WORKING paper

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Geopolitical Risk and Inflation: The Role of Energy Markets

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Abstract

Geopolitical shocks are not all alike -- different classes of geopolitical shocks can have different macroeconomic implications, particularly on inflation. This paper exploits the comovement between the Geopolitical Risk Index (GPR) developed by Caldara and Iacoviello (2022) and oil prices across major geopolitical events to disentangle two types of geopolitical shocks within a structural VAR model for the US economy. The VAR estimates suggest that geopolitical shocks associated with disruptions in energy markets are on average inflationary and contractionary. In contrast, geopolitical shocks associated with macroeconomic developments that are unrelated to energy markets are on average deflationary and contractionary. To validate this interpretation, the paper exploits the heterogeneity across sectoral output and prices of the US economy to show that a sector's response to a geopolitical shock depends on its energy intensity. Sectors characterized by higher energy intensity are subject to larger output losses and price increases in response to geopolitical energy shocks.

Keywords: Geopolitical Risk, Business Cycles, Energy, High-Frequency Sign Restrictions, High-Frequency Identification.

JEL classification: E31, E32, Q41, Q43.

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Non-Technical Summary

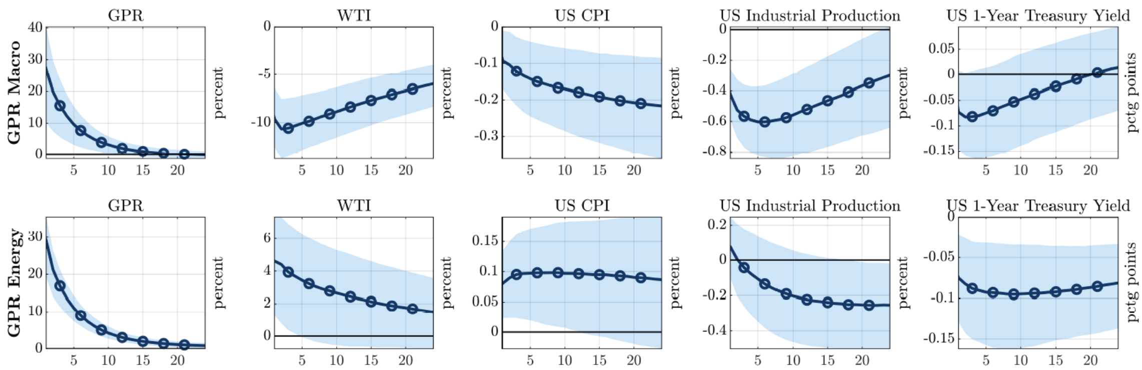
Do all geopolitical events affect the economy in the same way? This paper shows that distinguishing between different kinds of geopolitical shocks is essential to understanding their effects on inflation and output. Using a novel identification strategy, this paper identifies two distinct types of shocks: those related to disruptions in energy markets (geopolitical energy shocks) and those tied to broader non-energy macroeconomic developments (geopolitical macro shocks). By distinguishing between these, the paper provides insights into how energy markets contribute to shaping the response of inflation to geopolitical shocks.

The first type, labelled geopolitical energy shocks, typically occurs when geopolitical tensions lead to a sharp increase in oil prices—such as during the Gulf War or the Russian invasion of Ukraine. These shocks tend to be both inflationary and contractionary: they push consumer prices upward while reducing economic activity. The second type, geopolitical macro shocks, are characterized by rising geopolitical risk but falling oil prices—suggesting a deterioration in global demand.

To identify these shocks, the paper exploits the comovement of the Geopolitical Risk Index (GPR) developed by Caldara and Iacoviello (2022) and oil prices in a three-day window around major geopolitical events. This approach builds on the methodology developed by Jarociński and Karadi (2020), combining narrative information and high-frequency sign restrictions.

Figure bellow illustrates the estimated response of inflation and industrial production to a geopolitical energy shock and a geopolitical macro shock. Geopolitical energy shocks are both contractionary and inflationary. They lead to increased oil prices and higher overall inflation. Conversely, geopolitical macro shocks are typically contractionary and deflationary, resulting in decreased economic activity and a decrease in inflation. Furthermore, the paper shows that sectors within the U.S. economy respond differently to these shocks based on their energy intensity. Sectors with higher energy intensity suffer larger output losses and price increases when faced with geopolitical energy shocks.

The macroeconomic effects of geopolitical macro and geopolitical energy shocks



Note: Estimated impulse response functions in response to geopolitical macro (GPR Macro) and geopolitical energy (GPR energy) shocks. Black lines indicate point estimates and blue areas outline the 68% credible set.

These results underscore the need for policymakers to tailor their responses based on the type of shock encountered. Countering geopolitical macro shocks requires easing the monetary policy stance, as these shocks generally reduce inflation while also contracting economic activity. In contrast, energy-related shocks are associated with a more complex trade-off. In response to these, policymakers must balance efforts to stabilize inflation and economic output. Recognizing the distinctions between energy-related and macro-related geopolitical shocks is crucial for formulating effective economic policies in an environment marked by geopolitical uncertainty. Understanding these differences can lead to more informed policy decisions that better address the challenges posed by different types of geopolitical risks.

Risque géopolitique et inflation : le rôle des marchés de l'énergie

RÉSUMÉ

Les événements géopolitiques récents, tels que l'invasion de l'Ukraine par la Russie, soulignent l'importance de comprendre comment différents chocs géopolitiques affectent l'inflation et l'activité économique. Alors que la littérature traite souvent les chocs géopolitiques de manière homogène, cet article distingue deux types de chocs, mesurés par l'indice GPR développé par Caldara et Iacoviello (2022) : les chocs géopolitiques énergétiques, liés aux perturbations sur les marchés de l'énergie, et les chocs géopolitiques macroéconomiques, associés à des dynamiques macroéconomiques non énergétiques.

En mobilisant un modèle VAR structurel avec restrictions de signe en haute fréquence, dans le contexte d'une méthodologie *event-study*, l'article évalue l'impact différencié de ces deux chocs sur l'économie. Les résultats montrent que les chocs énergétiques sont à la fois récessifs et inflationnistes, tandis que les chocs macroéconomiques sont récessifs mais désinflationnistes. Par ailleurs, les effets varient selon l'intensité énergétique des secteurs : ceux à forte intensité énergétique subissent des effets sensiblement plus prononcés en cas de choc énergétique.

Ces résultats ont des implications importantes pour la conduite de la politique économique. Face à un choc macroéconomique géopolitique, un assouplissement monétaire peut être approprié. En revanche, les chocs géopolitiques énergétiques posent un arbitrage plus complexe entre stabilité des prix et soutien à l'activité. Distinguer clairement la nature des chocs géopolitiques apparaît donc crucial pour formuler des réponses adaptées dans un contexte d'incertitude géopolitique accrue.

Mots-clés : risque géopolitique, cycles économiques, énergie, restrictions de signe, identification en haute fréquence.

1 Introduction

Recent events such as the Russian invasion of Ukraine in February 2022 have sparked renewed interest in the macroeconomic consequences of geopolitical events. The empirical literature has shown that these events have significant contractionary effects.[1] However, geopolitical episodes are not all alike. They can be associated with multiple disturbances, ranging from energy market disruptions to trade and financial fragmentation. Some can hamper the supply of critical inputs, while others can affect aggregate demand. Within macroeconomic models, these can be characterized as a combination of different structural shocks. This paper shows that this distinction matters for macroeconomic outcomes, i.e. different geopolitical shocks can transmit differently to economic activity and inflation.

While energy market disruptions have been particularly prominent in recent history, energy price dynamics around geopolitical events suggest that there might be other important - and fundamentally different - shocks at play. In Figure 1, I plot the evolution of geopolitical risk and oil prices from 1986 to 2022, proxied respectively by the log of the monthly average of the GPR index developed by Caldara and Iacoviello (2022) (in blue), and the log of the West Texas Intermediate index (WTI) spot price, deflated by the US CPI (in red).

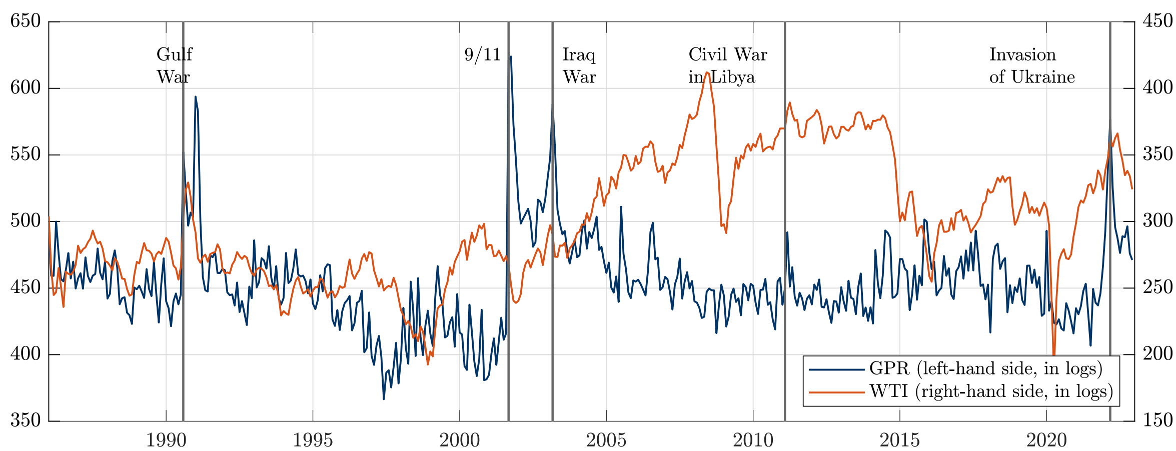


Figure 1 Geopolitical Risk and Oil Prices

During some of the most salient events in recent history, such as the outburst of the Gulf War, the Iraq War, the Civil War in Libya, and the Russian Invasion of Ukraine, increases in the GPR index are accompanied by a rise in WTI spot prices. On the other hand, in occasion of other events, such as the 9/11, the increase in the GPR index is accompanied by a drop in WTI spot prices.

[1] Caldara and Iacoviello (2022) developed an index of geopolitical risk (GPR) to quantify the contractionary effects of adverse events based on their coverage by the international press.

This paper shows that this comovement can be exploited to identify two distinct types of geopolitical shocks. The first type, referred to as geopolitical energy shocks (or GPR energy shocks), is associated with disruptions in energy markets. The second type, referred to as geopolitical macro shocks (or GPR macro shocks), encompasses a broader range of macro shocks that do not originate in energy markets. As these shocks may have different macroeconomic effects, disentangling them can shed light on the transmission of geopolitical risk to inflation and economic activity.

First, I disentangle these two shocks by exploiting the comovement between the GPR index and oil prices. The underlying premise is that when geopolitical events lead to increases in oil prices, their transmission operates through energy markets, anticipating future energy supply disruptions. In contrast, when geopolitical news leads to decreases in oil prices, the market anticipates a contraction in overall macroeconomic activity, leading to a decline in oil demand.

Second, I quantify the impact of these shocks on the US economy using a structural VAR model. I identify the model using a combination of sign restrictions, narrative information, and high-frequency sign restrictions following the approach proposed by Jarociński and Karadi (2020). The empirical analysis indicates that both geopolitical energy and geopolitical macro shocks lead to contractions in economic activity. However, the response of inflation differs across shocks: geopolitical energy shocks lead to inflationary effects, while geopolitical macro shocks result in deflationary effects. This suggests that the negative comovements between geopolitical risk and oil prices primarily originates from demand side disturbances.

Third, I validate the identification strategy by exploiting the heterogeneity in energy intensity across different sectors of the US economy. Using US sectoral data on output, prices, and energy intensity from the BEA, I show that sectors with higher energy use relative to their value-added are more strongly affected by geopolitical energy shocks. This highlights that the responses of activity and inflation to geopolitical shocks in a given sector depend on their energy intensity.

The paper is structured as follows. In Section 2, I review the main contributions in the literature related to the paper. In Section 3, I document some stylized facts and the methodology for the construction of the database. In Section 4, I describe the identification strategy, the econometric approach, and exploit the model estimates to assess the impact of the Russian invasion of Ukraine on CPI and industrial production in the US. In Section 5, I validate the identification strategy by evaluating the impact of the identified shocks sectoral US data. Finally, in Section 6, I conclude by outlining the normative and policy implications of the work.

2 Related Literature

The paper relates primarily to the geopolitical risk literature, which builds on the seminal work of Caldara and Iacoviello (2022), who develop a news-based geopolitical index and highlight the contractionary effect of geopolitical episodes for economic activity, which materializes via a reduction in investment and hours worked. Wang et al. (2023) show that this effect is more pronounced when firms have greater irreversible investment and higher market power. Brignone et al. (2024) shed light on the role of non-linearities in the transmission of geopolitical risk, emphasizing the role of the precautionary saving channel. Caldara et al. (2023) investigate the consequences of geopolitical shocks for inflation, but do not explore the heterogeneity characterizing geopolitical shocks of different nature.

The focus on the energy markets relates to a vast literature which analyzes the macro consequences of shocks originating in the oil sector. In the last decades, the literature has developed identification schemes to identify oil-specific shocks within VAR models which exploit zero restrictions as in Kilian (2009), sign restrictions as in Kilian and Murphy (2012) or Baumeister and Hamilton (2019), narrative information as in Antolín-Díaz and Rubio-Ramírez (2018), elasticity bound restrictions as in Caldara et al. (2019), high-frequency information as in Känzig (2021), or a combination of these methods as in Gazzani et al. (2024).

From a methodological perspective, the econometric approach used in the paper closely relates to the narrative approach and the high-frequency approach to the identification of monetary policy shocks. First, following the literature on the identification of monetary policy shocks, I identify geopolitical risk surprises by measuring the change in news-based geopolitical risk measures in a narrow window around key events selected on a narrative basis.[2] Second, I adopt the high-frequency sign restrictions approach proposed by Jarociński and Karadi (2020) jointly with narrative information using the three-day comovement between variables to distinguish between the different classes of geopolitical shocks.[3]

This paper contributes to the literature by highlighting the role of the heterogeneity across geopolitical events in their macroeconomic transmission, and developing an empirical framework to quantitatively assess the role of different shocks in the propagation.

[2] See Kuttner (2001), Gürkaynak et al. (2005), Nakamura and Steinsson (2018), Miranda-Agrippino and Ricco (2021).

[3] See Romer and Romer (2004) or Romer and Romer (2010).

3 Identification approach and construction of the surprise dataset

This section provides an overview of the rationale underlying the identification approach, the methodology used to construct the dataset of geopolitical risk surprises, and its main features.

3.1 Identification Approach

The adoption of an identification strategy based on a narrative high-frequency sign restrictions approach is motivated by the observation that in a narrow window around geopolitical episodes, oil prices sometimes increase, and sometimes decline, as I earlier illustrated in Figure 1. The positive comovement, is attributed to news regarding developments in energy markets, as it is associated with an increase in oil prices. For this reason, I define this class of shocks as geopolitical energy shocks, or GPR energy. Based on the empirical pattern, these shocks are likely to be prevalent in episodes like the Gulf War, the Iraq War, the Civil War in Libya, and the Invasion of Ukraine. The negative comovement, on the other hand, is attributed to news associated with macroeconomic dynamics which do not originate in energy markets. In line with this interpretation, this type of news results in oil price movements associated with fluctuations in the overall macroeconomic activity via the oil demand channel. As such, I define this class of shocks as geopolitical macro shocks, or GPR macro. Based on the empirical pattern, the contribution of this shock is likely to be important in geopolitical instances not characterized by severe disruptions in energy markets, like the 9/11.

The rationale for constructing a dataset of GPR surprises derives from the main identification challenge of the empirical analysis in the implementation of this identification strategy - namely the reduction of the noise-to-signal ratio in the data. Such additional discipline can be imposed by exploiting the comovement of the GPR index and oil prices around a list of key events in the spirit of Jarociński and Karadi (2020). As key events are by definition characterized by large fluctuations in the GPR index, in these instances, the variance of geopolitical shocks is likely to be relatively larger compared to the unconditional variance, resulting in an improvement of the signal-to-noise ratio.

3.2 Surprise Construction

Due to the presence of noise concerns in geopolitical risk measurement, I construct a series of three-day geopolitical risk surprises by cumulating the difference in the GPR index on a three-day window around the concerned event day t, i.e.:

$$s_t^{gpr} = \sum_{k=t-1}^{t+1} [GPR_k - GPR_{k-1}] \tag{1}$$

Using a window encompassing three days helps smoothing the volatility surrounding geopolitical risk events, circumvents potential reporting lags, and ensures that surprises reflect more persistent movements in GPR[4]. Likewise, I construct a series of three-day oil price surprises by cumulating the (log) difference in the WTI crude spot price on a three-day window around the concerned event day, i.e.:

$$s_t^{wti} = \sum_{k=t-1}^{t+1} [log(WTI_k) - log(WTI_{k-1})] \tag{2}$$

The use of spot prices as opposed to a principal component over a range of future contracts as in Känzig (2021) has pros and cons in the context of the analysis of geopolitical events. On one hand, the literature has argued that exploiting future contracts helps capturing the role of expectations in the oil market. On the other hand, future prices are not available for the single most important event in the GPR series, as following the 9/11, the New York Mercantile Exchange was closed for three days, and data availability on other markets is limited. Prioritizing the inclusion of the 9/11 and using spot contracts appears marginally more attractive than excluding the 9/11 and using future contracts, given the salience of 9/11 in the series and the high degree of comovement between futures and spot prices over short horizons.

The mapping of the surprises into a monthly variable is straightforward, as the statistical criterion used for the selection of the events ensures that there are no months with multiple events. In the three cases where the window spans over different months, as the spike occurs at the beginning or the end of a concerned month, I attribute the surprise to the month associated with the peak day.

[4]While less common than daily or intra-day windows in the context of event-studies, this is not the first study to use a multi-day window - see for instance Kogan et al. (2017). To help the reader appreciate the usefulness of using a wider window, I report in the Appendix a series of plots illustrating the fluctuations of the GPR index and WTI prices around each event in the dataset.

3.3 Event Selection

The list of the key geopolitical events employed for the dataset is compiled following a systematic approach, inspired by the statistical approach utilized by Bloom (2009) and Forbes and Warnock (2012). In particular, I define as key events those days t whereby the value of the GPR index exceeds its moving average over the past three years by at least three standard deviations, and no key event occurred in the prior 90 days. Formally, an event day t satisfies:

$$GPR_t > \mu_t^{3y} + 3 \cdot \sigma_t^{3y} \quad \text{and} \quad t - t_{\text{prev}} > 90 \tag{3}$$

where μ_t^{3y} and σ_t^{3y} denote the mean and standard deviation of the GPR index over the three years preceding day t, and t_{prev} is the most recent previously identified key event. The moving average threshold ensures that the selected events are geopolitically significant, while the exclusion window ensures that the events are not a direct consequence of previous events. This criterion yields a set of dates that aligns well with the major spikes in geopolitical risk identified by Caldara and Iacoviello (2022)[5], while relying on a transparent and replicable rule.

Table 1 illustrates the resulting list of key events. The list of events mostly includes wars, terror attacks, and international crises. Some notable examples are the start of the US involvement in the Gulf War, the terrorist attacks in London in July 2005 and in Paris in November 2015, and the Russian invasion of Ukraine in February 2022.

3.4 The Surprise Series

Figure 2 shows the dataset of surprises from a historical perspective. Consistent with Figure 1, on the left-hand side, I report the three-day variations in the GPR index on the selected geopolitical episode days (in blue). These episodes are identified using the statistical criterion described in the previous section, whereby a key event is defined as a day when the GPR index exceeds its three-year moving average by at least three standard deviations, and no similar spike occurred in the previous 90 days.

