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How Political Tensions and Geopolitical Risks Impact Oil Prices?*

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Abstract

This paper assesses the effect of US-China political relationships and geopolitical risks on oil prices. To this end, we consider two quantitative measures — the Political Relationship Index and the Geopolitical Risk Index — and rely on structural VAR and local projections methodologies. Our findings show that improved US-China relationships, as well as higher geopolitical risks, drive up the price of oil. Positive shocks on the political relationship index are associated with optimistic expectations regarding economic activity, whereas positive shocks on the geopolitical risk index reflect fears of supply disruption. Political tensions and geopolitical risks are thus complementary factors, the former being linked to the demand side and the latter to the supply side.

Keywords: Oil prices, political relationships, geopolitical risk, China.
JEL: Q4, F51, C32

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1. Introduction

The last two decades have been characterized by impressive changes in the oil market at the global level. Although the role of the Chinese economy in the oil market was negligible before China's entrance into the WTO, the situation dramatically evolved afterward. Indeed, China has become a significant player in the oil market, with 16.4% of global consumption in 2021.[1] Turning to the US, it is the first largest consumer (19.9% of world oil consumption) and producer (16.8% of world oil production). Given the weight of these two countries, the evolution of their political relationships could thus strongly affect the dynamics of oil prices, in addition to geopolitical risks.

This paper tackles this issue by investigating the impact of political tensions and geopolitical risks on oil prices. Whereas various articles have tried to capture these effects using proxy variables (Chen et al., 2016; Lee et al., 2017; Miao et al., 2017; Perifanis and Dagoumas, 2019; Abdel-Latif and El-Gamal, 2020; Qin et al., 2020; Caldara and Iacoviello, 2018), Cai et al. (2022) is the first study that relies on a quantitative measure of political relations to investigate their possible impacts on oil prices.

In the present paper, we go further than the previous literature by relying on two complementary quantitative measures. First, we use an index built by the Institute of International Relations at Tsinghua University to measure political relationships (see Yan (2010) for a discussion). This Political Relationship Index (hereafter PRI), ranging between -9 and 9, indicates whether the countries are rivals (between -9 and -6), in a tense relation (between -6 and -3), in a bad relation (between -3 and 0), in a normal relation (between 0 and 3), in good relation (between 3 and 6), and friends (between 6 and 9). PRI fluctuates according to a scale similar to the Goldstein scale (Goldstein, 1992). Each month, bad or good events appearing in People's Daily and on the Chinese Ministry of Foreign Affairs website are included to update the index.[2] As shown in Figure 1, the US-China political relationships dramatically deteriorated after the beginning of Trump's trade war.

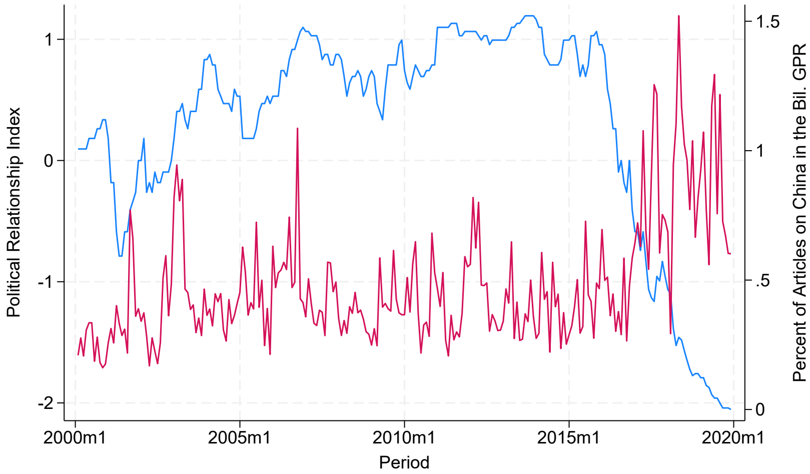
Second, we use the bilateral version specific to China of the Geopolitical Risk Index (hereafter GPR) introduced by Caldara and Iacoviello (2018). GPR is a monthly index obtained by running automated text searches on the electronic archives of 11 newspapers that counts the percentage of articles related to adverse geopolitical events (wars, terrorist attacks, tensions between countries, etc.). The bilateral version of GPR refers to the percentage of articles in US newspapers dealing with adverse geopolitical events that concern one specific country, namely China in our case. This bilateral index uses three US newspapers: The New York Times, Chicago Tribune, and The Washington Post. As shown in Figure 1, the percentage of articles associated with China increased substantially after Trump's trade war began.

