Dynamic Local Projections with Stata

VIMM Lab Seminar – September 9, 2025

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Seminar Overview

- Practical applications and coding exercises using Stata
- Focus on two frontier studies in macroeconomics:
  - Ginn & Saadaoui (2025) on monetary policy and geopolitical risks
  - Aizenman et al. (2024) on real exchange rates and reserves
- Application of local projections for impulse response functions

Motivation

- Geopolitical shocks (wars, tensions, terrorism) affect inflation, capital flows, and exchange rates
- Central banks respond via interest rates and unconventional tools
- Robust econometric modeling needed to identify causal mechanisms
- Local projections provide flexibility in highly instable environments

Study 1: Real Exchange Rates & Reserves

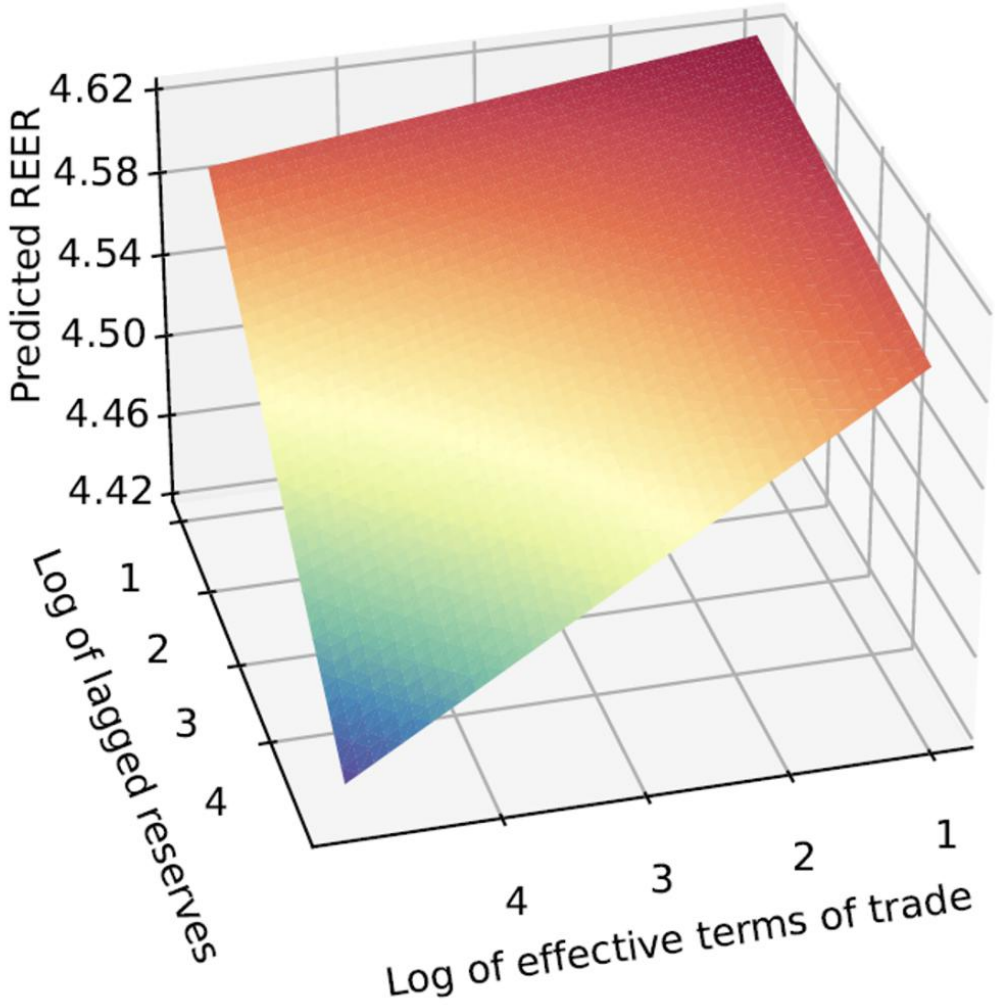
- Sample of 110 countries (2001–2020)
- International reserves buffer against terms-of-trade shocks
- Buffer effect stronger in countries with weak institutions
- Threshold effect: reserves above ~17% of GDP reinforce stability
- Reference: Aizenman et al. (2024), JIMF
- TWFE, Panel LPs

Main specification (Panel LP)

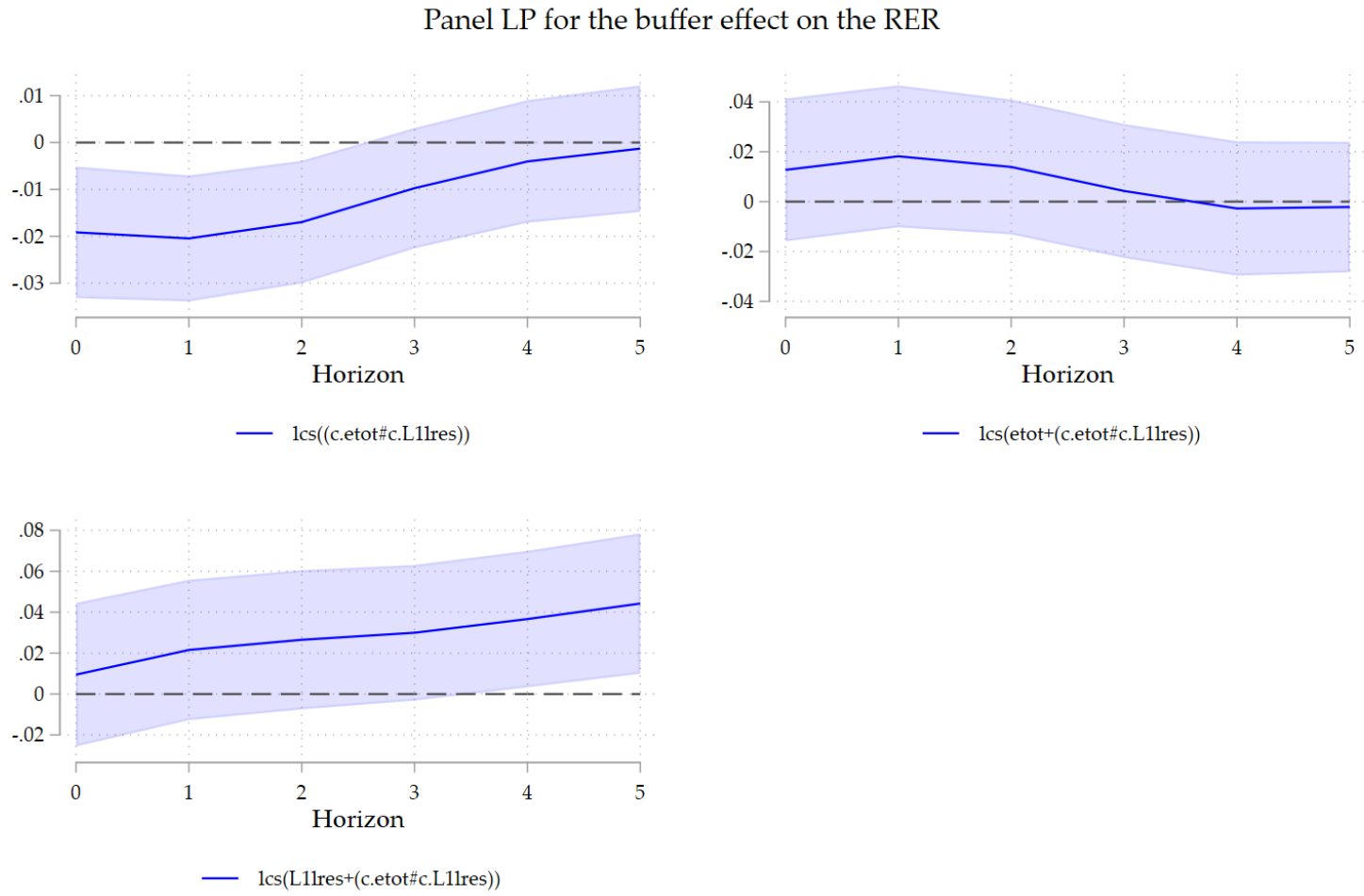
$$rer_{i,t+h} = b_h S_{i,t} + \gamma_h rer_{i,t-1} + \alpha' \mathbf{z}_{i,t-1} + v_{i,t+h} \quad h = 0,1,\ldots$$

