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An Economic Policy Uncertainty Index for Portugal*

Hugo Morão†

March 28, 2024

Abstract

This paper investigates the effects of policy uncertainty on major macroeconomic variables in Portugal, employing a Structural Vector Autoregression (SVAR) approach. I develop an Economic Policy Uncertainty (EPU) index utilizing data from over twenty news sources, which captures key moments such as elections, budget negotiations, and various crises. In response to a rise in policy uncertainty, firms delay projects, leading to a decline in industrial output and a rise in unemployment. Consumers, in turn, reduce their non-essential spending, resulting in a gradual decline in retail sales. On the financial side, rising policy uncertainty drives down equity prices and widens credit spreads, reflecting the concerns of investors and lenders.

JEL Codes: C43, D80, E32, E65, E66

Keywords: Economic uncertainty, Policy uncertainty, Uncertainty shocks, Proxy-SVAR, Correlation restrictions, Textual analysis

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1 Introduction

In an era of rapidly evolving economic conditions, the question of how policy uncertainty influences the macroeconomy is a pressing issue. This question is challenging because policymakers find themselves in a tug-of-war between the urgent need to implement economic policies and the uncertainty generated by the decision-making process. To address this, it is crucial to conduct thorough economic analyses that explore the macroeconomic consequences of uncertainty generated by policymaking. From a policy standpoint, these policy uncertainty shocks are particularly important to quantify, given their impact on the macroeconomic landscape. However, this poses a significant challenge, as uncertainty and the economy are interdependent.

Related literature and contribution. This study contributes to the body of literature dedicated to the empirical estimation of the repercussions of uncertainty shocks on real and financial variables. It aligns with the research approach initiated by Baker et al. (2016), which introduced novel measures of economic policy uncertainty (EPU). The versatility and global applicability of this research line are further highlighted by various studies that successfully employ the same methodology. This methodology is applied in diverse European contexts, including the Benelux countries like Belgium (Algaba et al. (2020)) and the Netherlands (Kok et al. (2015)), as well as economies impacted by the debt crisis, such as Greece (Fountas et al. (2018); Hardouvelis et al. (2018)), Ireland (Zalla (2017); Rice and Jonathan (2020)), and Spain (Ghirelli et al. (2019, 2021)). Notably, it has been particularly insightful for both Nordic countries without the Euro like Denmark (Bergman and Worm (2021)) and Sweden (Armelius et al. (2017)) or newcomers to the Euro like Croatia (Sorić and Lolić (2017)). In the Asia-Pacific region, the methodology proves to be effective in both financial centers, namely Hong Kong (Luk et al. (2020)) and Singapore (Istiak (2022); Feng (2014)), and major economies like Japan (Arbatli Saxegaard et al. (2022)) and China (Huang and Luk (2020)). The approach is versatile in diverse economies, from de-

veloped economies such as New Zealand (Ali et al. (2022)) to emerging ones like Pakistan (Choudhary et al. (2020)), Colombia (Gil and Silva (2018); Perico Ortiz (2022)) and Brazil (Ferreira et al. (2019)).

This paper constructs an EPU index for Portugal starting in 1998 that reflects the frequency of articles in more than twenty Portuguese news source that contain a specific trio of terms. Recent literature, such as Andres-Escayola et al. (2023) indicates that increasing the number of news outlets in the analysis is beneficial. The index notably spikes during major events such as political crises, elections, weather-related incidents, financial crises, and the COVID-19 pandemic.

Roadmap. In what follows, Section 2 describes the construction of the EPU index. Section 4 studies the effects of shocks and their quantitative importance and conducts a series of sensitivity checks to further test the robustness of the results. Finally, in Section 6, I provide concluding remarks.

