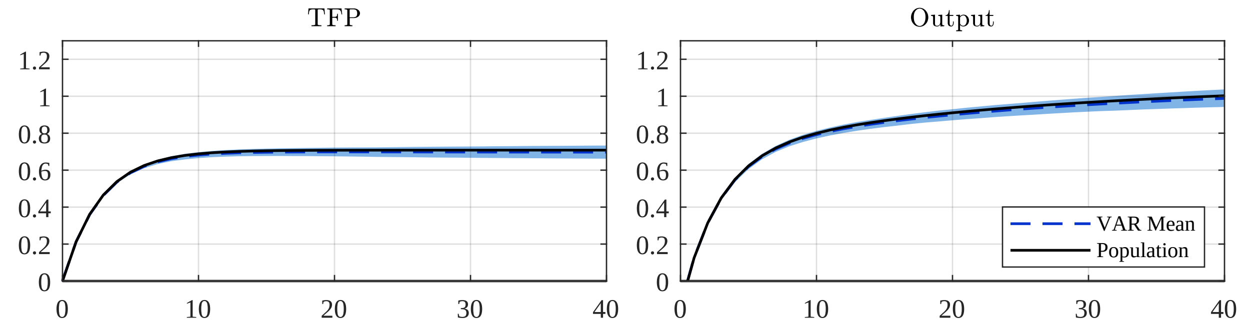
E ADDITIONAL RESULTS

This section presents several additional results:

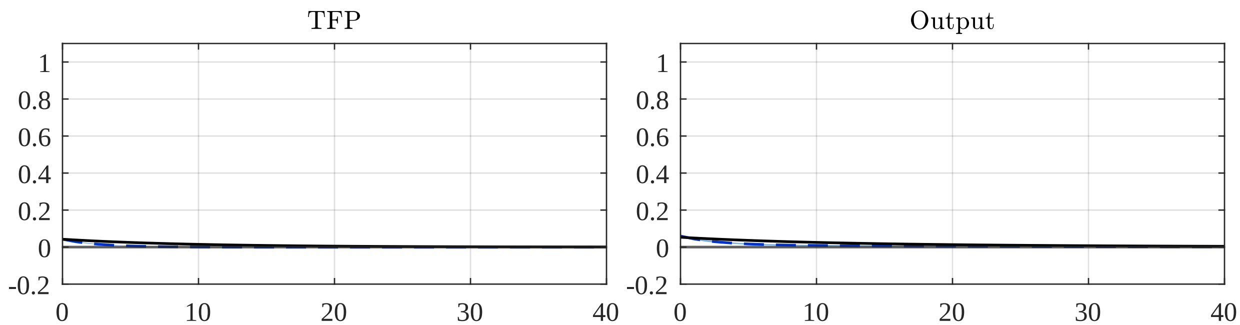
- Impulse responses based on the KS estimator and $\mathbf{y}_t = (a_t, y_t, i_t)'$ using data simulated from our baseline DSGE model with the KS TFP process and $T = 10{,}000$ (Figure 1).
- Impulse responses based on the Cholesky news estimator and $\mathbf{y}_t = (z_{t+1}, a_t, y_t)'$ using simulated data from our baseline DSGE model with $T = 10{,}000$ (Figure 2).
- Impulse responses based on the Cholesky news estimator and $\mathbf{y}_t = (z_{t+1}, \text{TFP}_t^u, y_t, i_t)'$ using simulated data from the KS DSGE model with $T = 10{,}000$ (Figure 3).
- Root mean squared errors based on the max share news and Cholesky news estimators, where the news variable is measured with error and the data is simulated from the KS DSGE model with calibrated shock processes and TFP measurement error (Table 3)
- Empirical impulse responses from 9-variable VAR models with alternative TFP news series of different lengths (Figure 4-Figure 7).
- Comparison of the empirical impulse responses from the 9-variable ICT model identified by Cholesky news to the 8-variable KS VAR model identified by TFP max share (Figure 8).

Figure 1: KS max-share identified responses based on the baseline DSGE model with KS TFP

(a) News shock



(b) Surprise shock



Notes: VAR(4) model with $T = 10{,}000$ and $\mathbf{y}_t = (a_t, y_t, i_t)'$. The responses are scaled so the estimated response of TFP matches the population value when the shock first takes effect.