To decipher the differences between the impact of political tensions and geopolitical risks — two concepts that are related to each other but are not entirely substitutable — on oil prices, we use

[1] Source: BP Statistical Review of World Energy 2022.

[2] See section 2.

Figure 1: Political Relationship Index (LHS) and Geopolitical Risk Index (RHS)



Notes: PRI (in blue) can be downloaded at: http://www.tuiir.tsinghua.edu.cn/imiren/info/1091/1320.htm, and the bilateral GPR (in red) at: https://www.matteoiacoviello.com/gpr_country.htm. PRI is expressed as $\text{sgn}(x) * ln(|x| + 1)$ and ranges between -2.30 and 2.30: rival countries between -2.30 and -1.95, in a tense relation between -1.95 and -1.39, in a bad relation between -1.39 and 0, in a normal relation between 0 and 1.39, in good relation between 1.39 and 1.95, and friends between 1.95 and 2.30.

Structural VAR (SVAR) and Local Projections (LP). Our findings show that improved US-China political relationships, as well as an amelioration of geopolitical risks, drive up the price of oil.

The rest of the paper is organized as follows. Section 2 presents the data and methodology. Section 3 reports our empirical results. Section 4 concludes.

2. Data and Methodology

Using monthly data from January 2000 to December 2019, we run SVAR and LP analyses (Jordà, 2005) to evaluate how oil prices react to shocks on PRI and on the bilateral GPR index. We consider the following variables in the SVAR model: bilateral GPR for China (*gpr_cn*), oil supply (global oil production, million barrels/day, *lpro*), oil demand (OECD and six major non-member economies (Brazil, China, India, Indonesia, the Russian Federation, and South Africa) industrial production, *ldem*), oil prices (real WTI spot price, *lrpo*), and PRI between China and the US (*lpri_us*), respectively.[3] These oil-related variables are transformed into natural logs. For PRI, we use the log-modulus transformation, which is defined for zero and negative values.

[3] All the oil-related variables are taken from: https://sites.google.com/site/cjsbaumeister/. More details can be found in Baumeister and Hamilton (2019).

As previously mentioned, PRI is updated using the news published in People's Daily and on the Chinese Ministry of Foreign Affairs website. Specifically, the formula used to update PRI is given by:

$$PRI_t = \frac{\left(\frac{N-PRI_{t-1}}{N}EV^{+} + \frac{N+PRI_{t-1}}{N}EV^{-}\right)}{5} + PRI_{t-1} \tag{1}$$

where N denotes the half of the range of the PRI index, EV^{+} is the level of good events, and EV^{-} is the level of bad events during the current month, respectively.[4] The first term after the equal sign is rounded to the smallest increment 0.1.

Following Lütkepohl (2005), the SVAR specification is given by:

$$\mathbf{A}\mathbf{y}_t = \mathbf{A}_1\mathbf{y}_{t-1} + \mathbf{A}_2\mathbf{y}_{t-2} + \cdots + \mathbf{A}_p\mathbf{y}_{t-p} + \mathbf{B}\varepsilon_t \tag{2}$$

where $\mathbf{y}_t$ is the vector of endogenous variables, $\mathbf{A}, \mathbf{A}_1, \mathbf{A}_2, \cdots, \mathbf{A}_p$ denote the structural coefficients, and ε_t are the orthonormal unobserved structural innovations, $\varepsilon_t \sim (0, I_K)$. We can rewrite equation 2 as follows:

$$\mathbf{y}_t = \mathbf{C}_1\mathbf{y}_{t-1} + \mathbf{C}_2\mathbf{y}_{t-2} + \cdots + \mathbf{C}_p\mathbf{y}_{t-p} + u_t \tag{3}$$

where $\mathbf{C}_{\mathrm{i}} := \mathbf{A}^{-1}\mathbf{A}_{\mathbf{i}} \quad (i = 1, 2, \ldots, p)$.

