Monetary Policy Reaction to Geopolitical Risks in Unstable Environments

William Ginn[1] Jamel Saadaoui[2]

[1] Labcorp, USA

[2] University Paris 8, IEE, LED, France

Visiting Scholar Seminar

Banque de France

October 24, 2024

Outline

Research question

Figure 1. A topical question

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How might a wider Middle East conflict affect the global economy?

The world economy is underperforming as a result of tight monetary policies, weaker global trade, a slowing Chinese economy and uncertainty around the US election. An escalation of conflict in the Middle East could increase uncertainties, harming inflation reduction efforts and hurting growth.

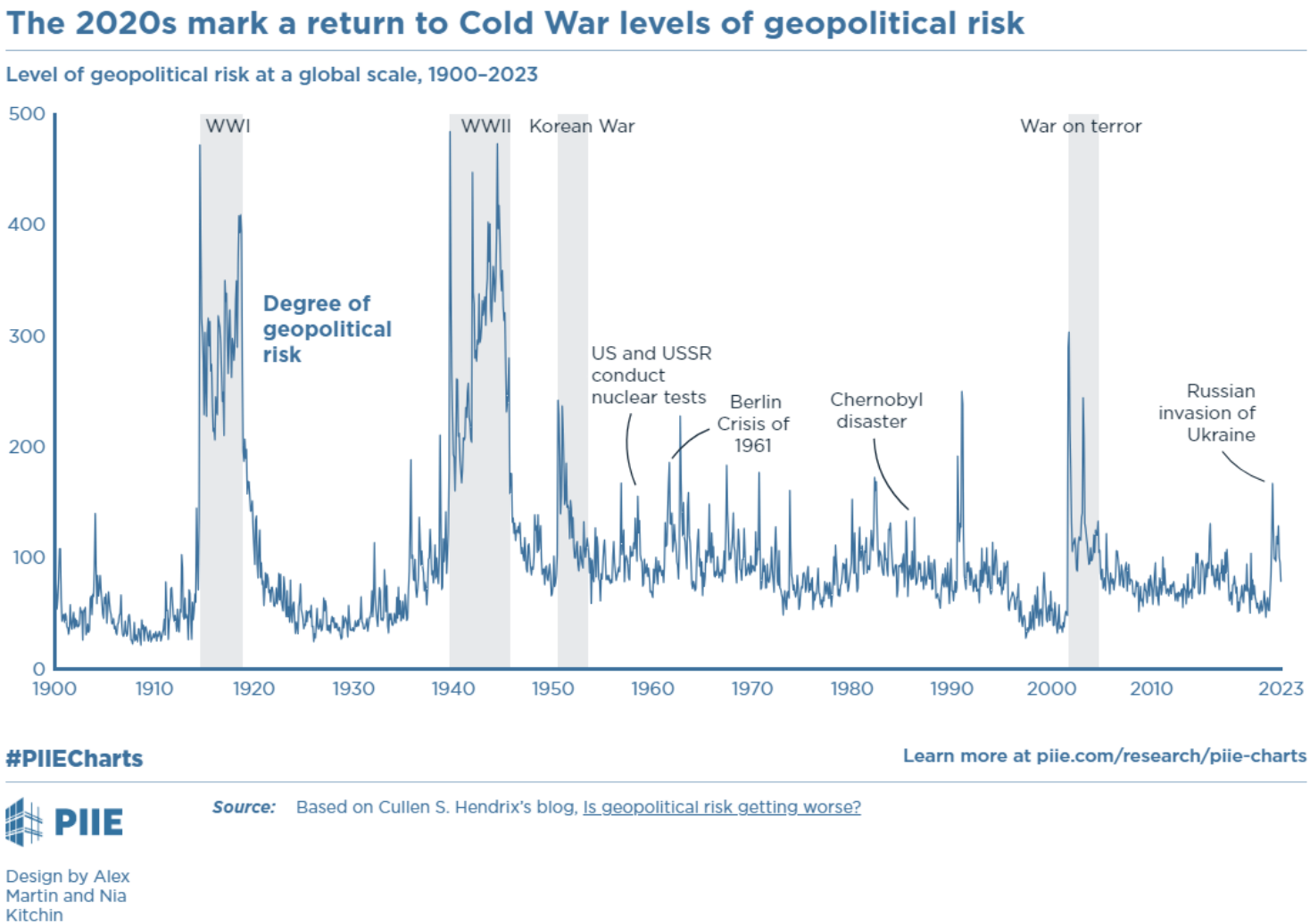
Related Questions

How are geopolitical risks affecting the world economy?

Update: how is the war in Ukraine affecting global food prices?

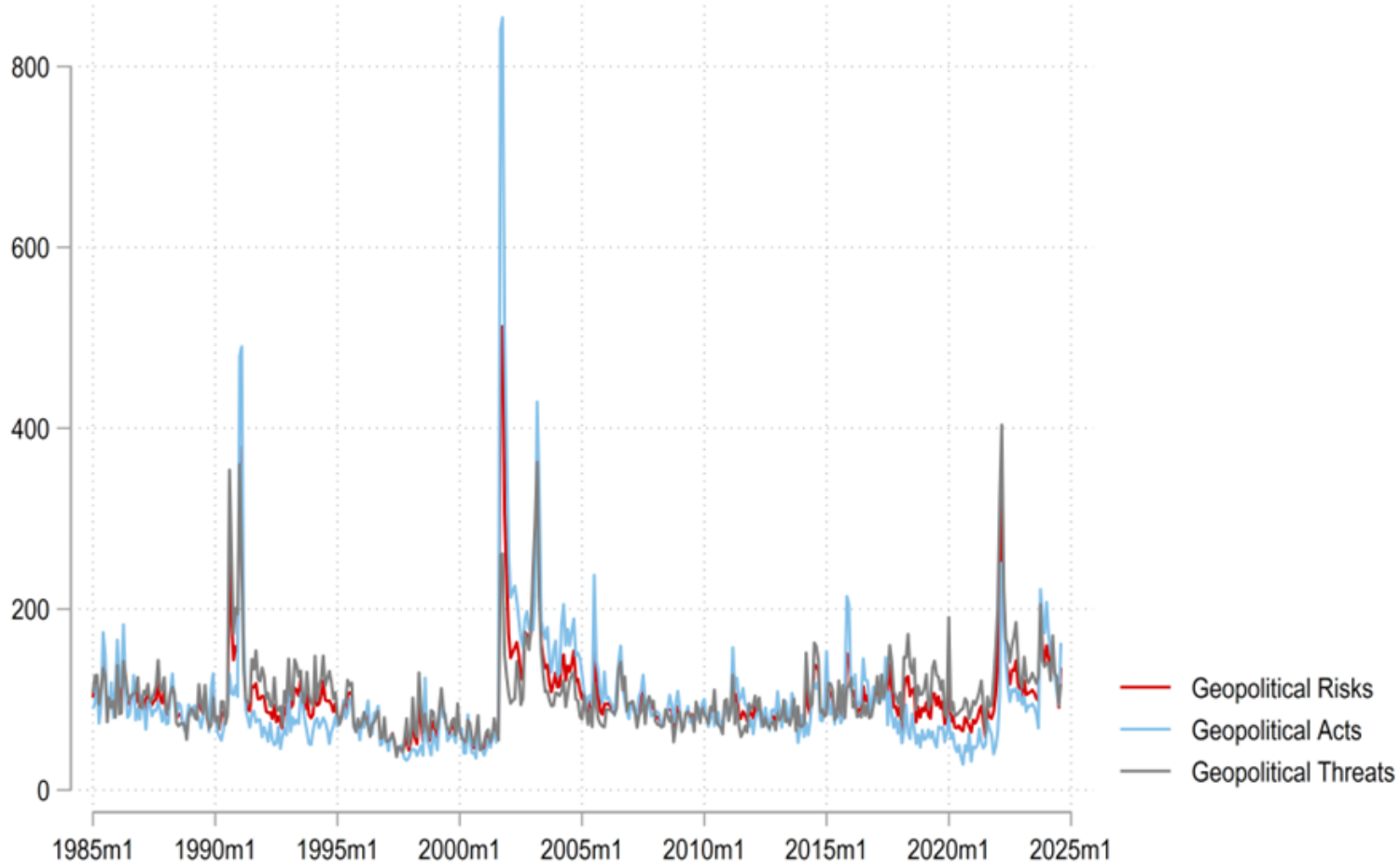
Research question

Figure 2. A topical question



Research question

Figure 3. A topical question



Notes: Normalized to equal to 100 over the period 1985-2019. The spikes correspond to the Gulf War, the 9/11 followed by the Iraq War, and the War in Ukraine.

Research question

Motivation

- World economy has been increasingly influenced by geopolitical considerations (Ukraine, Middle East, China-US, etc.)
- Geopolitical risk shocks affect the economy through different channels
- Some of them are ***inflationary***: such as the commodity price channel, especially the oil price (Mignon and Saadaoui, 2024), and the currency channel (Gopinath, 2015)
- Some other channels are ***deflationary***: such as the consumer sentiment channel and the financial condition channel (Forbes and Warnock, 2012)
- It is difficult to determine *ex ante* whether geopolitical risk shocks are inflationary or deflationary
- Recent research suggests that geopolitical shocks tend to be inflationary throughout history (Caldara et al., 2024)
- **How do geopolitical risk shocks impact monetary policy?**

Research question

Motivation

- More interconnected economies: Since the early 2000s, the world economy has faced numerous geopolitical events: e.g., 9/11, the first war in Ukraine, the China-U.S. trade dispute, the COVID-19 pandemic, and the second war in Ukraine
- Global business cycle and global financial cycle: e.g., Kose et al., 2003, Monfort et al., 2003, Ciccarelli and Mojon, 2010, Ginn, 2023a, Ginn, 2023b, Miranda-Agrippino and Rey, 2020
- Policymakers can respond to global shocks by implementing accommodating monetary policies to counteract negative impacts on economic activity and limiting international financial spillovers

Research question

Motivation

- Our empirical investigation will focus on the effects of geopolitical risks as an exogenous source of uncertainty
- High levels of uncertainty can affect the economic decision-making of individuals and companies, based on the theory of real options (Bernanke, 1983), where uncertainty can increase the option value of waiting (Bloom, 2009)
- Consequently, geopolitical uncertainty leads to a "wait-and-see" approach, thereby influencing the decision of economic agents. This could be illustrated by the ***consumer sentiment channel*** explored in Caldara et al. (2024)
- **Casual evidence:** correlation of -0.144 (p-value of 0.013) between the change in the GPR specific to the US and the change in the US consumer sentiment (January 2000 - June 2024)
- Before GFC, the correlation is strong due to the occurrence of bigger GPR shocks like the 9/11 attacks

Research question

Preview of the results

- We estimate an augmented Taylor rule based on a geopolitical shock via constant and time-varying LP models
- The panel evidence indicates that a geopolitical risk shock implies different monetary policy reactions
- In the short run, the central bank is more accommodative to limiting the negative effects on consumer sentiment (at the 2 month horizon, a unit shock on GPR imply a decrease of .1 pp in the short-term interest rate)
- In the medium run, the central bank is more committed to combating inflation pressures (at the 12 month horizon, a unit shock on GPR imply an increase of .5 pp in the short-term interest rate)
- After GFC, the monetary policy reaction is stronger
- In case of large GPR shocks, the central bank is more accommodative in the short-run