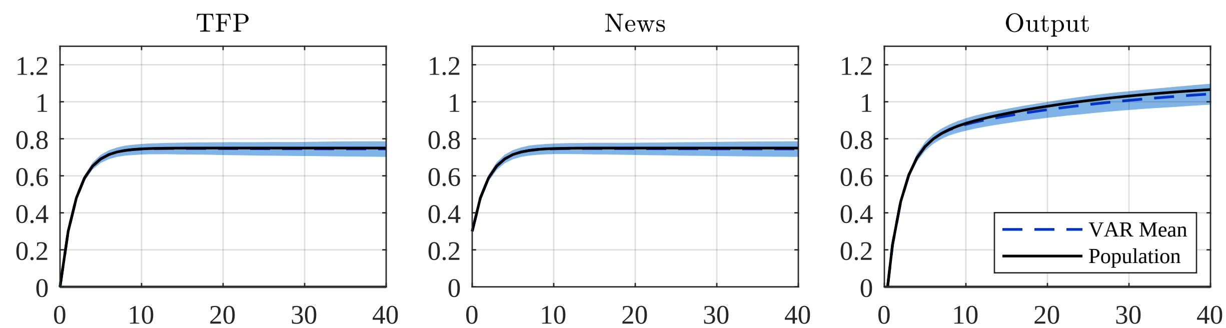
Table 3: RMSE over 40 quarters based on the KS DSGE model with calibrated shock processes

Estimator	TFP	Output	Investment	Total
KS Max Share	10.3	10.4	19.3	40.0
Max Share News ($\sigma_n = 0$)	6.4	2.8	7.6	16.8
Max Share News ($\sigma_n = 0.2\sigma_g$)	6.4	3.0	8.1	17.4
Max Share News ($\sigma_n = 0.5\sigma_g$)	6.4	3.6	9.1	19.1
Cholesky News ($\sigma_n = 0$)	6.4	2.7	7.5	16.6
Cholesky News ($\sigma_n = 0.2\sigma_g$)	5.9	2.9	7.8	16.6
Cholesky News ($\sigma_n = 0.5\sigma_g$)	4.2	3.8	8.6	16.6

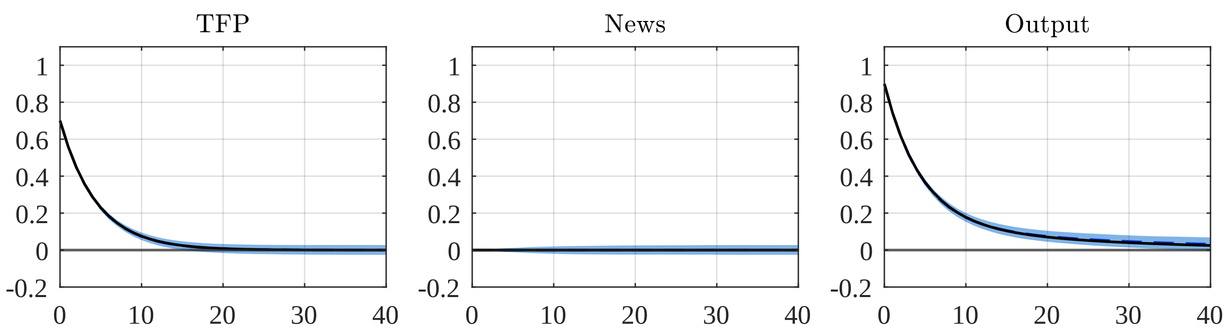
Notes: VAR(4) model with $T = 10{,}000$, where $\mathbf{y}_t = (\text{TFP}_t^u, y_t, i_t)'$ for the KS estimator and $\mathbf{y}_t = (z_{t+1}^n, \text{TFP}_t^u, y_t, i_t)'$ for the max share news and Cholesky news estimators.

Figure 2: Cholesky news identified impulse responses based on the baseline DSGE model