The reduced-form error u_t can be expressed by:

$$\mathbf{A}u_t = \mathbf{B}\varepsilon_t \tag{4}$$

$$u_t = \mathbf{A}^{-1}\mathbf{B}\varepsilon_t = \mathbf{S}\varepsilon_t \tag{5}$$

$$\mathbf{E}\left(u_t u_t'\right) = \Sigma_u = \mathbf{A}^{-1}\mathbf{B}\mathbf{B}'\mathbf{A}^{-1'} = \mathbf{S}\mathbf{S}' \tag{6}$$

with $\mathbf{S} = \mathbf{A}^{-1}\mathbf{B}$. To recover $\mathbf{S}$, we rely on the recursive identification scheme by using Cholesky decomposition to obtain a lower-triangular matrix. In line with the recent literature (Caldara and Iacoviello, 2022), the identified shocks of PRI for the US or GPR for China contemporaneously impact oil-related variables, but the reverse effects of other oil shocks take time.

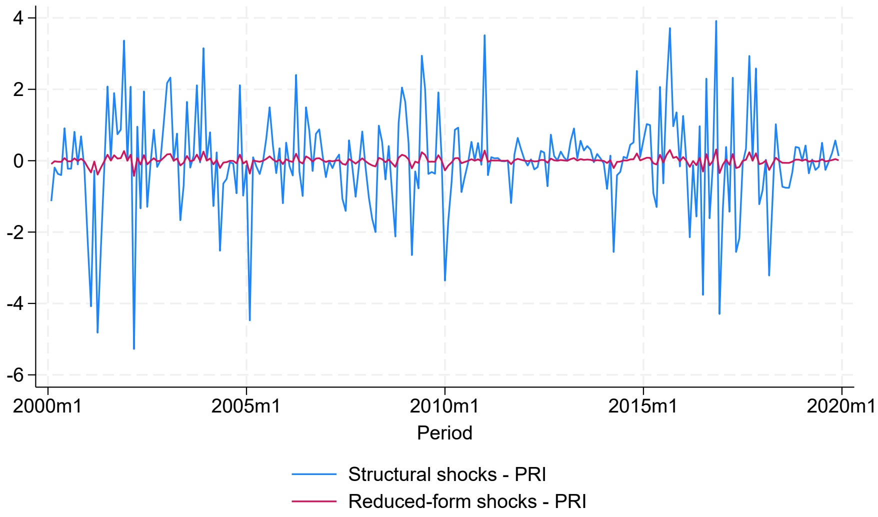
3. Empirical Results

Figures 2 and 3 report the reduced-form and structural shocks for PRI for the US and GPR for China, respectively. Figure 2 shows that unanticipated negative shocks (deterioration of political relations) are more frequent during Trump's trade war. Similarly, Figure 3 reveals a rise in the frequency of unexpected positive shocks (an increase in articles related to China in US newspapers) during the same trade war period.

To compare the results of VAR and LP, we present the dynamic multipliers in Figures 4 and 5. Dynamic multipliers measure the impact of a unit increase in an exogenous variable on endogenous

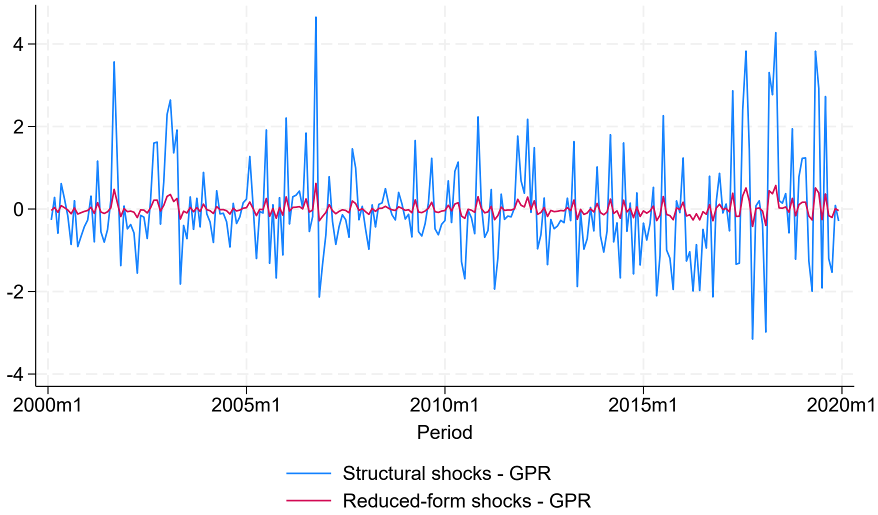
[4] The formula used to update PRI gives less weight (i) to bad events when the relation deteriorates, and (ii) to good events when the relationship is good.