$$\text{IRF}(h) = \hat{b}_h.$$

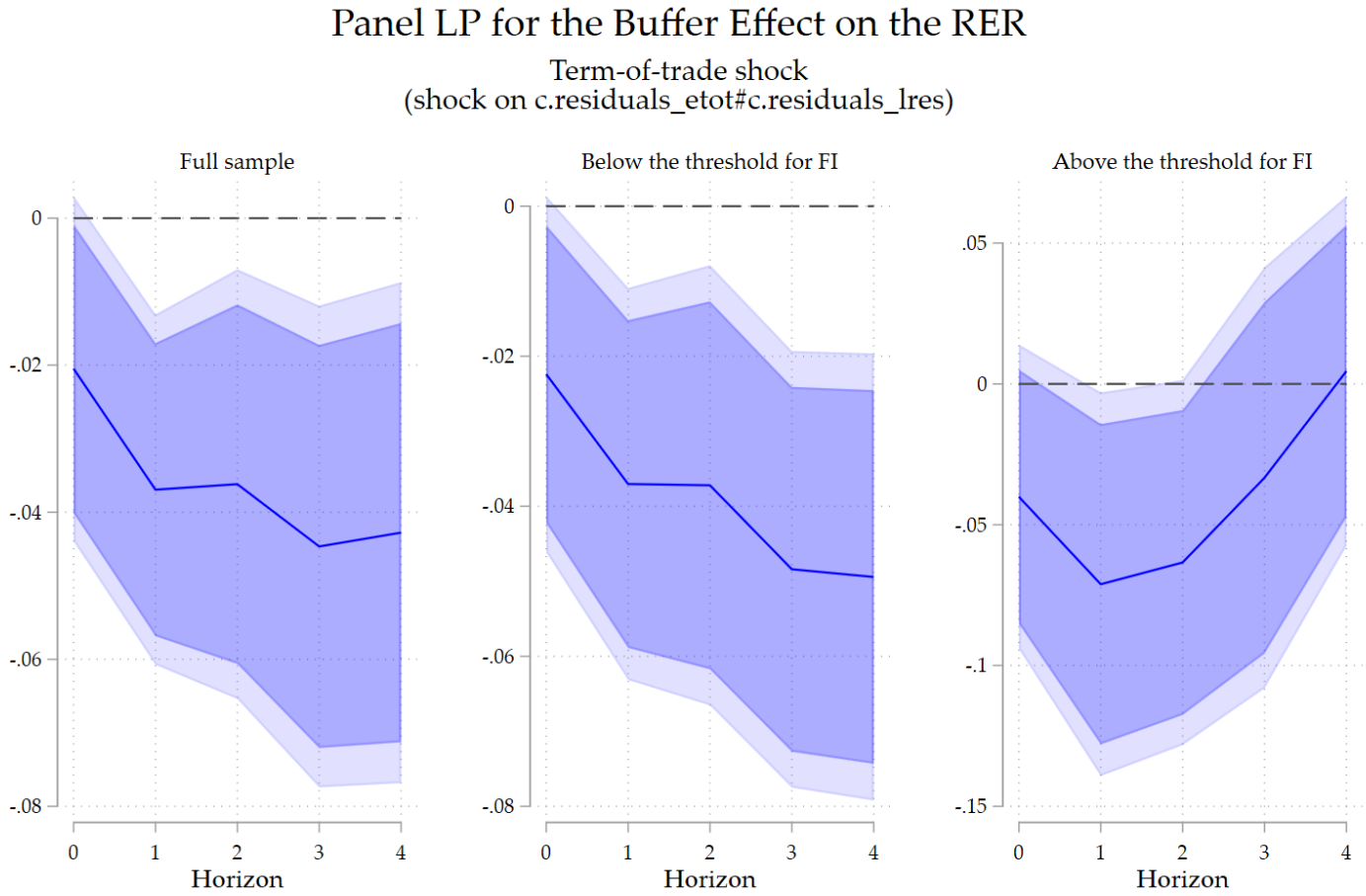
with y, is the explained variable, h, the horizon, S, the impulse variable, $\mathbf{z}$ is a vector of control variables, IRF, stands for the impulse response function and v, is the error term. In our case, the explained variable will be the real exchange rate, *rer*, and the impulse variable will be the interaction term between international reserves, *lres*, and effective terms of trade, *etot*, which captures the buffer effect. The control variables will be the same as in the baseline of Table 2, including the *de facto* exchange rate regime.



3-D plot for the buffer effect. The blue areas indicate that the buffer effect (i.e., the mitigation of real exchange rate appreciation after a terms-of-trade shock) is stronger when the level of reserves is higher. We include year-fixed effects in the regressions. The results are similar without the year-fixed effects. The results are very similar when we use lagged or present values for all the explanatory variables.



Panel LP for the buffer effect on the RER. *Notes:* In the left panel, the unit shock is only on the interaction. In the center panel, the unit shock is on the interaction term and the effective terms of trade variable, simultaneously. In the right panel, the unit shock is on the interaction term and the international reserves variable, simultaneously. Robust standard errors. 95% confidence intervals in light blue.



Panel LP for the buffer effect on the RER. We construct two residual variables for lres and etot by running OLS regressions with country-fixed effects. We regress the variation of these variables on the real exchange rate. In the left panel, the unit shock is on the full sample. In the center panel, we use the data below the previously identified threshold for the financial institution development. In the right panel, we use the data above the previously identified threshold for the financial institution development. Bootstrapped standard errors. 90%, 95% confidence intervals in dark and light blue, respectively.

Study 2: Monetary Policy & GPR

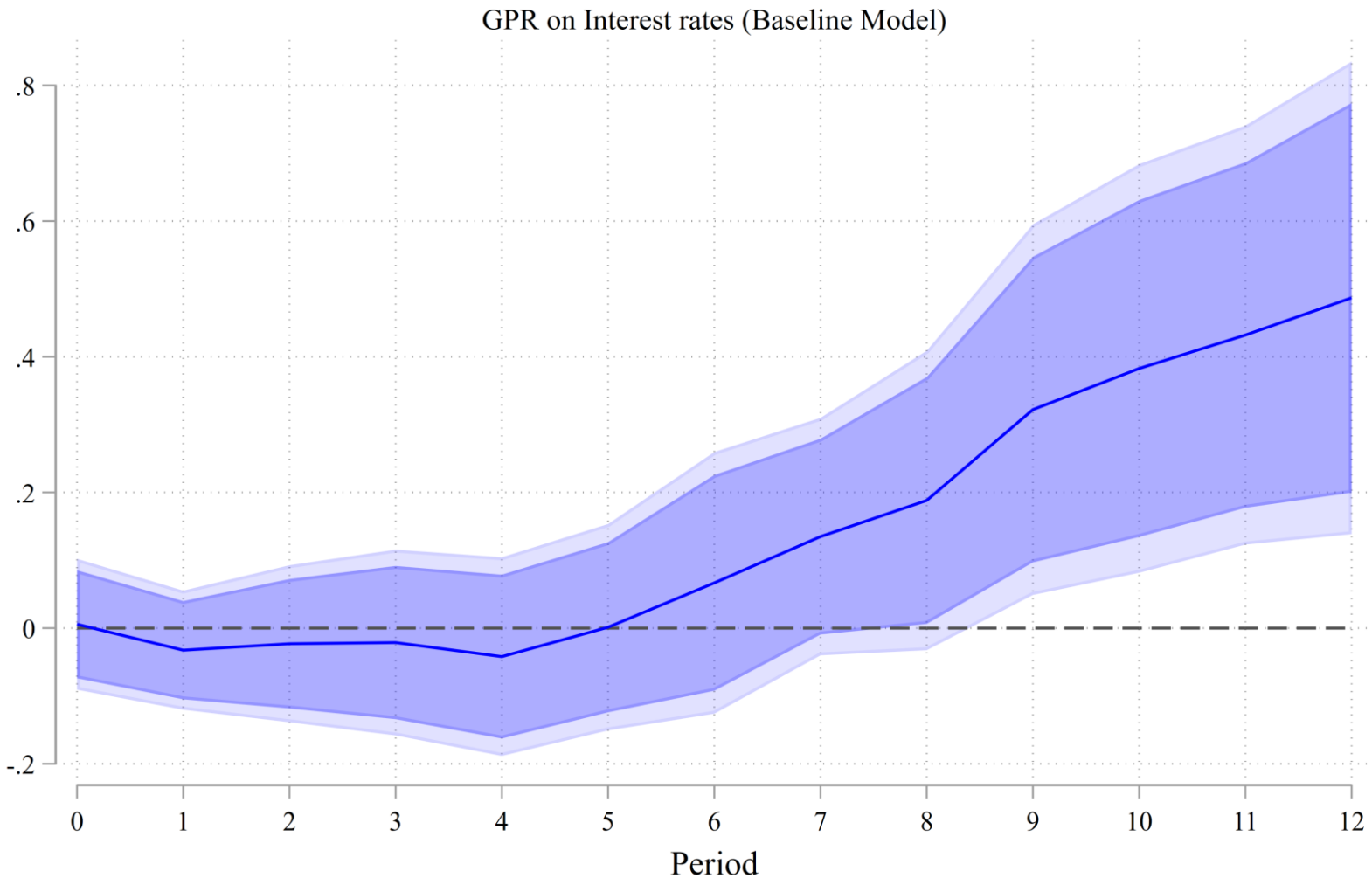
- Panel of 18 economies, monthly data (2000–2022)
- Geopolitical risk (GPR) shocks impact short-term interest rates differently:
  - Short run: accommodative response (↓ rates)
  - Medium run: anti-inflation response (↑ rates)
- Stronger reactions after the Global Financial Crisis
- Reference: Ginn, W., & Saadaoui, J. (2025), Macro. Dyn.
- Panel LPs, State-Dependent LPs, Time-series LPs, Time-varying LPs

Main specification (TVP-LP)