(a) News shock



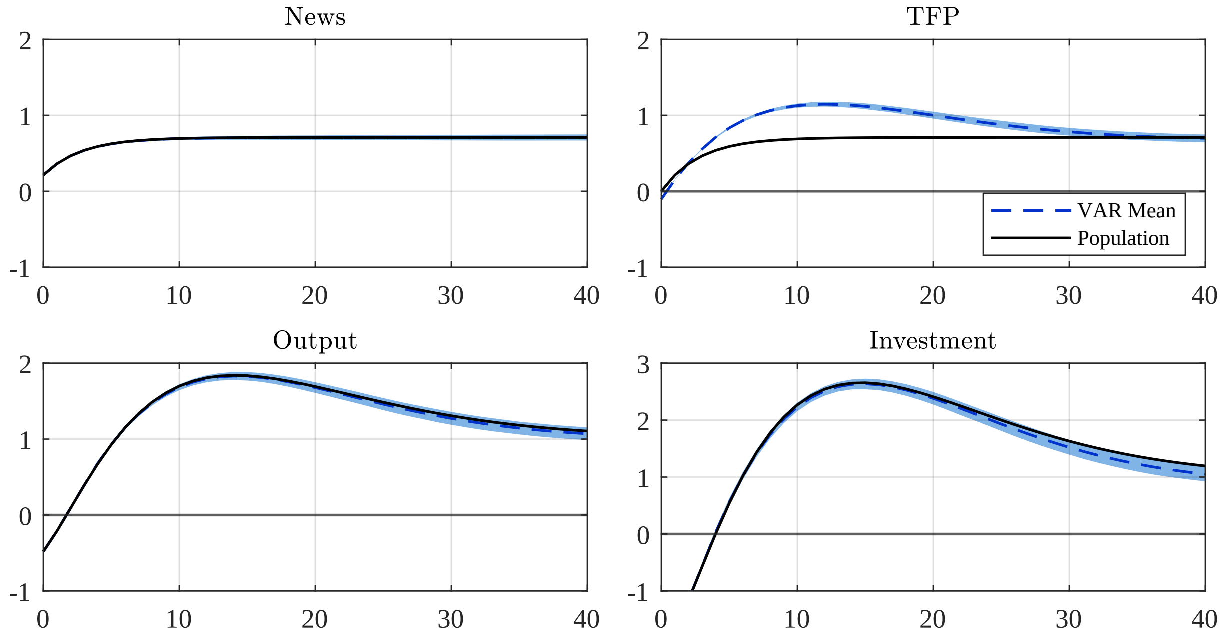
(b) Surprise shock



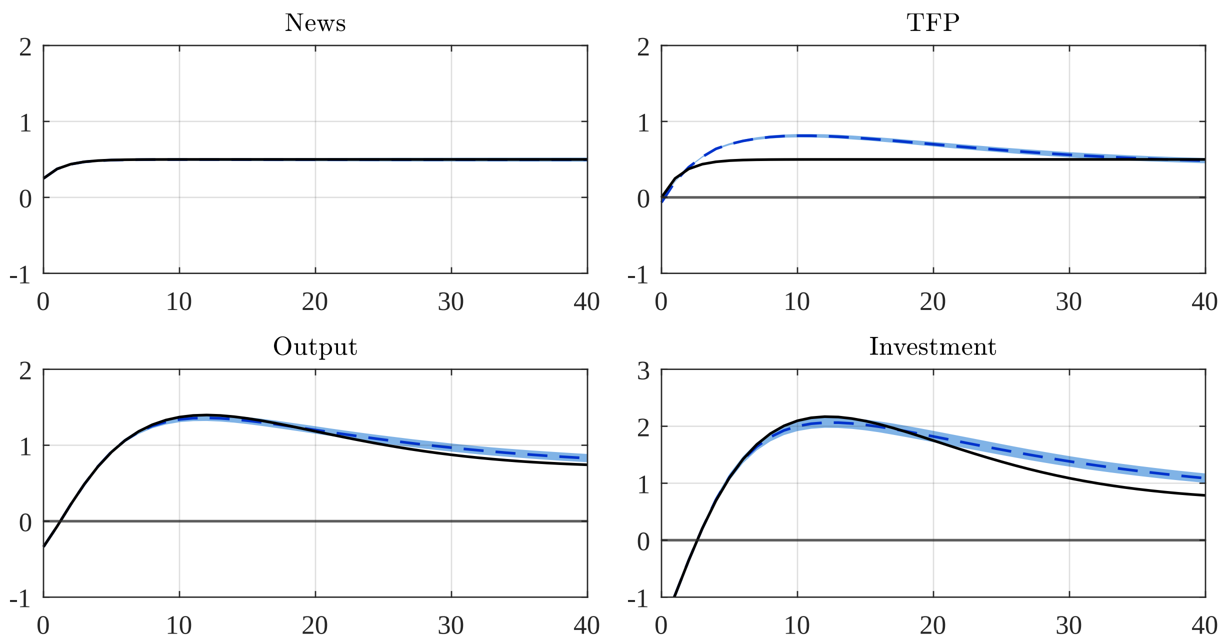
Notes: VAR(4) model with $T = 10{,}000$ and $\mathbf{y}_t = (z_{t+1}, a_t, y_t)'$. The responses are scaled so the estimated response of TFP matches the population value when the shock first takes effect.

