Online Appendix: The Time-Varying Effects of Oil News Shocks *

Ana María Herrera[†] Sandeep Kumar Rangaraju[‡]

Abstract

We investigate whether the transmission of oil news shocks to inflation and inflation expectations has changed over time. We employ a Bayesian time-varying parameter vector autoregressive model where we identify the structural shock of interest -an oil price shock- via a proxy variable. This framework allows us to explore what parameters drive the time variation and to inquire whether the reliability of the proxy is sensitive to alternative priors. We find evidence that there has been a considerable degree of time variation in the response of real oil prices, world economic activity, inflation, and, especially, inflation expectations to oil news shocks. Moreover, we trace back the sources of the time-varying effect of oil shock to fluctuations in the stochastic volatility of all variables–especially oil prices and inflation–and to time variation of the correlation between oil prices and inflation expectations. Our results suggest that, in times of higher and more volatile inflation, oil news shocks matter for the pass-through of shocks to realized inflation and inflation expectations.

JEL Classification: C32, E32

Keywords: Oil prices, TVP-VAR, inflation, inflation expectations.

^{*}We thank Elena Pesavento and conference participants at the 2025 Society for Economic Measurement(SEM), the 2024 Midwest Econometrics Group Conference(MEG), and the 2025 SNDE Symposium for helpful suggestions and comments.

[†]Department of Economics, Gatton College of Business and Economics, University of Kentucky, Lexington 40206-0034; phone: (859) 257-1119; e-mail: amherrera@uky.edu

[‡]Department of Economics, Goddard School of Business & Economics, Weber State University, Ogden 84408-3801; e-mail: srangaraju@weber.edu

A Tables and Figures

Figure A.1: Posterior Median Response of the Oil Price to the Oil News Shock-Inflation Expectations Proxy TVP-VAR Model



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.



Figure A.2: Posterior Median Response of World Oil Production to Oil News Shock-Inflation Expectations Proxy TVP-VAR Model

Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant coefficient Proxy VAR model The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.





Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent recession periods for the United States as identified by the NBER.



Figure A.4: Posterior Median Response of Inflation Expectations to Oil News Shock-Inflation Expectations Proxy TVP-VAR Model

Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.5: Posterior Median Response of the Oil Price to the Oil News Shock -Robustness to Prior Mean of $\overline{\sigma}_0$ is 0.177 and Prior variance of $v_0 = 0.020$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.6: Posterior Median Response of World Oil Production to Oil News Shock -Robustness to Prior Mean of $\overline{\sigma}_0$ is 0.177 and Prior variance of $v_0 = 0.020$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant coefficient Proxy VAR model The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.7: Posterior Median Response of World Industrial Production to Oil News Shock - Robustness to Prior Mean of $\overline{\sigma}_0$ is 0.177 and Prior variance of $v_0 = 0.020$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent recession periods for the United States as identified by the NBER.

Figure A.8: Posterior Median Response of Inflation to Oil News Shock - Robustness to Prior Mean of $\overline{\sigma}_0$ is 0.177 and Prior variance of $v_0 = 0.020$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.9: Posterior Median Response of Inflation Expectations to Oil News Shock -Robustness to Prior Mean of $\overline{\sigma}_0$ is 0.177 and Prior variance of $v_0 = 0.020$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.10: Posterior Median Response of the Oil Price to the Oil News Shock -Robustness to a Tighter Prior on the Prior Variance of $v_0 = 0.01$ and Prior Mean of $\sigma_0 = 0.354$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.11: Posterior Median Response of World Oil Production to Oil News Shock -Robustness to a Tighter Prior on the Prior Variance of $v_0 = 0.01$ and Prior Mean of $\sigma_0 = 0.354$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant coefficient Proxy VAR model The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.12: Posterior Median Response of World Industrial Production to Oil News Shock - Robustness to a Tighter Prior on the Prior Variance of $v_0 = 0.01$ and Prior Mean of $\sigma_0 = 0.354$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent recession periods for the United States as identified by the NBER.