[5]See Figure 2 at page 1202 in Caldara and Iacoviello (2022).

	Peak Date	Event Description	Three-Day GPR Surprise	Three-Day WTI Surprise
1	1986/04/15	US Airstrikes on Libya	149.7	-17.0%
2	1988/04/19	Operation Praying Mantis	62.8	-2.2%
3	1989/08/01	Lebanese Civil War Escalation	134.5	1.8%
4	1990/08/03	Iraqi Invasion of Kuwait	120.7	28.6%
5	1991/01/08	US Congress Vote on Gulf War	120.7	11.8%
6	1994/06/13	Civil War Escalation in Rwanda	16.6	1.4%
7	1994/10/11	Announcement of Iraqi Withdrawal from Kuwait	87.0	-6.4%
8	1998/05/13	Riots in Indonesia, Nuclear Tests in India	67.9	-0.7%
9	1998/08/21	US Bombings in Afghanistan and Sudan	64.0	2.4%
10	1998/12/18	Operation Desert Fox	53.9	-16.9%
11	1999/12/28	Indian Airlines Flight 814 Hijack	38.9	2.1%
12	2000/10/13	Second Intifada Escalation	27.9	-0.1%
13	2001/09/11	9/11 Attacks	655.4	-1.3%
14	2005/07/08	London Bombings	139.7	-3.3%
15	2006/08/11	Transatlantic Aircraft Terrorist Plot	50.4	-3.9%
16	2008/12/01	Terror Attacks in Afghanistan and Iraq	7.9	-14.2%
17	2009/12/29	Civil Terror Attacks in Pakistan	87.7	3.2%
18	2010/06/02	Terror Attacks in Iraq and Pakistan	31.1	0.8%
19	2010/11/30	Nuclear Threats from Iran and North Korea	37.7	3.4%
20	2011/08/23	Fall of Tripoli	40.1	3.2%
22	2014/06/17	Islamic State Offensive in Northern Iraq	45.1	-0.8%
23	2015/11/16	Paris Attacks Aftermath	309.9	-2.5%
24	2016/03/23	Brussels Bombings	29.4	-4.5%
25	2016/09/19	Bombings in New York and New Jersey	83.9	0.0%
26	2017/06/05	Qatar Diplomatic Crisis	136.6	-0.4%
27	2018/05/09	US Strikes on Syria	153.7	0.9%
28	2019/05/14	Gulf of Oman Incident	48.8	0.6%
29	2019/09/17	Abqaiq–Khurais Attacks on Saudi Aramco Facilities	44.8	6.1%
30	2020/01/06	Assassination of Qasem Soleimani	250.3	2.5%
31	2022/01/25	Russia-Ukraine Invasion Buildup	77.4	3.7%

Table 1 List of key geopolitical events

The table lists the series of key geopolitical events identified, using the statistical criterion detailed by equation (3). Each geopolitical event is associated with a geopolitical and a WTI price surprise, each calculated over a cumulative three-day window.

The GPR surprise series displays two salient features. First, all selected events are associated with sharp increases in geopolitical risk, reflecting the fact that the dataset systematically captures adverse geopolitical shocks. Benign geopolitical developments—such as peace agreements—are typically anticipated or diffuse over time, and thus rarely result in large, discrete changes in the GPR index.

Second, the GPR surprise series features distinct spikes around sudden and salient events, including the US airstrikes on Libya in April 1986, the 9/11 attacks, and the Russian invasion buildup in early 2022. These spikes may not necessarily align with the timing of news coverage or public discourse, as geopolitical events often exhibit a build-up phase. For instance, the US invasion of Iraq in 2003 and the Russian invasion of Ukraine in 2022 were preceded by extended periods of rising tension and military posturing. The statistical filter used here helps isolate moments of abrupt escalation, rather than protracted episodes of mounting geopolitical uncertainty and short-lived dynamics in the series.

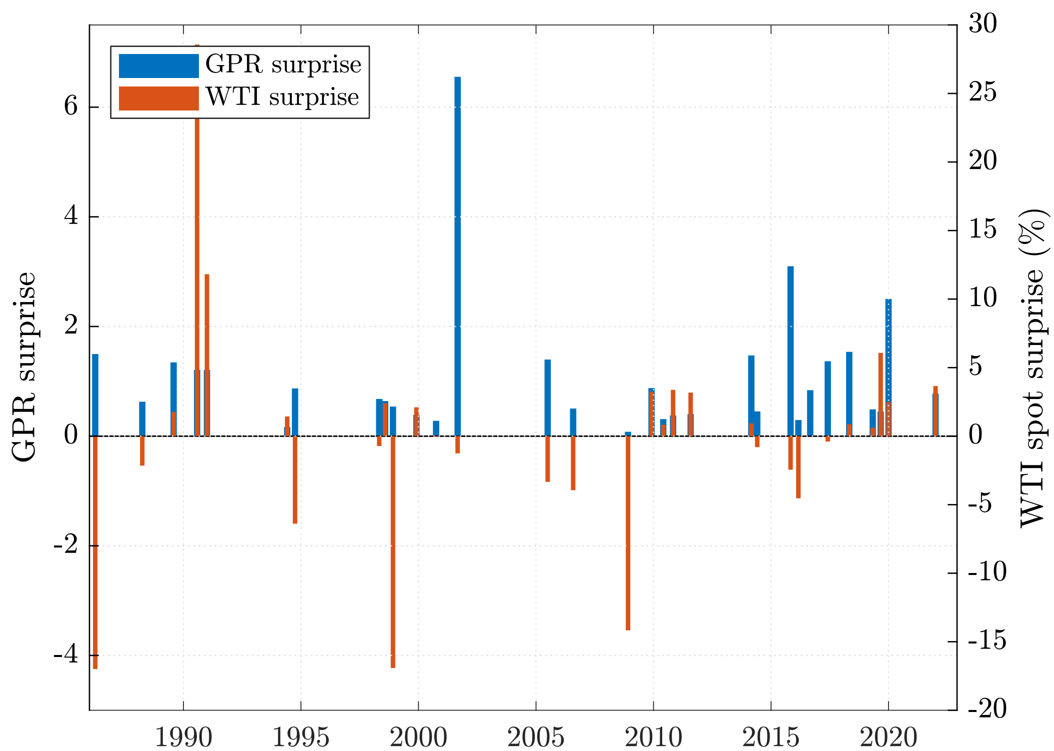


Figure 2 Geopolitical Risk and Oil Surprises

The figure highlights the comovement of geopolitical risk and WTI spot surprises around selected geopolitical episodes. Each pair of bars represents one of the episodes detailed in Table 1. On the left axis, I display the three-day change in the GPR index. On the right axis, I display the percentage change in the price of WTI spot contracts.

On the right-hand axis of Figure 2, I report the percentage change in the price of WTI spot contracts, over the same three-day window around each geopolitical event. The joint observation of the two surprise series highlights the heterogeneity in how geopolitical shocks affect oil markets.

This heterogeneity underscores the importance of jointly considering both dimensions — geopolitical risk and commodity price responses — when analyzing the transmission of shocks. It also motivates the decomposition of these joint surprises into distinct underlying shocks, which I pursue in the following sections within a structural econometric framework.

4 The Effect of GPR Energy and GPR Macro Shocks

This section explains the methodology used to estimate the VAR model including GPR and oil price surprises on top of standard macroeconomic and financial variables, and how the structural shocks of interest are identified. This class of VAR models allows combining elements from three popular identification approaches in the structural VAR literature, namely narrative, high-frequency, and sign restrictions. First, the narrative character is associated with the narrative approach used in the selection of the events. Second, the high-frequency character refers to the use of a narrow window for the measurement of the surprises. Third, sign restrictions are applied to disentangle the role of GPR macro and GPR energy shocks in driving GPR and WTI surprise series.

4.1 Baseline Model Specification

The baseline VAR model specification is described by Equation (4):

$$\begin{pmatrix} s_t \\ y_t \end{pmatrix} = \begin{pmatrix} 0 \\ c_y \end{pmatrix} + \sum_{l=1}^{p} \begin{pmatrix} 0 & 0 \\ B_p^{YS} & B_p^{YY} \end{pmatrix} \begin{pmatrix} s_{t-p} \\ y_{t-p} \end{pmatrix} + \begin{pmatrix} u_t^s \\ u_t^y \end{pmatrix} \tag{4}$$

$$\begin{pmatrix} u_t^s \\ u_t^y \end{pmatrix} \sim \mathcal{N}(0, \Sigma)$$

On the left-hand side, $s_t = \begin{pmatrix} s_t^{gpr} & s_t^{wti} \end{pmatrix}'$ indicates a 2×1 vector of surprises, where s_t^{gpr} is the three-day geopolitical risk surprises around the list of selected geopolitical episodes, while s_t^{wti} is the three-day surprise of WTI spot prices around selected geopolitical episodes. When any of the selected geopolitical episodes occurs in the concerned month t, the surprise series s_t^{gpr} and s_t^{wti} take a value equal to the sum of the surprises occurred in that month. If no surprises occur in the concerned month t, s_t^{gpr} and s_t^{wti} take zero value. The $n \times 1$ vector y_t includes a set of US and global macro variables at monthly frequency.

The set of considered variables contains the monthly average of the GPR index, real WTI spot prices, US CPI from the US Bureau of Economic Analysis, US Industrial Production and US 1-Year Treasury Rate from the Board of Governors of the Federal Reserve System. The VAR sample includes 37 years of macroeconomic data at monthly frequency, from January 1986 to December 2019. Hence, in the baseline setup, the last surprise - the Russian invasion of Ukraine - is not used to estimate the VAR in-sample in the baseline specification. In a robustness check, included in the Appendix, I extend the sample up to December 2022 and show that its inclusion does not alter the baseline results.

4.2 Identification via High-Frequency Sign Restrictions

The identification strategy builds on two assumptions. First, GPR and oil surprises are only systematically driven by the two identified shocks. Second, the identification builds on the idea that the nature of the geopolitical shocks can be characterized by the comovement they imply between GPR and oil surprises. GPR macro shocks are associated with a negative comovement between GPR and oil prices. On the other hand, GPR energy shocks are associated with a positive comovement between GPR and oil prices. In addition to that, I impose that the response of GPR must be consistent with the sign of the high-frequency structural shocks in the three months following the event, which helps to control for the noise surrounding these events.[6]

	Macro GPR	**Energy GPR**	**Other Shocks**
GPR surprises	+	+	0
WTI surprises	−	+	0
GPR	+	+	unrestricted
other variables	unrestricted	unrestricted	unrestricted

Table 2 Scheme of selected high-frequency sign restrictions

Table 2 provides an overview of the identifying restrictions. These restrictions divide

[6] In Figure A.1 in the Appendix, I show that the results also hold without imposing impact restrictions on GPR, but the significance of the WTI response is weaker.

each surprise into two components: a geopolitical macro shock (associated with a rise in GPR and a drop in real WTI prices) and a geopolitical energy shock (associated with a rise in GPR and a rise in real WTI prices). On the other hand, the two zeros on the third column reflect the fact that business cycle frequency shocks are assumed not to affect the surprise variables within the days characterized by geopolitical episodes. All the rest of the structural relations are left unrestricted.

The model exploits Minnesota priors with a relatively low tightness and 12 lags. Sampling is performed using a Gibbs sampling algorithm with 10000 draws. The first 2000 draws are discarded, while every fourth of the remaining 8000 draws are kept, for a total of 2000 draws. The posterior draws of the shocks are computed with the use of a uniform prior on the space of rotations, as in Rubio-Ramírez et al. (2010).

4.3 The Transmission of GPR Macro and Energy Shocks

In this section, I discuss the main results of the empirical analysis, by looking at the transmission of different classes of geopolitical shock to the US economy. In order to make the responses comparable, I normalize the size of both shocks so that they are associated with a one standard deviation rise in the geopolitical risk index.

The first considered variable is the GPR index. Following a one standard deviation shock to the GPR index, the level of geopolitical risk remains particularly elevated in the first three months, for then declining gradually in the first two years after the shock. The dynamics associated with the GPR macro and the GPR energy shock are similar. The dynamics associated with the GPR energy shock are more persistent, with the GPR index remaining 10% above its steady state level for the first six months, as opposed to two months.

Second, the model studies the response of WTI prices deflated by US CPI. Following a one standard deviation GPR macro shock, WTI prices decline persistently, reaching levels between 7% and 13% in the first six months after the shock. The response associated with the GPR energy shock, is instead positive, reaching an increase of between 1% and 8% immediately after the shock. The response is, however, slightly less persistent than the one associated with the GPR macro shock.

The third reported variable is CPI in terms of deviations from the steady state level. On one hand, the GPR macro shock is associated with a drop in CPI of between 0.1% and 0.4%, on the other hand the GPR energy shock is associated with a very significant and persistent rise up to 0.2%. This response is crucial to understand the heterogeneity in the nature of the two shocks in question, with the GPR macro shock exhibiting the typical features of a

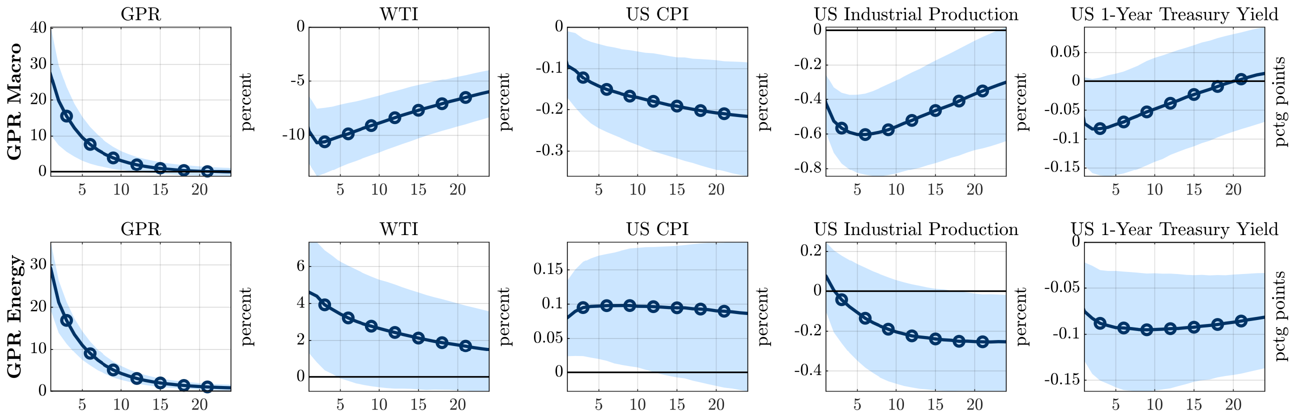


Figure 3 THE MACROECONOMIC EFFECTS OF GPR MACRO AND GPR ENERGY SHOCKS

The figure(s) displays the estimated dynamic response to GPR macro and GPR energy shocks. Black lines indicate point estimates and blue areas outline the 68% credible set. The shock is associated with a one standard deviation increase in the Geopolitical Risk Index (GPR).

demand shock, and the GPR energy shock exhibiting the typical features of a supply shock.

The fourth variable analyzed by the model is industrial production. For both the macro and the GPR energy shock, the response is also contractionary, but the profile of the response is rather different. For the GPR macro shock, industrial production falls in the first six months by between 0.4% and 0.8%, with the effect of the shock fading away in the first year. The GPR energy shock response instead features a gradual drop up to -0.5%, which reaches the trough only after one year, with industrial production remaining depressed up to the end of the considered horizon.

Finally, I include the 1-year sovereign yield, which sheds light on the average monetary policy response to the identified shocks. For the GPR macro shock, the 1-year rate temporarily drops by between 0 and 15 basis point. Similarly, for the GPR energy shock, yields drop by between 3 and 16 basis point.

For robustness, I show in the Appendix that these results are robust to the use of employment as alternative measure of economic activity, and to the inclusion of the Covid period in the sample. For completeness, I also report the responses obtained using what is referred to as the poor man's approach in Jarociński and Karadi (2020), whereby each geopolitical surprise is fully explained either by the macro or the energy shock based on their comovement with WTI spot prices. Using the poor man methodology, the responses of CPI are insignificant, underscoring the hybrid nature of geopolitical shocks. In other words, differently from monetary policy shocks, assuming that geopolitical shocks belong to a kind or another in a mutual exclusive way, seems too restrictive to capture the complexities of geopolitical events.

4.4 Decomposing Geopolitical Surprises

To further elucidate the heterogeneity characterizing geopolitical shocks, in this section I isolate four salient episodes and examine the composition of the underlying surprises using the historical decomposition implied by the median-rotation identification. These episodes include the September 11 attacks (September 2001), the London bombings (July 2005), the Paris terrorist attacks (November 2015), and the Russian invasion of Ukraine (the decomposition refers to January 2022, while the full-scale invasion took place in February). Each of these events triggered some of the largest estimated surprises in our sample, offering a insights into the structural heterogeneity of geopolitical risk[7].

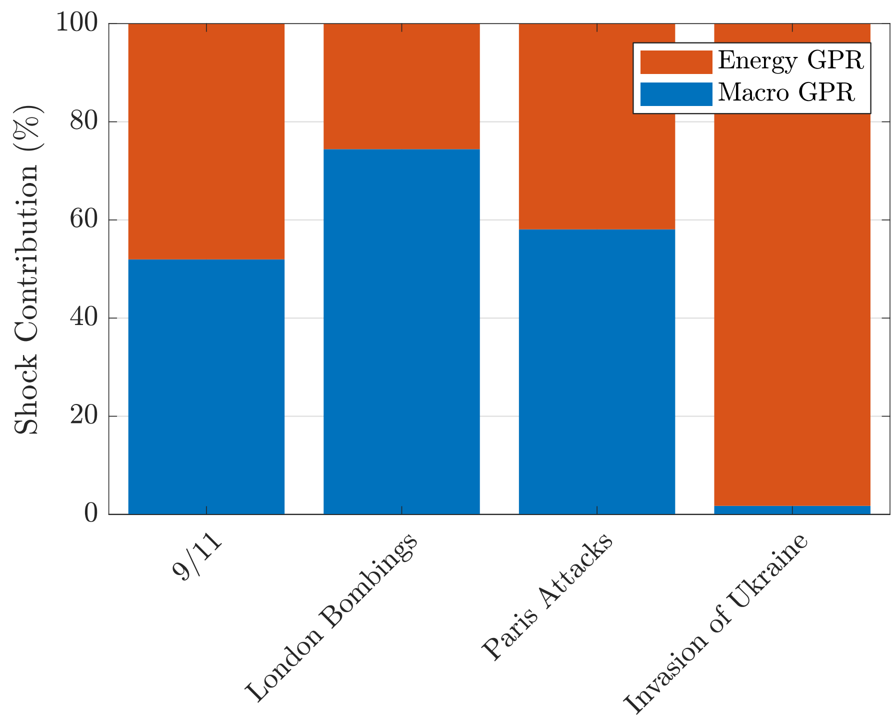


Figure 4 Historical Decomposition of Selected Geopolitical Events

Figure 4 shows the decomposition of each episode into its macro and energy-related components. The results underscore the non-uniform nature of geopolitical risk: while all

[7]The full decomposition, which also features sporadic instances where the two shocks have opposite signs, is reported in the Appendix. Episodes with contributions of opposite sign for the two shocks can be interpreted as shifts in the composition of geopolitical risk. For clarity of exposition, I report in the main text only episodes where the contribution from both shocks is positive.

events generated substantial overall surprises, the relative contributions of macro and energy channels differ markedly across cases.