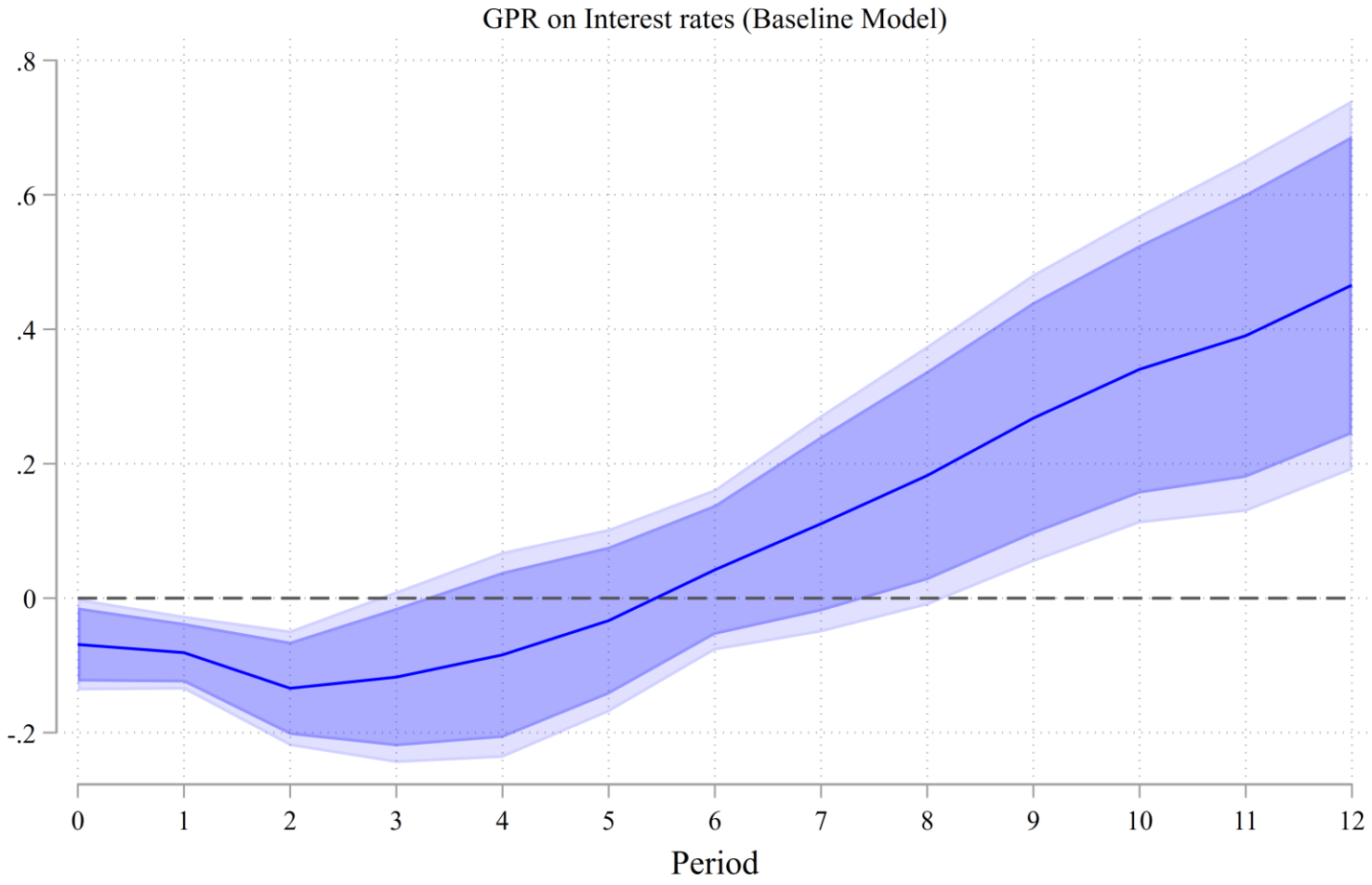
$$R_{t+h} = c_{t+h} + \beta_{h,t+h} S_t + \sum_{j=1} v'_{j,t+h} \mathbf{X}_{t-j} + \epsilon_{t+h} \quad h = 0,1,\ldots$$

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

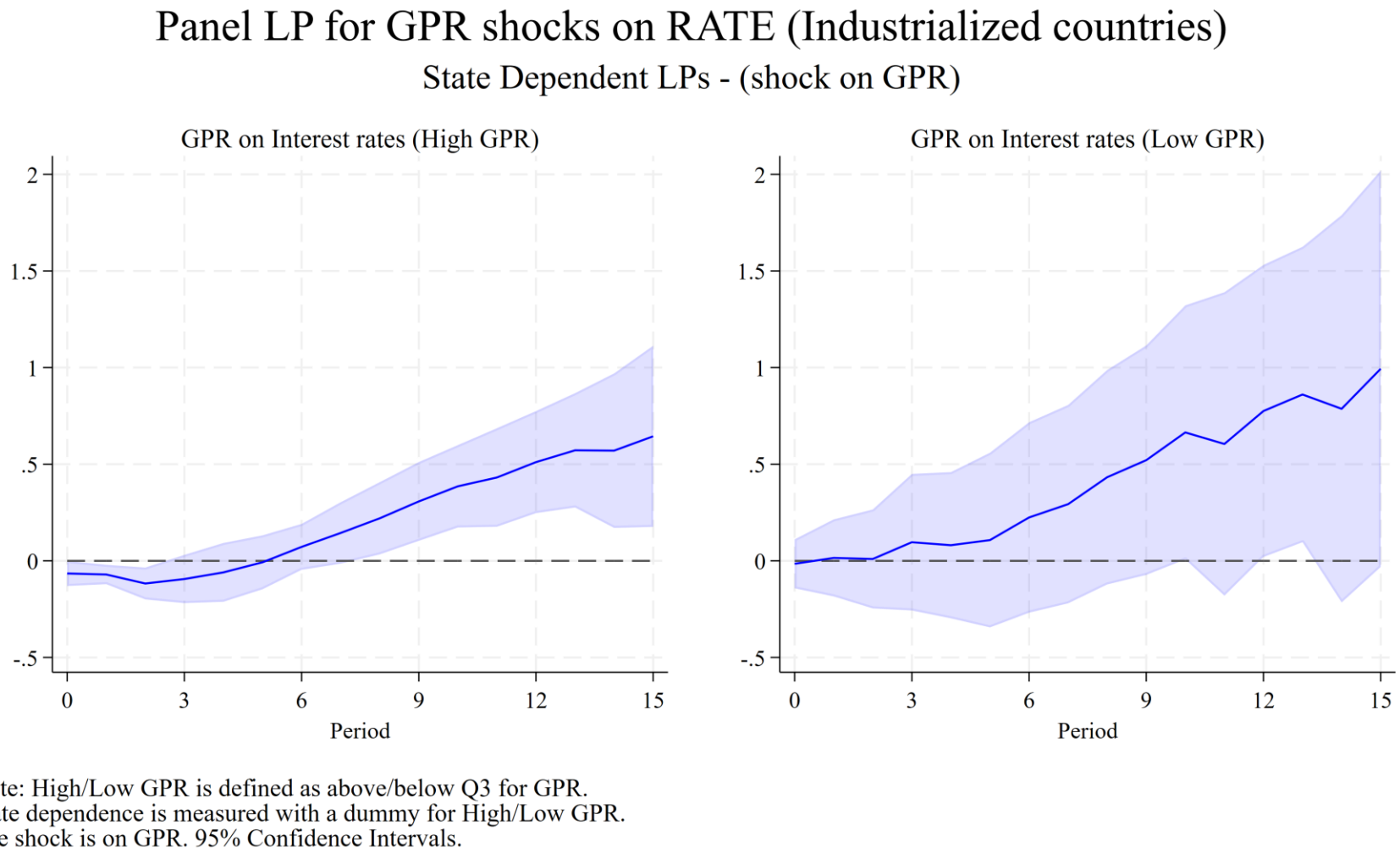
where **X**=*(R, INF, GAP, S)*. The vector of control variables includes the lagged values of the following variables: the short-term interest rate, *R*; the inflation rate, *INF*; the output gap, *GAP*; and the shock on the geopolitical risk index (GPR), *S*. The parameter of interest is the time-varying impulse response $\beta_{h,t+h}$ following a shock *S* on the geopolitical risk index. For each month, we obtain a specific impulse response function.