Figure 3: Cholesky news identified responses to news shocks based on the KS DSGE model

(a) KS model with measurement error



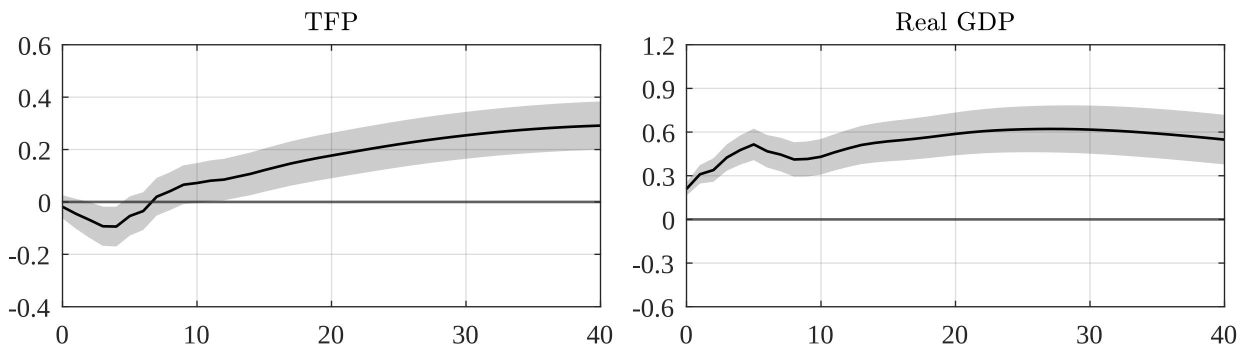
(b) KS model with calibrated shock processes and measurement error



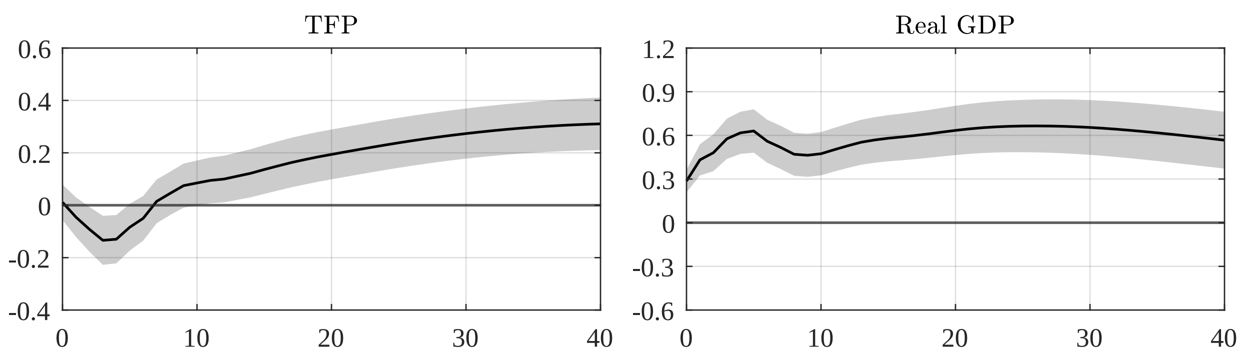
Notes: VAR(4) model with $T = 10{,}000$ and $\mathbf{y}_t = (z_{t+1}, \text{TFP}_t^u, y_t, i_t)'$. The responses are not scaled since the estimated responses of TFP tend to be close to zero when the shock first takes effect.