The 9/11 attacks and the Paris bombings are characterized by an important contribution of both the macro and the energy component, suggesting a dual nature of these events. While energy prices dropped in the aftermath of the 9/11, as highlighted by 1, the model seems to suggest that the implied drop in energy prices was partially offset by risks to global energy supply. The London bombings also register a large surprise, concentrated in the macro component. The response reflects heightened global risk aversion and security concerns, though the size of the energy shock component is again indicative of the localized and non particularly energy-intensive nature of the shock balance. Finally, the decomposition of the Russian invasion of Ukraine shows a dominant contribution from the GPR energy shock, suggesting that the energy channel was by far the largest channel of transmission of this shock, while other channels, as for instance food prices and international sanctions, might not have contributed to the transmission of this shock to the US economy as much as the energy disruption associated with this episode.

Taken together, these decompositions provide strong empirical support for the view that geopolitical risk is a multi-dimensional phenomenon. Understanding the relative weight of macroeconomic versus energy-related components is crucial not only for tracing the transmission of these shocks to asset prices and inflation, but also for designing appropriate policy responses.

4.5 The Macro Impact of the Russian Invasion of Ukraine in 2022

To illustrate a potential policy application of the model, I exploit the baseline estimates to recover the impact of the Russian invasion of Ukraine on CPI inflation and industrial production in the US. The model is well-suited for analyzing episodes involving multiple types of shocks, as it can distinguish the impact of energy market disruptions alongside other macroeconomic factors. This allows for a clearer understanding of how different forces can contribute to drive economic outcomes during periods of geopolitical tension.

To estimate the impact of the Russian invasion of Ukraine, it is first necessary to recover the size of the two structural shocks associated with GPR dynamics in the concerned period. The most straightforward approach would be (i) estimating a historical decomposition of the GPR surprise series, (ii) decomposing the surprise series into the two structural shocks, and (iii) projecting the associated impulse response function over the considered horizon. However, this approach would tend to underestimate the overall impact of the shock, since

Russia had gradually accumulated its troops at the frontier since a few days and the risk of invasion was largely anticipated, resulting in a smaller surprise at the impact. In quantitative terms, the GPR index rose by 77.44 on the surprise day, with the historical decomposition attributing the 1.74% of the GPR index increase to the GPR macro shock and the 98.26% of the increase to the GPR energy shock. On the other hand, the GPR index rose by 83.13% between January 2022 and March 2022. In the spirit of a back-of-the-envelope calculation, I calibrate the shock so to match the full extent of the January 2022 – March 2022 GPR variation while retaining the shares of the two shocks derived from an historical decomposition performed on the three-day surprises. Ultimately, this approach delivers a GPR macro shock associated with a 1.45% rise in the GPR index and a GPR energy shock associated with a 81.63% rise in the GPR index.

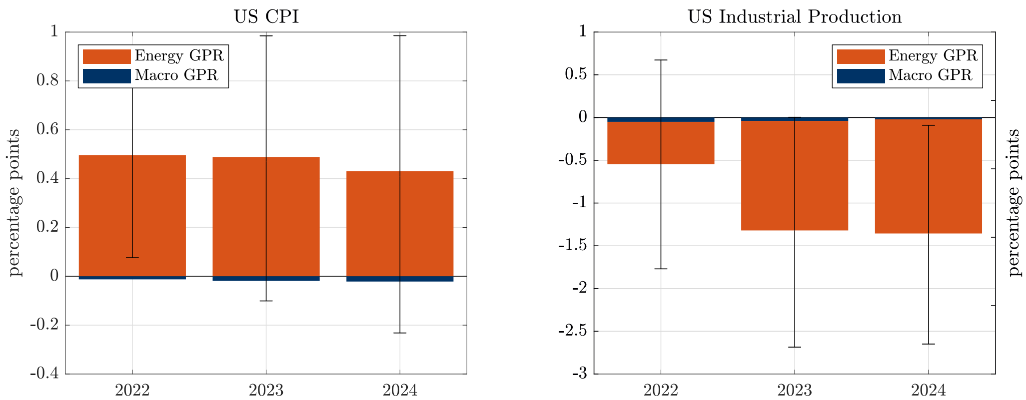


Figure 5 Impact of the Russian Invasion of Ukraine in February 2022

The figure displays the decomposition of the response of CPI inflation and industrial production to a GPR macro and a GPR energy shocks calibrated so to match the difference in the level of the GPR index between January and March 2022 in shares proportional to their contribution in the historical decomposition.

Based on this calibration, I use the estimated response to illustrate the impact of the outburst of the conflict on CPI and industrial production in the US. I assume that the shock occurs in March 2022, and study its propagation in the following months. The GPR energy shock is associated with a rapid growth in the inflation rate in the months following the shock, reaching the maximum impact in the first year at 0.5%. The effect on CPI persists up to 2023. Then, CPI starts to rapidly decline up to June 2023, when the effect dissipates. The effect of the GPR macro shock on CPI, on the other hand, is deflationary, but negligible.

Similarly to CPI, the effect on US industrial production is mostly coming from the GPR energy component. The GPR energy shock implies a contraction up to 0.5% percentage points in 2022, which deepens up to 1.3% in 2023, and persists at that level in 2024. The effect of the GPR macro shock on industrial production, on the other hand, is contractionary and negligible. These results are broadly consistent with the observation that CPI in the US rose only by about 1% from the outburst of the war to the peak of the inflation wave in June 2022.

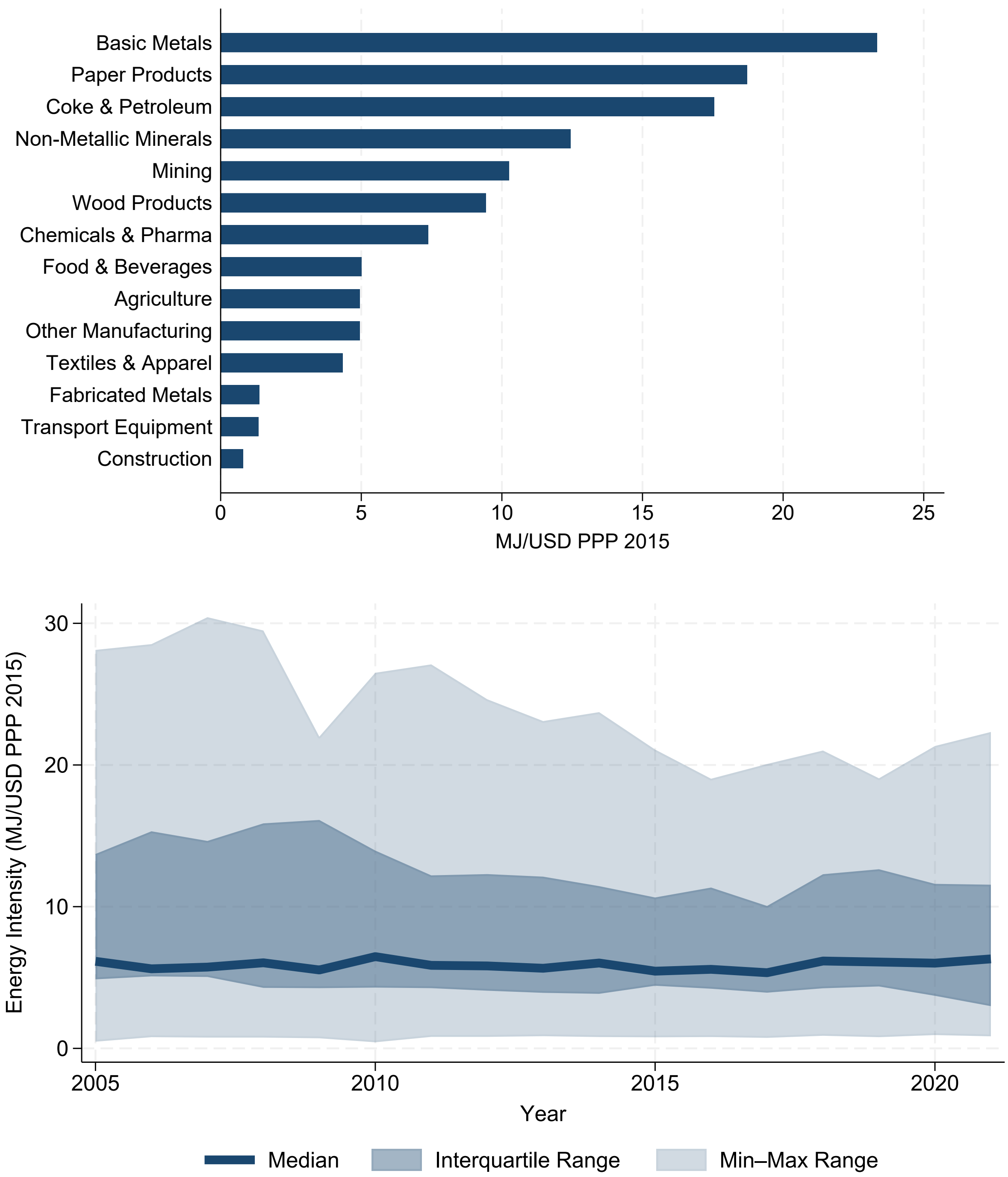
5 Heterogeneous Effects of GPR Macro and GPR Energy Shocks Across Sectors

In this section, I empirically investigate the response of sectoral output and prices in the US economy to validate the interpretation of the shocks. To this purpose, I evaluate whether the sectors of the US economy are more strongly affected by the energy component of geopolitical risk when their energy intensity is higher.

5.1 Data

The sector-level data on output and prices employed in the analysis are sourced from the Bureau of Economic Analysis (BEA). The selected aggregates for measuring output and prices are real value added (measured in millions of chained 2012 US dollars) and the chain-type price indexes for value added, respectively. The BEA data is quarterly, and covers the period 2005q2-2021q4 for 23 manufacturing sectors: Farms, Forestry, Fishing, Mining, Support Activities for Mining, Construction, Wood Products, Nonmetallic Mineral Products, Primary Metals, Fabricated Metal Products, Machinery Computer and Electronic Products, Electrical Equipment, Motor Vehicles, Other Transportation Equipment, Furniture and Related Products, Miscellaneous Manufacturing, Food and Beverage and Tobacco Products, Textile Products, Apparel and Leather, Paper Products, Printing, Chemical Products, Plastics and Rubber Products. These data are matched with yearly frequency information on the energy intensity of the US manufacturing sectors measured as the ratio of the aggregate amount of energy employed by these sectors from all sources as a ratio of the value added produced by these sectors (in MJ/USD 2015), provided by the International Energy Agency (IEA). The IEA dataset includes 15 sectors: Agriculture, Basic Metals, Chemicals & Pharma, Coke & Petroleum, Construction, Fabricated Metals, Food & Beverages, Mining, Non-Metallic Minerals, Other Manufacturing, Paper Products, Textiles & Apparel, Transport Equipment, Wood Products. There is no one-to-one match between IEA and BEA sector definitions. As IEA sectoral definitions are typically broader than BEA definitions, 23 sectors available in the BEA dataset match with 14 sectors from the IEA dataset, meaning that some BEA sector data will share the same energy intensity value. The detail of the match are reported in the Appendix.

Figure 6 Energy Intensity: Sectoral Average and Distribution



The top panel shows average energy intensity by sector over time (measured in MJ/USD PPP 2015). The bottom panel illustrates the distribution of energy intensity across sectors, showing the median, interquartile range, and full min–max range. All values are expressed in purchasing power parity-adjusted 2015 dollars.

Figure 6 documents the extent and persistence of cross-sectoral heterogeneity in energy intensity in the US economy. The top panel plots average energy intensity by sector, measured as megajoules of energy consumption per US dollar of value added (PPP-adjusted to 2015 prices). The variation across sectors is substantial. Energy intensity is highest in heavy industries such as Basic Metals, Paper Products, and Coke & Petroleum, where energy use exceeds 20 MJ per dollar of value added. In contrast, sectors such as Services, Construction, and Transport Equipment exhibit much lower energy intensity, often below 5 MJ per dollar. This wide dispersion highlights fundamental structural differences in energy dependence across industries.

The bottom panel illustrates the time-series distribution of energy intensity across sectors between 2005 and 2020. While the cross-sectional median remains relatively stable over the sample period, the interquartile range and the min–max spread reveal persistent and sizeable heterogeneity. The gap between energy-intensive and less energy-intensive sectors does not narrow over time, indicating that these differences are structural rather than cyclical. This persistent variation in energy intensity provides a natural source of cross-sectional heterogeneity that can be exploited to examine differential exposure to energy-driven geopolitical shocks in the empirical analysis that follows.

5.2 Average Sectoral Effects

Building on the observed cross-sectional heterogeneity in energy intensity documented in Figure 6, I next turn to a formal empirical assessment of sectoral responses to geopolitical risk shocks. The persistent and substantial variation in energy dependence across sectors provides a useful source of identification to investigate whether the energy intensity of production amplifies the transmission of geopolitical shocks, particularly those that operate through energy markets.

In a preliminary step, to validate the VAR results, I estimate the average dynamic response of sectoral output and prices using a panel local projections framework. The specification also enables a direct comparison between the effects of broad macroeconomic geopolitical risk shocks and those specifically related to energy markets, leveraging the distinction identified in the preceding VAR analysis. The estimated equation is as follows:

$$\Delta y_{j,t+h} = \alpha_h + \alpha_{j,h} + \alpha_{h,q} + \beta_h \varepsilon_t + \gamma_h X_t + u_{j,t+h} \quad (5)$$

In the equation above, $y_{j,t}$ are 2-digit quarterly sectoral prices and value added from the BEA for the period 2005q2-2021q4, α_h is a constant, $\alpha_{j,h}$ are sector-level fixed effects, $\alpha_{h,q}$

are quarter fixed effects, $\varepsilon_t = \{\varepsilon_t^{macro}, \varepsilon_t^{energy}\}$ are the draws of the GPR macro and GPR energy shocks associated with the median IRF (in the VAR identified via high-frequency sign restrictions), and $X_{j,t}$ is a vector of controls including four lags of the macro GPR and energy GPR shocks and four lags of the variables included in the VAR in the previous sections of the paper, i.e. the year-on-year differences of the GPR index (in logs), the WTI deflated by US CPI (in logs), US CPI (in logs), US Industrial Production (in logs) and the 1-Year Treasury Rate, and a Covid dummy for the second quarter of 2020. The index j indicates the sector, t the time when the shock occurs, and h the considered horizon. Errors are clustered by sector, as the statistical criterion ensures the absence of autocorrelation in a systematic way.

In Figure 7, I show the average response of the sectors is line with the findings of the VAR exercise. In response to a one standard deviation shock to the GPR index associated with its macro component, output declines on average by between 0.1% and 0.9% in the third quarter following the shock. On the other hand, the contraction which follows the energy GPR shock reaches a trough between -0.3% and -1%. As in the VAR findings, the two shocks have distinct effects on the sectoral price level.

A. Sectoral Output Response *B. Sectoral Prices Response*

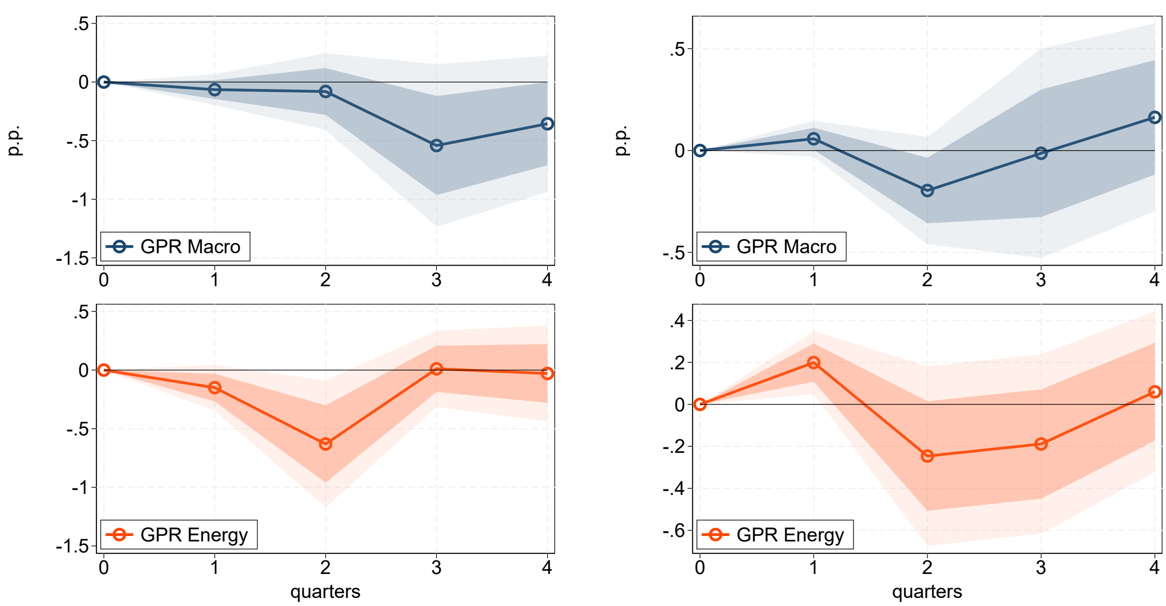


Figure 7 Average effect of a GPR macro shock and a GPR energy shock

The figure(s) display the average effect of sectoral value added and prices to a one standard deviation GPR macro and GPR energy shocks. Solid lines indicate point estimates, and shaded areas outline respectively the 68% and 90% credible sets.

On average, prices drop up to 0.3% in response to a one standard deviation GPR shock associated with the macro component of geopolitical risk. This occurs starting from the second quarter, while at the impact the response is insignificant, in line with the typical New Keynesian model response of the price level to a demand shock. On the other hand, the effect of a shock to the GPR index associated with the energy component of geopolitical risk is associated with a rise in sectoral prices by between 0.1% and 0.3%, which loses significance towards the end of the considered horizon.

Overall, the evidence from the average response of the sectors of the US economy to geopolitical shocks, is corroborative of the VAR findings: geopolitical shocks are always contractionary, although geopolitical shocks associated with the macro component of geopolitical risk are deflationary, while shocks associated with the energy component of geopolitical risk are inflationary.

5.3 Heterogeneous Effects: The Role of Energy Intensity

Second, I analyze the differential response of the energy intensive sectors. To do so, I introduce an energy intensity dummy $EI_{j,t}$, which takes value one if the energy intensity in a given sector-year is greater than the median across sectors, and zero otherwise. To evaluate the differential effect of sectors subject to a high-energy use in a given time period, I augment the previous specification with an interaction term and time fixed effects in the following way:

$$\Delta y_{j,t+h} = \alpha_h + \alpha_{j,h} + \alpha_{h,t} + \alpha_{h,q} + \beta_h \varepsilon_t EI_{j,t} + \gamma_h X_t + u_{j,t+h} \tag{6}$$

In the equation above, $y_{j,t}$ are 2-digit quarterly sectoral prices and value added from the BEA for the period 2005q2-2021q4, α_h is a constant, $\alpha_{j,h}$ are sector-level fixed effects, $\alpha_{h,t}$ are time fixed effects, $\alpha_{h,q}$ are quarter fixed effects, $\varepsilon_t = \{\varepsilon_t^{macro}, \varepsilon_t^{energy}\}$ are the draws of the GPR macro and GPR energy shocks associated with the median IRF (in the VAR identified via sign restrictions). The vector X_t includes four lags of the GPR macro and the GPR energy shocks, as well as four lags of the interaction term, and a Covid dummy for the second quarter of 2020. As in the previous exercise, errors are clustered by sector.