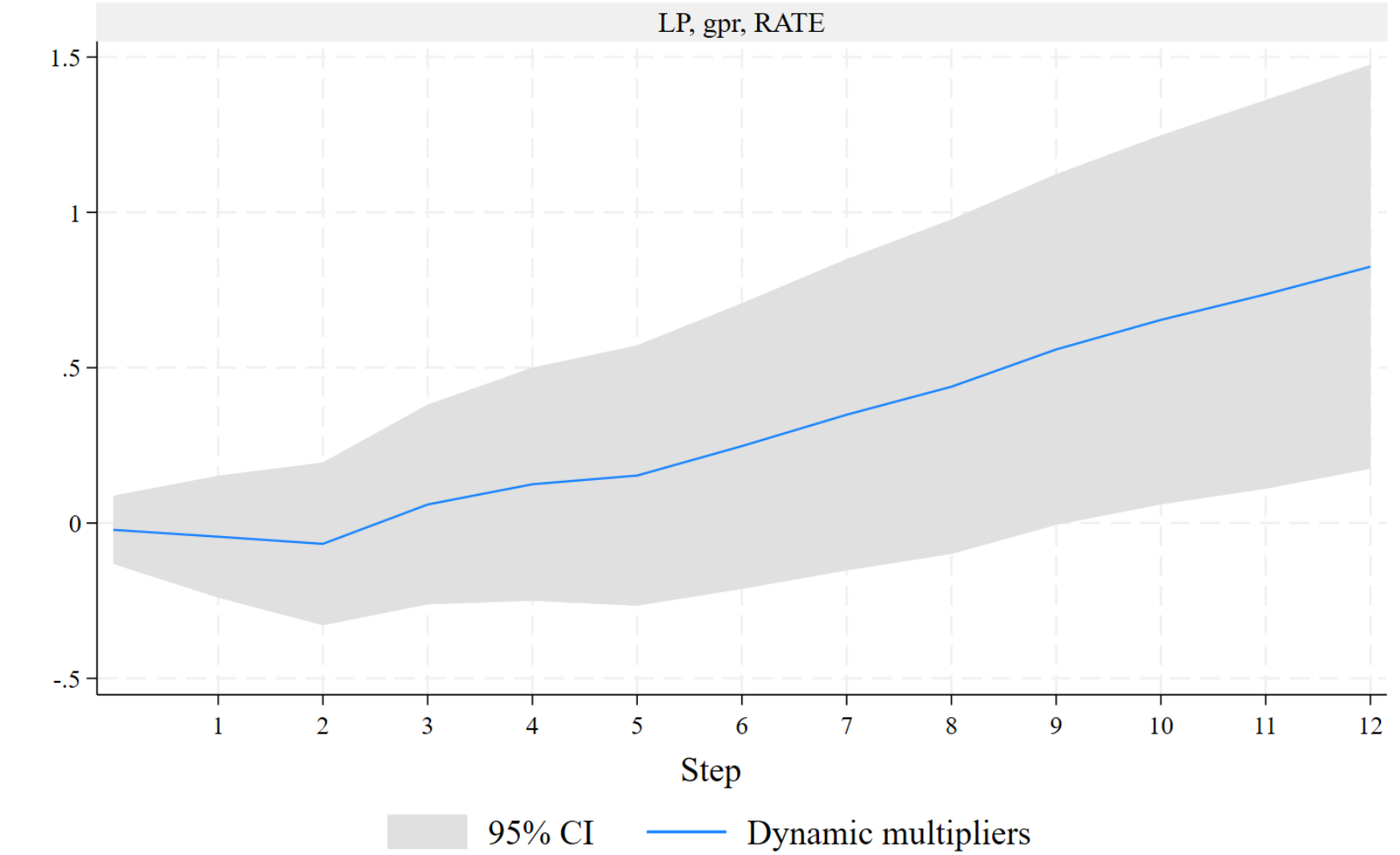
GPR on interest rates (Full sample).
Note: shock is a unit shock to GPR. SE are *bootstrapped (200 replications)* and clustered at the country level.
Source: authors' calculations.



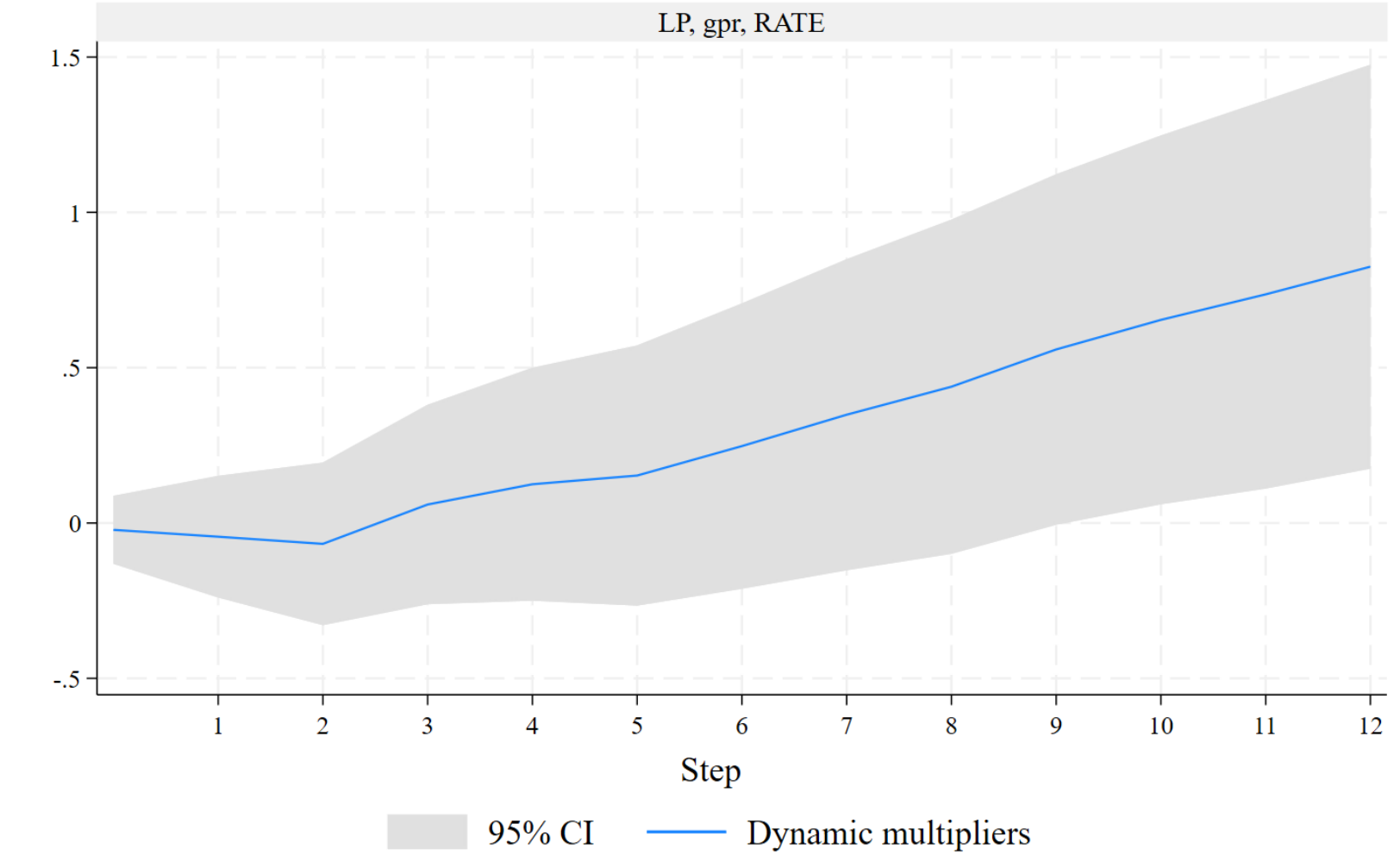
GPR on interest rates (Developed countries).
Note: the shock is a unit shock to GPR. SE are *bootstrapped (200 replications)* and clustered at the country level.
Source: authors' calculations.