2 Data methodology

From 1998 to 2023, I collected monthly data from a comprehensive set of Portuguese-language media outlets. This dataset includes data sourced from an array of media outlets, including two news agencies, seven national newspapers, five business newspapers, two regional newspapers, two online newspapers, four magazines, and one radio station. For a detailed list of these sources, please refer to Appendix A. The search is geographically limited to Portugal. The search criteria focused on articles that included at least one keyword from each of the designated categories: "Economy" (E),"'Policy" (P), and "Uncertainty" (U). The specific search parameters were as follows: ((económico/a OR economia) AND (Parlamento OR Palácio de São Bento OR governo OR ministério das finanças OR Comissão Europeia OR défice OR orçamento OR ((o OR de OR do OR um OR por OR este OR esse OR aquele) with imposto/s) OR legislação/ões OR regulação/ões

OR regulamento/s OR lei/s) AND (incerto/a OR incerteza OR instabilidade OR instável OR indefinição OR indecisão OR risco/s)). The translation in English can be seen in Appendix Table 2. The Portuguese EPU index is shown in Figure 1. The newly developed

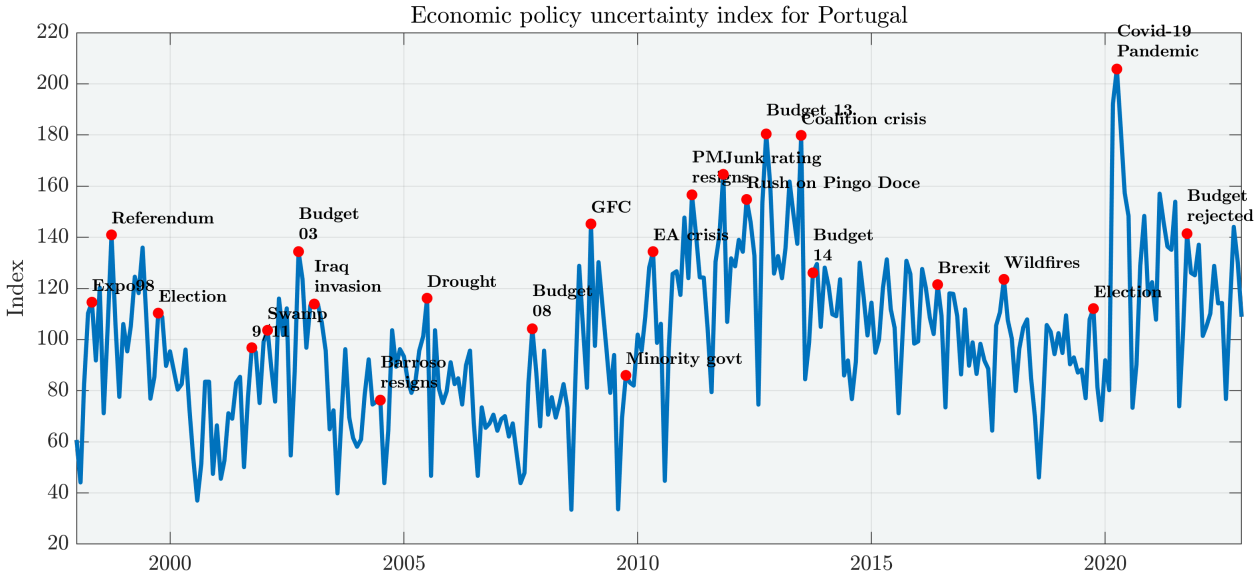


Figure 1: Economic policy uncertainty index for Portugal

index rises during periods of increased uncertainty. Notable spikes occurred during the Great Financial Crisis and the Euro Area Crisis, which led to the initiation of the Financial Assistance Programme. The programme goals were to restore confidence in international financial markets through fiscal consolidation, ensuring stability in the financial system, and implementing structural adjustments in the Portuguese economy. Considering the significance of this programme for Portugal, several events are mirrored in the EPU index. The government, working on approving a stability and growth package as a precursor to the forthcoming Financial Assistance Programme, was dissolved just two months before the official bailout. The downgrade to junk rating, driven by skepticism about meeting programme targets, was another significant moment. The 2013 budget discussion also caused a surge in the index due to the unpopularity of certain measures. The highest spike was recorded in April 2020, coinciding with the state of emergency to combat the Covid-19 pandemic. See Appendix Table 3 for a comprehensive list of events.