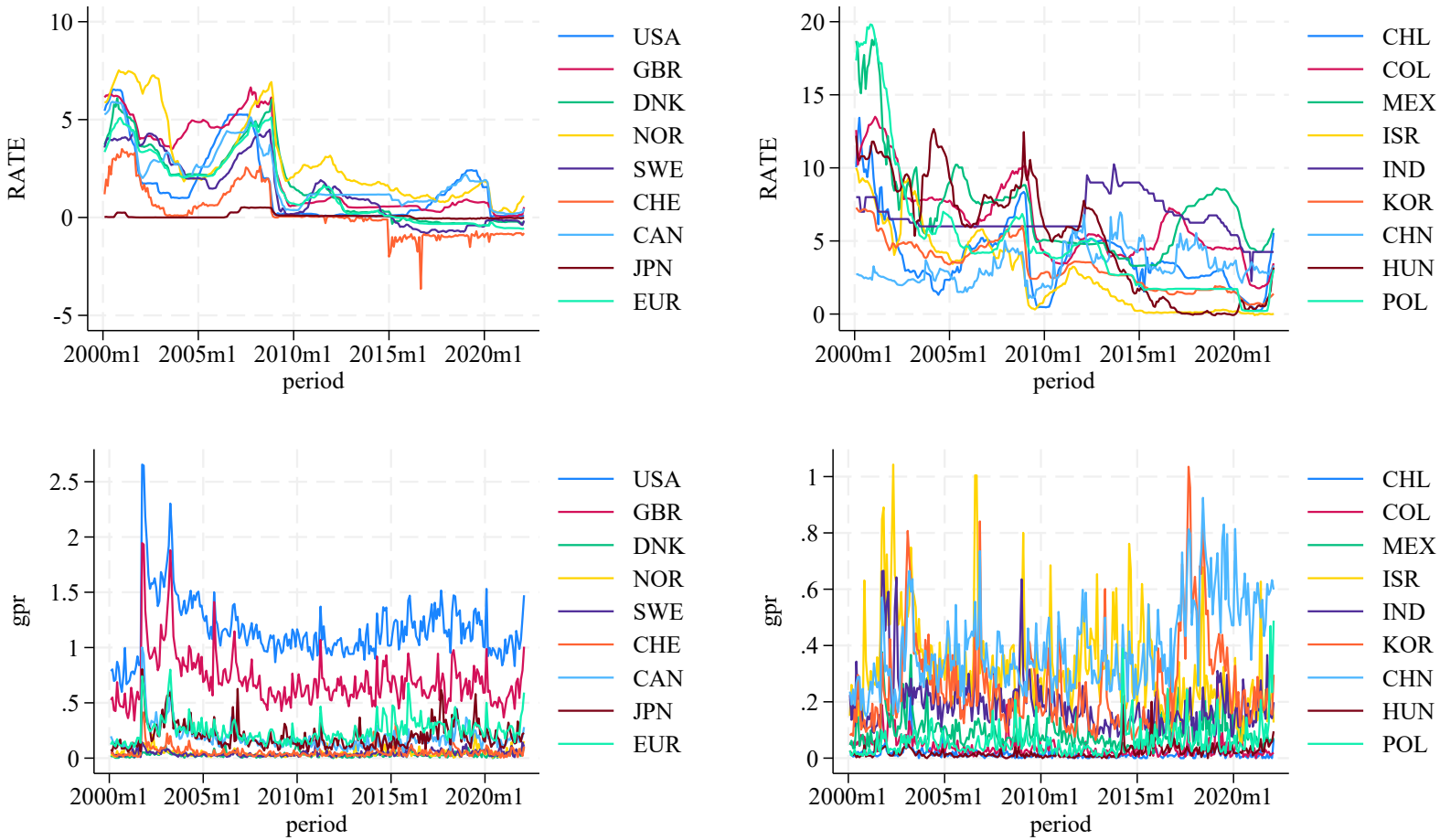
Outline

Empirical approach

- Monthly data for 18 economies (nine developed economies and nine emerging economies) from February 2000 to Ferbuary 2022 (around 80 percent of global GDP)
- These 20 economies include: Switzerland (CHE), Chile (CHL), Canada (CAN), China (CHN), Columbia (COL), Czech Republic (CZE), the Euro zone (19 countries; EUR), the United Kingdom (GBR), Hungary (HUN), Ireland (IRL), India (IND), Israel (ISR), Japan (JPN), Mexico (MEX), South Korea (KOR), Poland (POL), Sweden (SWE), and the United States (USA)

Results - Panel (18 × 265 = 4770 obs.)

Figure 4. Interest rates (RATE) and geopolitical risks (gpr)



Methodology

Empirical approach

- **Theory:** Taylor rule can be augmented with exchange rate in EM (Ball, 1999, Svensson, 2000, Taylor, 1999 and Ghosh et al., 2016); Exchange rate in the loss function: appreciation affect negatively output and inflation and is affected by the interest rate; GPR in the loss function: influence negatively the output and positively the inflation rate (can be included in the loss function of the CB)

- Taylor rules augmented with geopolitical risks following Aizenman (2011): panel regressions, panel local projections, time-series local projections, time-varying local projections

- Panel specification:

$$R_{i,t} = \alpha_i + \beta_1 R_{i,t-12} + \beta_2 GAP_{i,t-1} + \beta_3 INF_{i,t-1} + \beta_3 GPR_{i,t-12} + \beta_4 REC_{i,t-1} + \epsilon_{i,t} \quad (1)$$

- where α_i are country fixed effects to control for unobserved cross-country heterogeneity, R, stands for the short-term interest rate; GAP, the centered moving average of the output gap; INF, is the year-on-year inflation rate; GPR, stands for the GPR index, and REC, is the recession dummy

Methodology

Empirical approach

- In the local projection specification, we estimate the nominal interest rate for country i at time t as follows:

$$R_{i,t+h} = \alpha_i + \rho_i R_{i,t-1} + \beta_h S_{i,t-k} + \sum_{j=1}^{k} \nu_j' \mathbf{X}_{i,t-j} + \epsilon_{i,t+h} \tag{2}$$

- where α_i are country fixed effects to control for unobserved cross-country heterogeneity, ρ_i is an autoregressive term to account for persistence (the autoregressive term ρ_i is further justified to account for policy inertia) and $S_{i,t}$ is a one unit shock to *GPR*
- The vector $\mathbf{X}_{i,t}$ of control variables is the same as in Equation (1)
- Following Jordà and Taylor (2024), we proceed to a lag-aumentation to consider non-stationarity. Besides, lag-augmentated Local Projections (LP) perform similarly to the Newey-West correction
- We add one lag for the shock and control variables (thus, $k = 2$), $\epsilon_{i,t+h}$ relates to the error term at each horizon

Methodology

Empirical paper

- **Recent papers on the LP's / VAR's IRFs:**
- Lloyd and Manuel (2024): One-step (with appropriate controls) vs Two-step approach in the LP approach (OVB)
- Olea Montiel, Plagborg-Møller, Qian and Wolf (2024): LP's are more robust to various form misspecification, while VAR's are not (No free lunch for VARs: need to increase the lags to achieve correct coverage, and not necessary to get the lag length exactly right to achieve correct coverage in LPs)
- Inoue, Rossi, and Wang (2024): parameters evolve over time, local time variation based on the path estimator of Müller and Petalas (2010), Monte-Carlo exercises suggest that adding lags improves performance (bias, RMSE, and coverage)
- Their approach "does not require specifying parametrically the exact form of the instability process"
- Difference with the State-dependent LP: the time-varying structural impulse responses (i.e., the dynamic causal effects of the structural shocks) are deterministic and exogenous and do not suffer from the potential endogeneity of the transition variable when shocks are large, as shown by Gonçalves et al. (2024)

Methodology

Empirical approach

- The central bank may be more accommodating in the wake of a large GPR shock to restore household confidence. This, in turn, might explain why the effect for short-run horizons differs from those in the medium run. Finally, the effect of geopolitical risk shock may be different during recessions or large GPR. The TV-LP model (Inoue et al., JoE 2024) can be formulated as follows:

$$R_{t+h} = c_{t+h} + \beta_{h,t+h} S_t + \sum_{j=1}^{2} v'_{j,t+h} \mathbf{X}_{t-j} + \epsilon_{t+h} \quad h = 0, 1, \ldots \tag{3}$$

$$\text{IRF}(h) = \beta_{h,t+h}$$

- where $\mathbf{X} = (R, INF, GAP, S)'$. The vector of control variables includes the lagged values of the following variables: the short-term interest rate; R; the inflation rate, INF; the output gap, GAP; and the shock on the geopolitical risk index (*GPR*), S

- The parameter of interest is the time-varying impulse response $\beta_{h,t+h}$ following a shock S on the geopolitical risk index; for each $T - h$ months, we obtain a specific impulse response function, where T is the sample size and h is the horizon.

Outline

Results - Panel

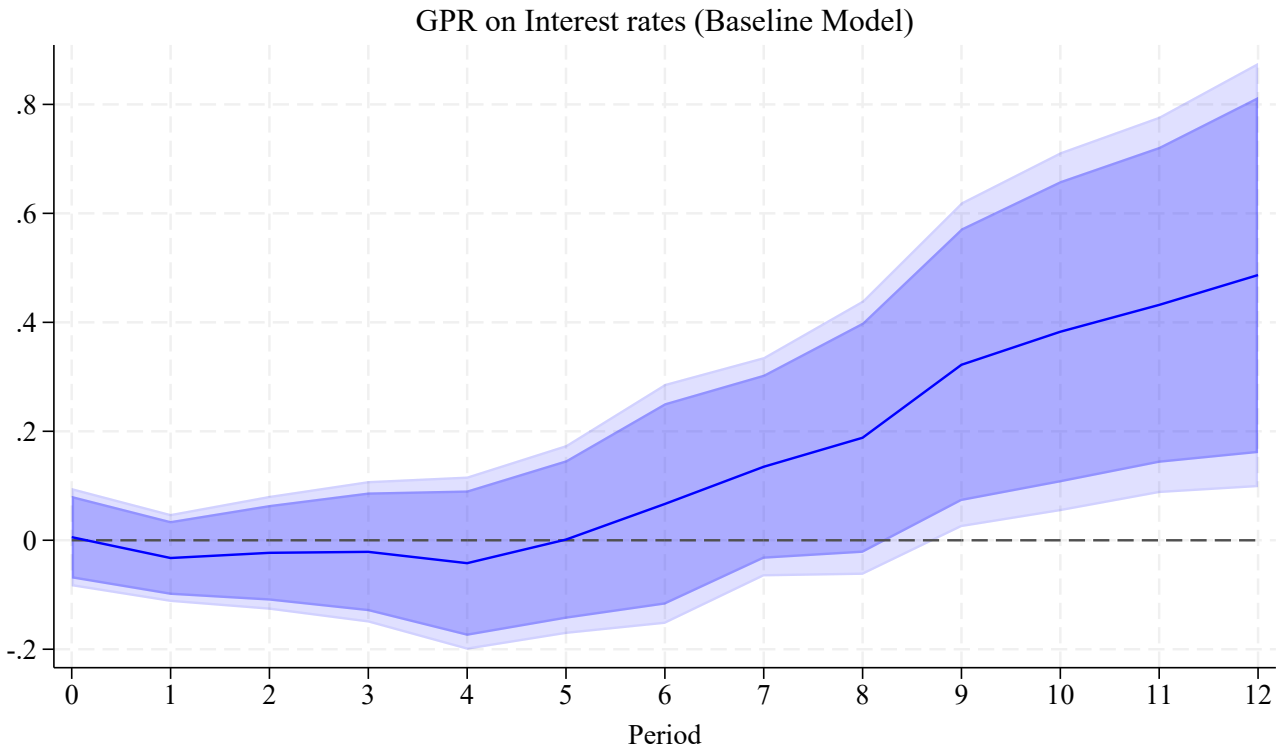
Table 1. Panel Taylor rule augmented with geopolitical risks

	1		2		3	
L12.*R*	0.663	***	0.749	***	0.626	***
	(0.007)		(0.011)		(0.010)	
GAP	0.054	***	0.079	***	0.041	***
	(0.004)		(0.005)		(0.006)	
INF	0.358	***	0.228	***	0.394	***
	(0.011)		(0.018)		(0.015)	
L12.*GPR*	0.774	***	0.896	***	0.357	
	(0.130)		(0.124)		(0.257)	
REC	-0.069		-0.190	***	0.026	
	(0.037)		(0.040)		(0.061)	
Intercept	-0.211	***	-0.340	***	0.058	
	(0.045)		(0.051)		(0.075)	
Number of observations	4554		2277		2277	
Number of countries	18		9		9	
R-squared	0.86		0.79		0.81	
RMSE	1.08		0.83		1.26	
AIC	13604.65		5615.97		7513.55	

Note: The dependent variable is the short-term interest rate. Model 1 is the model for the full sample. Model 2 is the model for the developed countries sample. Model 3 is the model for the sample of emerging countries. The symbol *** indicate statistical signifiance at the one percent level.

Results - Panel

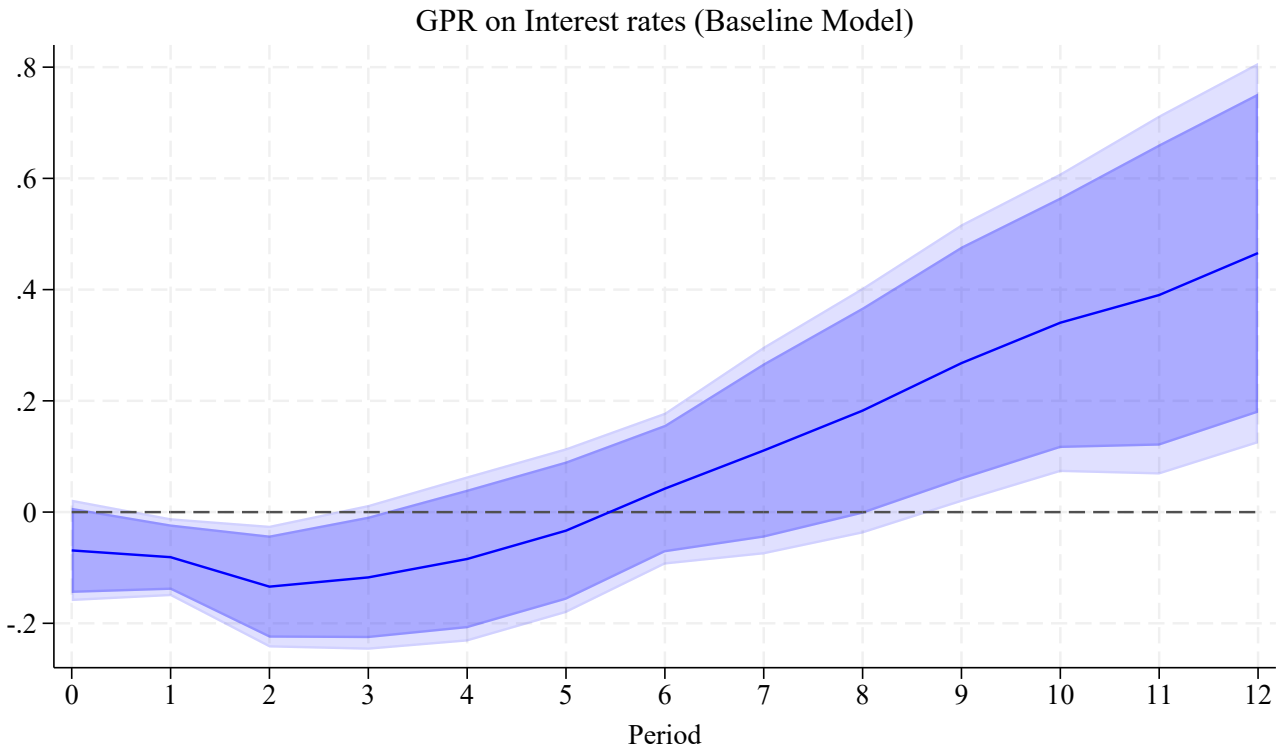
Figure 5. GPR on Interest rates (Full sample)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level.