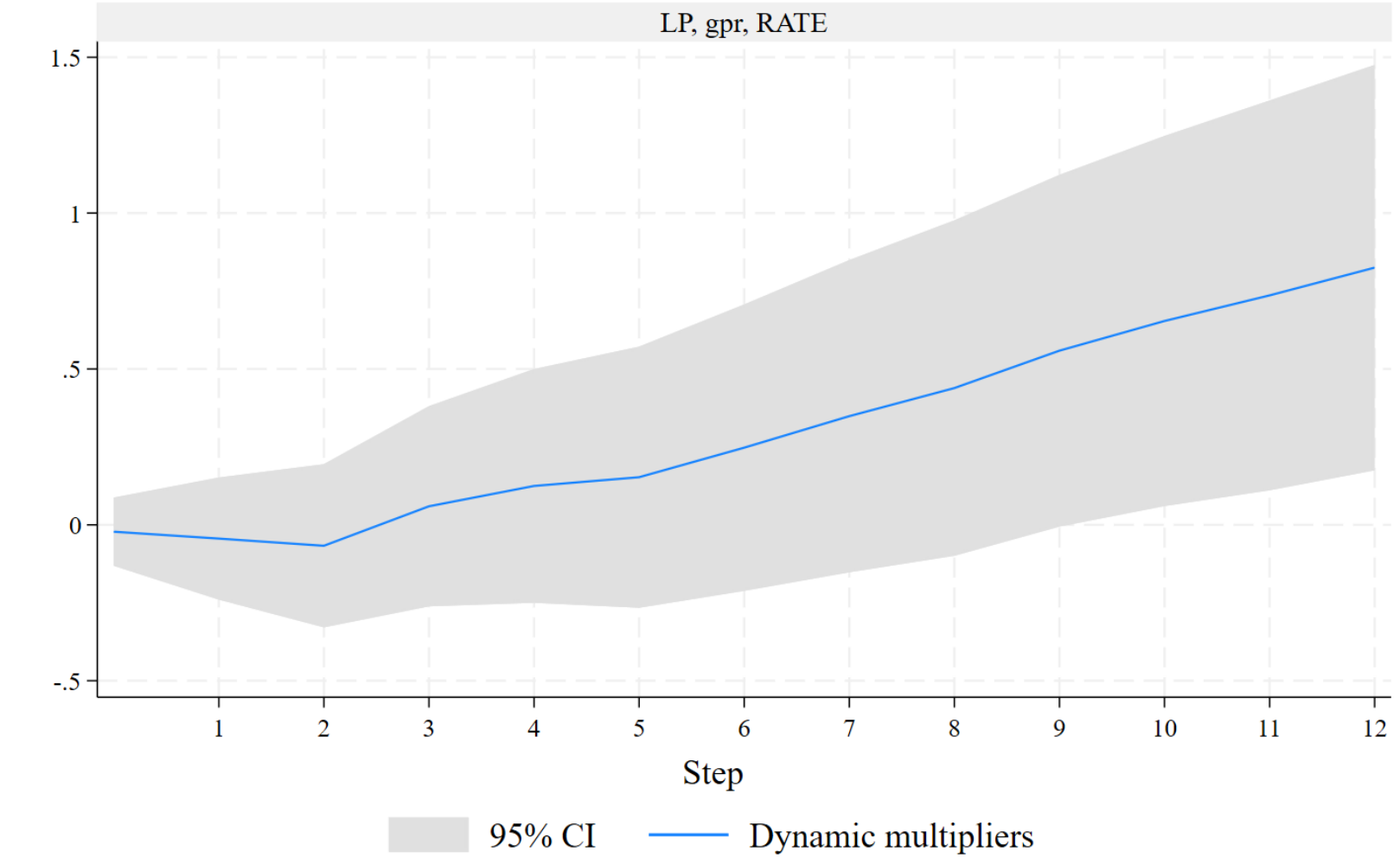
GPR on interest rates (State-dependent LPs).
Note: the shock is a unit shock to GPR. *LP* stands for local projections, *GPR* for the GPR index, and *RATE* for the short-term interest rate.
Source: authors' calculations.



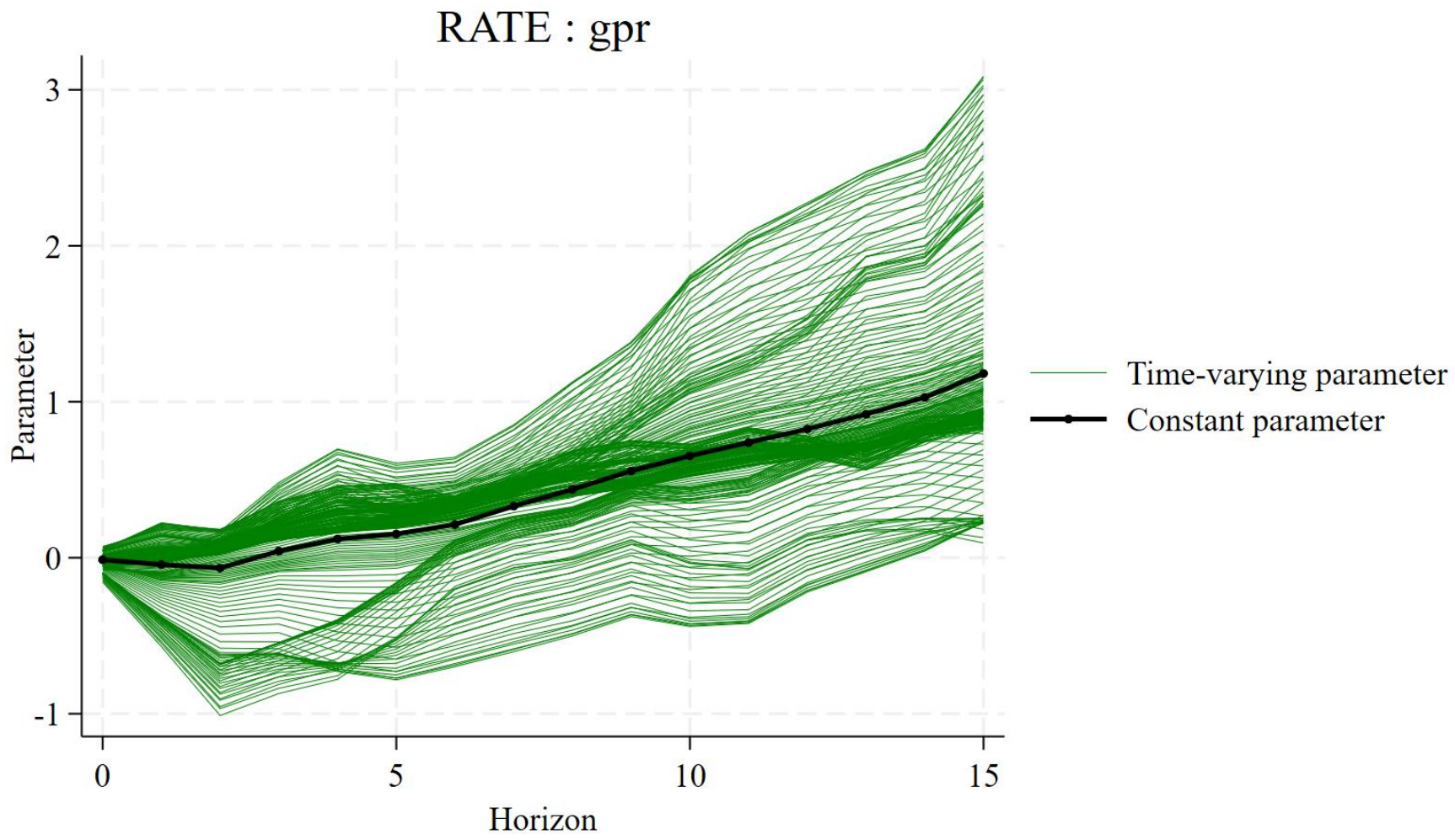
GPR on interest rates (United Kingdom).
Note: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.
Source: authors' calculations.



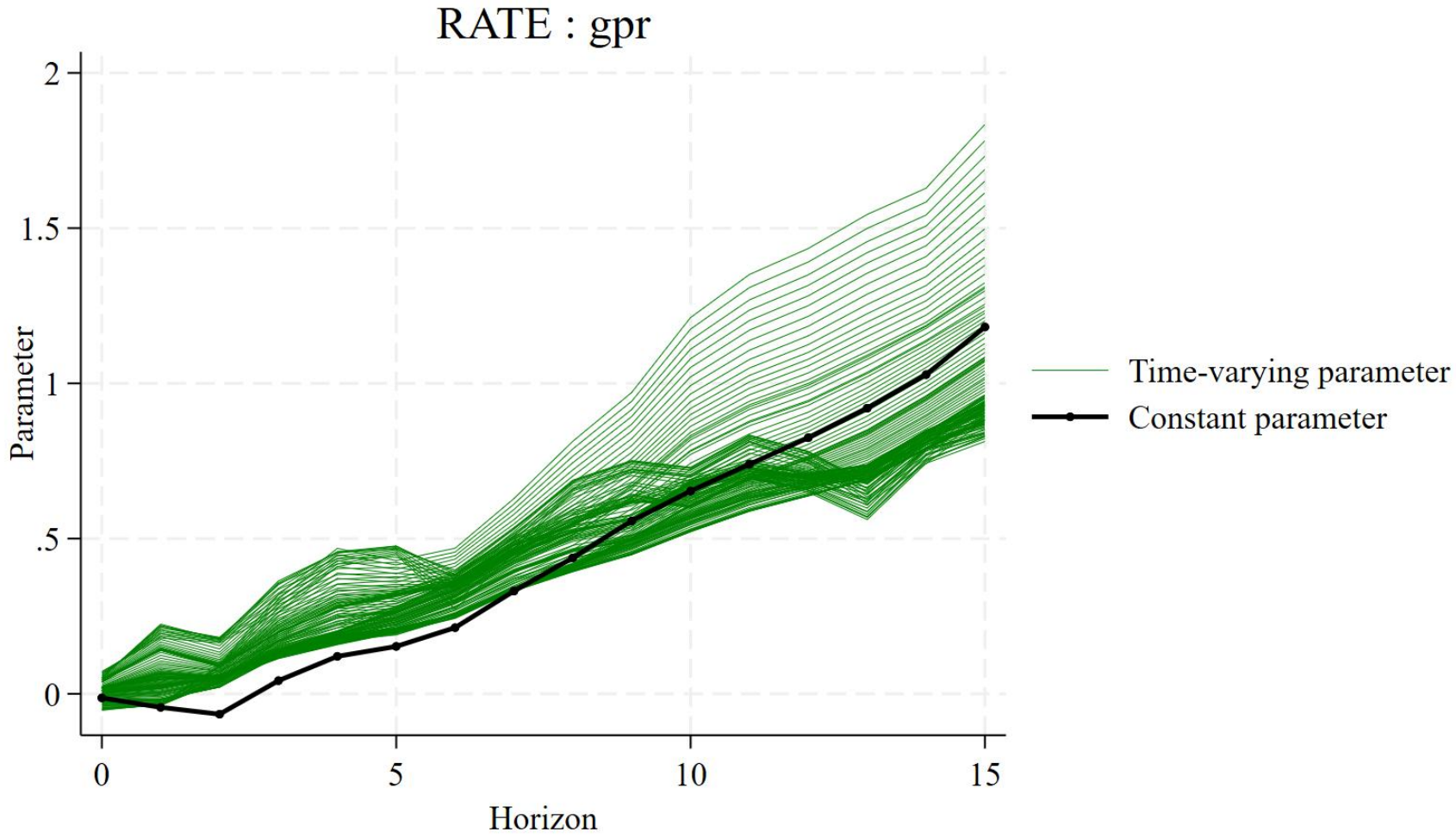
GPR on interest rates (Canada).
Note: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.
Source: authors' calculations.