3 Empirical framework

Consider a VAR model with n endogenous variables and p lags which can be written as:

$$y_t = \mathcal{B}_1 y_{t-1} + \ldots + \mathcal{B}_p y_{t-p} + \mathcal{C} x_t + \varepsilon_t \qquad \varepsilon_t \sim \mathcal{N}(0, \Sigma) \tag{3.1}$$

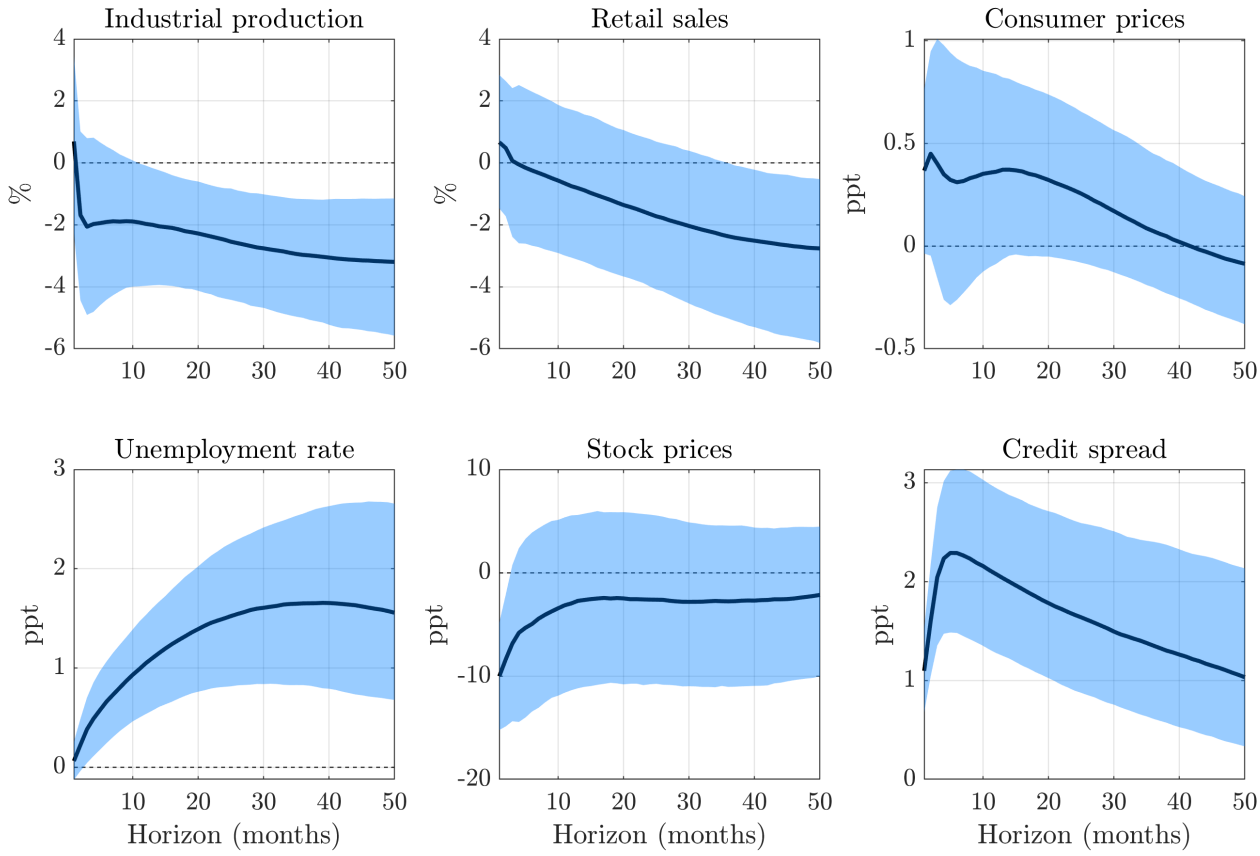
where y_t is an $n \times 1$ vector of endogenous variables, $\mathcal{B}_1, \ldots \mathcal{B}_p$ are $n \times n$ coefficient matrices, $\mathcal{C}$ is an $n \times 1$ vector of constants, and ε_t is an $n \times 1$ vector of reduced-form innovations. ε_t is related to η_t structural shocks via linear mapping, $\eta_t = \mathcal{D}\varepsilon_t$, where $\mathcal{D}$ is a non-singular, $n \times n$ structural impact matrix and η_t is an $n \times 1$ vector of mutually uncorrelated structural shocks with $\Sigma = \mathcal{D}_t \mathcal{D}_t'$.