In Figure 8, I show the additional response of a sector characterized by an energy intensity one standard deviation above the median. In this specification, sector-time fixed effects absorb all the common variation from geopolitical shocks. Hence, the responses in Figure 8 have to be interpreted as deviations from the average response. In response to a one standard deviation shock to the GPR index associated with its macro component, the response of high energy-intensive sectors is positive (0.3%-2%), indicating that high-energy intensive sectors contract less than the average sector in response to GPR macro shocks. However, in response to a standard deviation shock to GPR associated with the energy shock, on average the sectoral output of high energy-intensive sectors declines very persistently until reaching a trough between -0.6% and -3% at the end of the considered horizon. This is a much stronger response compared to the average response (between -0.3% and -1%).

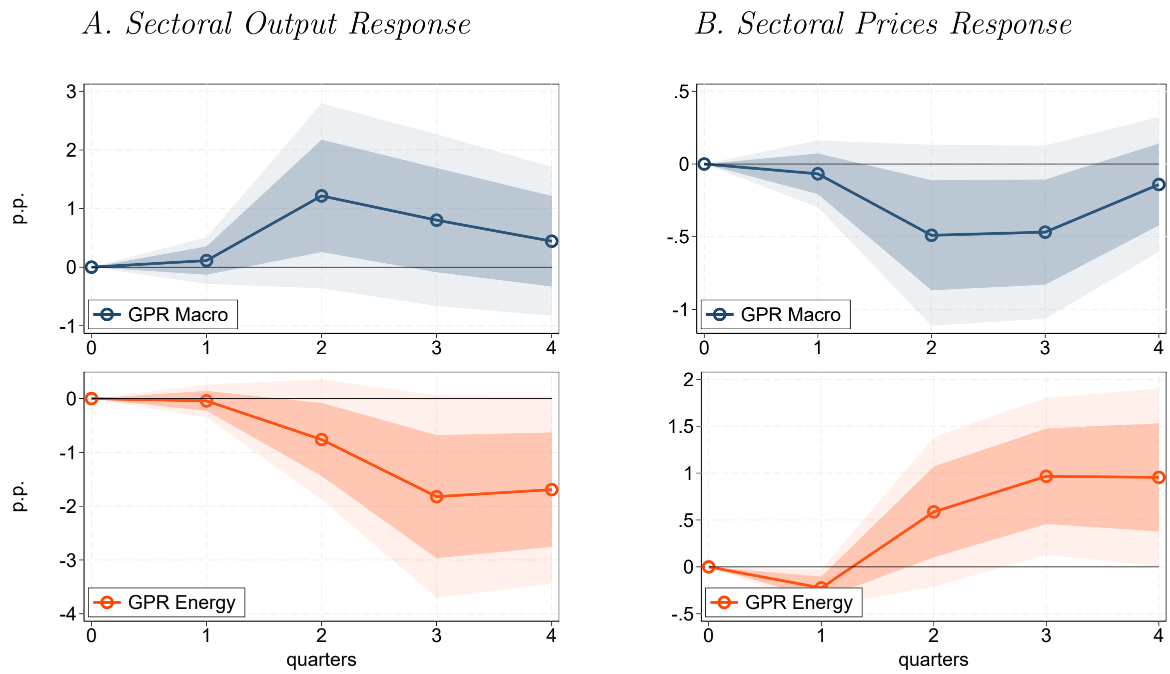


Figure 8 Relative effect of a GPR macro shock and GPR energy shock

The figure(s) displays the relative effect of a one standard deviation GPR macro and GPR energy shocks on value added and prices of high-intensive sectors compared to the average response. Solid lines indicate point estimates, and shaded areas outline respectively the 68% and 90% credible sets.

A similar pattern emerges for sectoral prices. In response to a one standard deviation shock to the GPR index associated with the macro component, the response of high energy-intensive sectors is between -0.1% and -0.8%, showing that the deflationary effect of the GPR macro shock is much stronger on high-energy intensity sectors. On the other hand, in response to a standard deviation shock to the GPR index associated with the energy shock, on average sectoral prices of high energy-intensive sectors rise persistently up to 0.4% and 1.3%. This additional increase makes the overall response much larger compared to the average response of between 0.1% and 0.3%, suggesting that most of the inflationary response might be driven by energy-intensive sectors. These results show that the energy component of geopolitical shocks affects more strongly more energy intensive sectors, by validating the interpretation of the GPR energy shock as such.

The heterogeneous sectoral effects documented in this section complement and extend the cross-country evidence reported by Caldara et al. (2023). In particular, Caldara et al. (2023) show that the transmission of geopolitical risk shocks to inflation varies substantially across countries, with larger inflationary effects concentrated in economies that experience sharper declines in GDP, larger contractions in trade, and higher military spending and money growth. Their panel regression framework attributes these differences to structural country characteristics, suggesting that the inflationary consequences of geopolitical risk reflect both supply-side disruptions and demand-side adjustments that differ by country.

These results provide a within-country counterpart to this cross-country heterogeneity. By exploiting persistent differences in energy intensity across US sectors, this analysis shows that the inflationary impact of geopolitical risk shocks is not uniform even within a single advanced economy, and shed light on its drivers. Specifically, sectors with higher energy dependence experience significantly stronger price increases in response to energy-related geopolitical shocks. In this sense, the sectoral heterogeneity observed in the US mirrors the cross-country variation identified by Caldara et al. (2023): in both cases, entities (whether countries or sectors) that are more exposed to energy-related supply shocks tend to exhibit larger inflationary responses.

6 Conclusion

This paper explores the consequences of different classes of geopolitical shocks for inflation and economic activity, and shows that energy markets are crucial for their transmission. The paper contributes to the literature by investigating the heterogeneity across geopolitical shocks, by providing an identification strategy to isolate the energy component of geopolitical shocks which combines state-of-the-art methodologies from the VAR literature.

The paper proposes a concise distinction between geopolitical shocks associated with disruptions on energy markets from geopolitical shocks associated with macroeconomic dynamics which do not originate in energy markets. These two shocks are associated with distinct macro implications.

One of the main insight from the analysis is that geopolitical risk episodes should not all be treated equally for policy analysis purposes, as interpreting them as a unique class of shocks might be misleading for inferring the macro implications of individual geopolitical episodes. The findings of the empirical analysis suggest that a rise in geopolitical risk is always contractionary for economic activity, irrespective of its nature. However, a rise in the GPR index is deflationary when associated with geopolitical macro shocks and inflationary when associated with geopolitical energy shocks. The magnitudes of these effects are estimated to be economically meaningful from a policymaking perspective.

Finally, the findings of this paper come with important implications for monetary policy. The conduct of monetary policy in response to geopolitical events should be conditional on their composition in terms of structural shocks. Central banks should respond to geopolitical macro shocks by loosening interest rates, while the optimal response to energy-related geopolitical shocks is a priori ambiguous, as they face a trade-off between the stabilization of output and inflation.

References

Antolín-Díaz, J. and J. F. Rubio-Ramírez (2018): "Narrative sign restrictions for SVARs," *American Economic Review*, 108, 2802–2829.

Baumeister, C. and J. D. Hamilton (2019): "Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks," *American Economic Review*, 109, 1873–1910.

Bloom, N. (2009): "The Impact of Uncertainty Shocks," *Econometrica*, 77, 623–685.

Brignone, D., L. Gambetti, and M. Ricci (2024): "Geopolitical risk shocks: When the size matters," *ECB Working Paper Series, No. 2972.*

Caldara, D., M. Cavallo, and M. Iacoviello (2019): "Oil price elasticities and oil price fluctuations," *Journal of Monetary Economics*, 103, 1–20.

Caldara, D., S. Conlisk, , M. Iacoviello, and M. Penn (2023): "Do Geopolitical Risks Raise or Lower Inflation?" *mimeo.*

Caldara, D. and M. Iacoviello (2022): "Measuring Geopolitical Risk," *American Economic Review*, 112, 1194–1225.

Forbes, K. J. and F. E. Warnock (2012): "Capital flow waves: Surges, stops, flight, and retrenchment," *Journal of International Economics*, 88, 235–251.

Gazzani, A., F. Venditti, and G. Veronese (2024): "Oil price shocks in real time," *Journal of Monetary Economics*, 144.

Gürkaynak, R. S., B. Sack, and E. Swanson (2005): "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking*, 1.

Jarociński, M. and P. Karadi (2020): "Deconstructing Monetary Policy Surprises—The Role of Information Shocks," *American Economic Journal: Macroeconomics*, 12, 1–43.

Kilian, L. (2009): "Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market," *American Economic Review*, 99, 1053–1069.

Kilian, L. and D. P. Murphy (2012): "Why agnostic sign restrictions are not enough: understanding the dynamics of oil market VAR models," *Journal of the European Economic Association*, 10, 1166–1188.

Kogan, L., D. Papanikolaou, A. Seru, and N. Stoffman (2017): "Technological Innovation, Resource Allocation, and Growth," *The Quarterly Journal of Economics*, 132, 665–712.

Kuttner, K. N. (2001): "Monetary policy surprises and interest rates: Evidence from the Fed funds futures market," *Journal of Monetary Economics*, 47, 523–544.

Känzig, D. R. (2021): "The Macroeconomic Effects of Oil Supply News: Evidence from OPEC Announcements," *American Economic Review*, 111, 1092–1125.

Miranda-Agrippino, S. and G. Ricco (2021): "The Transmission of Monetary Policy Shocks," *American Economic Journal: Macroeconomics*, 13, 74–107.

Nakamura, E. and J. Steinsson (2018): "High-Frequency Identification of Monetary Non-Neutrality: The Information Effect," *The Quarterly Journal of Economics*, 133, 1283–1330.

Romer, C. D. and D. H. Romer (2004): "A New Measure of Monetary Shocks: Derivation and Implications," *American Economic Review*, 94, 1055–1084.

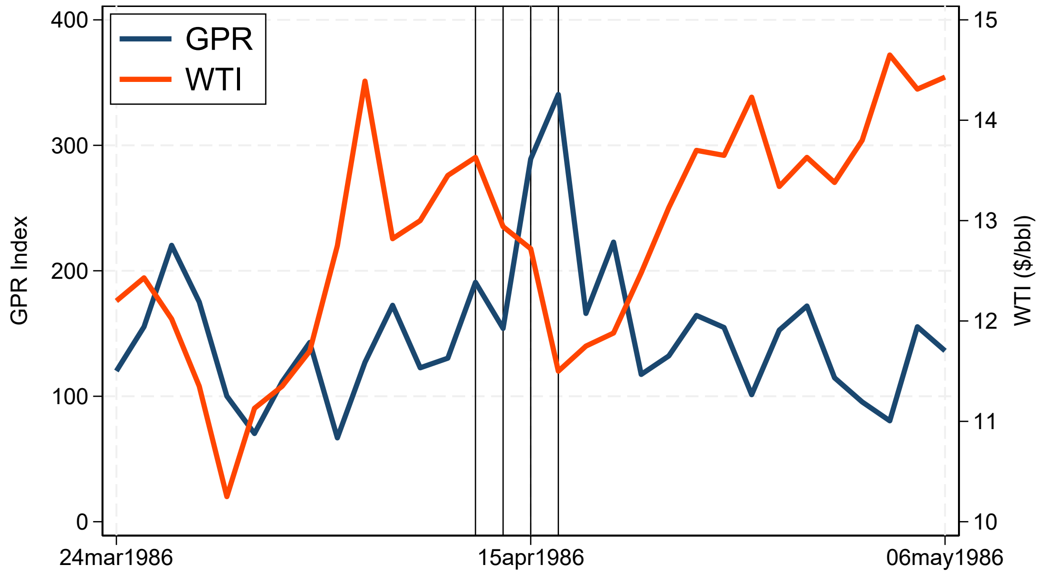
——— (2010): "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," *American Economic Review*, 100, 763–801.

Rubio-Ramírez, J. F., D. F. Waggoner, and T. Zha (2010): "Structural Vector Autoregressions: Theory of Identification and Algorithms for Inference," *Review of Economic Studies*, 77, 665–696.

Wang, X., Y. WU, and W. XU (2023): "Geopolitical Risk and Investment," *Journal of Money, Credit and Banking*.

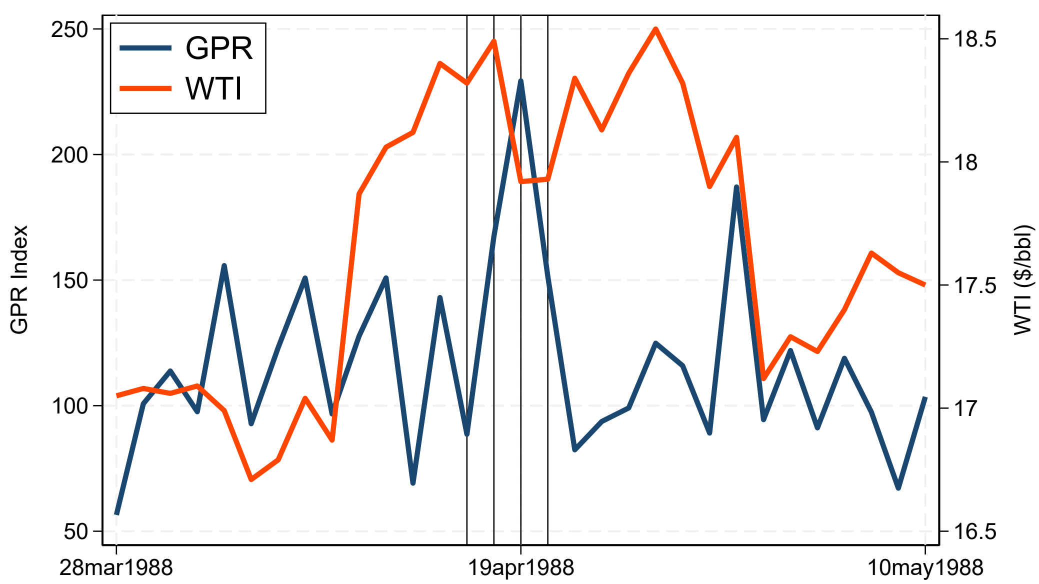
Event 1 – US Airstrikes on Libya (1986/04/15)

The US launched airstrikes against Libya in response to the Berlin discotheque bombing. The event signaled rising geopolitical tensions in the Middle East. [Source: New York Times]



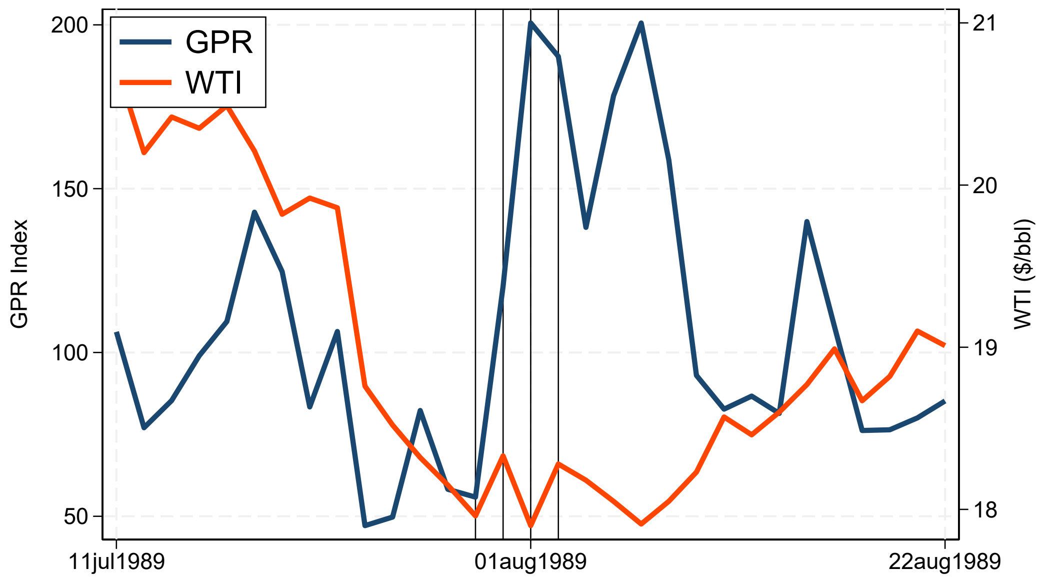
Event 2 – Operation Praying Mantis (1988/04/19)

A major US naval action against Iran in the Persian Gulf, following the mining of US ships. The incident intensified tensions during the Iran–Iraq War. [Sources: New York Times]



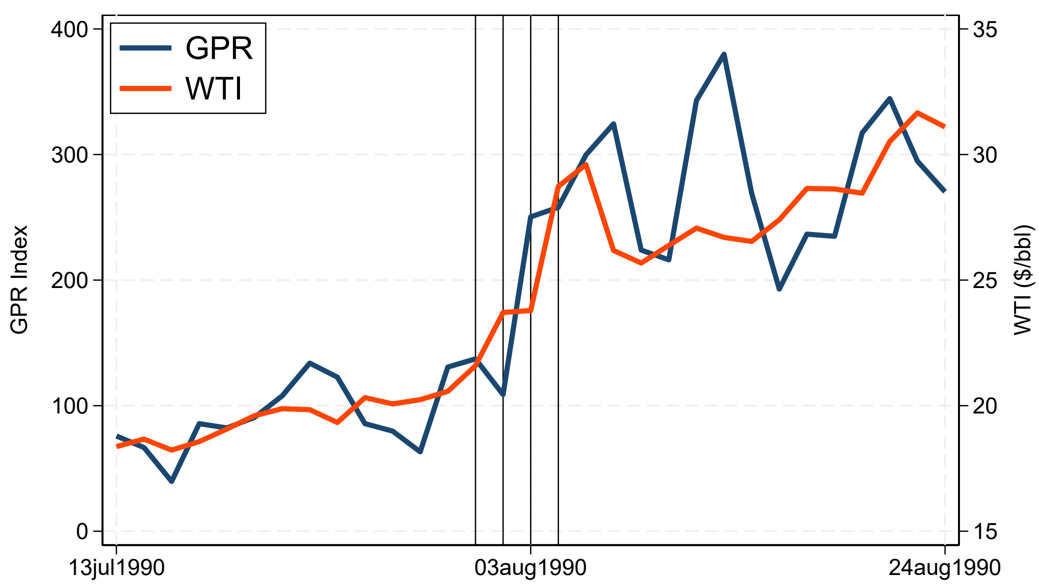
Event 3 – Lebanese Civil War Escalation (1989/08/01)

Renewed fighting in Lebanon highlighted ongoing instability in the region, raising concerns about conflict spillovers. [Sources: New York Times, New York Times]



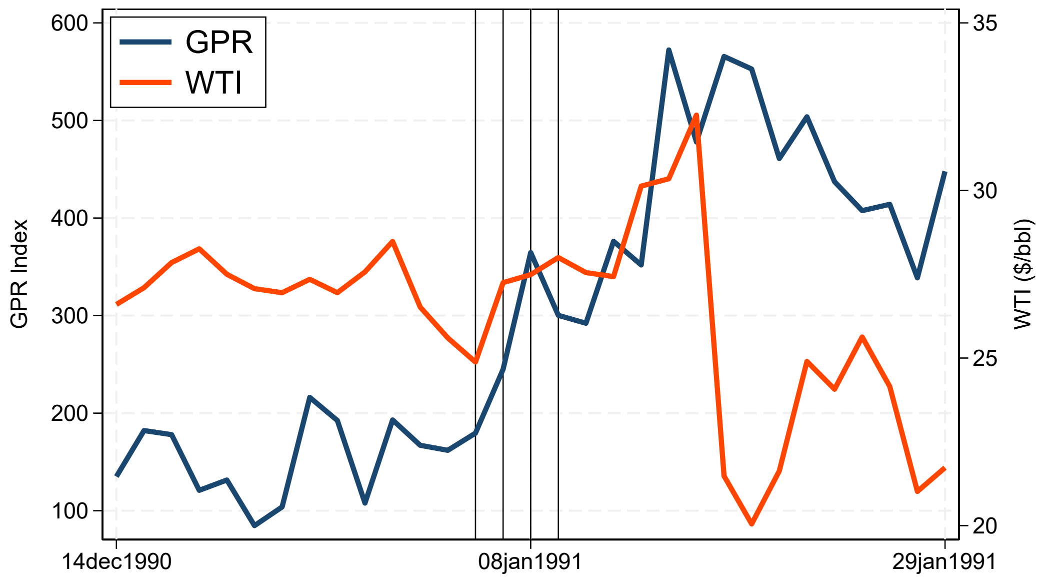
Event 4 – Iraqi Invasion of Kuwait (1990/08/03)