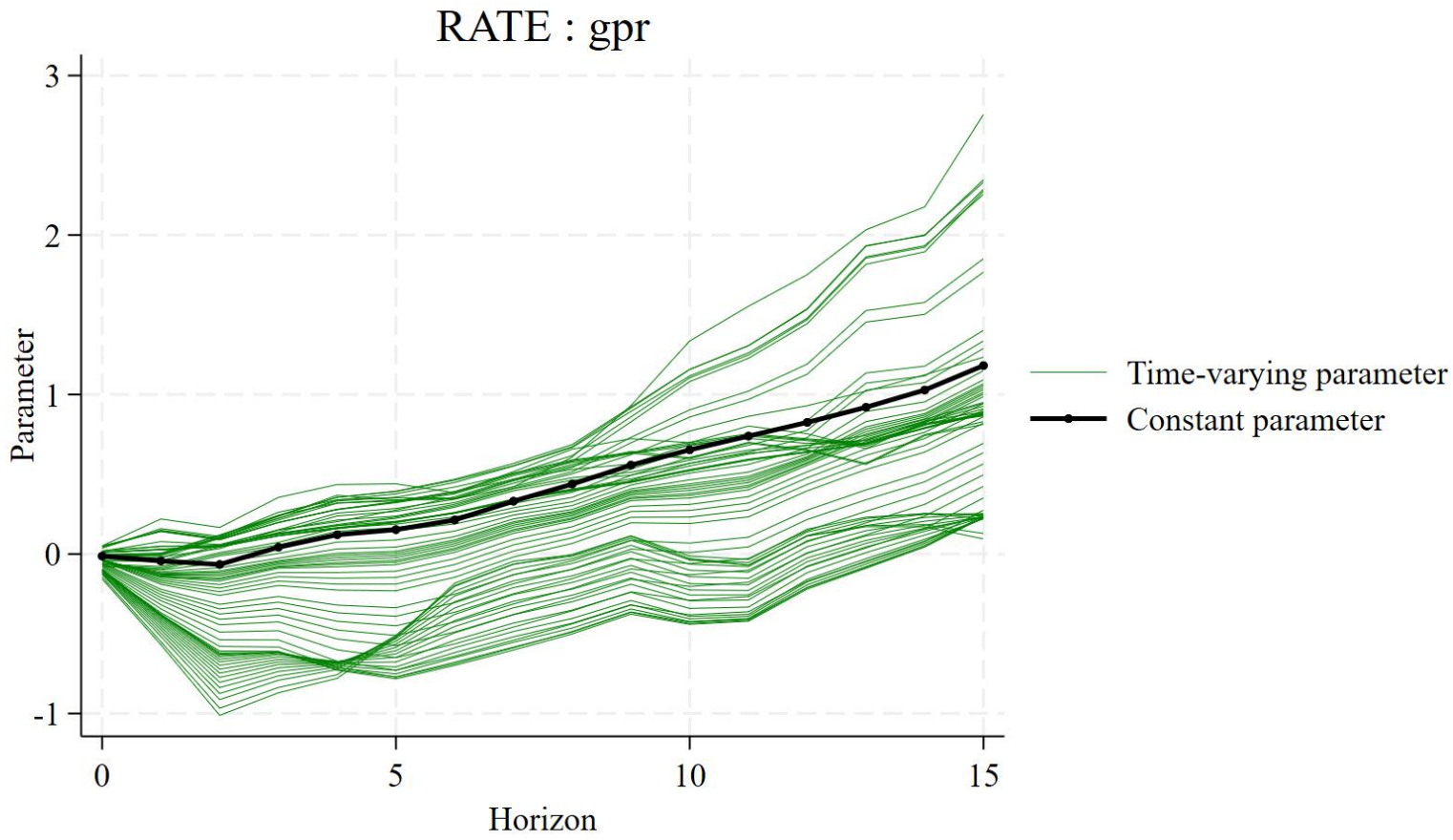
GPR on interest rates (Israel).
Note: the shock is a unit shock to GPR. *LP* stands for local projections, *gpr* for the GPR index, and *RATE* for the short-term interest rate. IRF coefficients for exogenous variables are dynamic multipliers.
Source: authors' calculations.



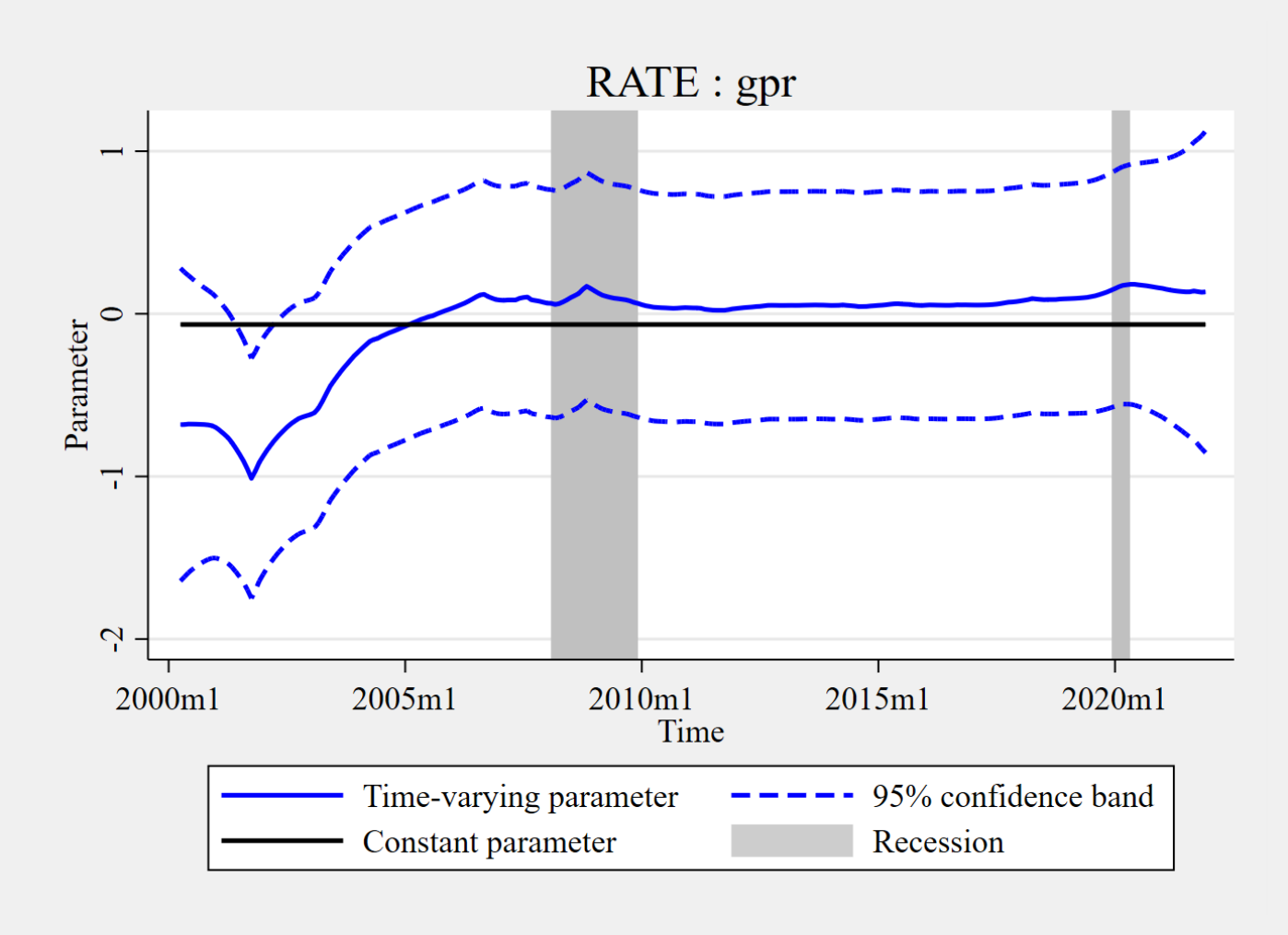
GPR on interest rates in an unstable environment (United Kingdom).
Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *GPR*, stands for the geopolitical risk index.
The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each month, we have an IRF.
The time horizon for the IRF is 15 months.
Source: authors' calculations.