Empirical specification. The baseline model, specified in Equation 3.1, includes six endogenous variables: the Industrial Production Index (IPI), retail sales, the unemployment rate, the Consumer Price Index (CPI), a stock market index, and the credit spread between short-term and long-term government bond rates. It employs a lag order of 3 based on the AIC criteria and includes both a constant and the Global Economic Policy Uncertainty Index (GEPU) by Baker et al. (2016) as exogenous variables[1]. Detailed information regarding the data sources can be consulted in Appendix Table B5. Additionally, Figure B4 in the Appendix visually represents the time-series data used. The model dataset spans monthly observations from January 1998 through December 2019. The estimation of the model employs Bayesian methods with an independent normal-Wishart prior distribution, as elaborated by Dieppe et al. (2016). Hyperparameters values are listed in Table B7 in the Appendix.

[1] Appendix Table B8 show the Lag order criteria and Appendix Table B9 provide the DIC scores for alternative exogenous variables specification.

4 The real and financial effects

To better understand the economic ramifications of policy uncertainty, I focus on the responses of selected real and financial variables, omitting quarterly variables like GDP which have been previously covered in Manteu and Serra (2017).



Note: Impulse responses to a economic policy uncertainty shock normalized to drop the stock prices by 10% on impact. The solid black line represents the posterior median estimate and the shaded areas 68% confidence bands.

Figure 2: Impulse responses to a EPU shock

When faced with increased policy uncertainty, firms become reluctant to commit to long-term production and investment plans. This caution leads them to postpone projects, resulting in a delayed decline in industrial output, as illustrated in Figure 2. Meanwhile, retail sales remain stable on impact. However, as consumers become increasingly wary of the policy uncertainty, they delay non-essential purchases, resulting in a slow but consistent drop in retail sales. Consumer prices exhibit a slight uptick, though not significant,

which can be attributed to uncertainty associated with supply chain disruptions. The unemployment rate escalates as firms lay off workers to cut costs and safeguard against uncertainty surrounding future business conditions. When examining the financial variables, we can observe that they are forward-looking and swiftly adjust to new information. A rise in policy uncertainty leads to an immediate drop in equity prices due to weakened investor sentiment. Investors foresee potential negative effects on future corporate earnings. Simultaneously, credit spread widens as lenders seek a higher premium for their loans, sensing a riskier environment due to deteriorating economic conditions.

5 Additional Analysis

Pandemic. The Covid-19 pandemic introduced a lot of uncertainty in economic agents decisions. I evaluate the Covid-19 pandemic's impact on the model's by adding the pan-