Figure 4: Impulse responses with real R&D expenditures

(a) Cholesky news identified VAR model



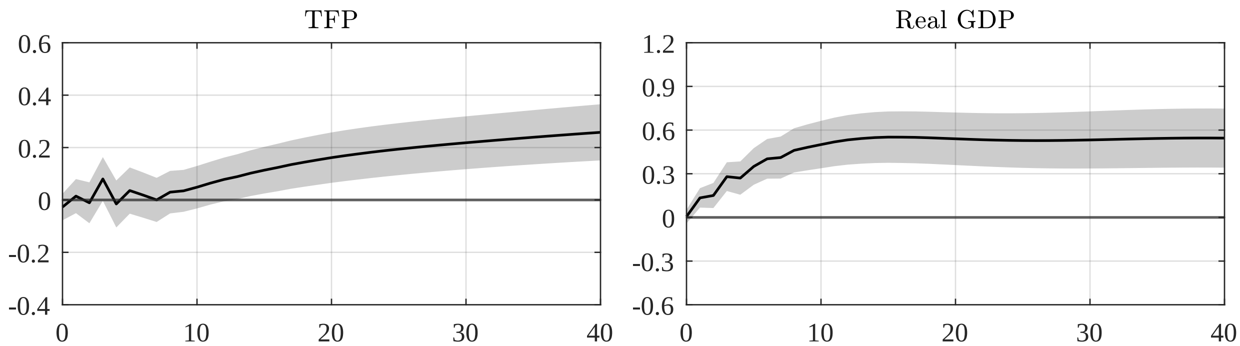
(b) Max share news identified VAR model



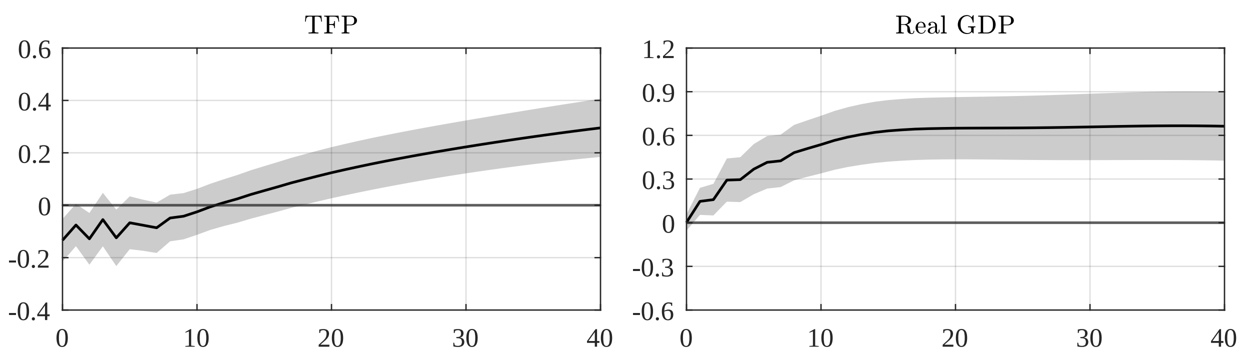
Notes: Shaded regions represent 1-standard deviation error bands computed by bootstrap.