Figure 2: Structural and Reduced-form Shocks for PRI



Notes: Structural shocks are obtained in the following way: $\mathbf{B}^{-1}\mathbf{A}u_t = \varepsilon_t$.

Figure 3: Structural and Reduced-form Shocks for GPR



Notes: Structural shocks are obtained in the following way: $\mathbf{B}^{-1}\mathbf{A}u_t = \varepsilon_t$.

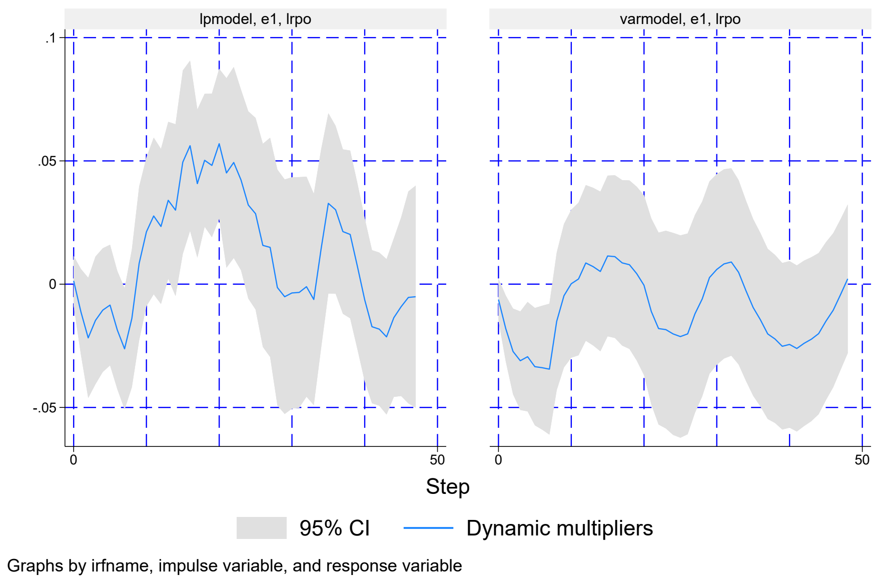
variables over time. The contemporaneous effect of the exogenous variable (the structural shocks on PRI for the US and on GPR for China) is not constrained to 1. A regression of the endogenous variables at time $t + h$, $\mathbf{y}_{t+h}$, on the exogenous variable today, $\mathbf{x}_t$, gives the dynamic multiplier at horizon h:

$$\mathbf{y}_{t+h} = \mathbf{D}^h \mathbf{x}_t + u_{t+h} \tag{7}$$

Matrix $\mathbf{D}^h$ contains the dynamic multipliers at horizon h. For the exogenous variables, $\mathbf{x}_t$, we focus on the structural shocks, ε_t, identified in the SVAR for PRI and GPR variables, respectively. Finally, we focus on the real price of oil for the endogenous variables, $\mathbf{y}_{t+h}$.

In Figure 4, the LP's dynamic multipliers show that improving political relations positively affects the real price of oil after 13 months; this positive effect lasting about 10 months. Turning to the VAR's dynamic multipliers, we observe (i) an initial drop that is not significant in LP, and (ii) the absence of a significant positive effect. Overall, LP seems to capture the short-run dynamics. These results are rather intuitive. An unanticipated improvement in PRI for the US means a better relationship between the two major players in the world economy and in the oil market. Positive shocks on PRI are thus linked to the demand side and are associated with optimistic expectations regarding future economic activity, driving up oil prices.