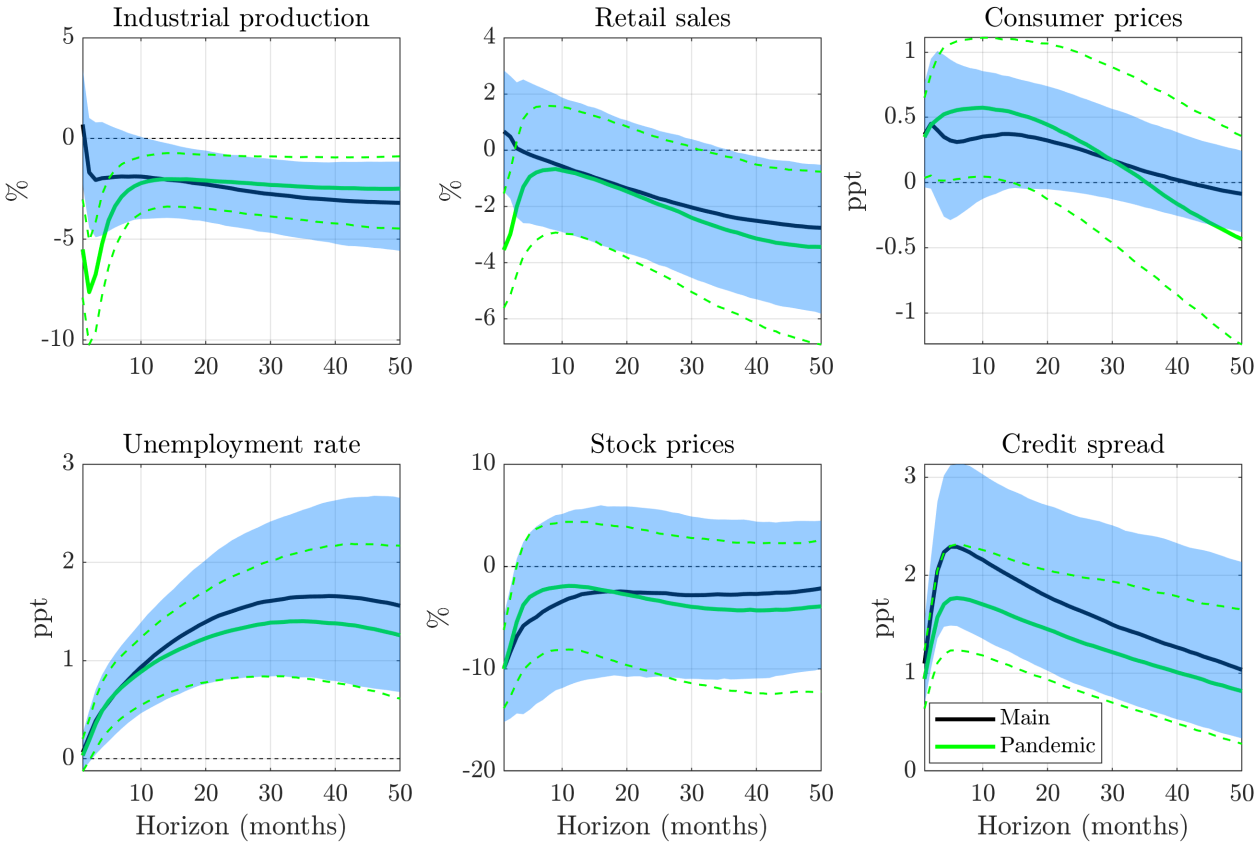


Figure 3: Including Covid-19 pandemic

demic period with a dummy[2] and contrasting it with the benchmark model results. Figure 3 shows significant differences in the magnitude and persistence of macroeconomic responses due to the pandemic. The significant decline in industrial output, when accounting for the pandemic, is attributed to the widespread shutdowns of factories and businesses which led to supply chain disruptions that increased consumer prices. On the other hand, the decline in retail sales resulted from lockdowns and social distancing measures, which led to decreased consumer demand for many services and non-essential services. The unemployment rate response shows only a slight increase compared with benchmark, primarily due to the proliferation of telework, which provided some sectors with the flexibility necessary to mitigate the effects of the pandemic on labor markets. Credit markets were not spared either, as increased credit spreads indicating heightened perceptions of lending risk due to the pandemic. Equity prices response mirror pre-pandemic, but with quicker recovery due to the COVID bailouts. However, the long-term outlook is less favorable, as companies will ultimately face higher taxes and inflation to offset bailout costs.

Variance decomposition analysis To further analyze the impact of EPU shocks on macroeconomic variables, I perform a forecast error variance decomposition (FEVD). In light of this, I have adopted the identification scheme proposed by Ludvigson et al. (2020), which applies *correlation restrictions* to the shocks. The EPU shock, represented as η_t, is identified using the EPU index S_t as variable external to the SVAR. The relationship is formally represented as:

$$\rho_1 = \text{corr}\left(S_t, \eta_{1,t}\right) \geq \bar{c} \tag{5.1}$$

This configuration ensures that the correlations between the EPU shock and the EPU index does not fall below a predetermined threshold ($\bar{c}$). Figure 4 displays the IRF results obtained through proxy identification. Although they exhibit similar signs and shapes,

[2] Álvarez and Odendahl (2022) and Carriero et al. (2022) offer more complex modeling approaches for the pandemic.

these seem to generate less negative impacts to policy uncertainty. Notably, aside from sales, the recursive approach pronounced adverse effects of the shock, resulting in a steeper decline in industrial production and equity prices, a more significant increase in consumer prices and unemployment, and wider spreads. Table 1 shows the percentage contribution of the shock to the variance of each variable at three different forecast horizons: 12 months, 24 months, and long-run (50 months). Policy uncertainty exerts an