Figure 5: Impulse responses with the ICT index

(a) Cholesky news identified VAR model



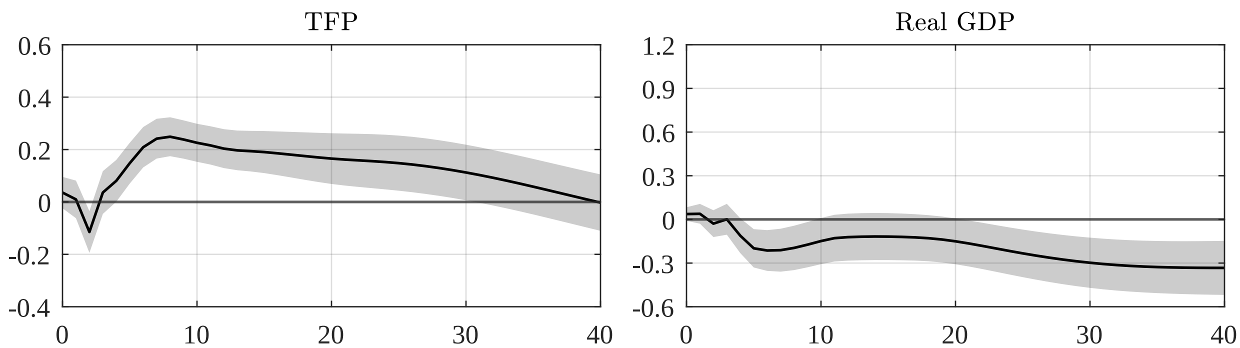
(b) Max share news identified VAR model



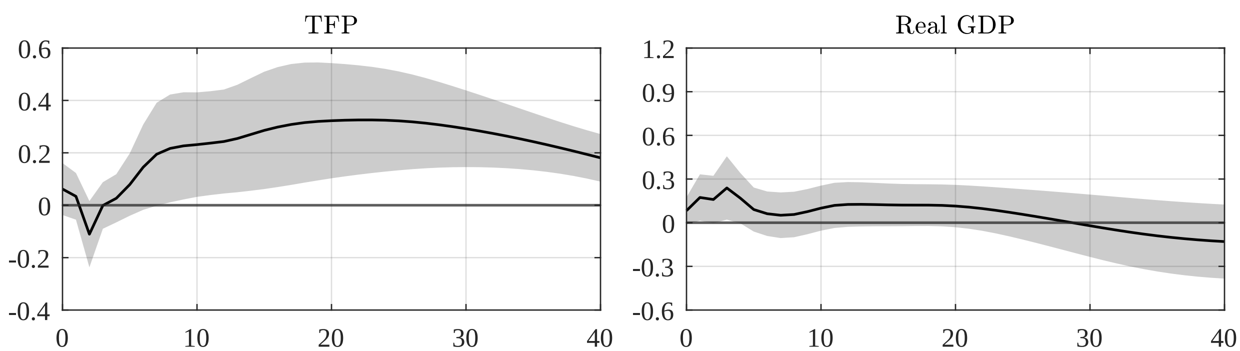
Notes: Shaded regions represent 1-standard deviation error bands computed by bootstrap.

Figure 6: Impulse responses with the CGV series

(a) Cholesky news identified VAR model



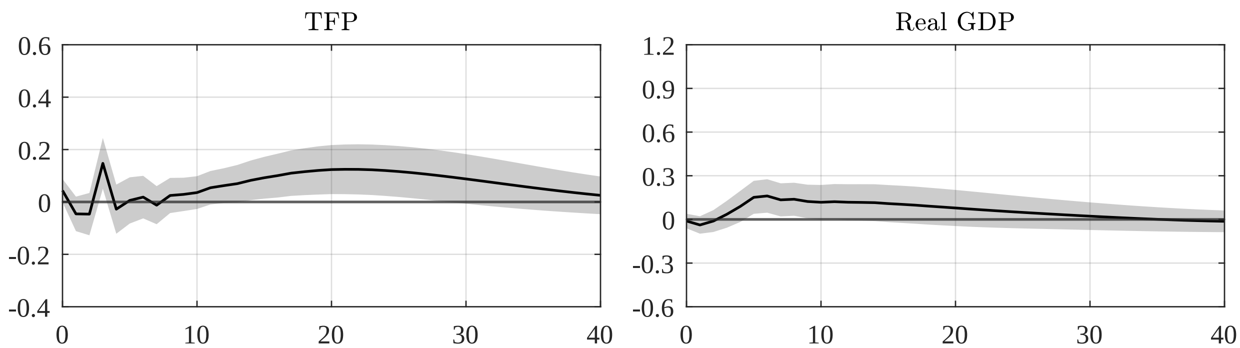
(b) Max share news identified VAR model



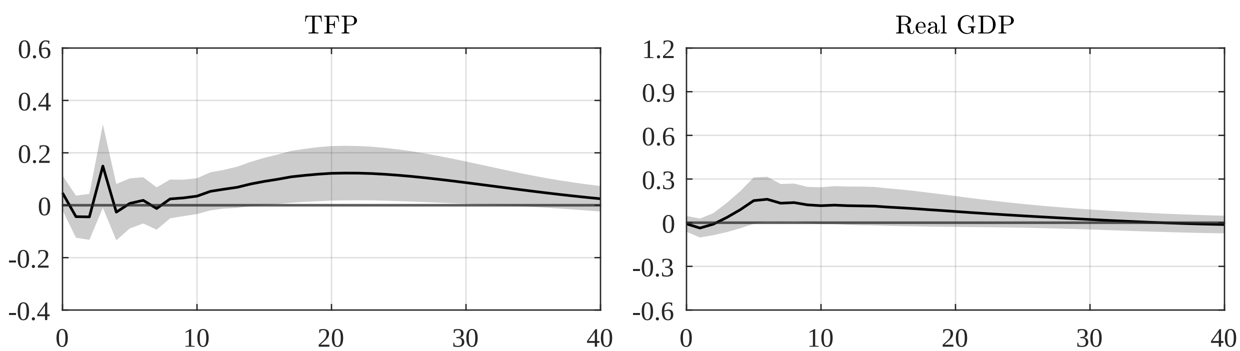
Notes: Shaded regions represent 1-standard deviation error bands computed by bootstrap.