Results - Panel

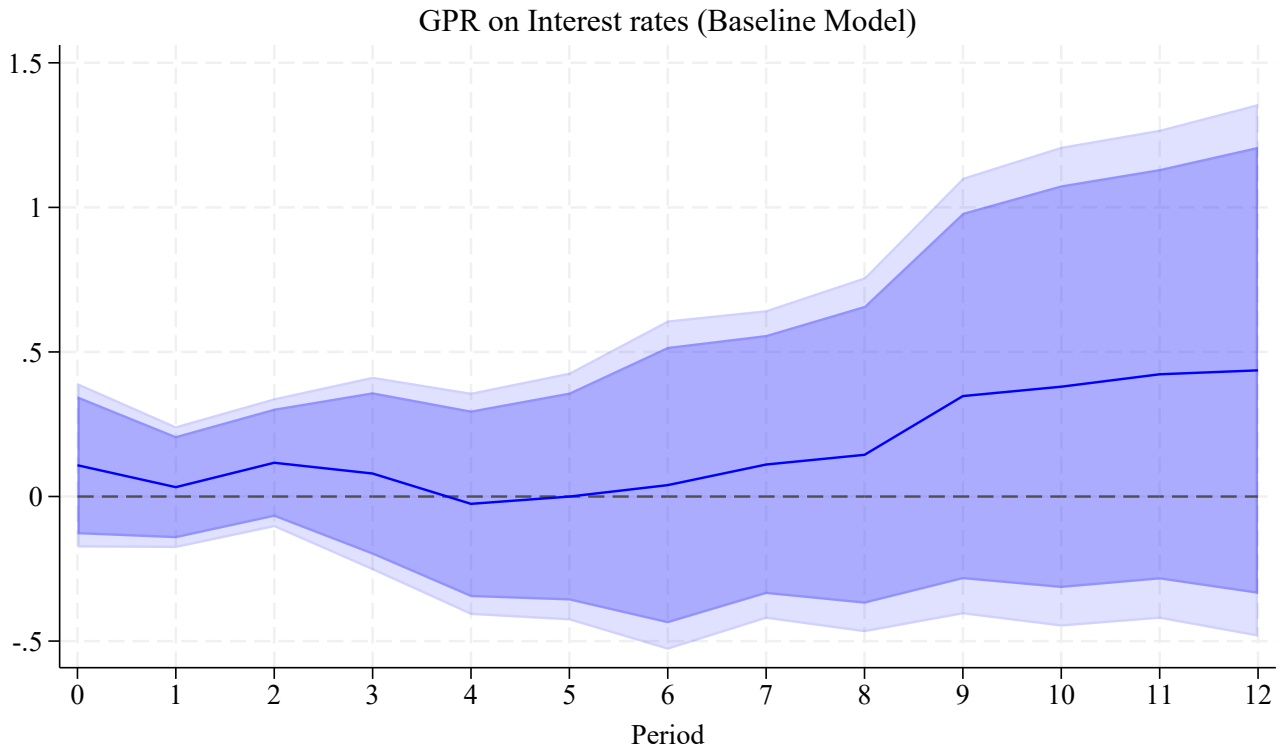
Figure 6. GPR on Interest rates (Developed countries)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level.

Results - Panel

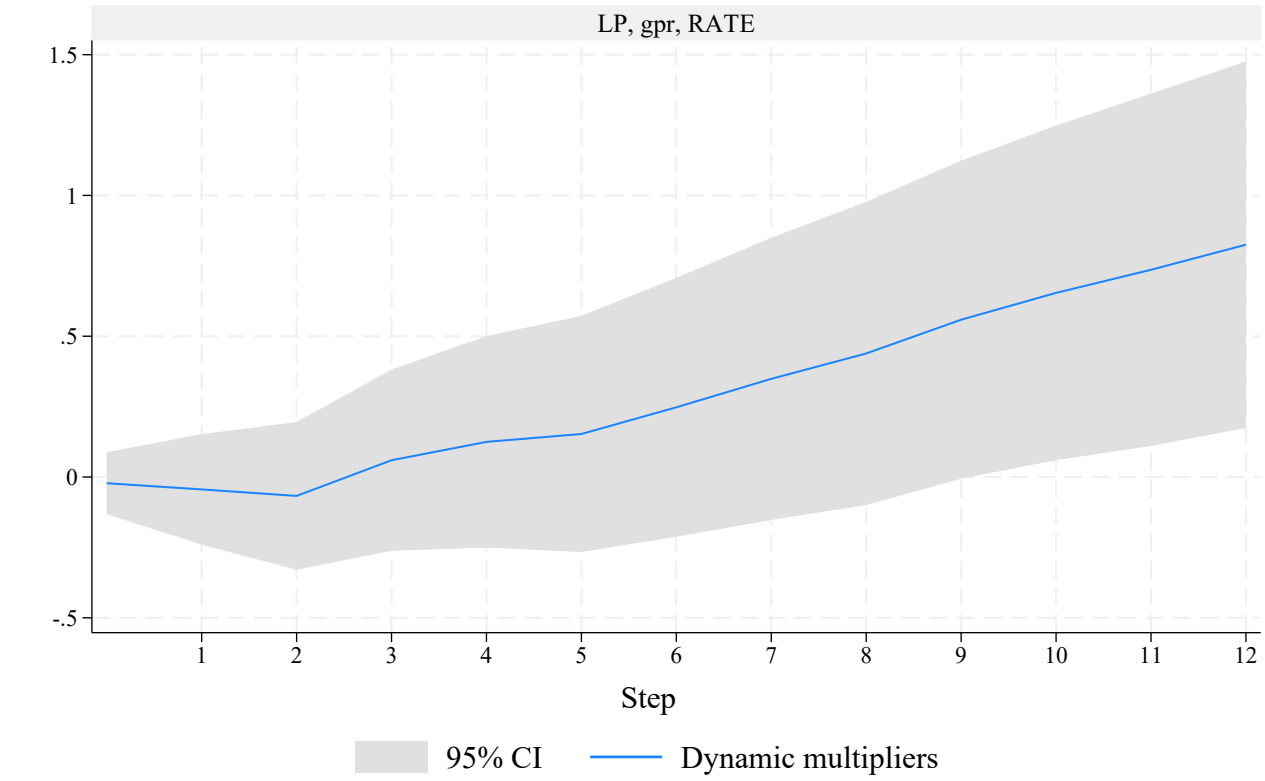
Figure 7. GPR on Interest rates (Emerging countries)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level.

Results - Time series (constant parameter)

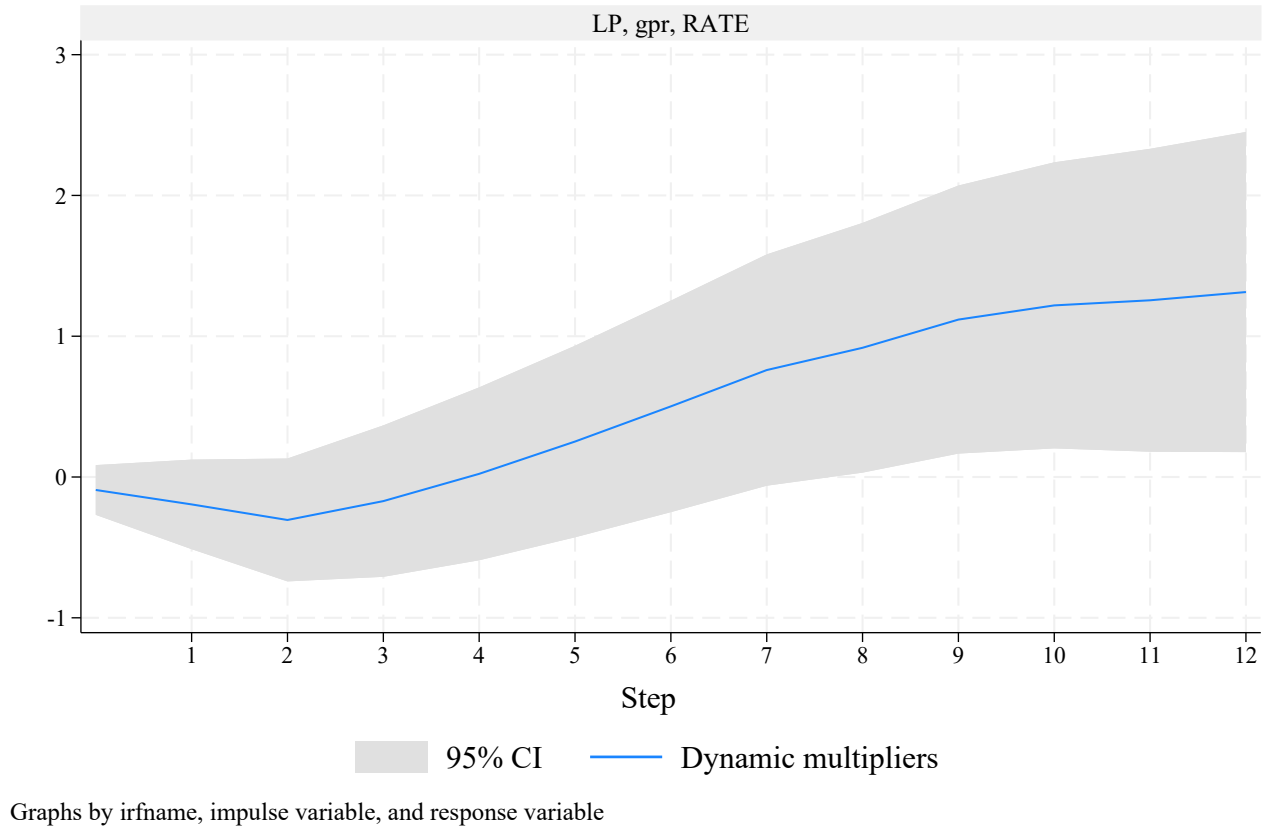
Figure 8. GPR on Interest rates (UK)



Notes: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.

Results - Time series (constant parameter)

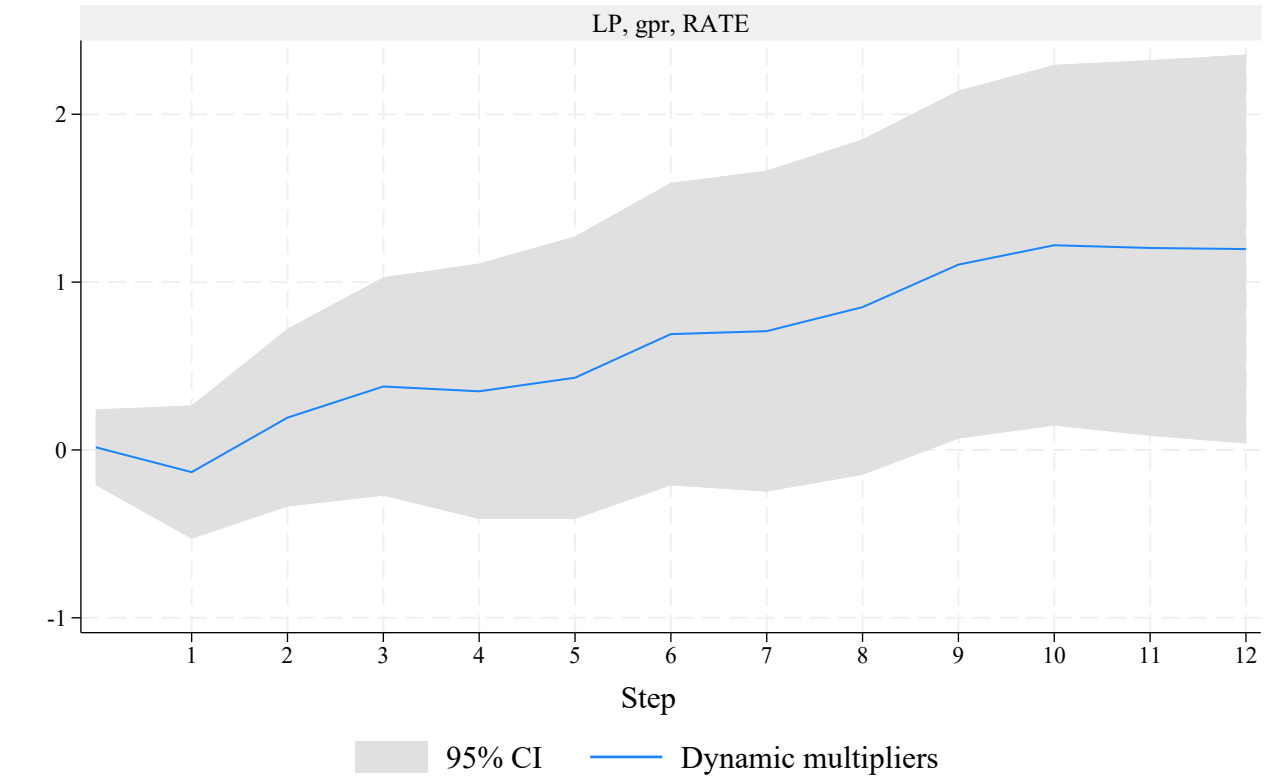
Figure 9. GPR on Interest rates (CAN)



Notes: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.