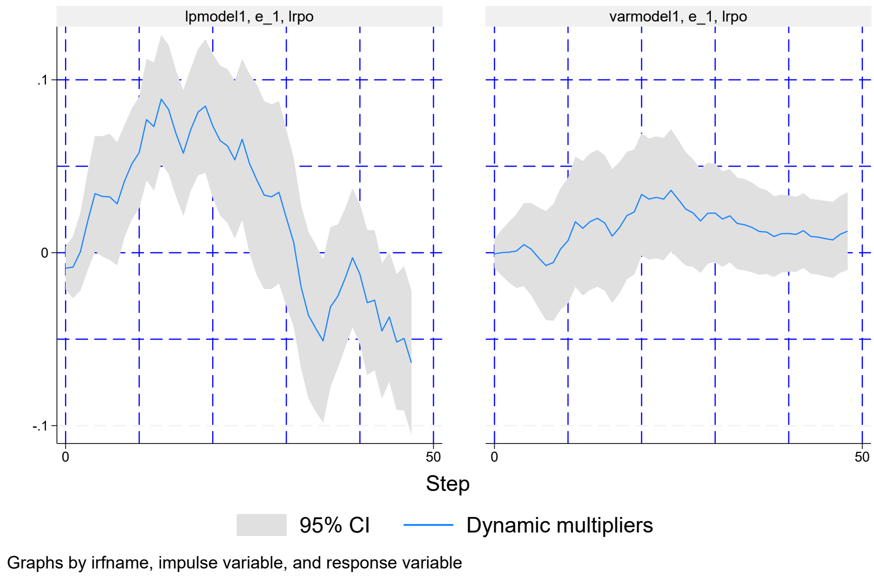
Figure 4: Dynamic Multipliers for the Real Price of Oil (Shock on PRI for the US)



Notes: Left graph: LP, right graph: SVAR. As shown by Cai et al. (2022), the results are robust to different orderings. The real price of oil and the series of structural shocks on PRI for the US are uncorrelated (see Appendix A).

In Figure 5, we consider the structural shocks in GPR for China. The LP's dynamic multipliers results are very similar to those related to PRI for the US. Indeed, we observe a rise in the real price of oil after 8 months. This increase lasts around 18 months and is of higher magnitude than the shocks on PRI for the US. Regarding the VAR's dynamic multipliers, the increase is not significant, as in Figure 4. Our result that higher geopolitical risks drive up oil prices persistently is in line with the fact that there is a tendency to confound all geopolitical tensions with oil supply shocks provoked by geopolitical tensions in the Middle East (Caldara and Iacoviello, 2022). Positive shocks on GPR are thus linked to the supply side and reflect fears of oil supply disruption, pulling up oil prices.

Figure 5: Dynamic Multipliers for the Real Price of Oil (Shocks on GPR for China)



Notes: Left graph: LP, right graph: SVAR. As shown by Cai et al. (2022), the results are robust to different orderings. The real price of oil and the series of structural shocks on PRI for the US are uncorrelated (see Appendix B)

Finally, to assess the robustness of our findings to the proxy retained for oil demand, we rely on the index of global real economic activity in industrial commodity markets, as Kilian (2009, 2019) and Kilian and Zhou (2018) proposed. As shown in Appendix C and Appendix D, our findings remain similar, illustrating the robustness of our conclusions.[5]

4. Conclusion

This paper presents new evidence on the impact of US-China political relationships and geopolitical risks on the oil market. Our findings show that an improvement in the US-China political

[5]Similar results are found with samples from Feburary 1990 after the 1989 Tiananmen Square Events, and from February 1985 where the GPR index is available.

relationships positively affects the oil market: positive shocks on PRI are associated with optimistic expectations regarding future economic activity, driving up oil prices. Similarly, we find that higher geopolitical risks drive up oil prices, as positive shocks on GPR reflect fears of oil supply disruption, pulling up oil prices. Overall, our findings show that political tensions and geopolitical risks play a crucial role, illustrating that they are complementary rather than substitute factors in explaining oil price dynamics.

References

Abdel-Latif, H. and El-Gamal, M. (2020), 'Financial liquidity, geopolitics, and oil prices', *Energy Economics* **87**, 104482.

Cai, Y., Mignon, V. and Saadaoui, J. (2022), 'Not all political relation shocks are alike: Assessing the impacts of us–china tensions on the oil market', *Energy Economics* **114**, 106199.