Figure 7: Impulse responses with the MAHB series

(a) Cholesky news identified VAR model

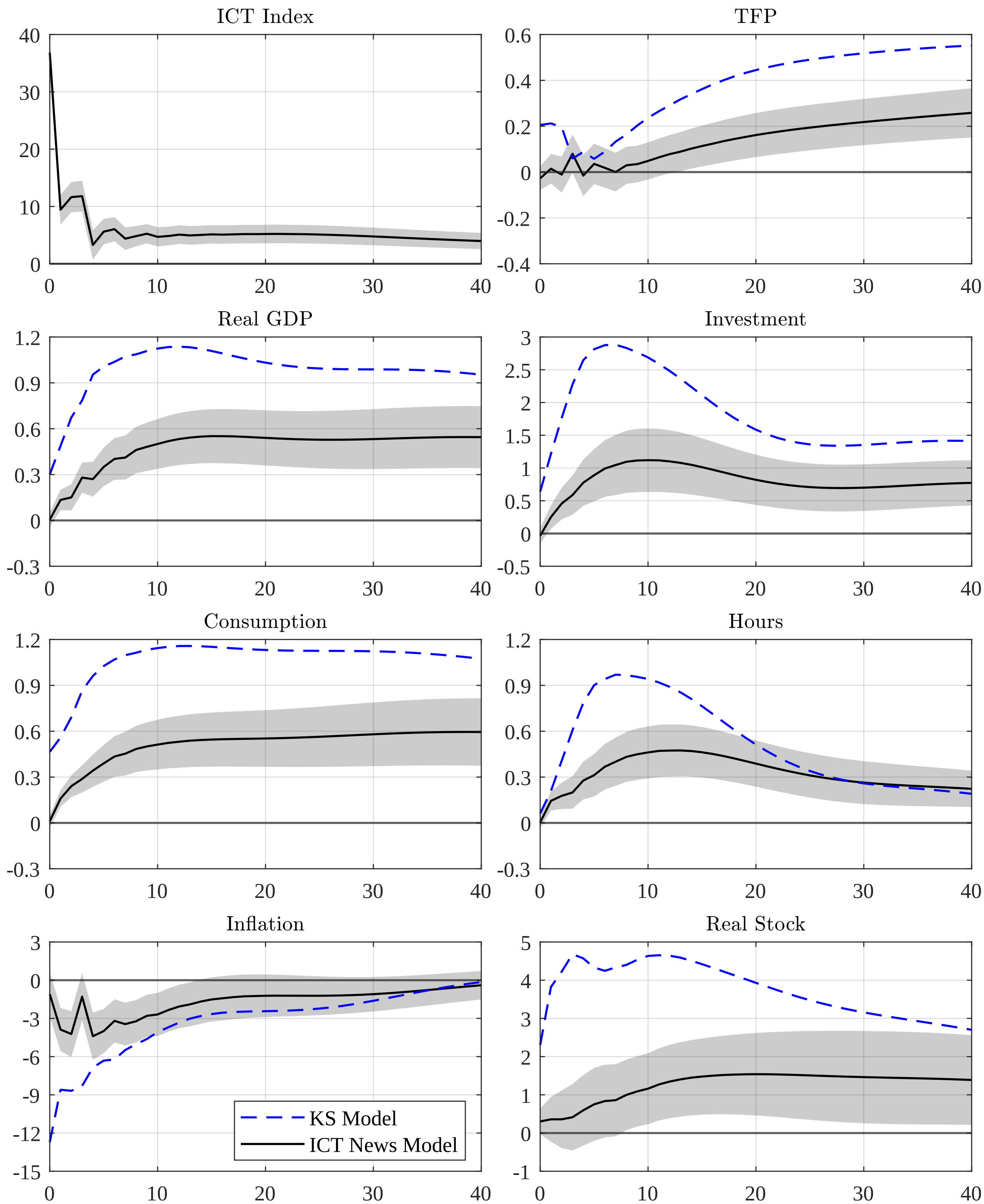


(b) Max share news identified VAR model



Notes: Shaded regions represent 1-standard deviation error bands computed by bootstrap.

Figure 8: Comparison of Cholesky news and TFP max share identified impulse responses



Notes: VAR(4) models estimated on identical samples from 1960-2014. Shaded regions represent 1-standard deviation error bands computed by bootstrap for the ICT news model.

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