Results - Time series (constant parameter)

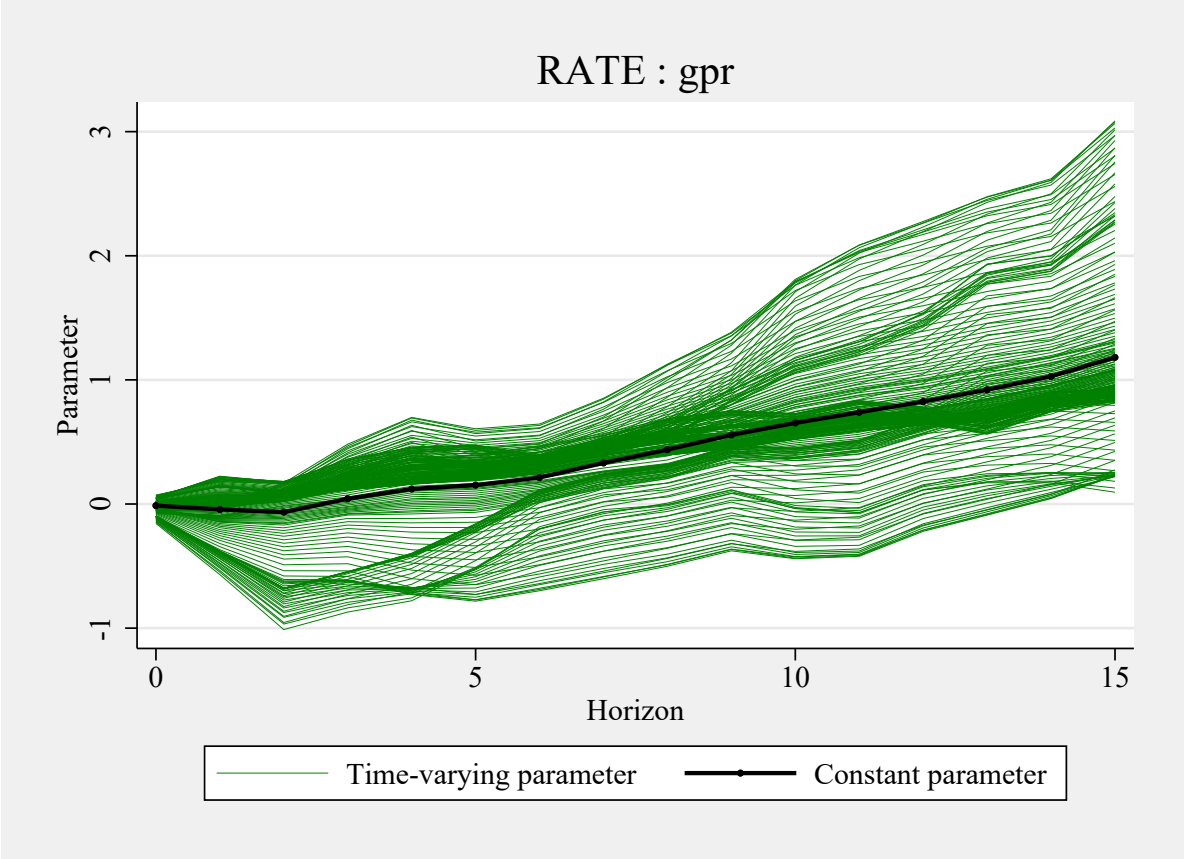
Figure 10. GPR on Interest rates (ISR)



Notes: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.

Results - Time series (time-varying parameter)

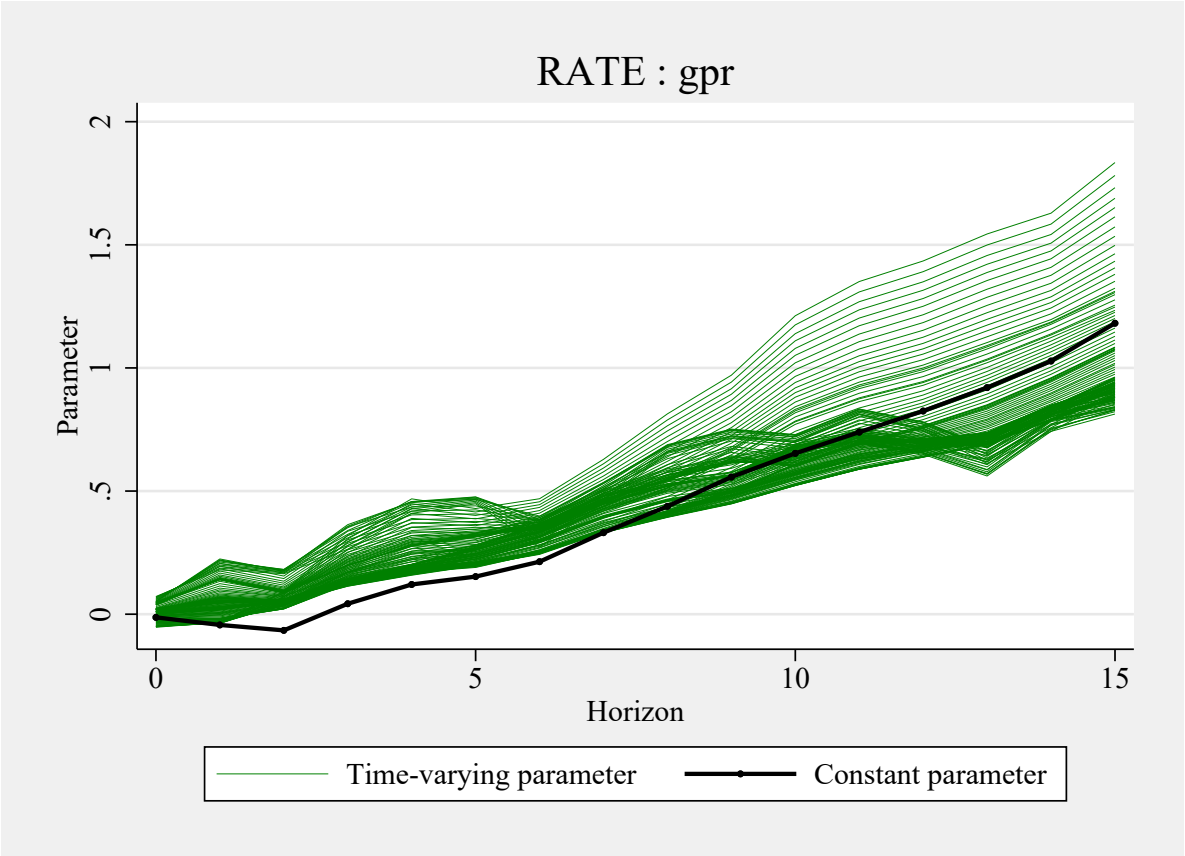
Figure 11. GPR on Interest rates in an unstable environment (United Kingdom)



Note: The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each time horizon, we have a specific IRF. Here, we have $T = 265$ months (from February 2000 to February 2022) and the horizon is equal to $h = 15$ months, thus we have $T - h = 265 - 15 = 250$ impulse response functions.

Results - Time series (time-varying parameter)

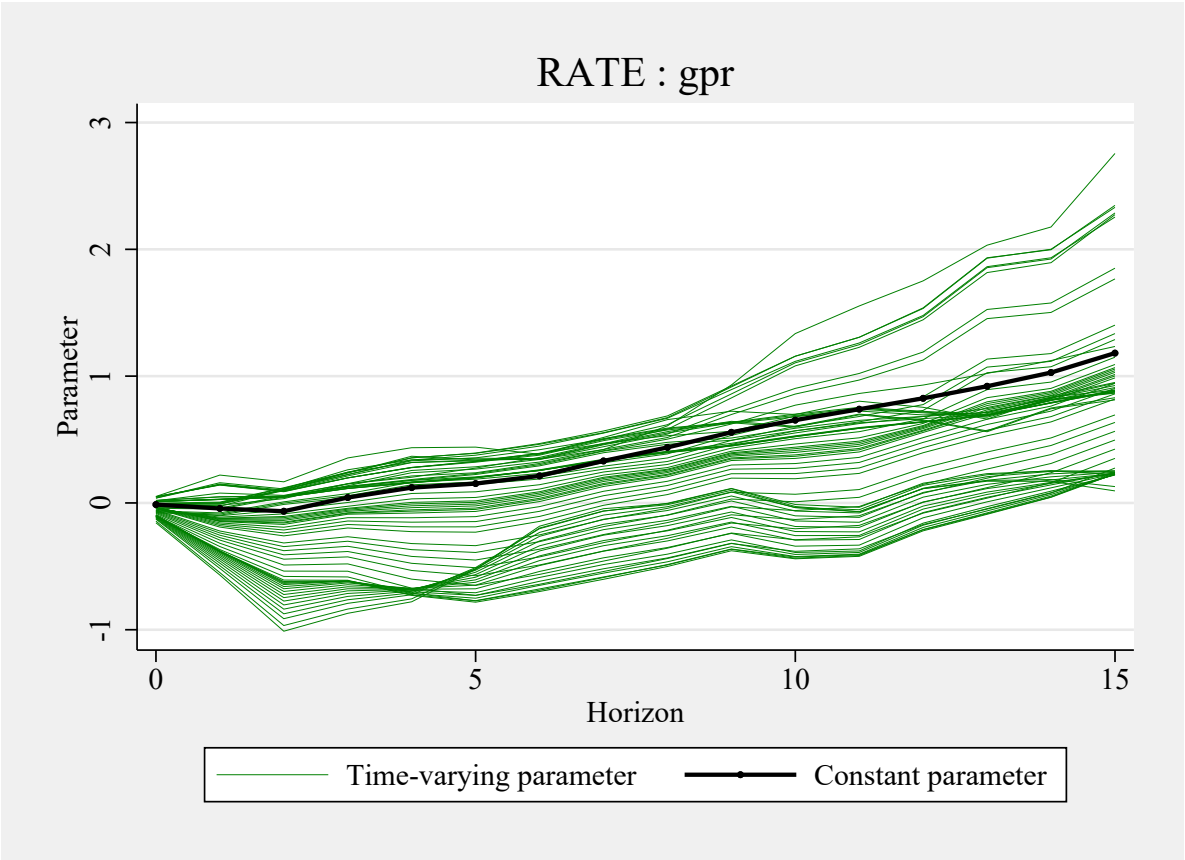
Figure 12. GPR on Interest rates after GFC (United Kingdom)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF after GFC.