Figure A.13: Posterior Median Response of Inflation to Oil News Shock - Robustness to a Tighter Prior on the Prior Variance of $v_0 = 0.01$ and Prior Mean of $\sigma_0 = 0.354$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.14: Posterior Median Response of Inflation Expectations to Oil News Shock -Robustness to a Tighter Prior on the Prior Variance of $v_0 = 0.01$ and Prior Mean of $\sigma_0 = 0.354$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.15: Posterior Median Response of the Oil Price to the Oil News Shock -Robustness to a Prior Variance of $v_0 = 0.1$ and Prior Mean of $\sigma_0 = 0.177$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.16: Posterior Median Response of the Oil Production to the Oil News Shock -Robustness to a Prior Variance of $v_0 = 0.1$ and Prior Mean of $\sigma_0 = 0.177$



Note: The oil supply news shock normalized to a 10 percent increase in the real price of crude oil. The dotted red line is the response from a constant coefficient Proxy VAR model The shaded area indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.17: Posterior Median Response of the World Industrial Production to the Oil News Shock - Robustness to a Prior Variance of $v_0 = 0.1$ and Prior Mean of $\sigma_0 = 0.177$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent recession periods for the United States as identified by the NBER.





Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.

Figure A.19: Posterior Median Response of the Inflation Expectations to the Oil News Shock - Robustness to a Prior Variance of $v_0 = 0.1$ and Prior Mean of $\sigma_0 = 0.177$



Note: The oil supply news shock normalized to a 1 percent increase in the real price of crude oil. The dotted red line is the response from a constant-coefficient Proxy VAR model. The dashed lines indicated the 68 percent posterior credible sets. The vertical bars represent the recession periods for the United States as identified by the NBER.



Figure A.20: Response to Oil News Shocks - Constant Coefficient Proxy VAR Model

Note: This figure reports impulse responses for the aggregate variables to an oil news shock normalized to increase the real price of oil by 10 percent on impact. All responses are reported in percentages. The dark and light shaded areas, respectively, correspond to 68 and 90 percent confidence intervals. The dotted orange line represents the "Without Inflation" specification that excludes inflation from the baseline model. The dash-dot purple line shows the "Without Inflation Expectations" specification that excludes inflation the baseline model.



Figure A.21: Response of Macroeconomic Aggregates to an Oil News Shock- Constant Coefficient Proxy VAR Model

Note: This figure reports impulse responses for the aggregate variables to an oil news shock, normalized to increase the real price of oil by 10 percent on impact. All responses are reported in percentages. The solid blue line represents the baseline model which includes Real Price of Oil, World Oil Production, World Industrial Production, Expected Inflation, and Inflation. The dashed green line shows results from the "With Inventories" specification that adds a global oil inventories variable to the baseline. The dotted orange line represents the "Without Inflation" specification that excludes inflation from the baseline model. The dash-dot purple line shows the "Without Inflation Expectations" specification that excludes inflation expectations from the baseline model. The dotted red line represents the "Kanzig Updated Sample" specification that uses an alternative dataset as described in Kanzig (2021) and includes Real Price of Oil, World Oil Production, World Industrial Production, World Oil Inventories, US Industrial Production, and Inflation Rate. The shaded areas represent the 68% confidence interval (darker blue) and 90% confidence interval (lighter blue) for the baseline specification respectively.



Figure A.22: Response of Macroeconomic Aggregates to an Oil News Shock- Constant Coefficient Proxy VAR Model

Note: This figure reports impulse responses for the aggregate variables to an oil news shock normalized to increase the real price of oil by 10 percent on impact. All responses are reported in percentages. The solid blue line represents the baseline model, with shaded areas in light and medium blue depicting the 90% and 68% confidence intervals, respectively. The green dashed line shows results from the Känzig. specification with the Känzig sample, while the orange dotted line presents the Känzig specification with an updated sample. The purple dashed-dotted line shows the results of a 5-variable specification with the Känzig sample, respectively.