Iraq's invasion disrupted a major oil-exporting state and triggered an international crisis. The resulting uncertainty had immediate implications for global oil markets. [Source: New York Times]



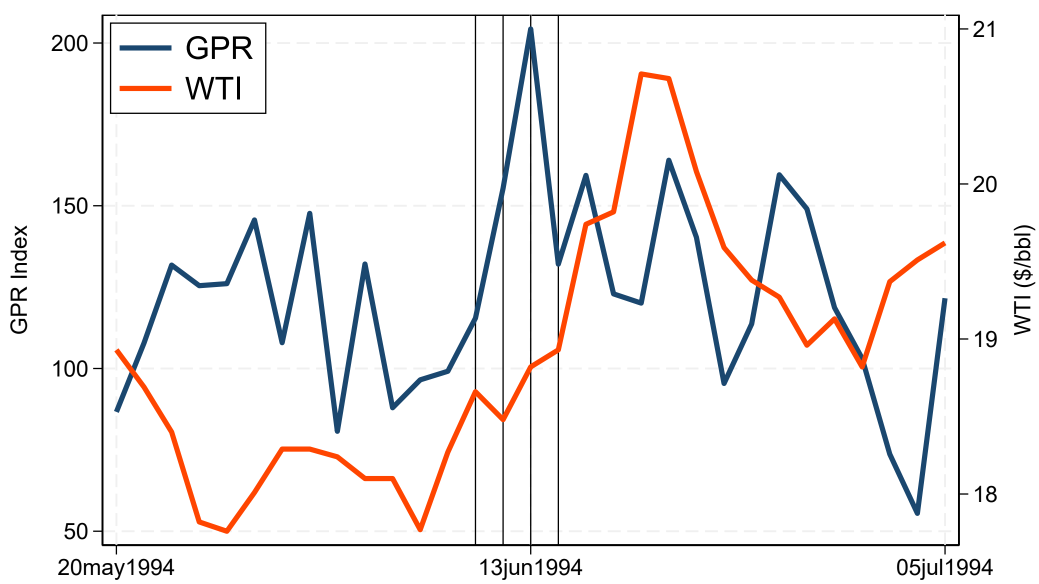
Event 5 – US Congress Vote on Gulf War (1991/01/08)

The Congressional authorization for military action against Iraq formalized the US commitment to war, with broad implication for global energy markets. [Source: New York Times]



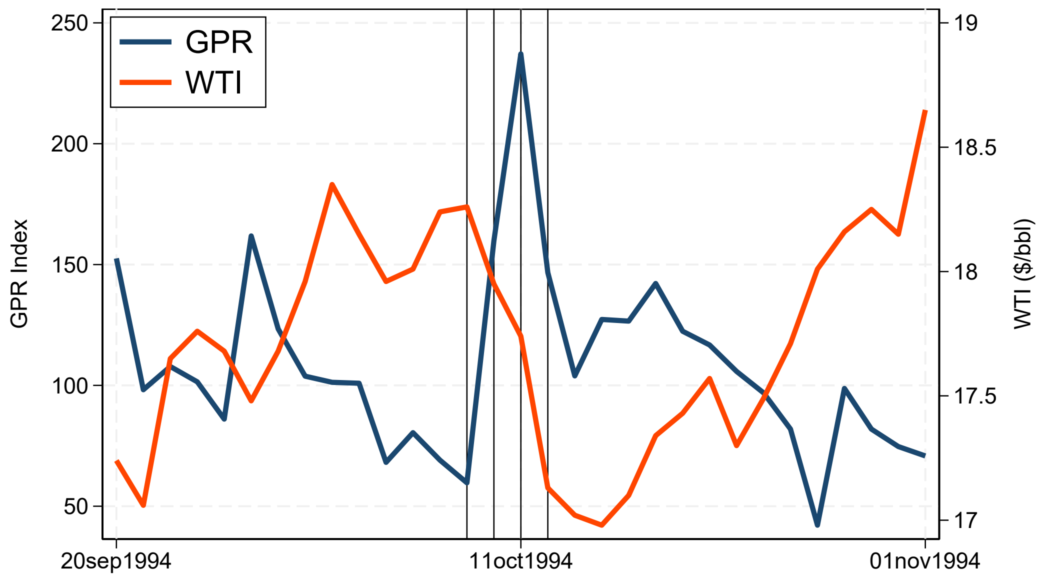
Event 6 – Civil War Escalation in Rwanda (1994/06/13)

The intensification of Rwanda's civil war and genocide shocked global observers, and underscored the role of political instability in the region. [Source: New York Times]



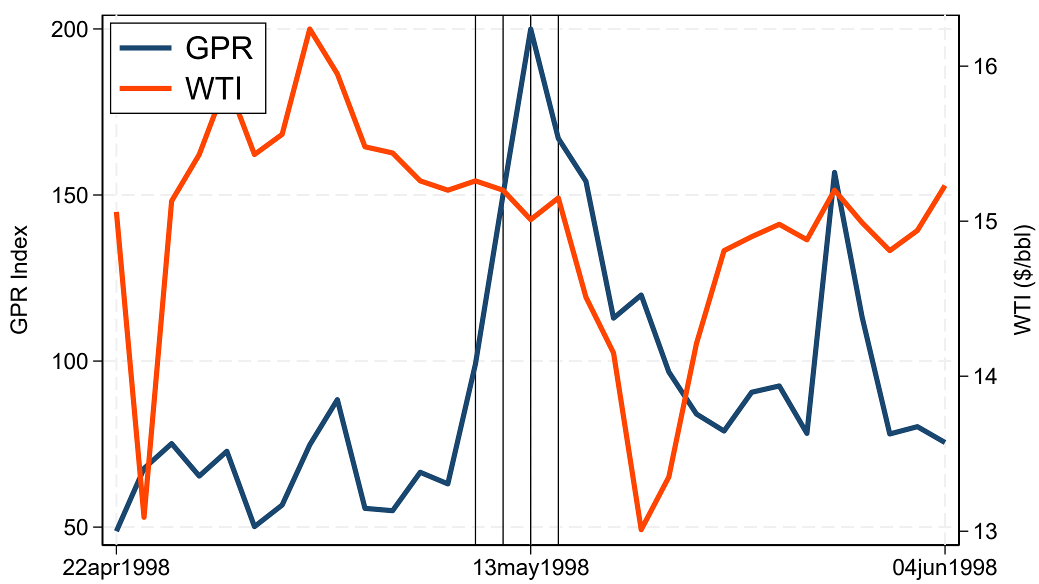
Event 7 – Announcement of Iraqi Withdrawal from Kuwait (1994/10/11)

Saddam Hussein states his intention to withdraw from Kuwait. This event is not included in the dataset, as the GPR index rises as the narrative analysis suggests geopolitical tensions ease. [Source: New York Times]



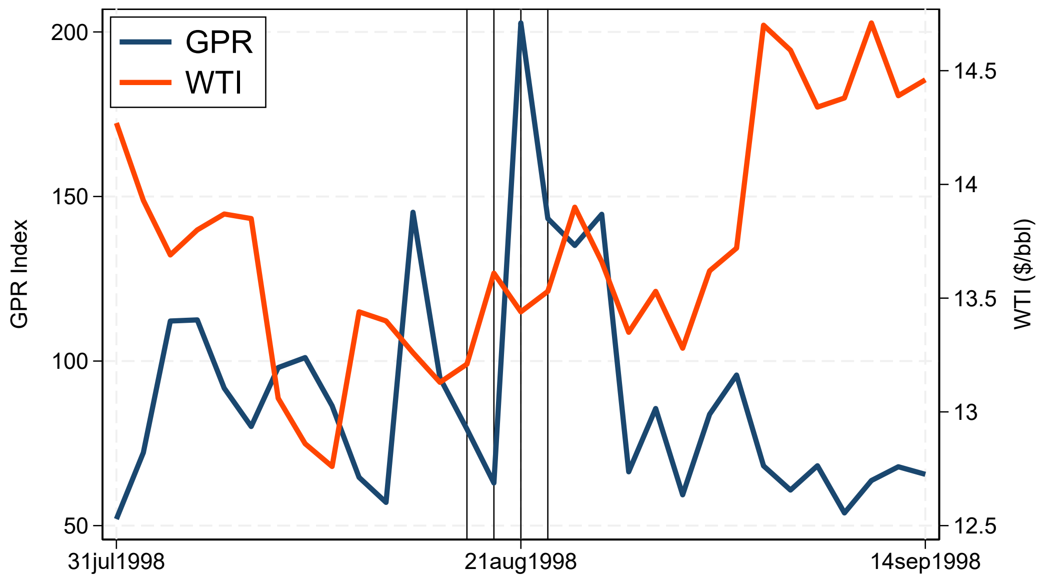
Event 8 – Riots in Indonesia, Nuclear Tests in India (1998/05/13)

Political unrest in Indonesia and nuclear escalation in India signaled rising instability in emerging markets, contributing to global uncertainty and regional risk repricing. [Sources: New York Times, New York Times]



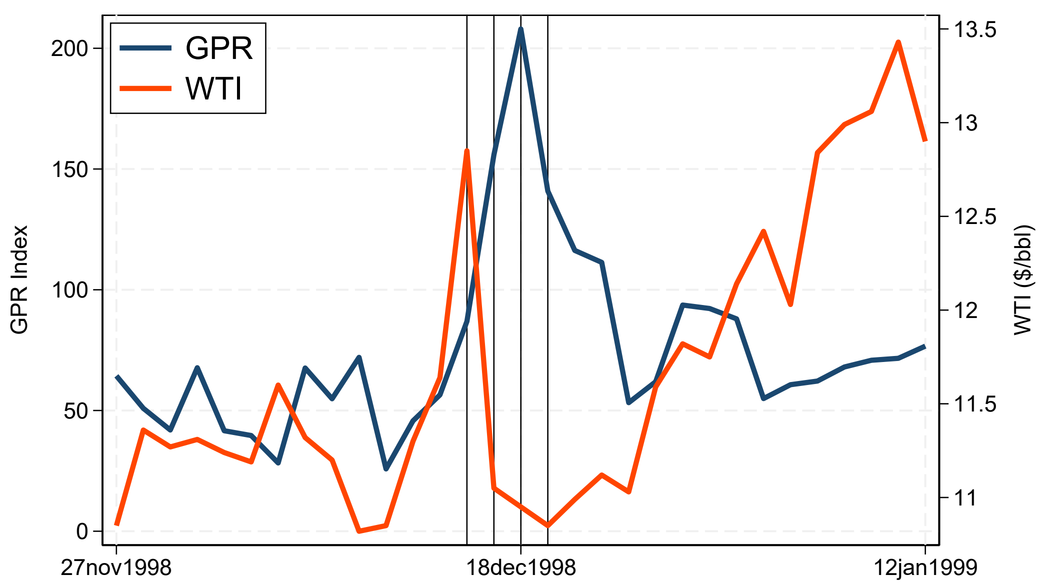
Event 9 – US Bombings in Afghanistan and Sudan (1998/08/21)

The US targeted terrorist facilities following embassy bombings in Africa, signaling a new phase in counterterrorism policy with potential long-term strategic implications. [Source: New York Times]



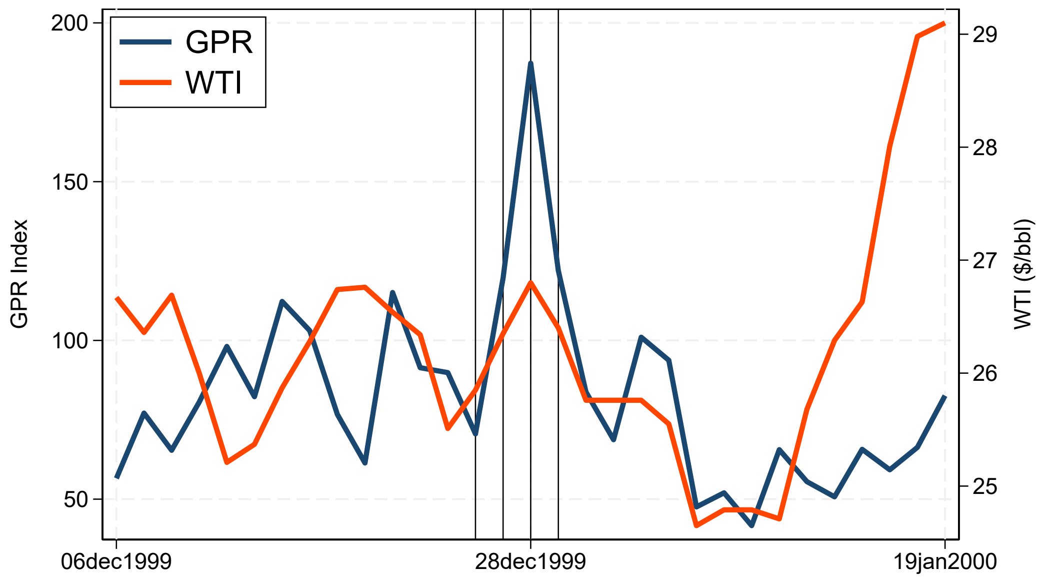
Event 10 – Operation Desert Fox (1998/12/18)

Joint US–UK military operation against Iraq following non-compliance with UN inspections. The strikes briefly heightened oil market volatility due to renewed tensions in the Gulf. [Source: New York Times]



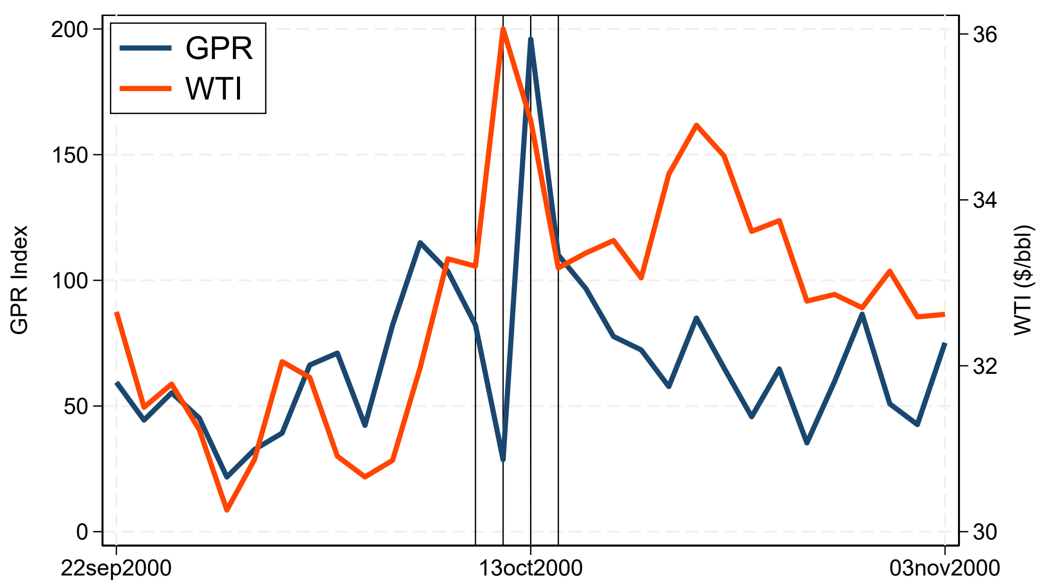
Event 11 – Indian Airlines Flight 814 Hijack (1999/12/28)

The hijacking of an Indian commercial flight raised security concerns in South Asia and highlighted vulnerabilities in the region's political stability. [Source: New York Times]



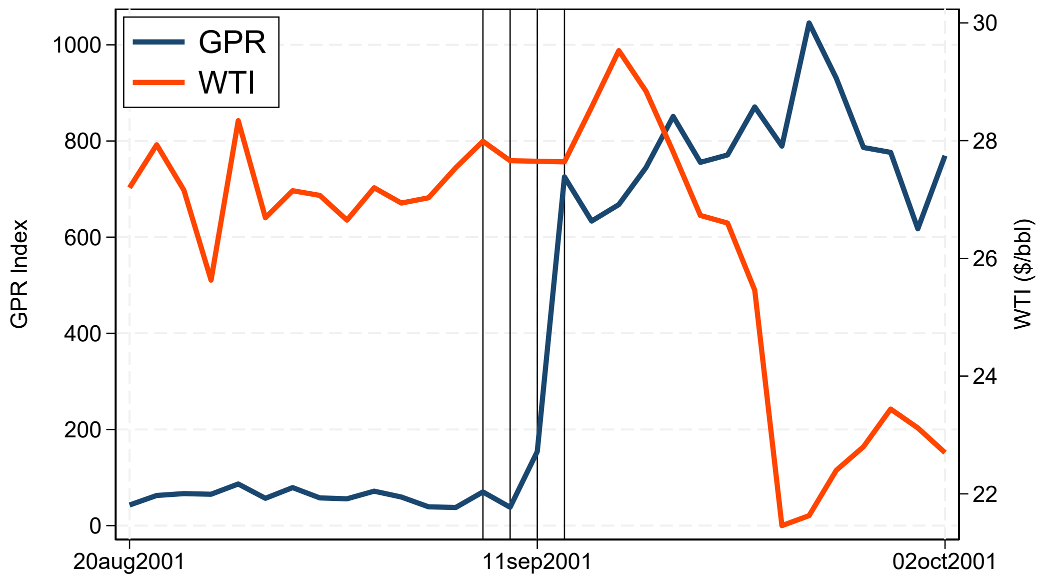
Event 12 – Second Intifada Escalation (2000/10/13)

Escalation of the Palestinian uprising against Israeli occupation led to broader regional uncertainty and concerns over future oil supply. [Source: New York Times]



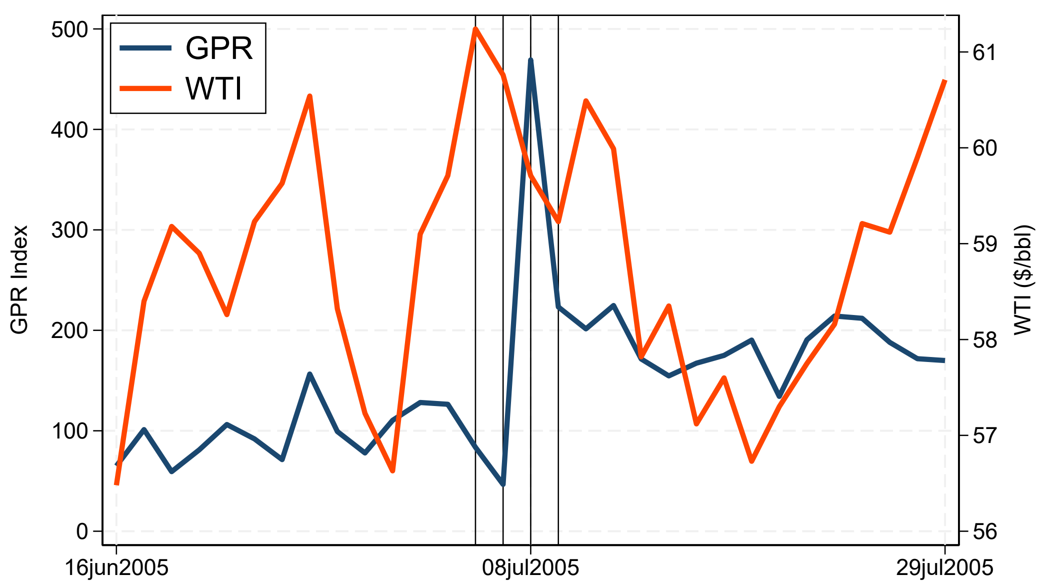
Event 13 – 9/11 Attacks (2001/09/11)