Results - Time series (time-varying parameter)

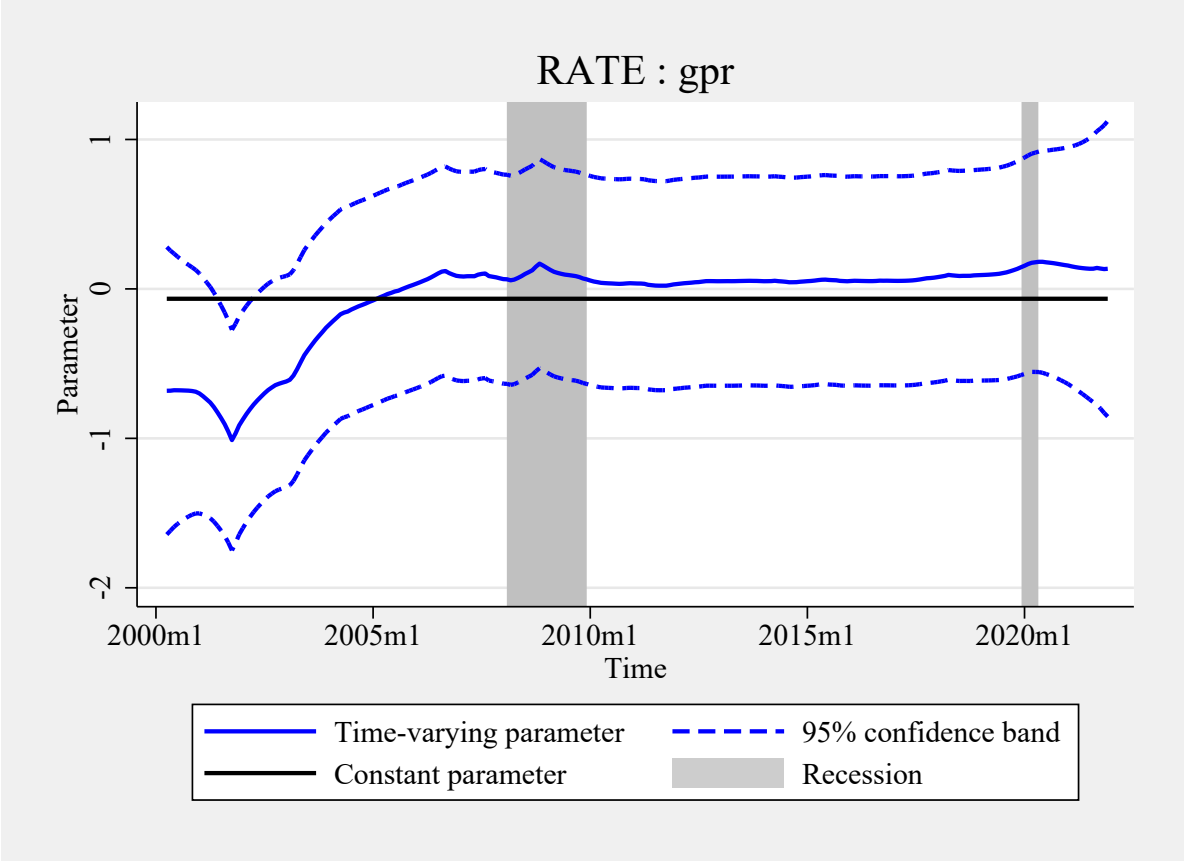
Figure 13. GPR on Interest rates for the top quartile of GPR (United Kingdom)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF for the top quartile of GPR.

Results - Time series (time-varying parameter)

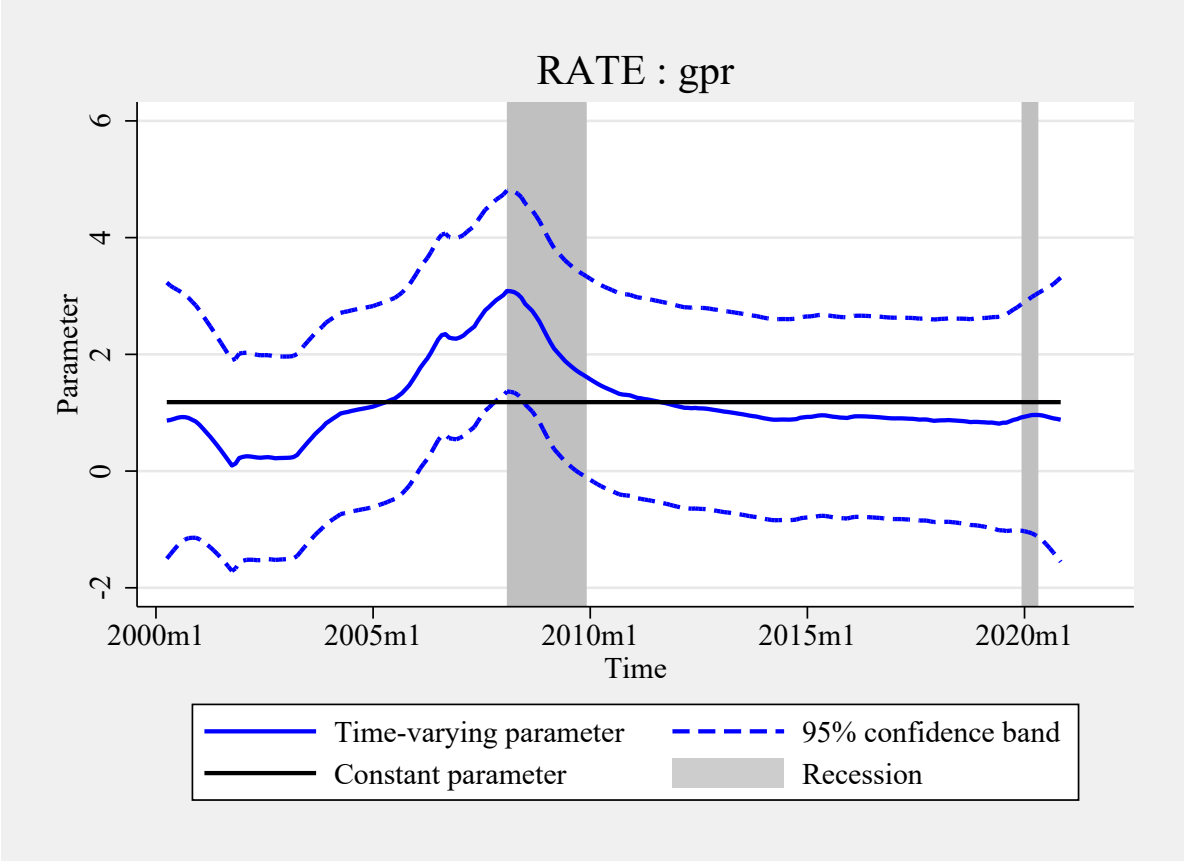
Figure 14. Time-varying parameter plot at horizon $t = 2$ (United Kingdom)



Note: The time-varying parameters for the IRFs are observed 2 months after the shock. The black line corresponds to the unique IRF's coefficient 2 months after the shock. The blue line corresponds the series of IRFs 2 months after the shock. The sample starts in February 2000 and ends after $T - h = 265 - 2 = 263$ months in December 2021.

Results - Time series (time-varying parameter)

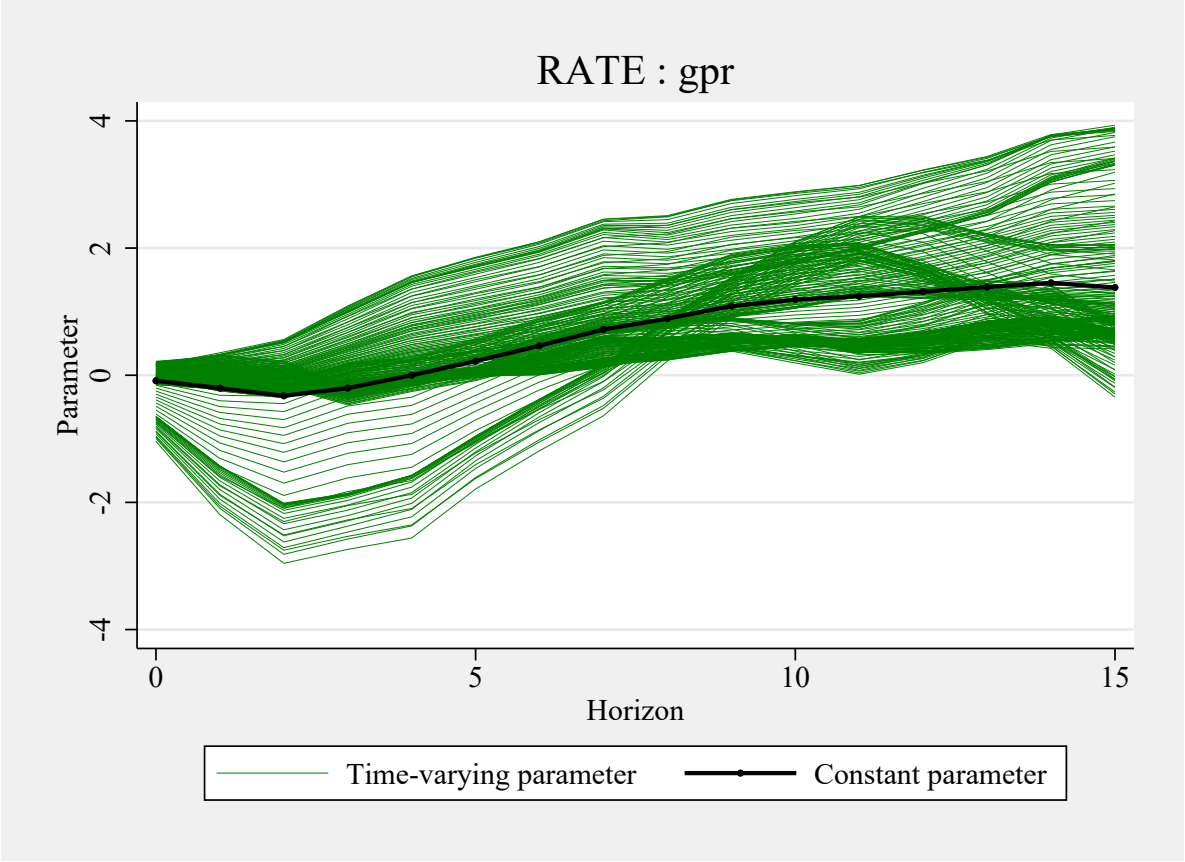
Figure 15. Time-varying parameter plot at horizon $t = 15$ (United Kingdom)



Note: The time-varying parameters for the IRFs are observed 15 months after the shock. The black line corresponds to the unique IRF's coefficient 15 months after the shock. The blue line corresponds the series of IRFs 15 month after the shock. The sample starts in February 2000 and ends after $T - h = 265 - 15 = 250$ months in November 2020.

Results - Time series (time-varying parameter)

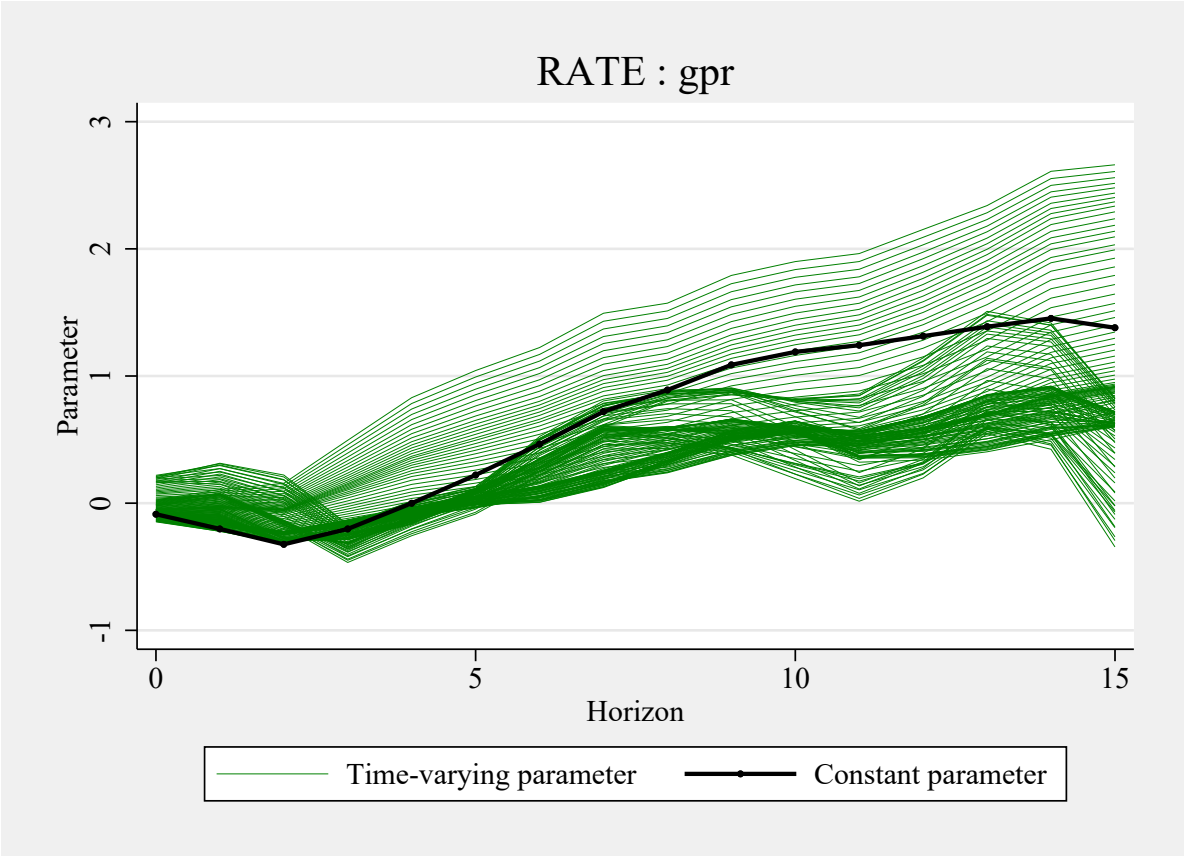
Figure 16. GPR on Interest rates in an unstable environment (Canada)



Note: The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each time horizon, we have a specific IRF. Here, we have $T = 265$ months (from February 2000 to February 2022) and the horizon is equal to $h = 15$ months, thus we have $T - h = 265 - 15 = 250$ impulse response functions.