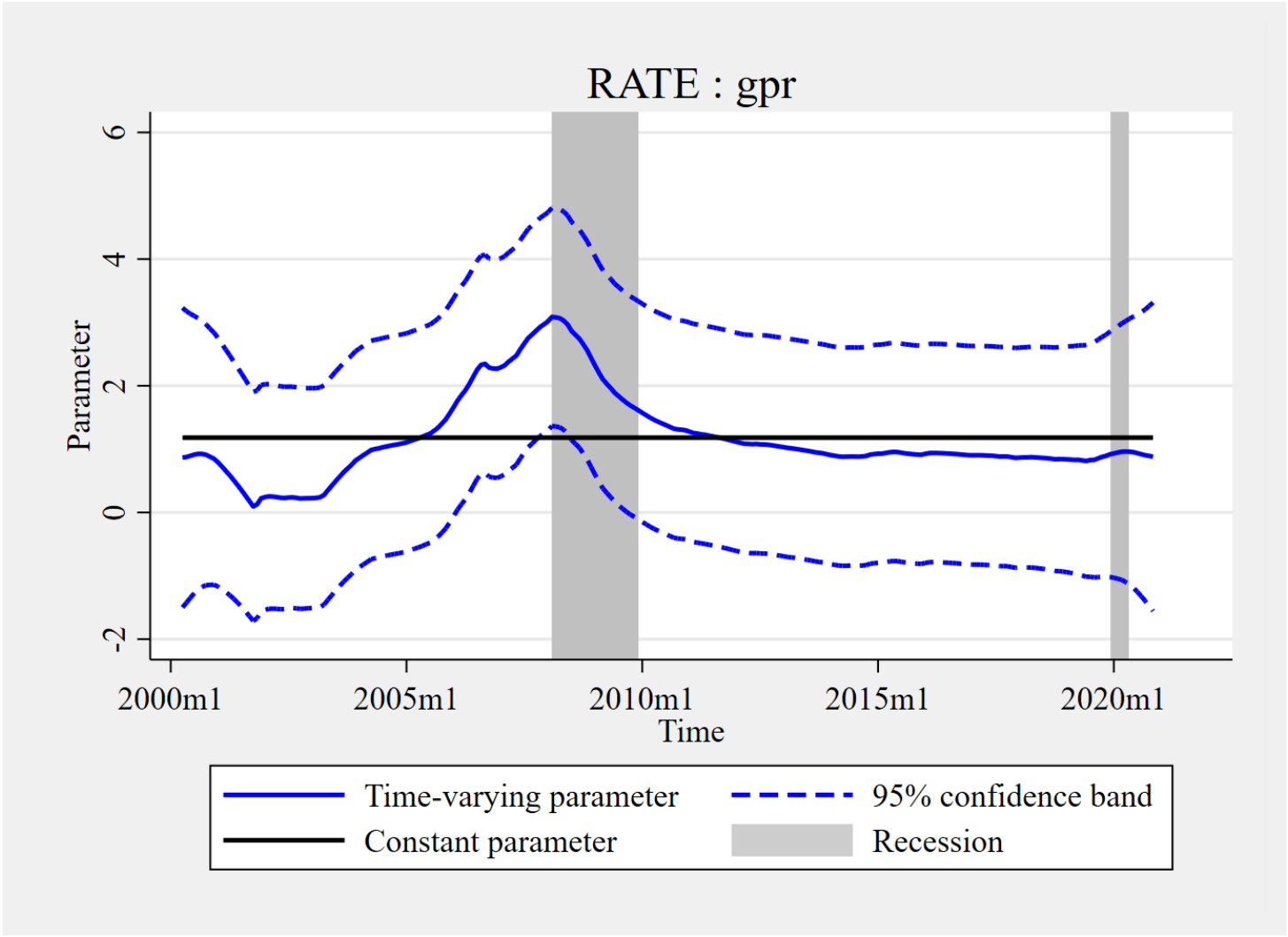
GPR on interest rates after Global Financial Crisis (United Kingdom).
Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *GPR*, stands for the geopolitical risk index.
The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each month, we have an IRF.
The time horizon for the IRF is 15 months.
Source: authors' calculations.



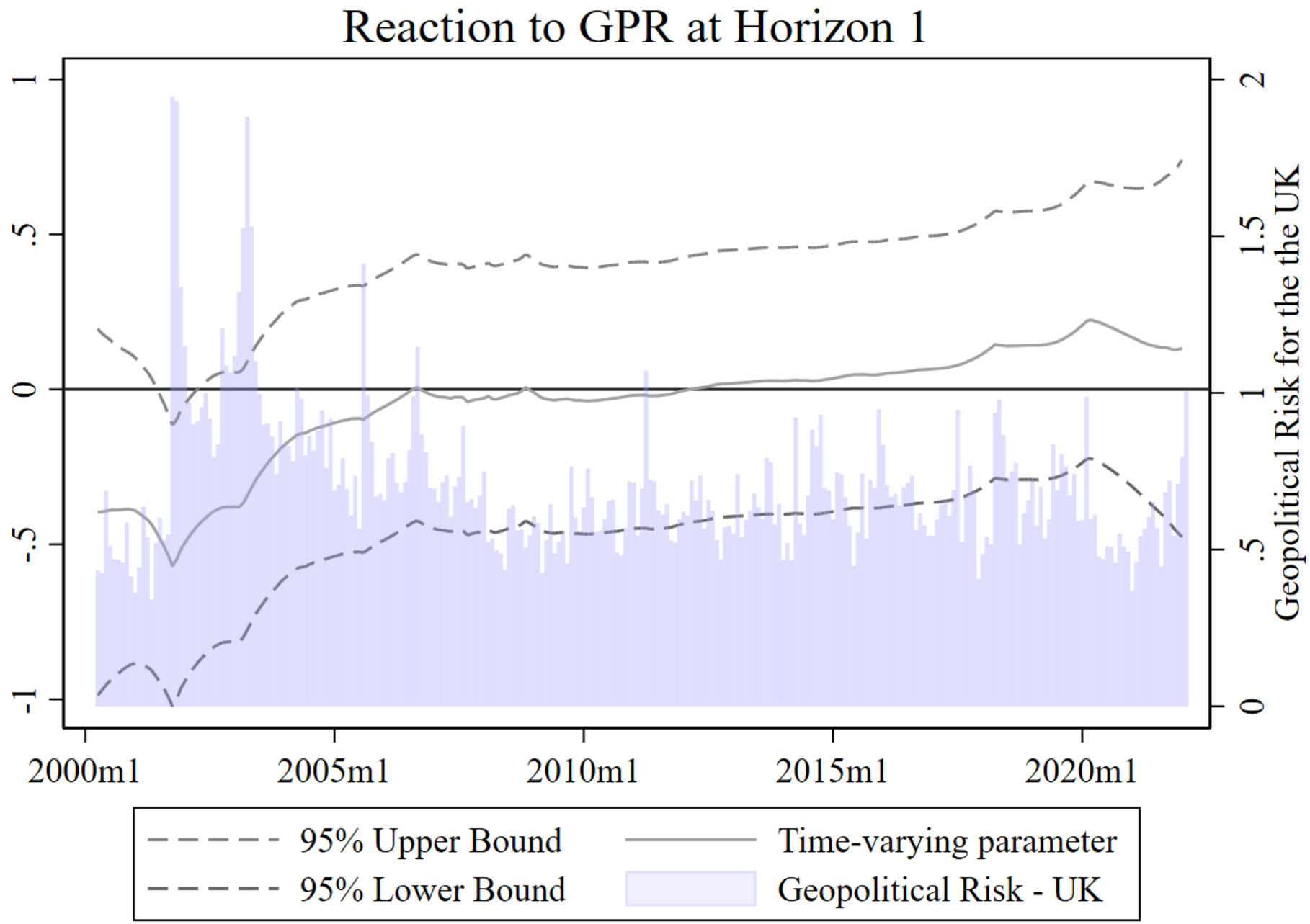
GPR on interest rates for the top quartile of GPR (United Kingdom).
Note: the shock is a unit shock to GPR. *RATE* stands for the short-term interest rate, *GPR*, stands for the geopolitical risk index.
The black curve is the standard LP's IRF, and the green lines depict the time-varying IRF. For each month, we have an IRF.
The time horizon for the IRF is 15 months.
Source: authors' calculations.