The September 11 terrorist attacks represented a structural break in global geopolitical risk, reshaping security policy and investor expectations worldwide. [Source: New York Times]



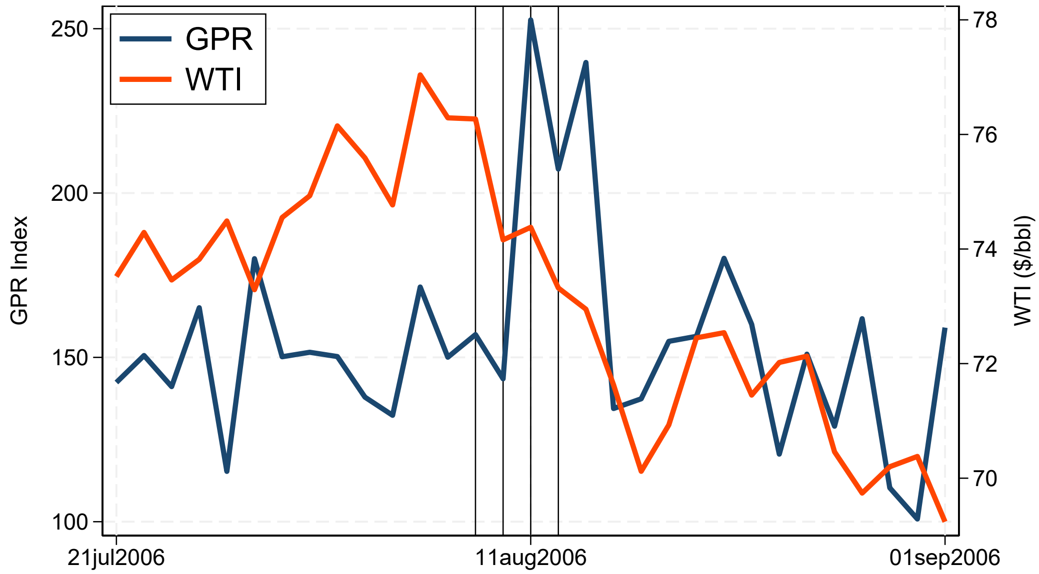
Event 14 – London Bombings (2005/07/08)

Coordinated terrorist bombings targeted the London public transport system, raising new concerns on terrorist threats in advanced economies and a broader geopolitical escalation. [Source: New York Times]



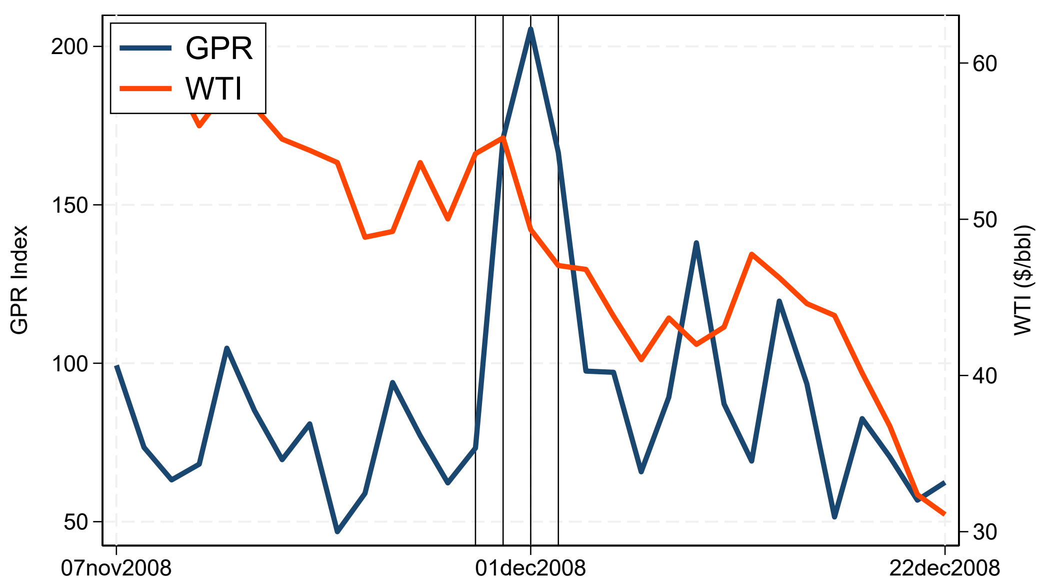
Event 15 – Transatlantic Aircraft Terrorist Plot (2006/08/11)

UK authorities disrupted a major terror plot targeting transatlantic flights. The event elevated global security protocols and impacted travel-related sectors. [Source: New York Times]



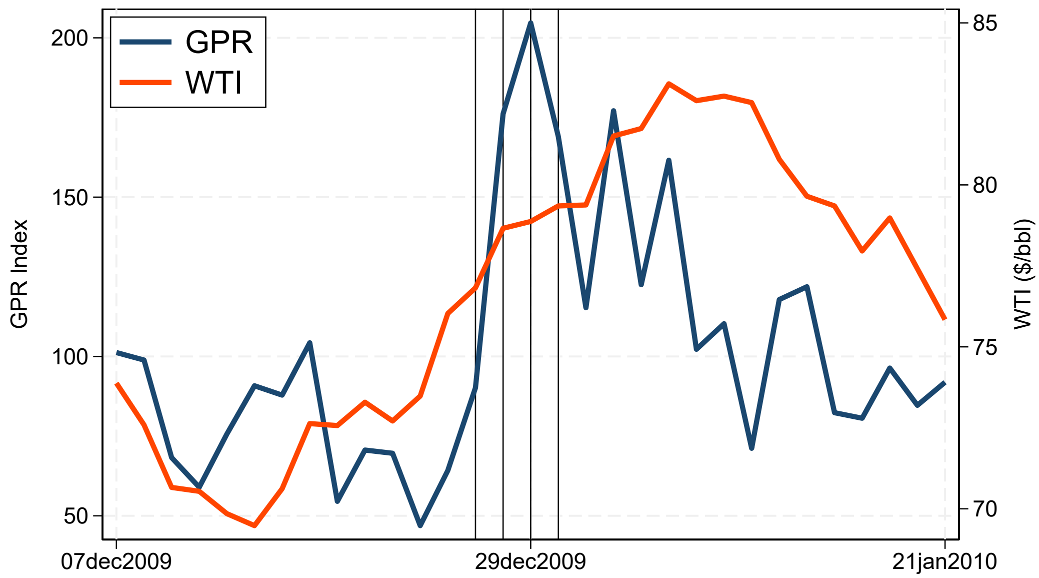
Event 16 – Terror Attacks in Afghanistan and Iraq (2008/12/01)

A series of high-casualty attacks occurred across key conflict zones, contributing to elevated perceptions of instability in oil-producing regions. [Sources: New York Times, New York Times]



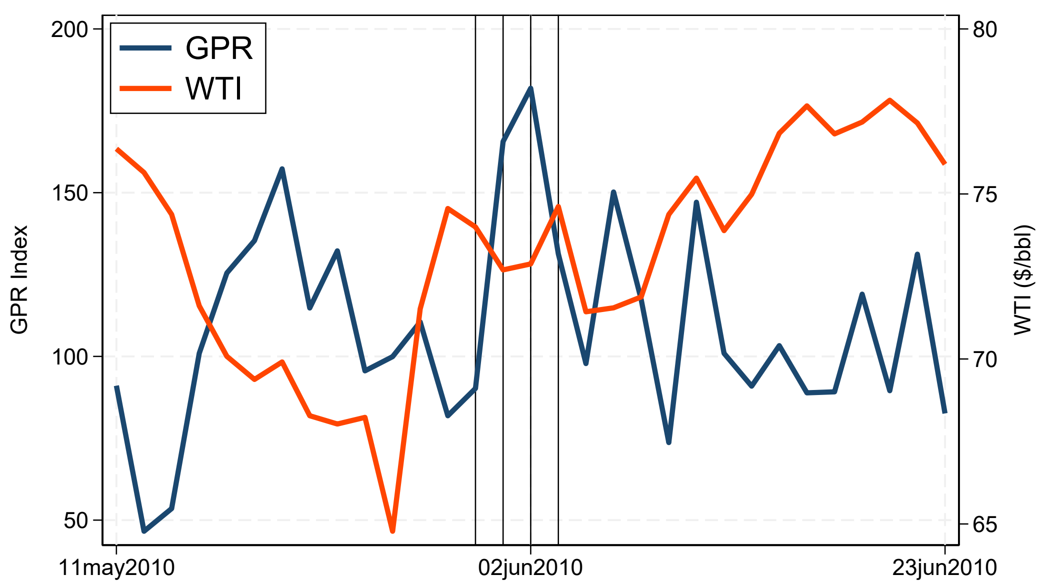
Event 17 – Terror Attacks in Pakistan (2009/12/29)

Terror attacks in Pakistan fueled fears of regional conflict escalation, against the backdrop of religious tensions. [Sources: New York Times, New York Times]



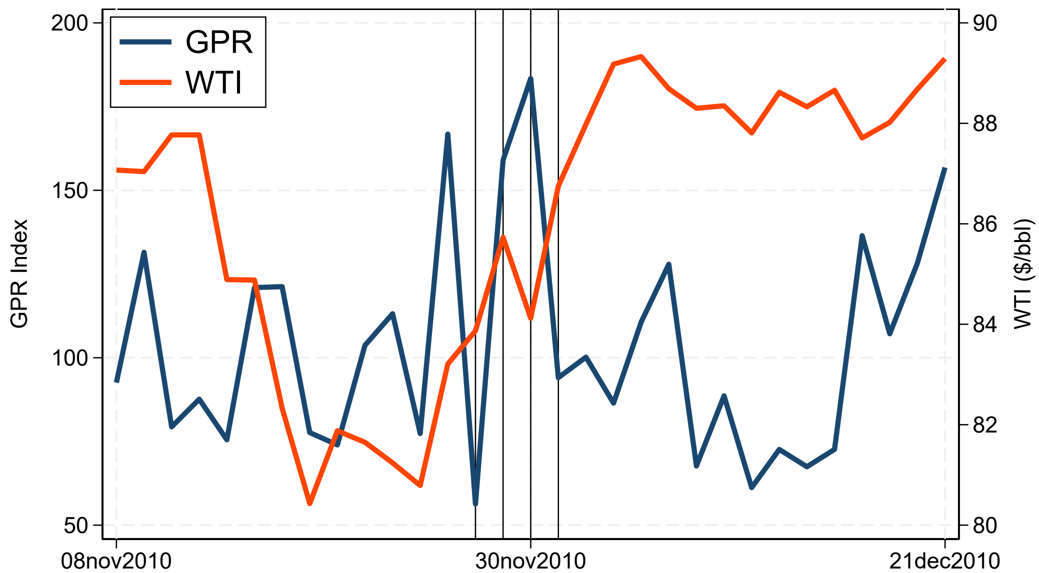
Event 18 – Terror Attacks in Iraq and Pakistan (2010/06/02)

Simultaneous attacks across two politically fragile countries emphasized ongoing instability in regions with geopolitical significance. [Source: New York Times]



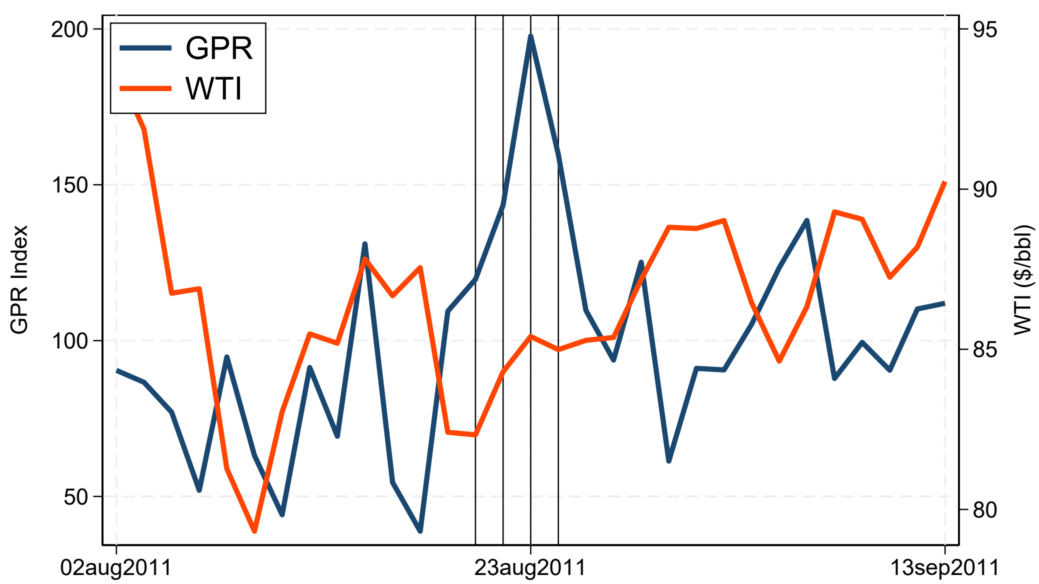
Event 19 – Nuclear Threats from Iran and North Korea (2010/11/30)

North Korea suspends nuclear disarmament talks, while two leading atomic experts are assassinated in Iran. [Sources: New York Times, New York Times]



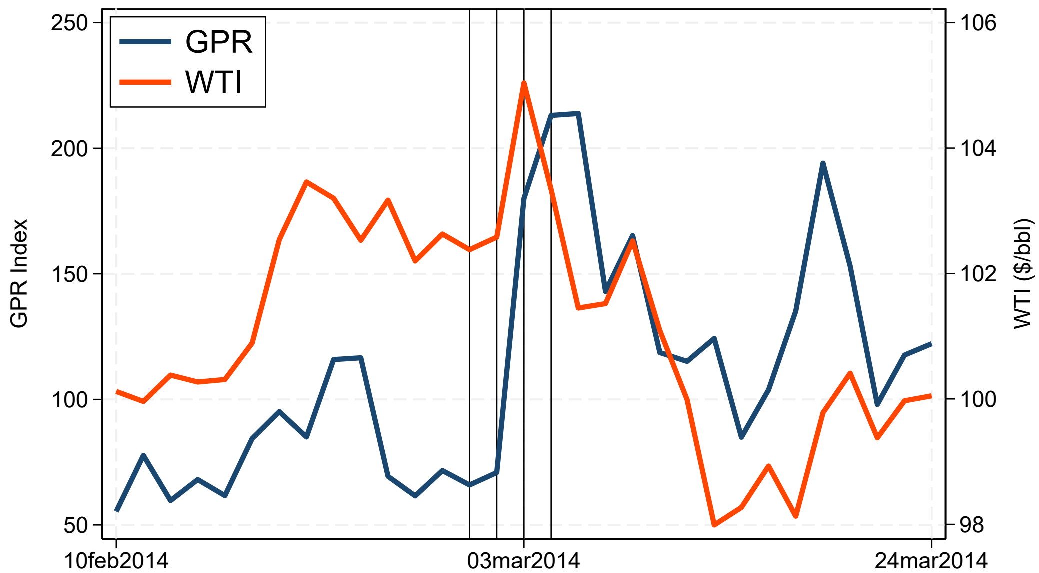
Event 20 – Fall of Tripoli (2011/08/23)

The collapse of Gaddafi's regime marked a turning point in Libya's civil war, and introduced long-term uncertainty regarding governance and oil production. [Source: New York Times]



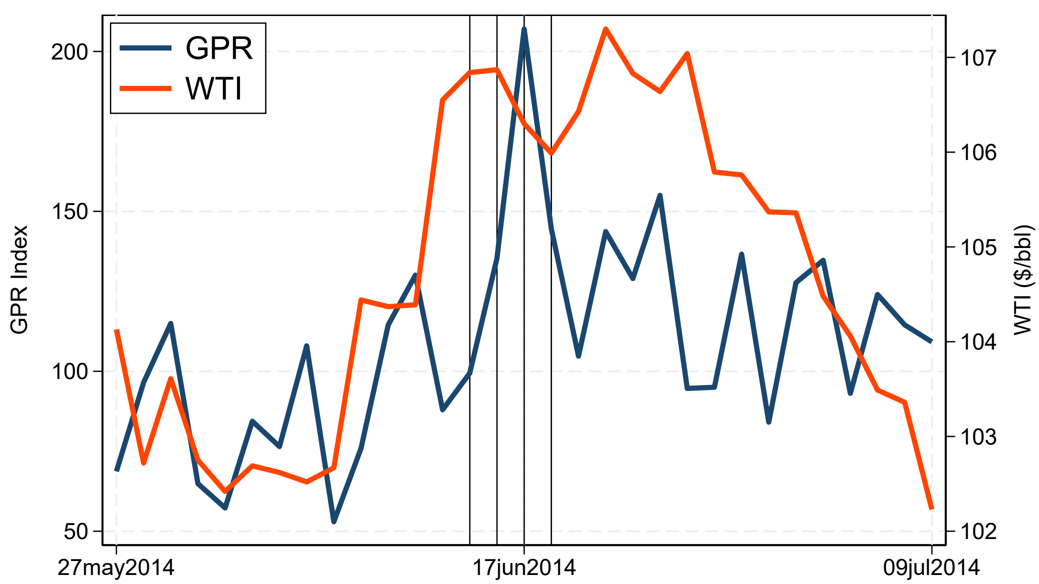
Event 21 – Russia-Ukraine War Fears over Crimea (2014/03/03)

Russia's annexation of Crimea triggered fears of a broader military escalation, with potential consequences for energy supply and geopolitical stability. [Sources: New York Times, New York Times]



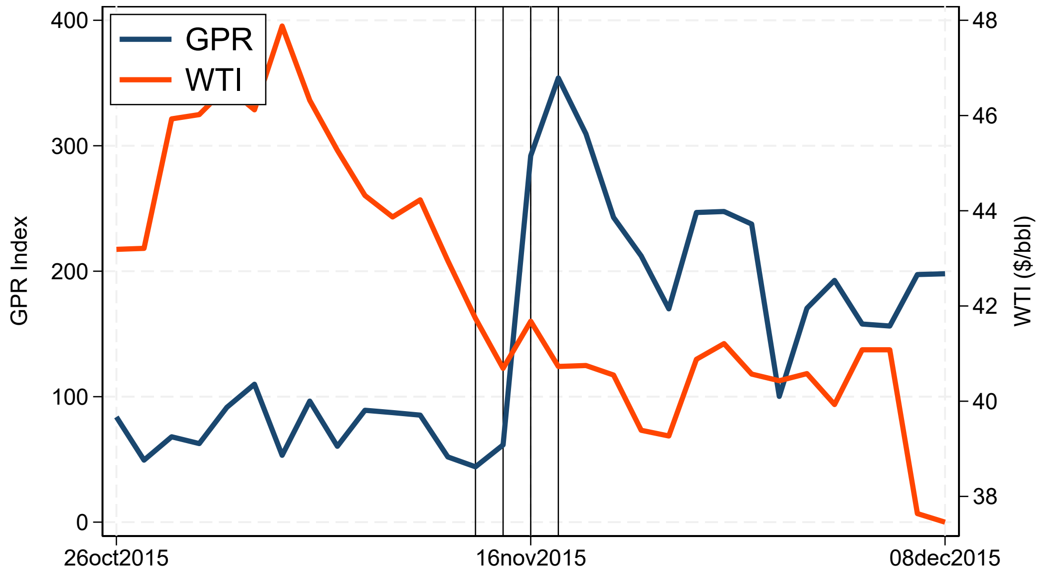
Event 22 – Islamic State Offensive in Northern Iraq (2014/06/17)