Table 1: Forecast error variance decomposition

h	IPI	SALES	CPI	UNEMP	STOCK	CREDIT
1	10.01	9.68	11.82	13.23	27.57	43.85
12	10.17	9.71	11.95	32.22	23.48	43.48
24	12.22	11.59	12.05	39.92	19.88	40.62
50	17.32	15.92	12.51	37.82	18.59	35.39

Notes: The table shows the median forecast error variance decomposition of the economic policy uncertainty shocks results at horizons 1, 12, 24, and 50 months.

immediate effect on the Industrial Production Index (IPI) and equity prices (STOCK). At the 1-month horizon ($h = 1$), the policy uncertainty shock accounts 10.59% of the variation in Industrial Production Index (IPI), 9.68% of Sales, 11.82% of Consumer Price Index (CPI), 13.23% of Unemployment rate (UNEMP), 27.57% of Stock prices, and 43.85% of Credit spread. Given the uncertainty, businesses swiftly reassess their production and investment strategies, and investors realign their portfolios reflecting new risk assessments. In the long run, the effects of the EPU shock diverge across the different variables. At the 24-month mark, the influence on equity prices wanes to 18.59%, whereas the effect on industrial production escalates to 12%. Notably, as the credit conditions susceptibility to policy uncertainty plateaus at 40% by the 24-month threshold, this indicates an amplification in the impact on financial markets and investment choices as perceptions of risk and the cost of borrowing escalate. Concurrently, an increase in the unemployment rate's variance contribution becomes evident. This trend is likely a result of firms recalibrating their workforce in reaction to the instantaneous shift in production levels triggered by

the surge in policy uncertainty. By the 50-month horizon, the variance contributions of industrial production peaks at 17%, whereas unemployment (37.82%) and credit spread (35.59%), which continue to show relatively elevated percentages. This persistence might be influenced by intrinsic labor behavior and current credit market conditions, particularly in light of the decline in industrial production and sales. In Appendix Table 4, the FEVD using the recursive identification method can be found. These results are inconclusive, as the shock to individual variables predominantly explains their variations. This behavior is not observed when using the more precise proxy identification approach, as the EPU index is used to identify the EPU shocks, making the shocks more sensitive to actual variations in policy uncertainty.

Sensitivity analysis To evaluate the robustness of the results more comprehensively, I conduct a series of robustness checks. Additional details and figures are in Appendix C. The findings remain consistent even when incorporating different exogenous variables such as the real Brent oil price (as shown in Figure 7) and removing the global EPU index of Baker et al. (2016) (illustrated in Figure 8). The results are consistent across different lag lengths (Figures 9 and 10), various priors (Figures 11 and 12, 13, 17), alternative hyperparameters choices (Figures 14 and 15), diverse assumptions regarding the S_0 matrix (Figure 16), and the inclusion of deterministic terms (Figure 18). These tests bolster confidence in the resilience of the main analysis.

6 Conclusion

In this paper, I develop an Economic Policy Uncertainty (EPU) index specific for Portugal using the influential methodology developed by Baker et al. (2016). I assess the effects of policy uncertainty shocks using an SVAR approach, covering the period from 1998 to 2023. The findings indicate that higher policy uncertainty leads to adverse economic outcomes, specifically causing turmoil in financial markets and a decline in economic

activity.

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APPENDIX FOR PUBLICATION

A EPU index

Table 2: Translation of the search words

Portuguese term	English term
Economy terms	
economia or económico	″economic″ or ″economy″
Uncertainty terms	
incerto or incerteza	″uncertain″ or ″uncertainty″
instável or instabilidade	″instability″ or ″unstable″
indefinido or indecisão	″indefiniteness″ or ″indecision″
risco	″risk″
Policy terms	
Parlamento or Palácio de São Bento	″Parliament″ or ″Parliament place″
Governo or Ministério da Finanças	″Government″ or ″Ministry of Finance″
Comissão Europeia	″European Commission″
défice or orçamento	″deficit″ or ″budget″
imposto	″tax″
legislação or regulação or lei	″legislation″ or ″regulation″ or law″