Results - Time series (time-varying parameter)

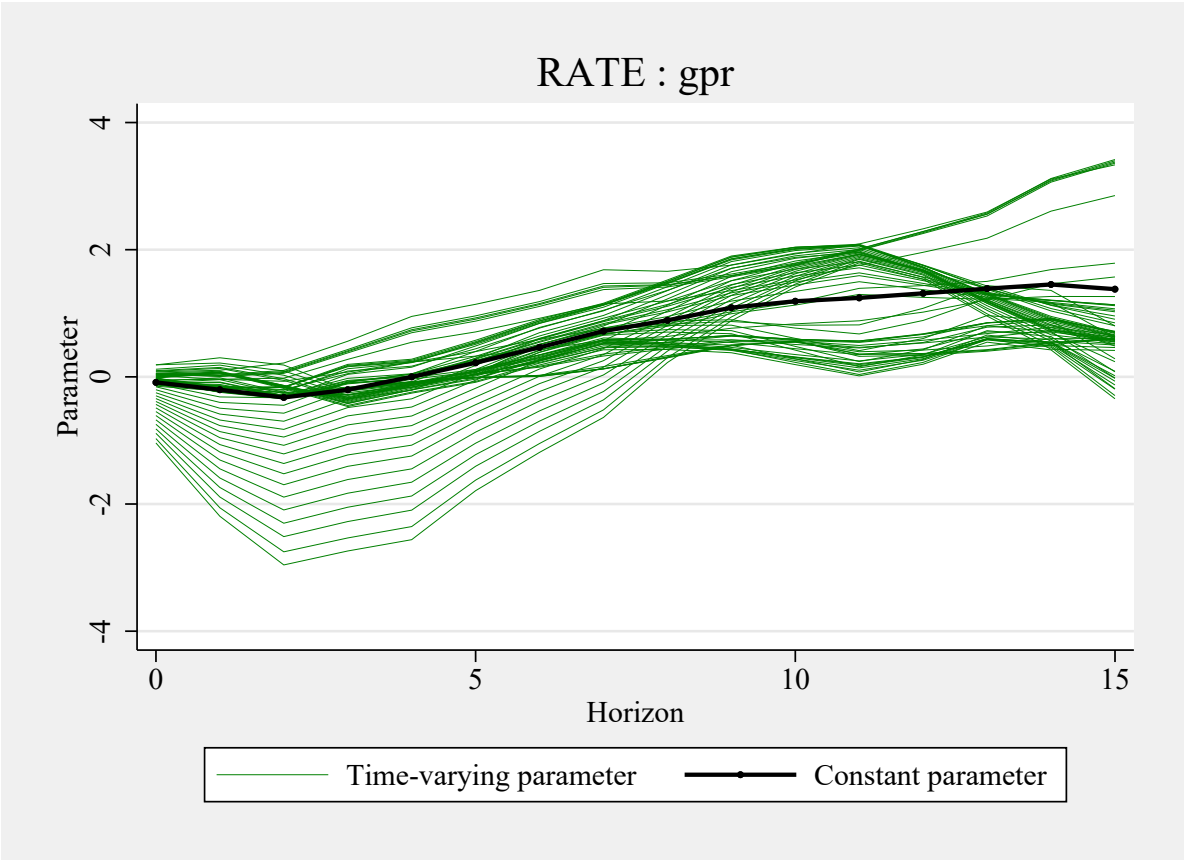
Figure 17. GPR on Interest rates after GFC (Canada)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF after GFC.

Results - Time series (time-varying parameter)

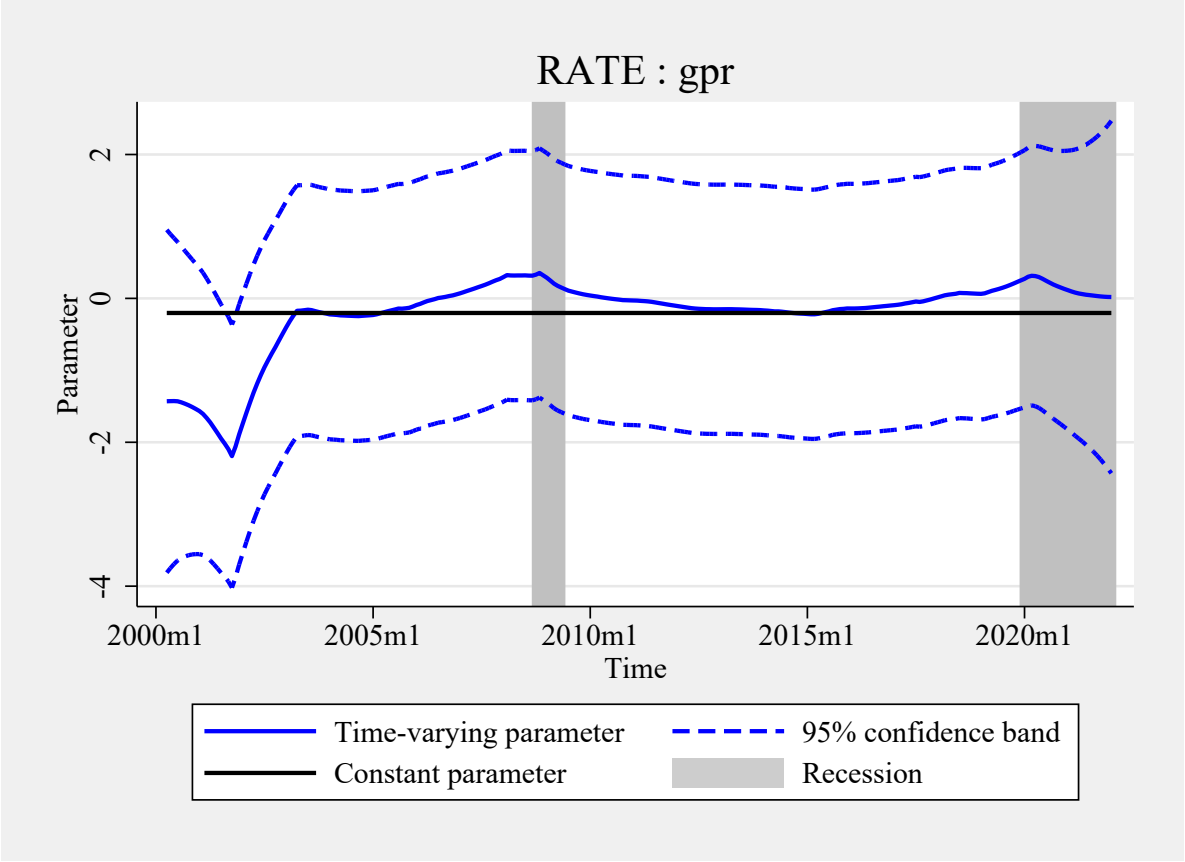
Figure 18. GPR on Interest rates for the top quartile of GPR (Canada)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF for the top quartile of GPR.

Results - Time series (time-varying parameter)

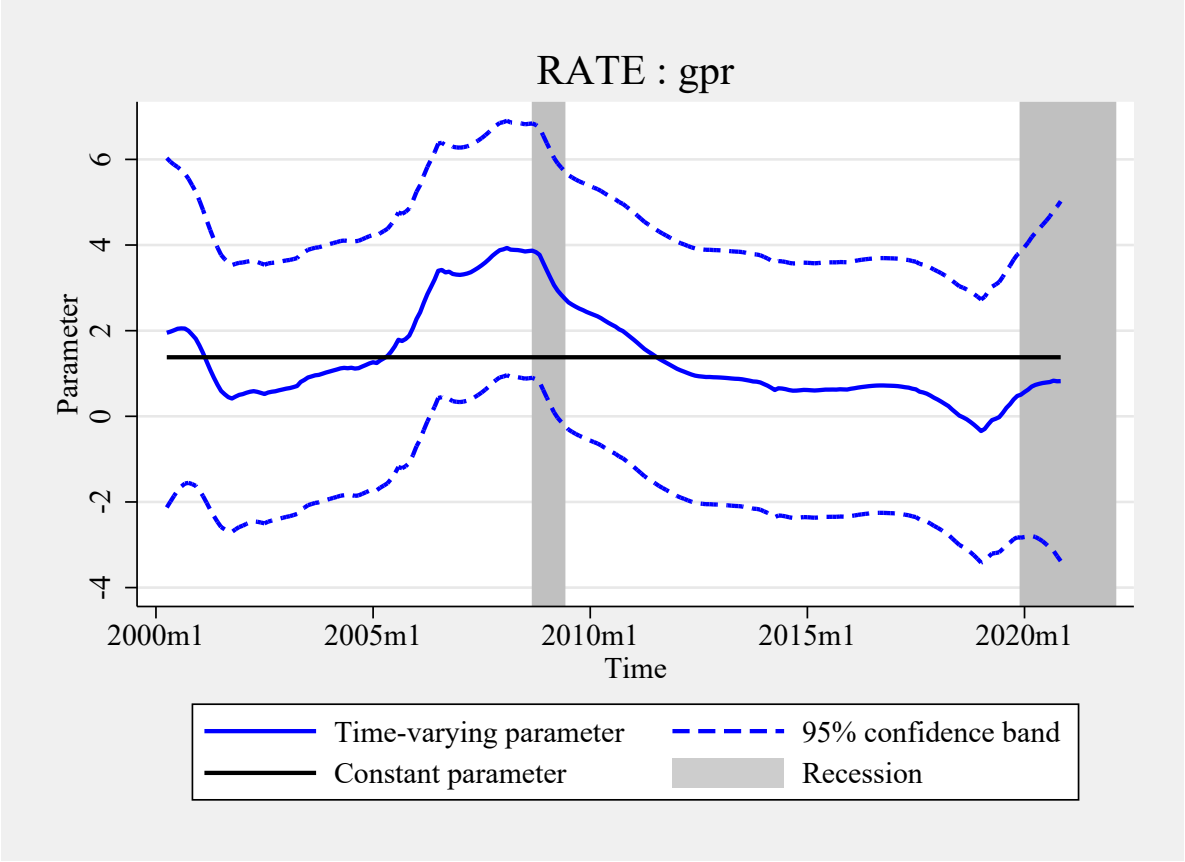
Figure 19. Time-varying parameter plot at horizon $t = 1$ (Canada)



Note: The time-varying parameters for the IRFs are observed 1 month after the shock. The black line corresponds to the unique IRF's coefficient 1 month after the shock. The blue line corresponds the series of IRFs 1 month after the shock. The sample starts in February 2000 and ends after $T - h = 265 - 1 = 264$ months in January 2022.

Results - Time series (time-varying parameter)

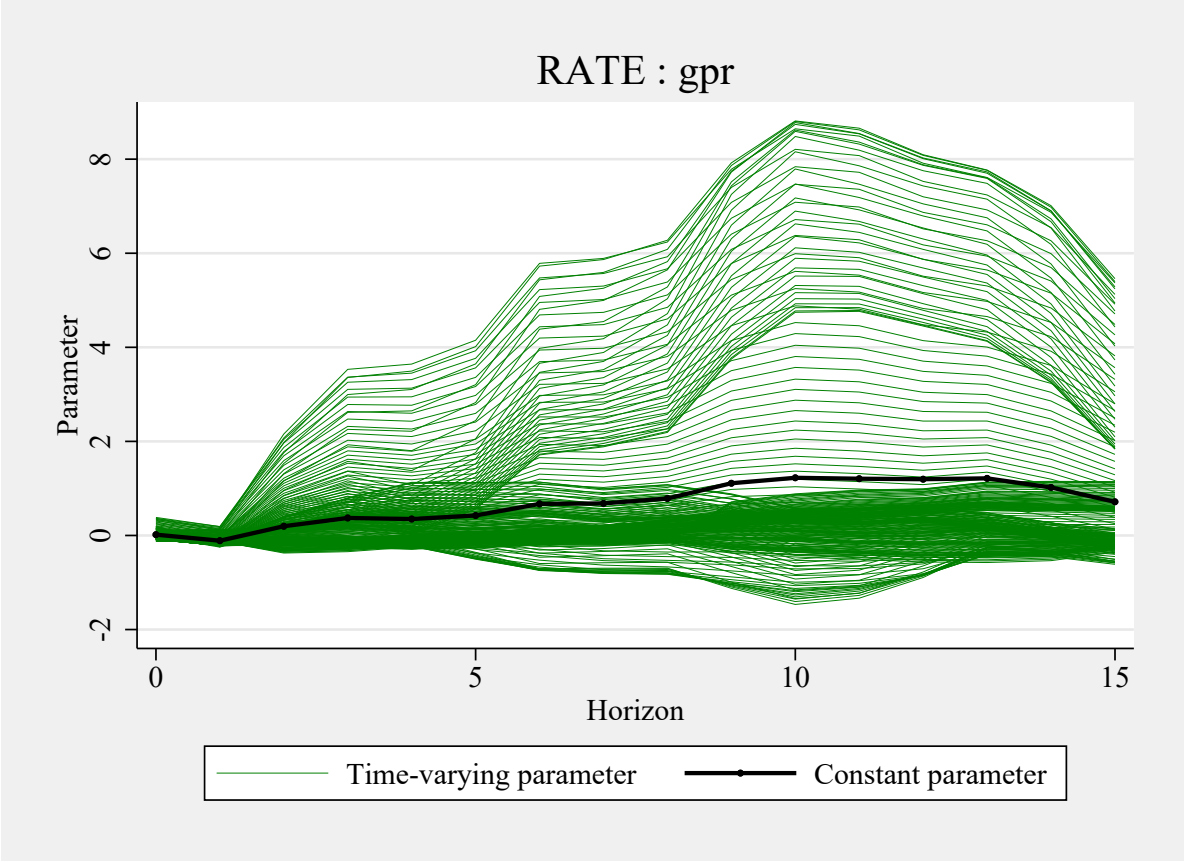
Figure 20. Time-varying parameter plot at horizon $t = 15$ (Canada)



Note: The time-varying parameters for the IRFs are observed 15 months after the shock. The black line corresponds to the unique IRF's coefficient 15 months after the shock. The blue line corresponds the series of IRFs 15 months after the shock. The sample starts in February 2000 and ends after $T - h = 265 - 15 = 250$ months in November 2020.