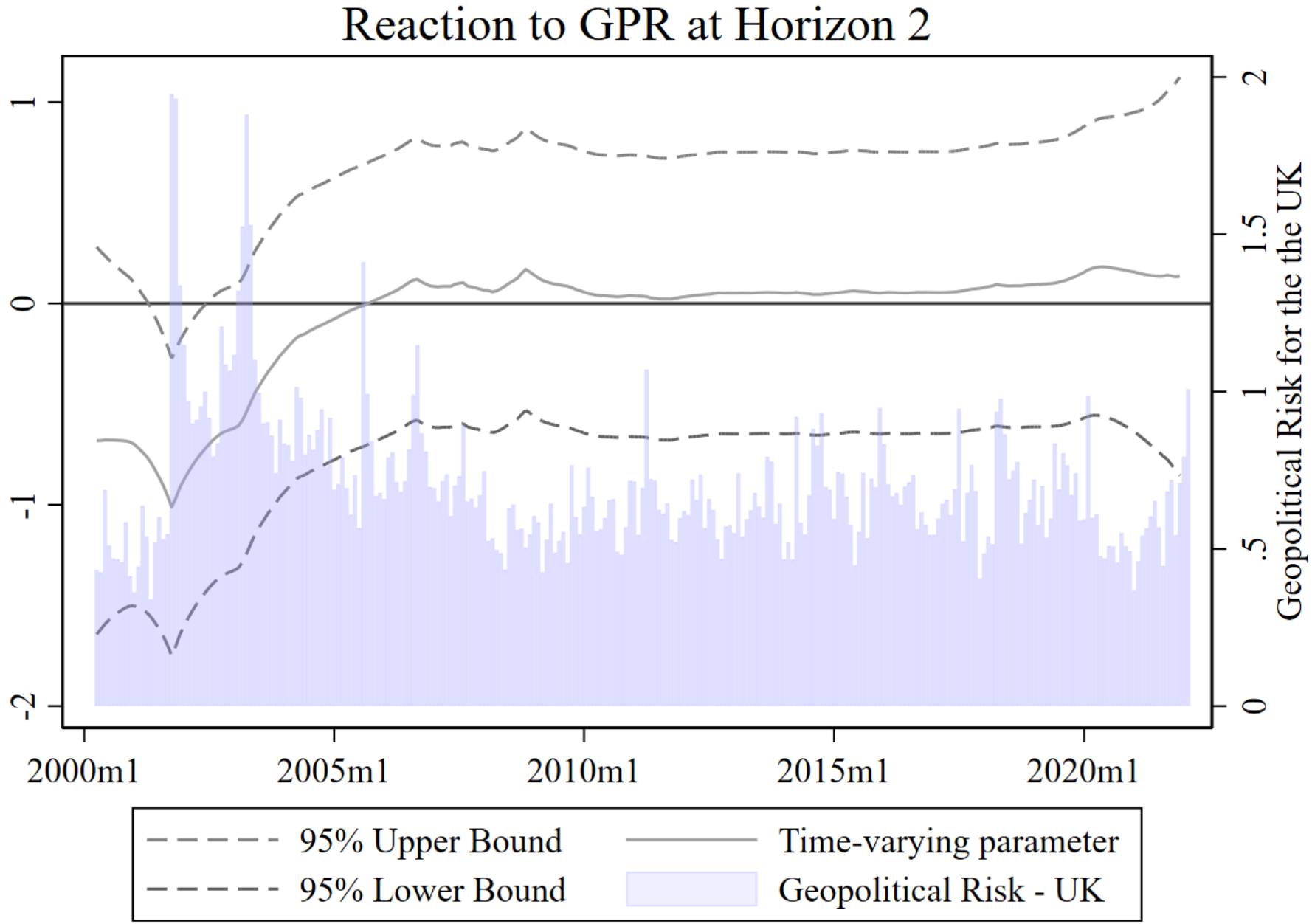


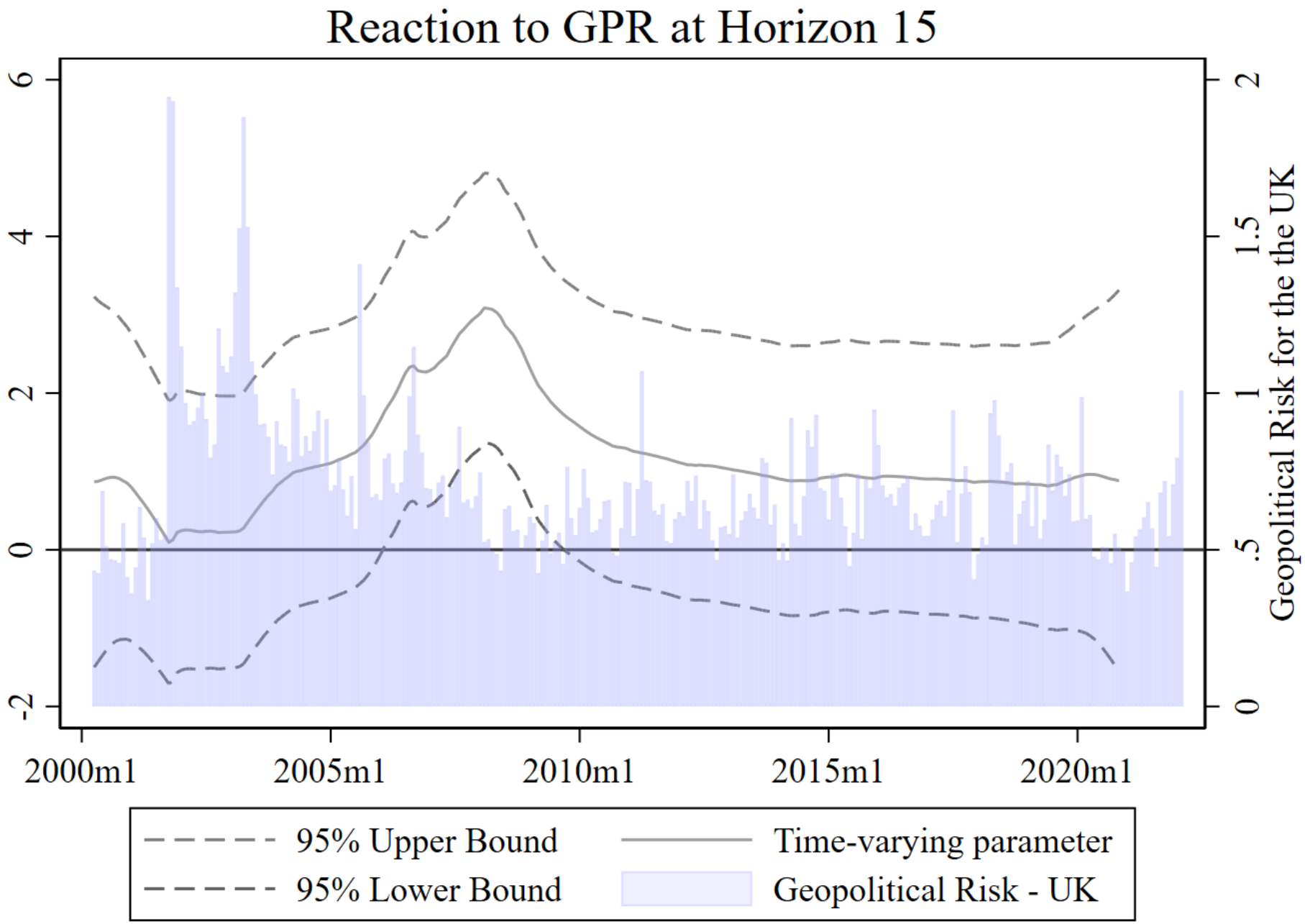
Time-varying parameter plot at horizon *t* =2 (United Kingdom).
The time-varying parameter for the IRFs is observed at the month 2 in Figure 9. At the beginning of the sample, the effect of a shock differs significantly from the constant parameter LP at the 5 percent level. The black line corresponds to the unique IRF at the horizon *t* =1 in Figure 9. The black line corresponds to the series of IRF at the horizon *t* =2 in Figure 9. When the interval formed by the black dotted lines does not include the zero line, then the IRF is statistically significant at the 5 percent level, implying time-varying effects.
Source: authors' calculations.



Time-varying parameter plot at horizon *t* =15 (United Kingdom).
The time-varying parameter for the IRFs is observed at the month 15 in Figure 9. At the beginning of the sample, the effect of a shock differs significantly from the constant parameter LP at the 5 percent level. The black line corresponds to the unique IRF at the horizon *t* =15 in Figure 9. The black line corresponds to the series of IRF at the horizon *t* =2 in Figure 9. When the interval formed by the black dotted lines does not include the zero line, then the IRF is statistically significant at the 5 percent level, implying time-varying effects.
Source: authors' calculations.


Reaction to GPR at Horizon 1
1
.5
0
-.5
-1
2
1.5
1
.5
0
Geopolitical Risk for the the UK
2000m1
2005m1
2010m1
2015m1
2020m1
95% Upper Bound
95% Lower Bound
Time-varying parameter
Geopolitical Risk - UK


Reaction to GPR at Horizon 2
1
0
-1
-2
2
1.5
1
.5
0
Geopolitical Risk for the the UK
2000m1
2005m1
2010m1
2015m1
2020m1
95% Upper Bound
95% Lower Bound
Time-varying parameter
Geopolitical Risk - UK


Reaction to GPR at Horizon 15
6
4
2
0
-2
2
1.5
1
.5
0
Geopolitical Risk for the the UK
2000m1
2005m1
2010m1
2015m1
2020m1
95% Upper Bound
95% Lower Bound
Time-varying parameter
Geopolitical Risk - UK

Key Takeaways

- Local projections in Stata enable tracing dynamic responses to shocks
- Geopolitical shocks: short-term accommodation, medium-term tightening
- International reserves: effective buffer under limited financial integration
- Attendees gain hands-on coding tools and methodological insights

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