ISIS advances into key oil-producing regions threatened supply disruptions and spurred international concern over regional security. [Source: New York Times]



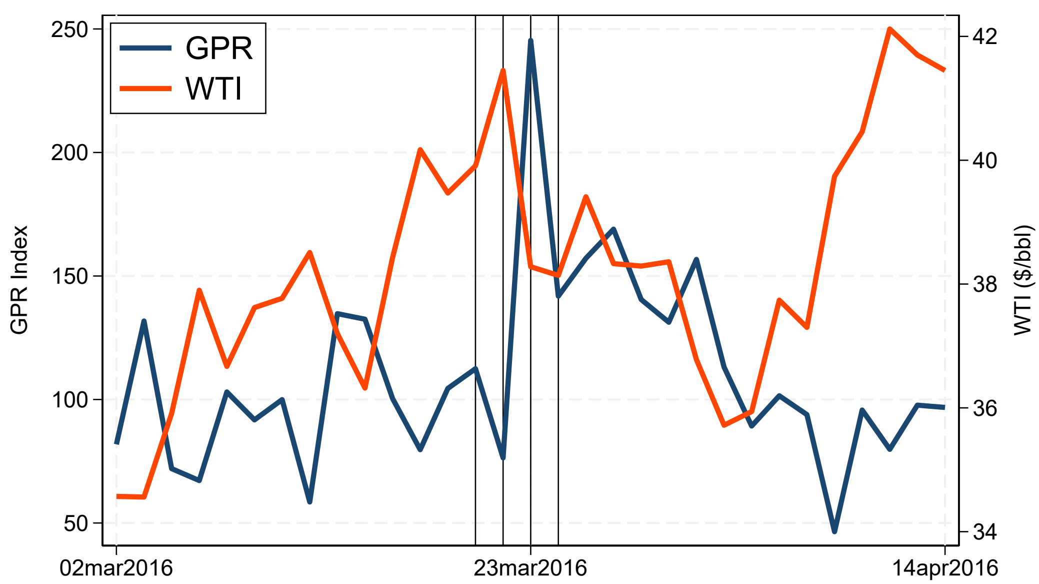
Event 23 – Paris Attacks Aftermath (2015/11/16)

Following coordinated terrorist attacks in Paris, France strikes ISIS targets in the Syrian city of Raqqa in retaliation. [Source: New York Times]



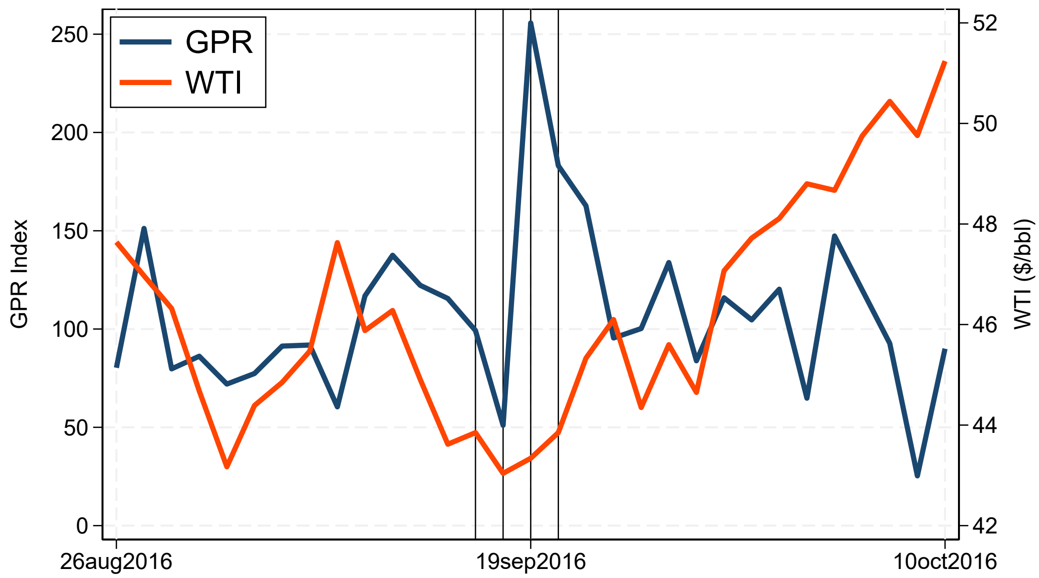
Event 24 – Brussels Bombings (2016/03/23)

Terrorist attacks at Brussels Airport and a metro station underscored persistent security threats in Europe. [Source: New York Times]



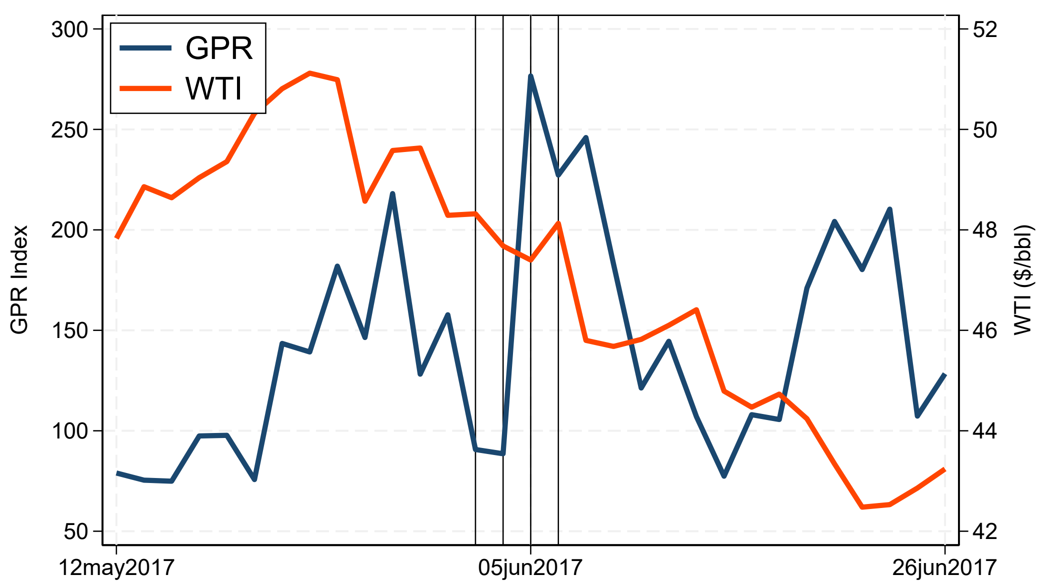
Event 25 – Bombings in New York and New Jersey (2016/09/19)

Explosions in US urban centers led to temporary disruptions and raised new concerns on future geopolitical developments. [Sources: New York Times, New York Times]



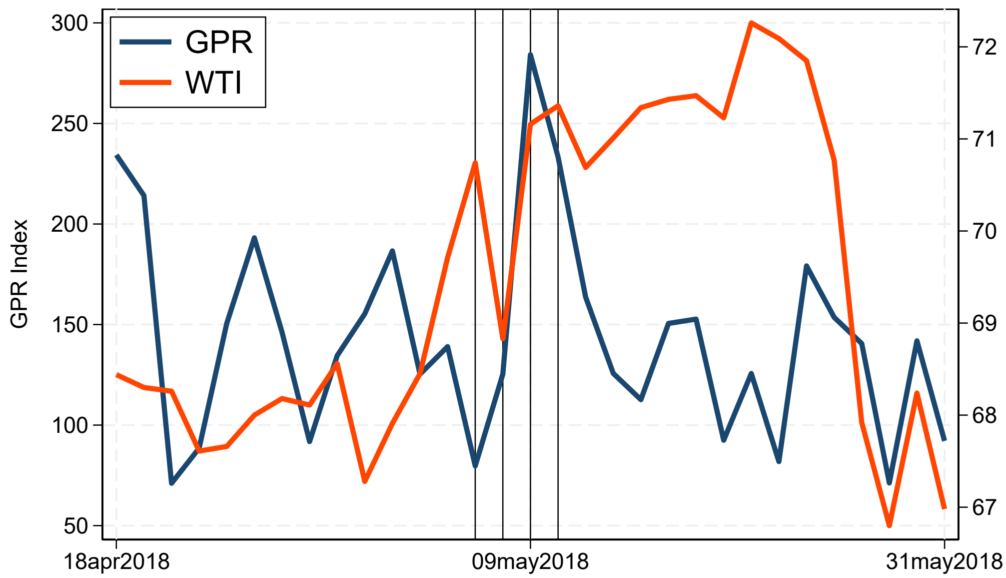
Event 26 – Qatar Diplomatic Crisis (2017/06/05)

Saudi Arabia and allies severed diplomatic ties with Qatar, creating uncertainty over regional alliances and energy cooperation in the Gulf. [Source: New York Times]



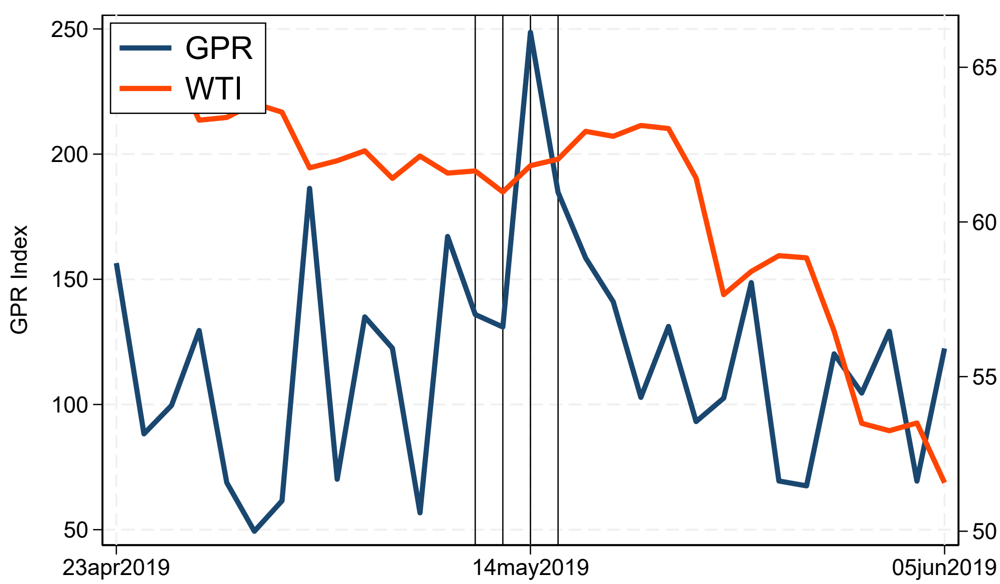
Event 27 – US Strikes on Syria (2018/05/09)

The US conducted strikes against Syrian regime targets, continuing a pattern of intervention with implications for regional balance and global perceptions of US foreign policy. [Source: New York Times]



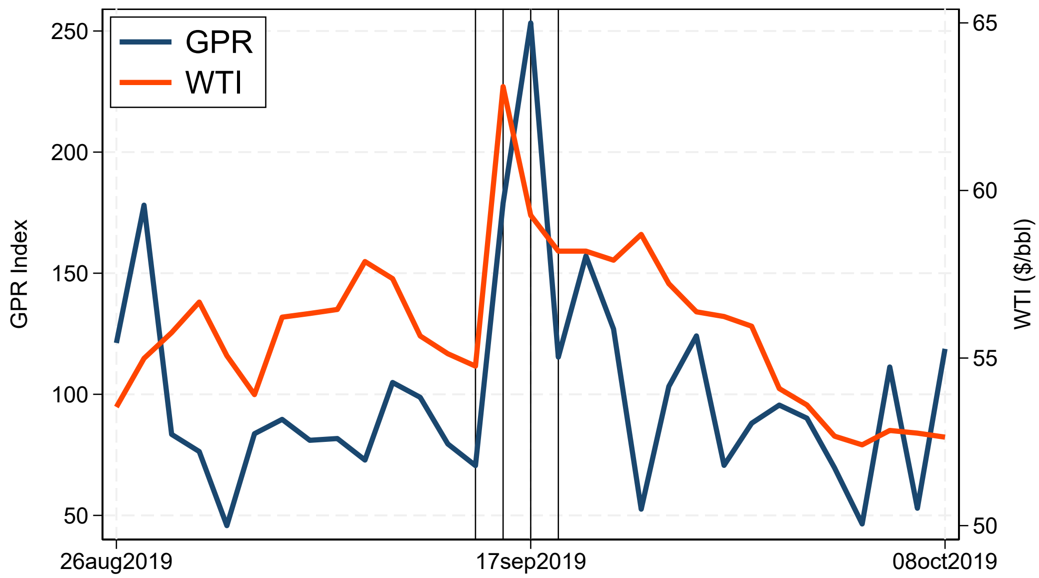
Event 28 – Gulf of Oman Incident (2019/05/14)

Attacks on oil tankers in the Gulf of Oman raised fears of disruptions to one of the world's most critical shipping lanes. [Source: New York Times]



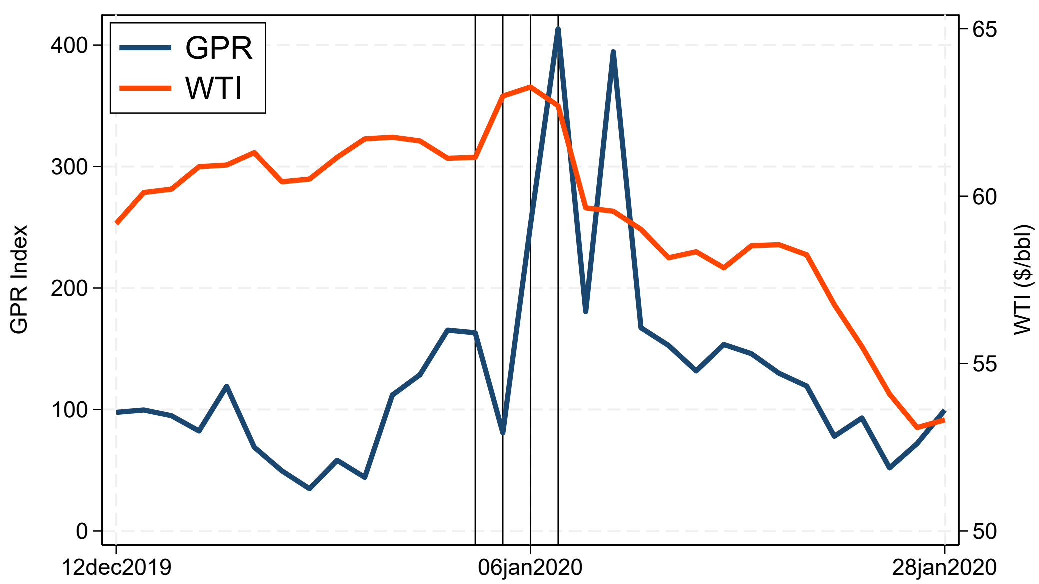
Event 29 – Abqaiq–Khurais Attacks on Saudi Aramco (2019/09/17)

A drone and missile attack on major Saudi oil facilities temporarily disrupted over 5% of global supply, leading to a brief but sharp spike in oil prices. [Source: New York Times]



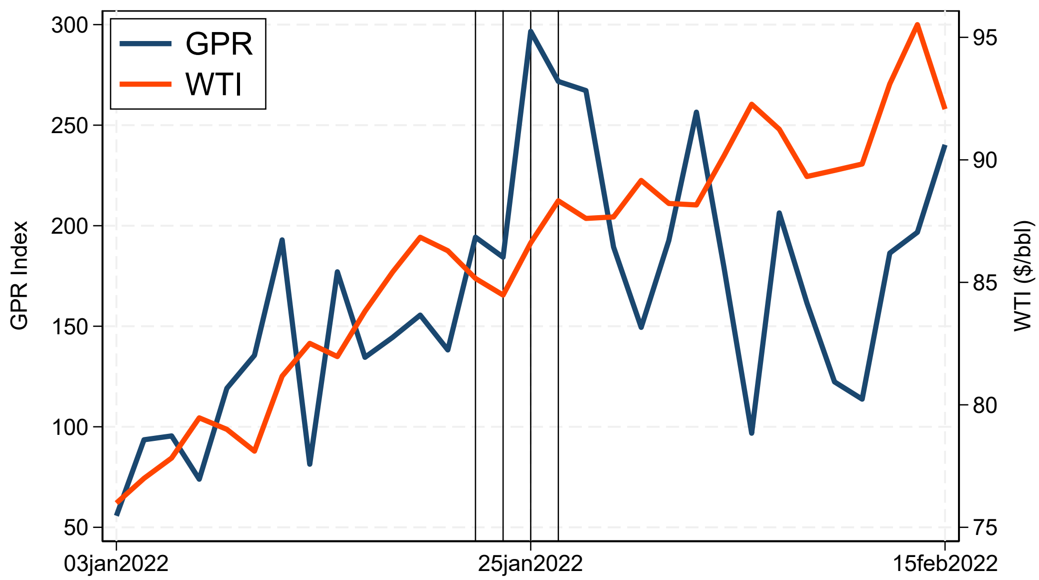
Event 30 – Assassination of Qasem Soleimani (2020/01/06)

The US killing of Iran's top general marked a major escalation in US–Iran tensions, prompting fears of retaliation and market repricing of geopolitical risks. [Source: New York Times]



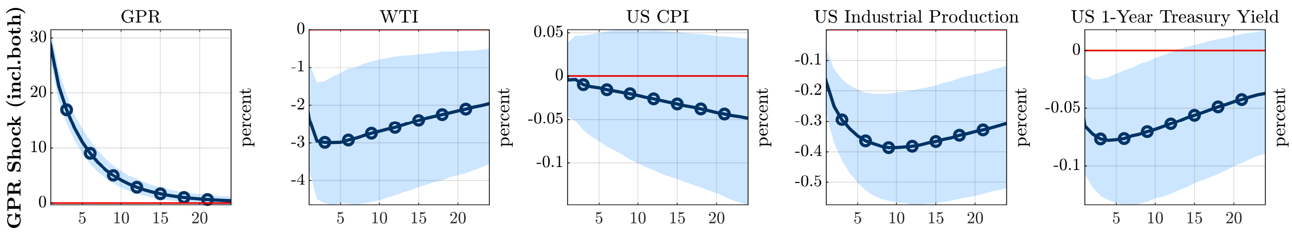
Event 31 – Russia–Ukraine Invasion Buildup (2022/01/25)

With Russian forces amassing at the Ukrainian border, markets anticipated the possibility of a full-scale invasion, contributing to elevated risk premiums across energy and financial markets. [Source: New York Times]