Caldara, D. and Iacoviello, M. (2018), Measuring geopolitical risk, Technical report, Board of Governors of the Federal Reserve System (U.S.).

Caldara, D. and Iacoviello, M. (2022), 'Measuring geopolitical risk', *American Economic Review* **112**(4), 1194–1225.

Chen, H., Liao, H., Tang, B.-J. and Wei, Y.-M. (2016), 'Impacts of OPEC's political risk on the international crude oil prices: An empirical analysis based on the SVAR models', *Energy Economics* **57**, 42–49.

Goldstein, J. S. (1992), 'A conflict-cooperation scale for weis events data', *Journal of Conflict Resolution* **36**(2), 369–385.

Jordà, Ò. (2005), 'Estimation and inference of impulse responses by local projections', *American Economic Review* **95**(1), 161–182.

Kilian, L. (2009), 'Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market', *American Economic Review* **99**(3), 1053–69.

Kilian, L. (2019), 'Measuring global real economic activity: Do recent critiques hold up to scrutiny?', *Economics Letters* **178**, 106–110.

Kilian, L. and Zhou, X. (2018), 'Modeling fluctuations in the global demand for commodities', *Journal of International Money and Finance* **88**, 54–78.

Lee, C.-C., Lee, C.-C. and Ning, S.-L. (2017), 'Dynamic relationship of oil price shocks and country risks', *Energy Economics* **66**, 571–581.

Lütkepohl, H. (2005), *New introduction to multiple time series analysis*, Springer Science & Business Media.

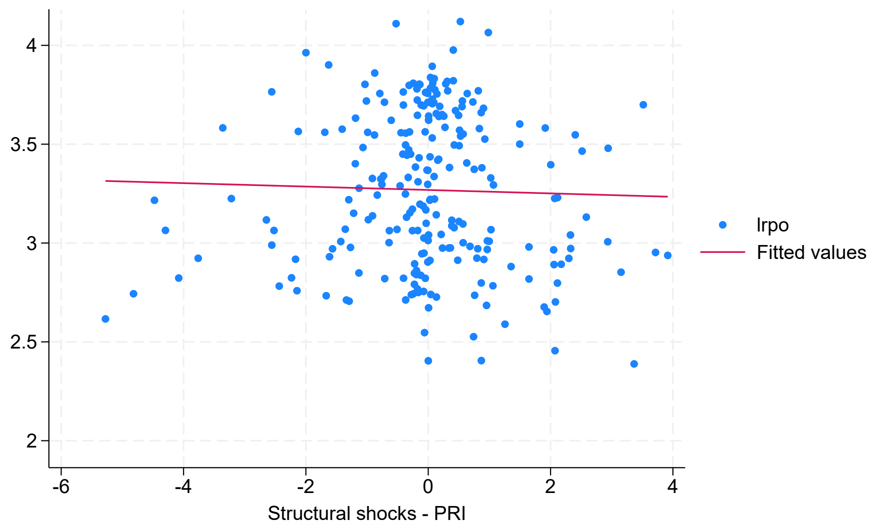
Miao, H., Ramchander, S., Wang, T. and Yang, D. (2017), 'Influential factors in crude oil price forecasting', *Energy Economics* **68**, 77–88.

Perifanis, T. and Dagoumas, A. (2019), 'Living in an era when market fundamentals determine crude oil price', *The Energy Journal* **40**(SI), 317–335.

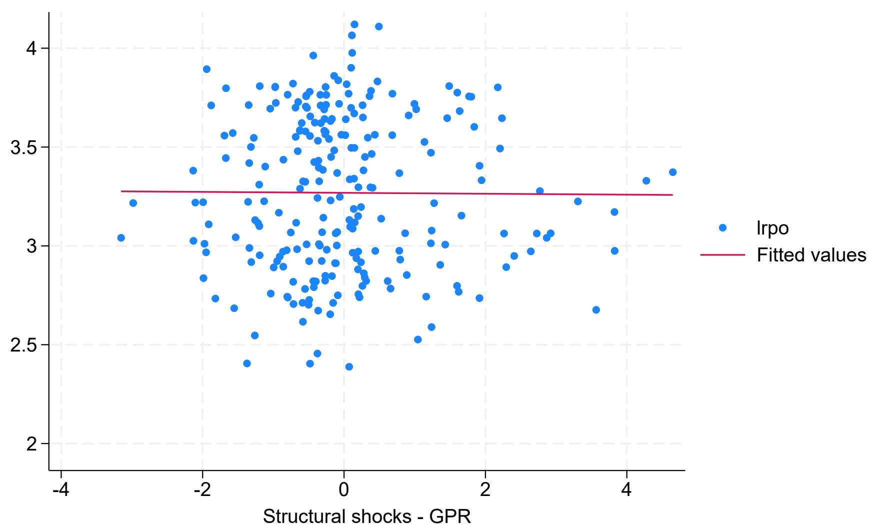
Qin, Y., Hong, K., Chen, J. and Zhang, Z. (2020), 'Asymmetric effects of geopolitical risks on energy returns and volatility under different market conditions', *Energy Economics* **90**, 104851.