Results - Time series (time-varying parameter)

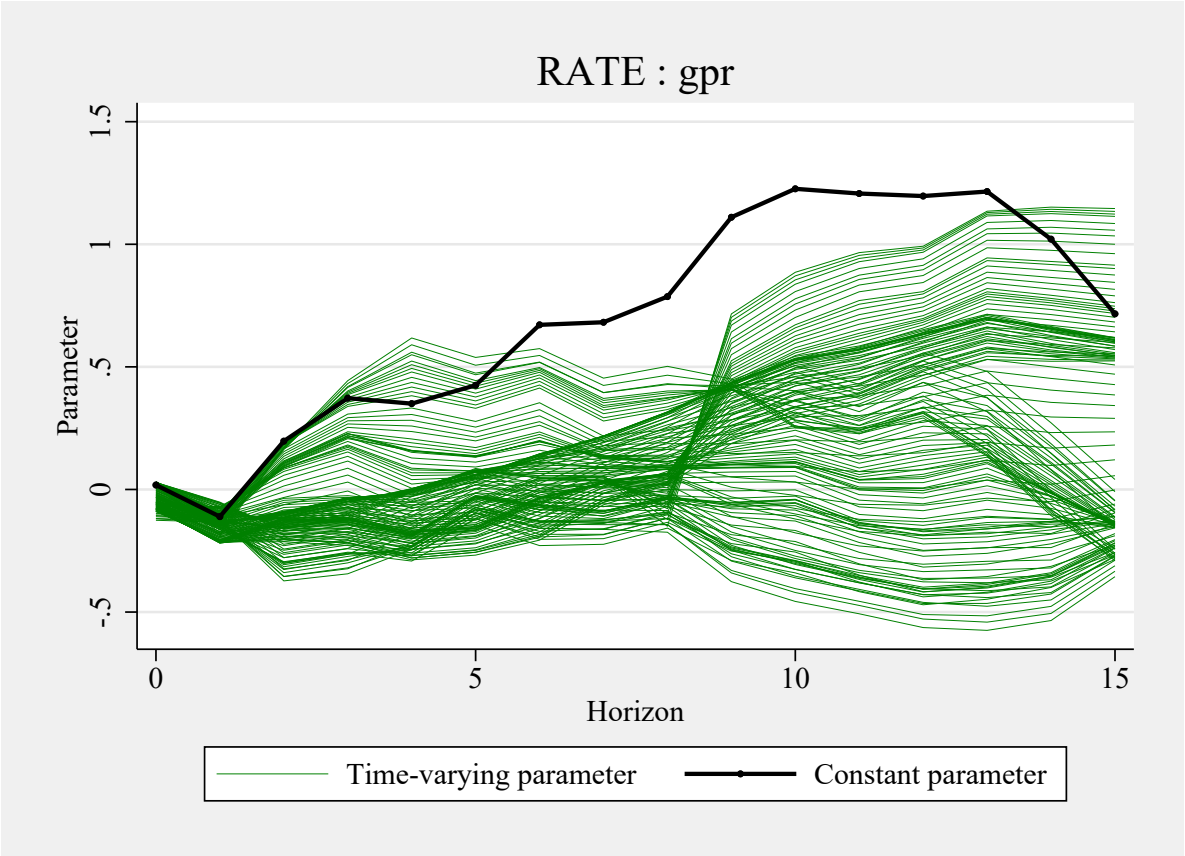
Figure 21. GPR on Interest rates in an unstable environment (Israel)



Note: The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each time horizon, we have a specific IRF. Here, we have $T = 265$ months (from February 2000 to February 2022) and the horizon is equal to $h = 15$ months, thus we have $T - h = 265 - 15 = 250$ impulse response functions.

Results - Time series (time-varying parameter)

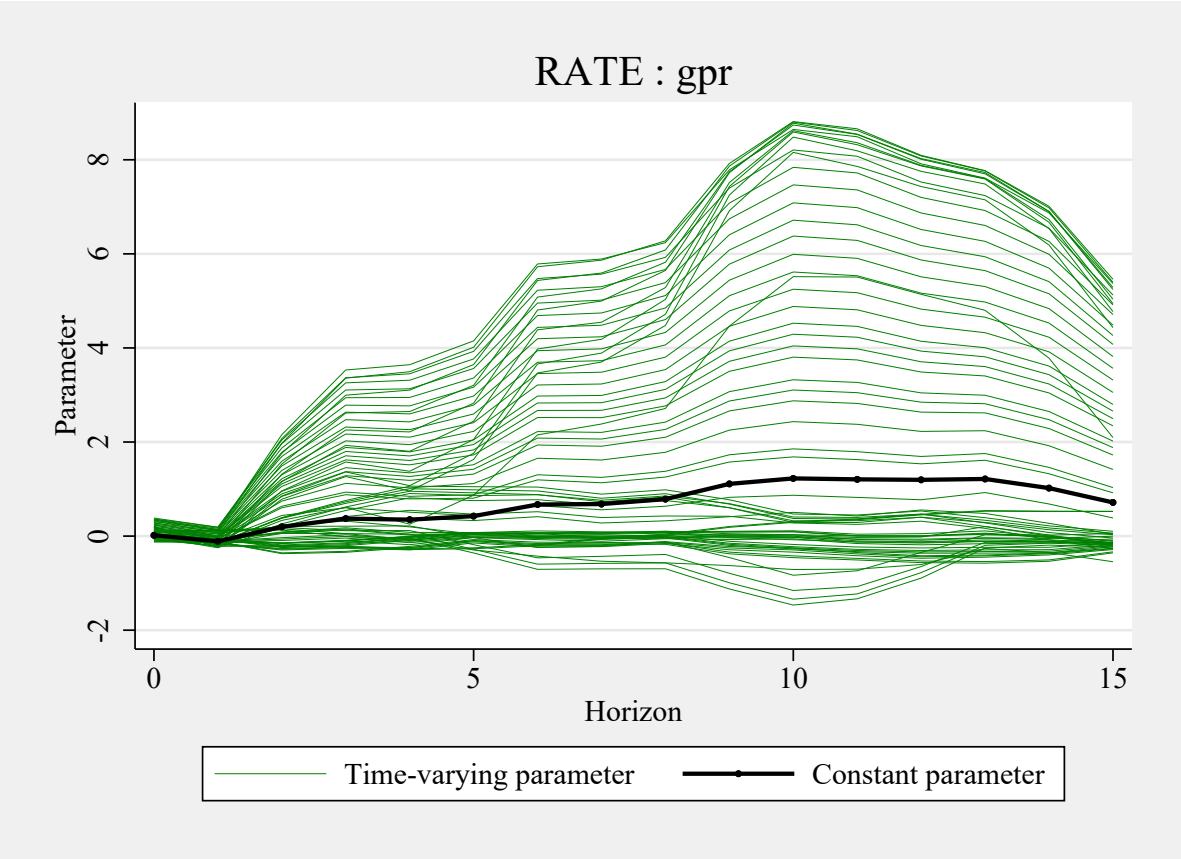
Figure 22. GPR on Interest rates after GFC (Israel)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF after GFC.

Results - Time series (time-varying parameter)

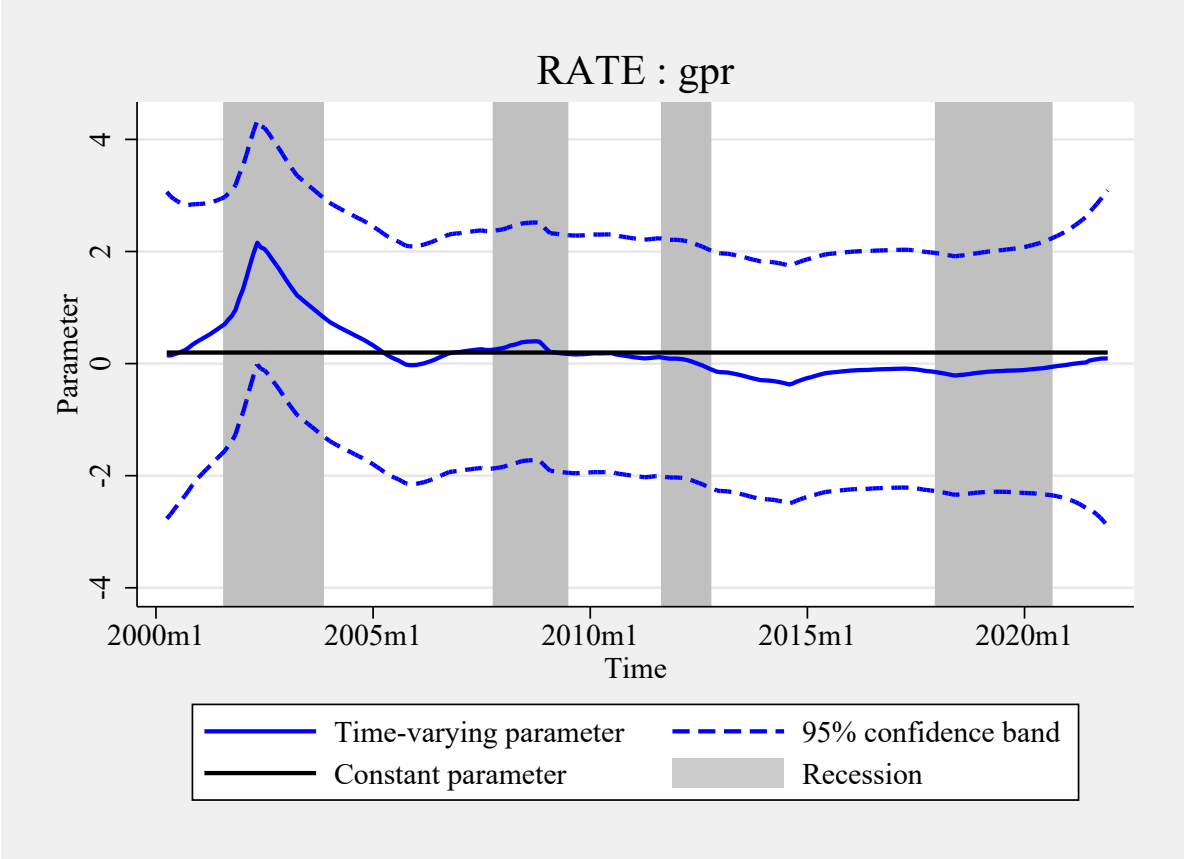
Figure 23. GPR on Interest rates for the top quartile of GPR (Israel)



Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *gpr*, stands for the geopolitical risk index. The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF for the top quartile of GPR.