Table 3: Major events in Portugal

Y	M	Event
’98	May	Expo ’98 opens in Lisbon
’98	Nov	Referendum on reorganising the administrative map
’99	Jan	Portugal joins Eurozone
’99	Jun	European Parliament election
’01	Sep	Terrorist attacks (11/09)
’01	Dec	PM resigns
’02	Jan	The EC advised Portugal over its increasing budget deficit
’03	Feb	Iraq invasion
’05	Jul	Portugal worst drought in 60 years
’07	Oct	Budget discussion
’09	Jan	Great financial crisis
’09	Oct	Local elections
’10	May	PM resigns
’11	Mar	Portugal’s government falls due to austerity measures
’11	Nov	Fitch downgrads portuguese rating to junk
’13	Oct	Budget discussion
’13	Jul	Several senior ministers resign
’14	May	Last month of the financial adjustment program
’16	Jun	Brexit
’17	Oct	Local elections
’19	Oct	Legislative election
’20	Apr	State of emergency to combat the Covid-19 pandemic
’21	Oct	Budget rejection
’23	Nov	PM resigns

Table 4: FEVD using recursive identification

h	IPI	SALES	CPI	UNEMP	STOCK	CREDIT
1	0.21	0.26	0.41	0.19	1.73	2.98
12	0.64	0.50	0.84	2.35	0.87	6.19
24	1.06	0.69	1.12	4.14	0.91	6.11
50	2.17	1.33	1.31	5.07	1.11	5.70

Notes: The table shows the median forecast error variance decomposition of the economic policy uncertainty shocks results at horizons 1, 12, 24, and 50 months.