Yan, X. (2010), 'The instability of China–US relations', *The Chinese Journal of International Politics* **3**(3), 263–292.

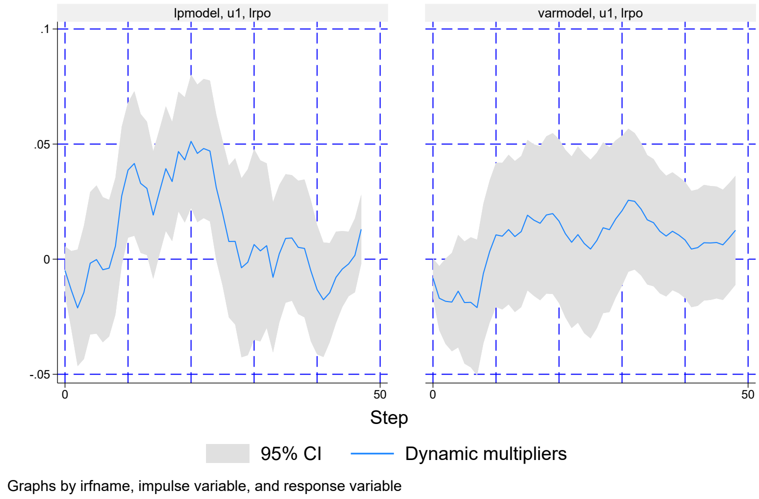
Appendix A. Correlation between structural shocks on PRI for the US and the real price of oil



Appendix B. Correlation between structural shocks on GPR for China and the real price of oil

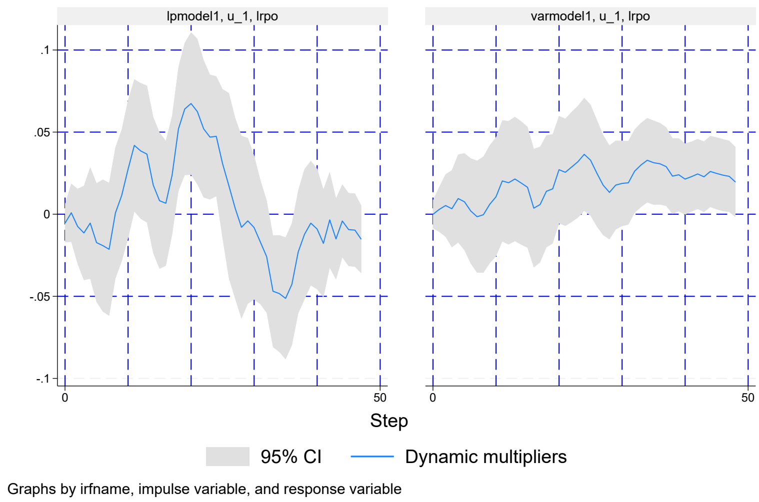


Appendix C. Robustness for the dynamic multipliers (Shock on PRI for the US)



Notes: Left graph: LP, right graph: SVAR. In this robustness exercise, we use an alternative proxy for oil demand introduced by Kilian and Zhou (2018): https://www.dallasfed.org/research/igrea.

Appendix D. Robustness for the dynamic multipliers (Shock on GPR for China)



Notes: Left graph: LP, right graph: SVAR. In this robustness exercise, we use an alternative proxy for oil demand introduced by Kilian and Zhou (2018): https://www.dallasfed.org/research/igrea.