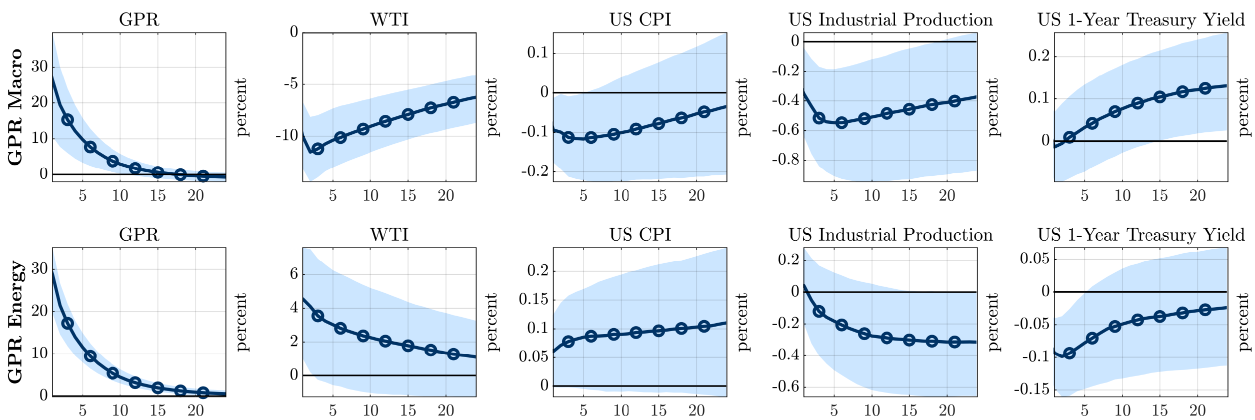
A Additional Results

Figure A.1 Response to a generic GPR shock (GPR ordered first)



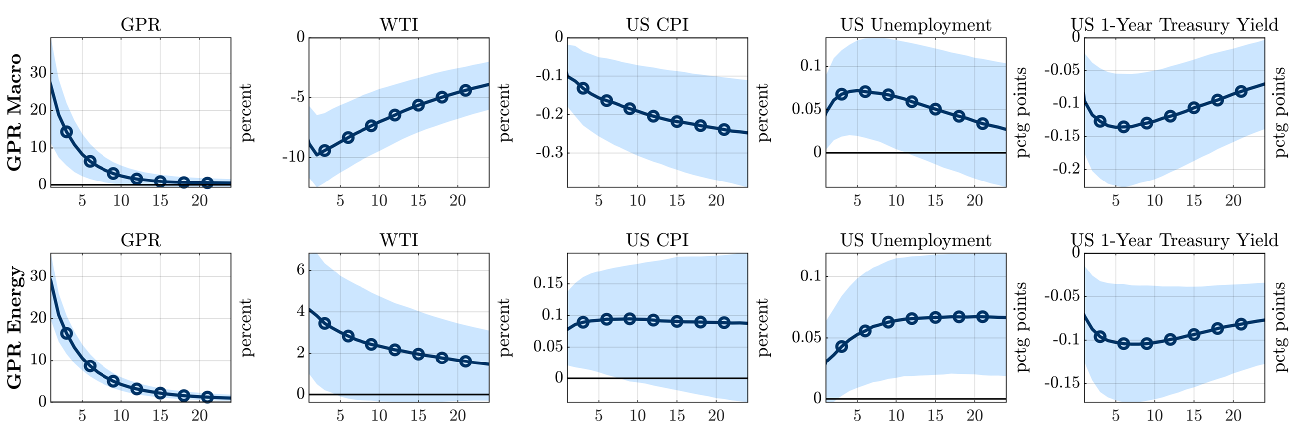
The figure(s) displays the estimated responses in a model where GPR surprises are ordered first. Black lines indicate point estimates and blue areas outline the 68% credible set.

Figure A.2 IRFs of the baseline variables (including Covid)



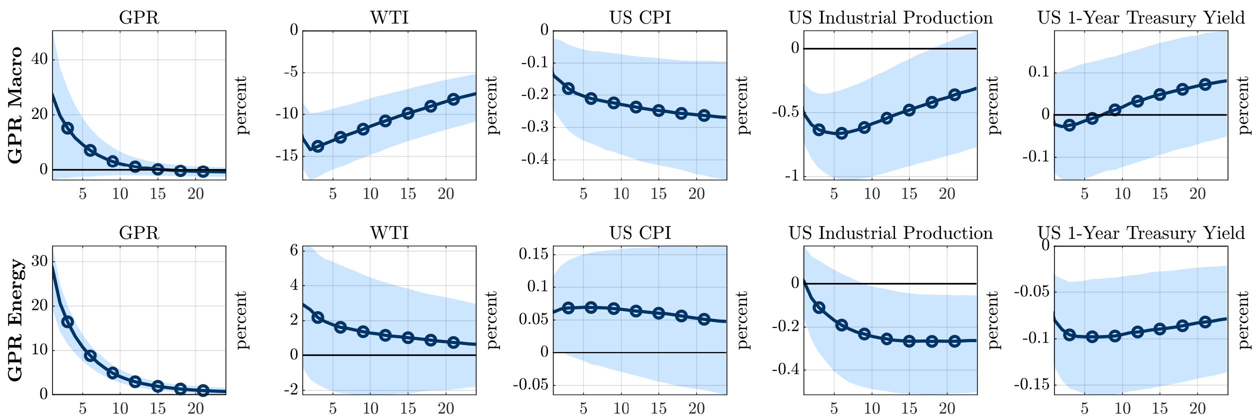
The figure(s) displays the estimated responses of the baseline set of variables when the sample is extended up to the end of 2022. Black lines indicate point estimates and blue areas the 68% credible set.

Figure A.3 IRFs of the baseline variables (with unemployment)



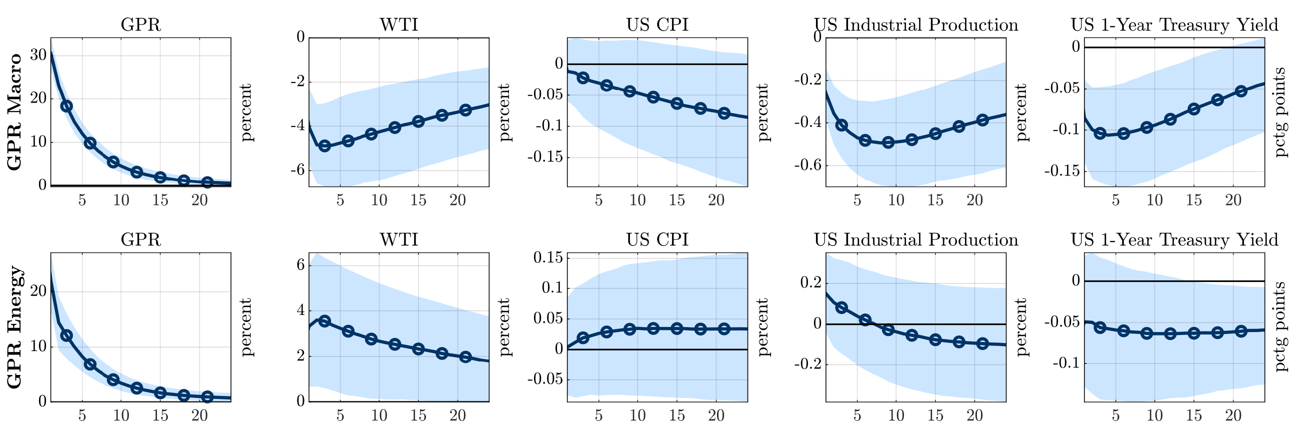
The figure(s) displays the estimated responses of the baseline set of variables when unemployment is included as opposed to industrial production. Black lines are point estimates and blue areas are the 68% credible set.

Figure A.4 IRFs of the baseline variables (w/o reinforcing GPR response)



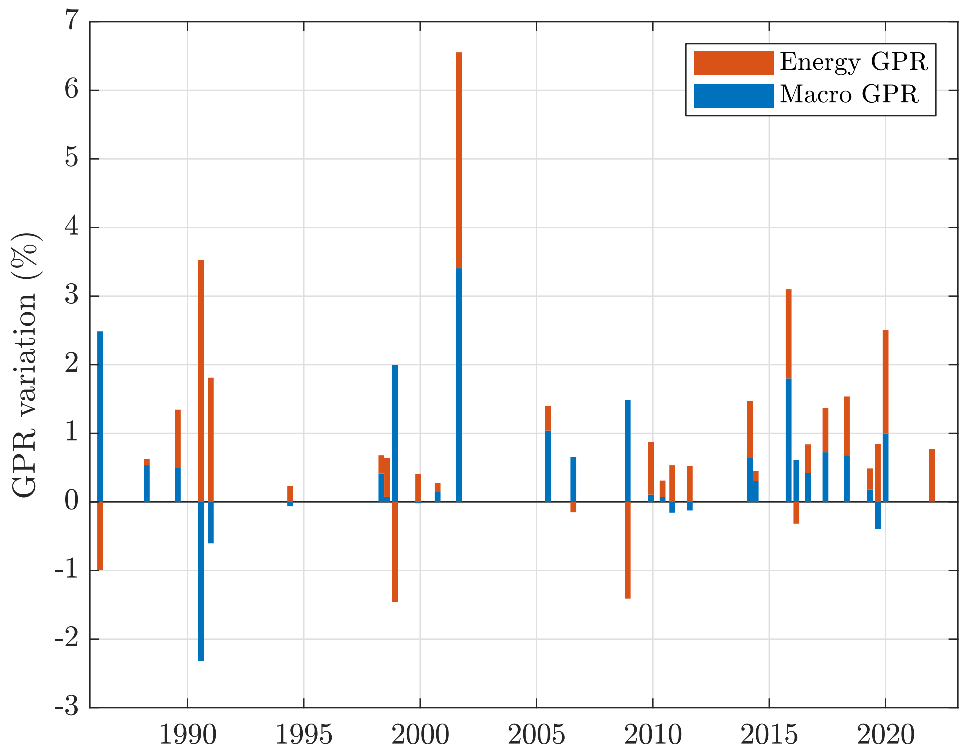
The figure(s) displays the estimated responses when the restriction that GPR must rise for three periods after the shock is relaxed. Black lines are point estimates and blue areas are the 68% credible set.

Figure A.5 IRFs of the baseline variables (poor man's approach)



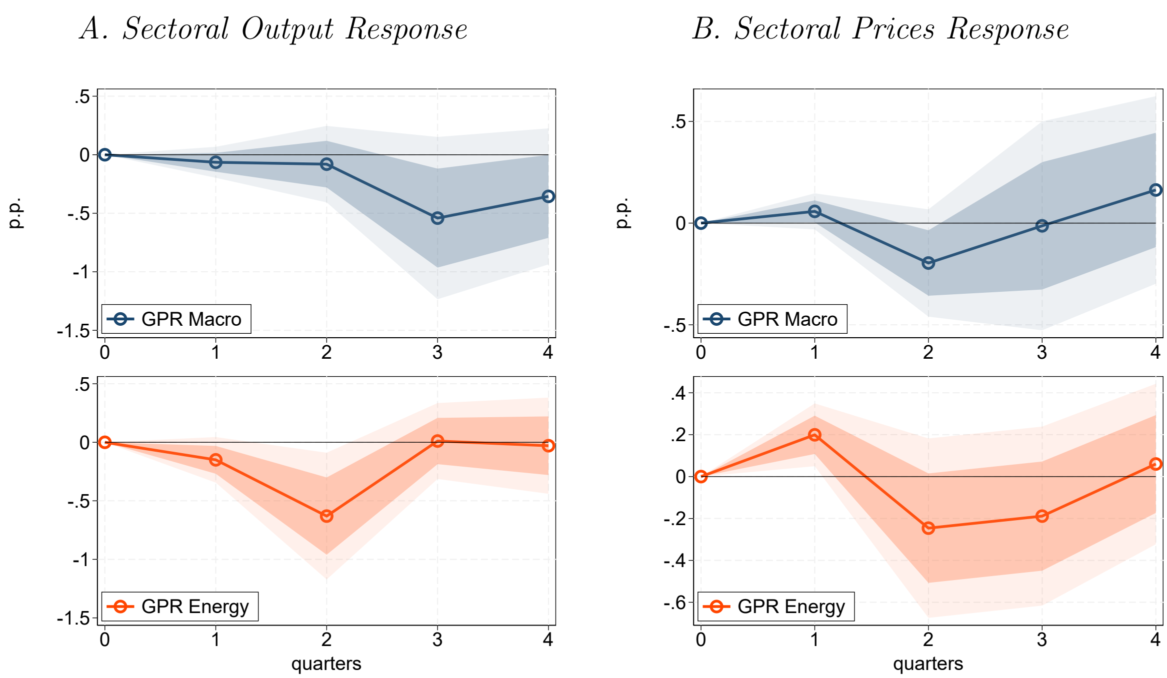
The figure(s) displays the estimated responses when shocks are identified using the poor man's approach by Jarociński and Karadi (2020). Black lines indicate point estimates and blue areas are the 68% credible set.

Figure A.6 HISTORICAL DECOMPOSITION OF GPR SURPRISES



The figure displays the historical decomposition of geopolitical risk surprises into GPR macro and GPR energy shocks implied by the median rotation. Blue bars outline the contribution of GPR macro shocks, while red bars outline the contribution of GPR energy shocks. The sum of each pair of bars returns the overall GPR surprise (as in Table 1 or Figure 2).

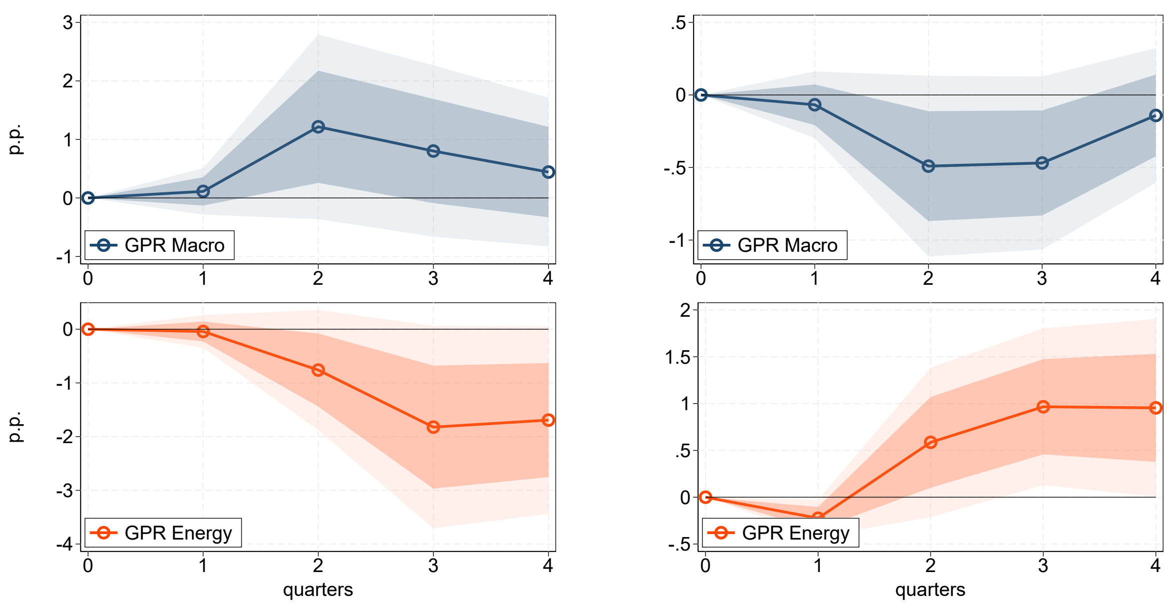
Figure A.7 Average effect of a GPR macro shock and GPR energy shock (excluding Mining)



The figure(s) display the average effect of sectoral value added and prices to a one standard deviation GPR macro and GPR energy shocks. Solid lines indicate point estimates, and shaded areas outline respectively the 68% and 90% credible set.

Figure A.8 Relative effect of a GPR macro shock and a GPR energy shock (excluding Mining)

A. Sectoral Output Response *B. Sectoral Prices Response*



The figure(s) displays the relative effect of a one standard deviation GPR macro and GPR energy shocks on value added and prices of high-intensive sectors compared to the average response. Solid lines indicate point estimates, and shaded areas outline respectively the 68% and 90% credible set.

B Data and Sources

Table B.1 Data and Sources - Baseline VAR Variables

Data	Source	Description	Sample	Freq
GPR surprises	Caldara and Iacoviello (2022)	Number of articles related to adverse geopolitical events in each newspaper for each month.	1986-2022	D
WTI surprises	US Energy Information Administration	Daily spot price of West Texas Intermediate (WTI) crude oil delivered at Cushing in $/bbl.	1986-2022	D
GPR Index	Caldara and Iacoviello (2022)	Share of daily articles related to adverse geopolitical events in major international newspapers.	1986-2022	M
Real WTI Spot Price	US Energy Information Administration	Monthly average of the daily spot price of the West Texas Intermediate (WTI) crude oil delivered at Cushing in $/bbl, deflated with US CPI, and expressed in logs.	1986-2022	M
US Real Industrial Production	US Bureau of Economic Analysis	Inflation-adjusted index of US industrial production, seasonally adjusted, deflated with US CPI, and expressed in logs.	1986-2022	M
US CPI	US Bureau of Economic Analysis	Inflation measure derived from the change in the weighted-average price of a basket of common goods and services.	1986-2022	M
US 1-Year Treasury Yield	Board of Governors of the Federal Reserve System	Monthly average of the 1-Year US government benchmark bid yield, close price.	1986-2022	M

Table B.2 Data and Sources - Sectoral Data

Data	Source	Description	Sample	Freq
Sectoral Output	US Bureau of Economic Analysis	Chain-Type Quantity Indexes for Value Added by Industry.	2005q2-2021q4	Q
Sectoral Prices	US Bureau of Economic Analysis	Chain-Type Price Indexes for Value Added by Industry.	2005q2-2021q4	Q
Sectoral Energy Intensity	International Energy Agency	Amount of energy from all sources employed in production per unit of value added.	2005q2-2021q4	Y

Legend: D=Daily, W=Weekly, M=Monthly, Q=Quarterly, Y=Yearly

Table B.3 Mapping Between BEA and IEA Industries

No.	BEA Industry	IEA Industry (short name)	IEA Industry (full name)
1	Farms	Agriculture	Agriculture, Forestry & Fishing
2	Forestry, Fishing, and Related Activities	Agriculture	Agriculture, Forestry & Fishing
3	Mining, Except Oil and Gas	Mining	Mining & Quarrying
4	Support Activities for Mining	Mining	Mining & Quarrying
5	Construction	Construction	Construction
6	Wood Products	Wood Products	Wood and Wood Products
7	Nonmetallic Mineral Products	Non-Metallic Minerals	Non-Metallic Minerals
8	Primary Metals	Basic Metals	Basic Metals
9	Fabricated Metal Products	Fabricated Metals	Fabricated Metal Products
10	Machinery	Fabricated Metals	Fabricated Metal Products
11	Computer and Electronic Products	Other Manufacturing	Other Manufacturing
12	Electrical Equipment, Appliances, and Components	Other Manufacturing	Other Manufacturing
13	Motor Vehicles, Bodies and Trailers, and Parts	Transport Equipment	Transport Equipment
14	Other Transportation Equipment	Transport Equipment	Transport Equipment
15	Furniture and Related Products	Other Manufacturing	Other Manufacturing
16	Miscellaneous Manufacturing	Other Manufacturing	Other Manufacturing
17	Food and Beverage and Tobacco Products	Food & Beverages	Food & Beverages
18	Textile Mills and Textile Product Mills	Textiles & Apparel	Textiles & Apparel
19	Apparel and Leather and Allied Products	Textiles & Apparel	Textiles & Apparel
20	Paper Products	Paper Products	Paper Products & Printing
21	Printing and Related Support Activities	Paper Products	Paper Products & Printing
22	Chemical Products	Chemicals & Pharma	Chemicals & Pharmaceuticals
23	Plastics and Rubber Products	Other Manufacturing	Other Manufacturing