Results - Time series (time-varying parameter)

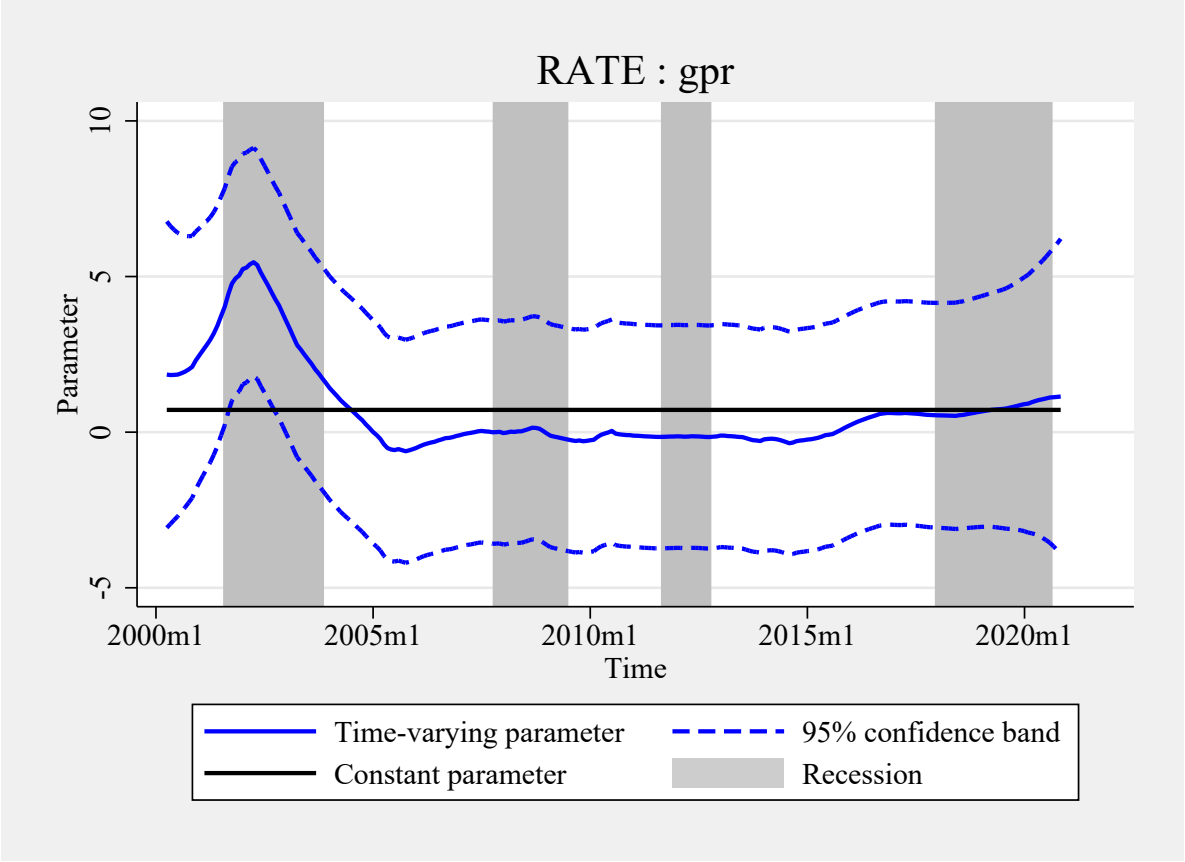
Figure 24. Time-varying parameter plot at horizon $t = 2$ (Israel)



Note: The time-varying parameters for the IRFs are observed 2 months after the shock. The black line corresponds to the unique IRF's coefficient 2 months after the shock. The blue line corresponds the series of IRFs 2 months after the shock. The sample starts in February 2000 and ends after $T - h = 265 - 2 = 264$ months in December 2021.

Results - Time series (time-varying parameter)

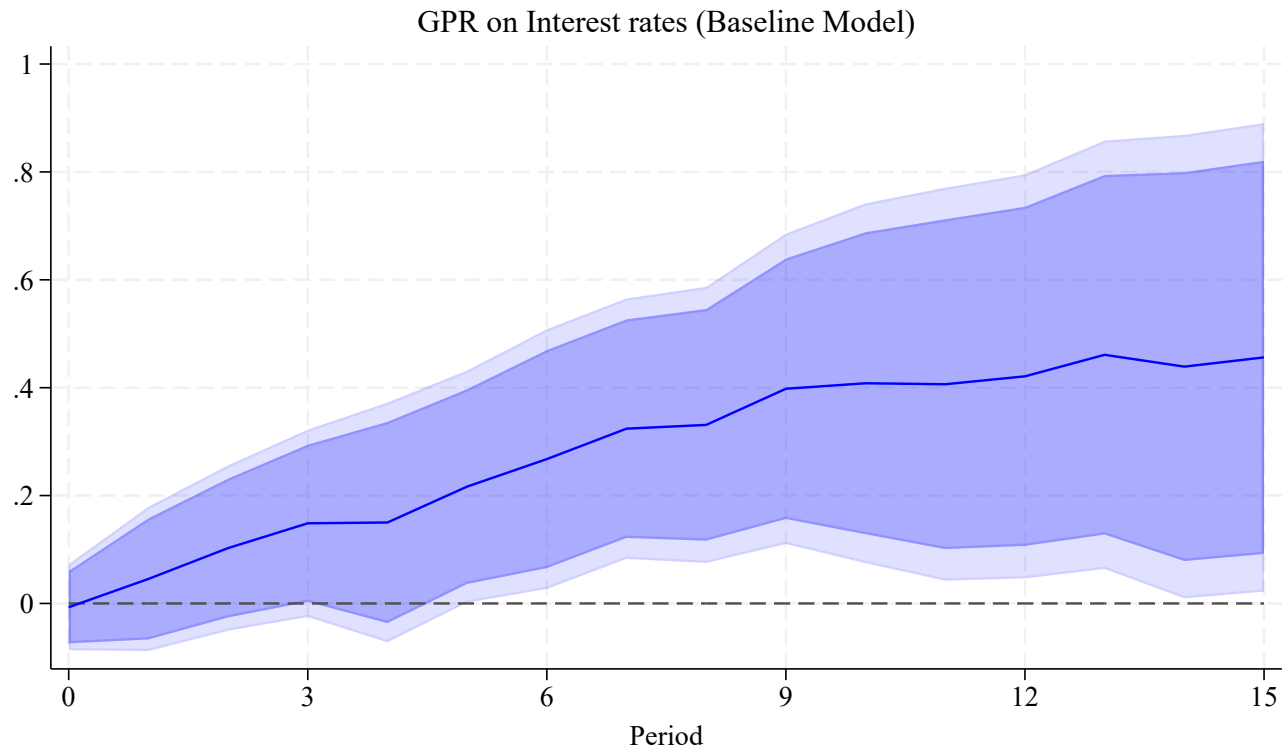
Figure 25. Time-varying parameter plot at horizon $t = 15$ (Israel)



Note: The time-varying parameters for the IRFs are observed 15 months after the shock. The black line corresponds to the unique IRF's coefficient 15 months after the shock. The blue line corresponds the series of IRFs 15 month after the shock. The sample starts in February 2000 and ends after $T-h = 265-15 = 250$ months in November 2020.

Results (Panel) - Robustness (adding Time Fixed Effects)

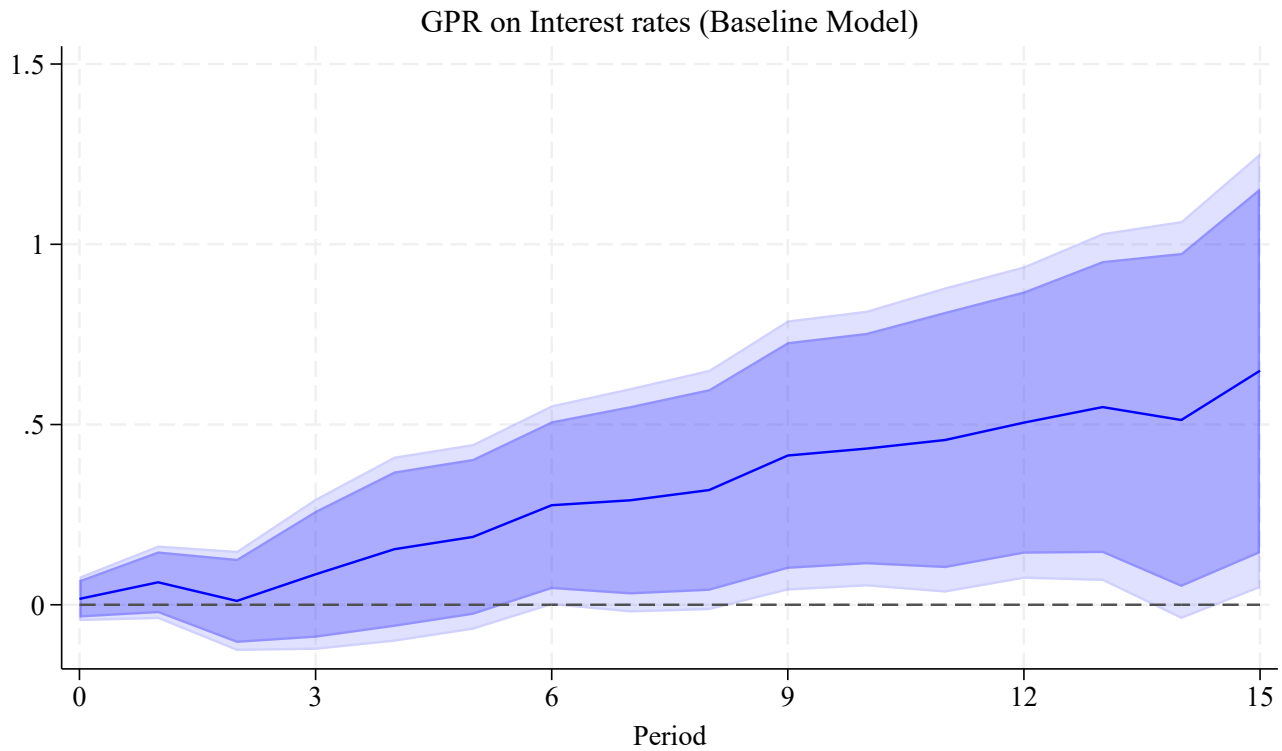
Figure 26. GPR on Interest rates (Full sample)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level. Adding Time Fixed raises the question of controlling for global shocks like the global GPR shocks and so on. However, it constraints the answer to be homogenous across countries.

Results (Panel) - Robustness (adding Time Fixed Effects)

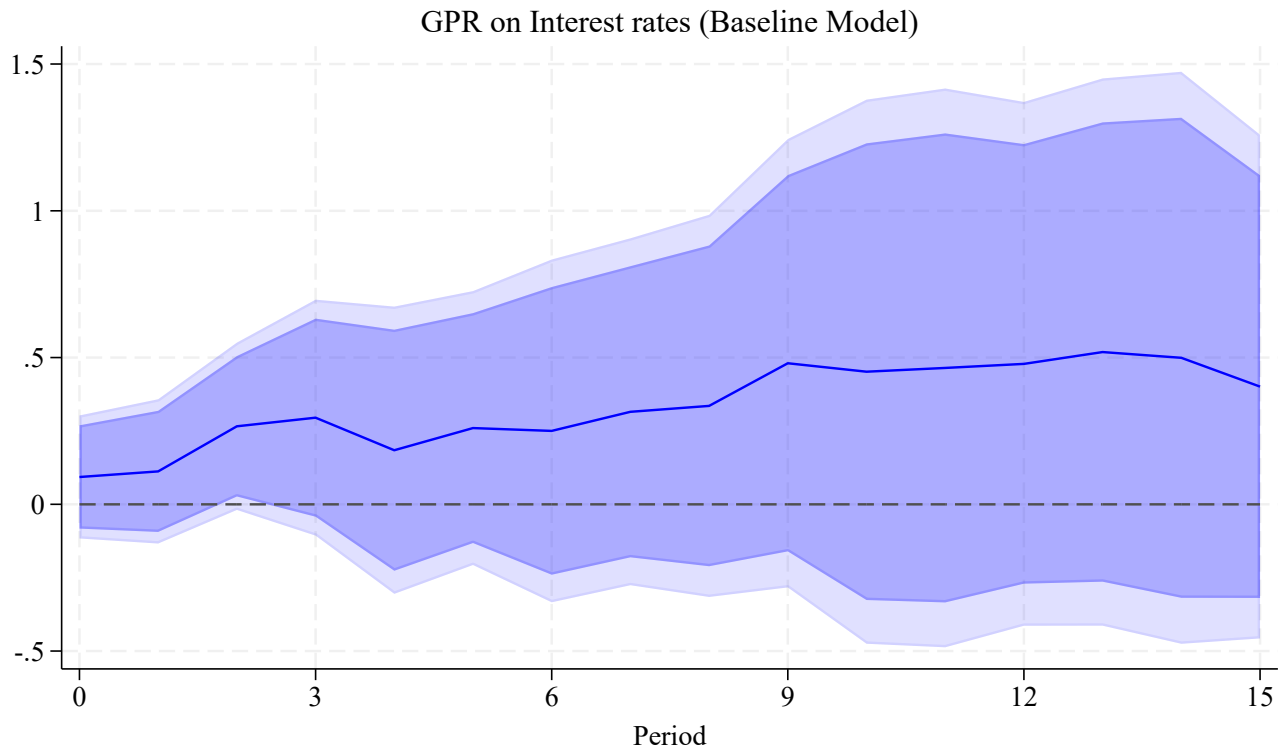
Figure 27. GPR on Interest rates (Developed countries)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level. Adding Time Fixed raises the question of controlling for global shocks like the global GPR shocks and so on. However, it constraints the answer to be homogenous across countries.

Results (Panel) - Robustness (adding Time Fixed Effects)

Figure 28. GPR on Interest rates (Emerging countries)



Notes: the shock is a unit shock to GPR. SE are boostrapped (200 replications) and clusterized at the country level. Adding Time Fixed raises the question of controlling for global shocks like the global GPR shocks and so on. However, it constraints the answer to be homogenous across countries.

Final thoughts

Key takeaways

- The panel LP model demonstrates that the reaction of monetary policy depends on the time horizon, especially in the developed country group
- Following a GPR shock, the central bank is more accommodative to limit the negative effects on consumer sentiment
- In the medium term, the central bank is more interested in limiting inflation pressures, which may be due to second-round effects
- The time-varying local projections confirm these findings for the Bank of England, the Bank of Canada, and the Bank of Israel
- At both short- and medium-term horizons, significant instabilities are detected in the impulse response functions before the GFC when the oil prices were high, and during large-scale geopolitical events, like 9/11 or the London Bombings
- ***Policymakers responsible of monetary policies are increasingly vigilant about developments in the geopolitical arena***