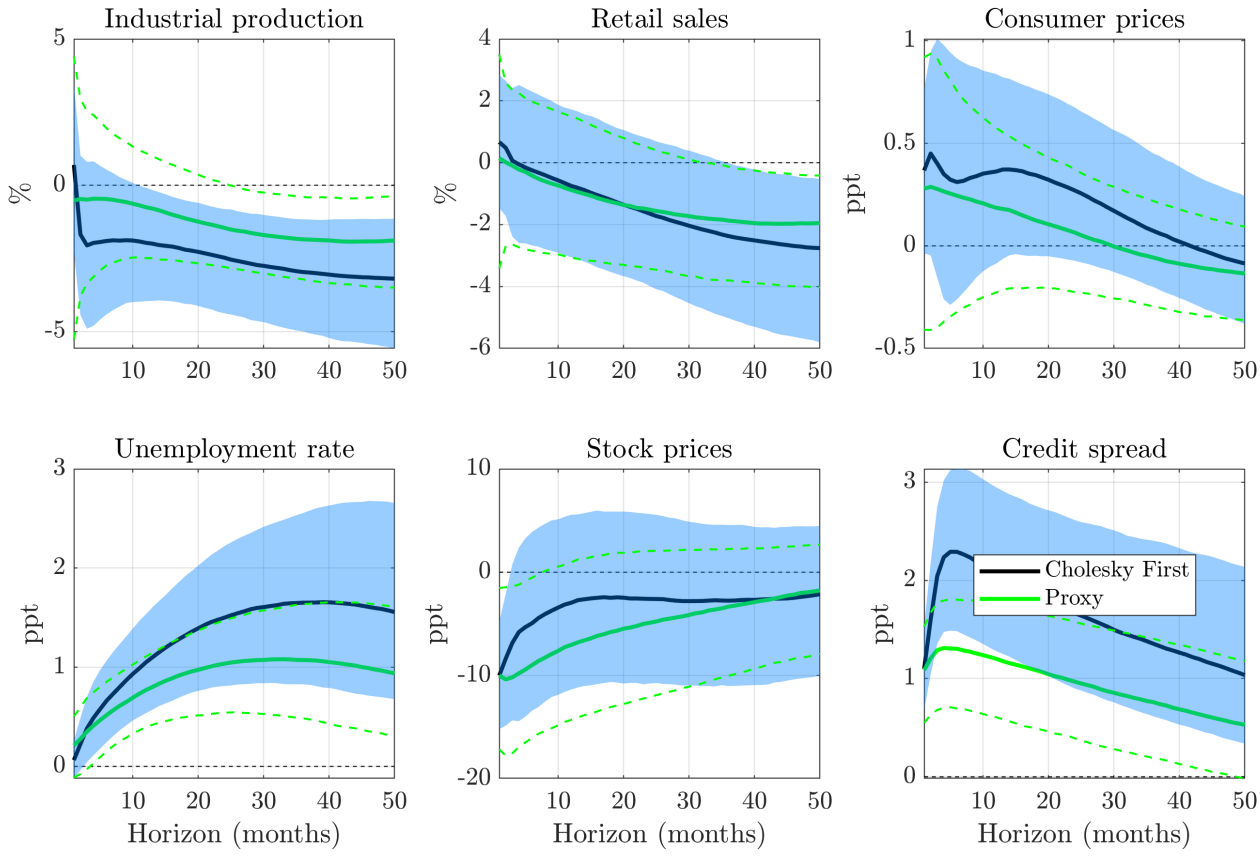

Figure 4: Model identified with EPU as Proxy

B Appendix: EPU index

B.1 Sources

Table 5: Sources

name	Freq	Type	fry	frm	frd	toy	tom	tod
Jornal de Notícias	D	National newspaper	1998	1	1	2023	11	30
Correio da Manhã	D	National newspaper	2008	12	1	2023	11	30
Diário de Notícias	D	National newspaper	2010	5	1	2023	11	30
Publico	D	National newspaper	2010	11	1	2023	11	30
Expresso	W	National newspaper	2013	9	1	2023	11	30
Jornal I	D	National newspaper	2013	12	1	2023	11	30
O Sol	W	National newspaper	2017	1	1	2023	11	30
Vida Económica	D	Business newspaper	1998	1	1	2023	11	30
Diário Económico	D	Business newspaper	1998	2	1	2016	5	31
Jornal de Negócios	D	Business newspaper	2011	10	1	2023	11	30
Dinheiro Vivo	W	Business newspaper	2014	4	1	2023	11	30
O Jornal Económico	W	Business newspaper	2017	7	1	2023	11	30
Açoriano Oriental	D	Regional newspaper	2010	6	1	2023	11	30
Jornal do Fundão	W	Regional newspaper	2011	7	1	2018	7	31
Observador		Online newspaper	2017	7	1	2023	11	30
ECO		Online newspaper	2019	2	1	2023	11	30
Visão Online		Magazine	2013	5	1	2023	11	30
Exame		Magazine	2013	9	1	2023	11	30
Executive Digest		Magazine	2019	11	1	2023	11	30
Sábado		Magazine	2020	5	1	2023	11	30
Reuters		News agency	1998	1	1	2023	11	30
Agência Lusa		News agency	2001	2	1	2023	11	30
TSF Online		Radio	2021	9	1	2023	11	30

B.2 Appendix: Model

Table 6: Data Description and Sources

Label	Description	Source
S_t	Economic policy uncertainty index in Portugal	Own
y_t	Production of Total Industry in Portugal	FRED
c_t	Total Retail Trade in Portugal	FRED
π_t	Consumer Price Index: All Items for Portugal	FRED/Own
u_t	Harmonized Unemployment Rate: Total: All Persons for Portugal	FRED
s_t	Total Share Prices for All Shares for Portugal	FRED
i_t	90-Day Interbank Rates for Portugal	FRED
l_t	Long-Term Government Bond Yields: 10-year: Main for Portugal	FRED
credit_t	Credit spread = 10-year rate - 90-Day rate	FRED/Own
gepu_t	Global Economic Policy Uncertainty Index	Baker et al. (2016)

Notes: The variables are incorporated into the main analysis spanning from January 1998 to December 2019.

Table 7: Hyperparameters

	Value	Description	Observation
ρ	1	autoregressive coefficients	Used in all models
λ_1	0.1	overall tightness	$\lambda_1 = 2$ used in 14 and $\lambda_1 = 1000$ in 11
λ_2	0.5	cross-variable weighting	$\lambda_2 = 1$ used in model 14
λ_3	1	lag decay	Used in all models
λ_4	10^5	exogenous variable tightness	Used in all models
λ_6	1	sum-of-coefficients tightness	Used in model 13
λ_7	0.1	dummy initial observation tightness	Used in model 17

Table 8: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-2947.59	4506.841	56.18637	23.8936	24.77596*	24.24864
2	-2861.64	160.9875	41.94659	23.60034	25.16897	24.23153*
3	-2793.89	123.1344	36.23227*	23.45152*	25.70644	24.35885
4	-2752.09	73.65339	38.53019	23.50864	26.44983	24.69211
5	-2721.88	51.5431	45.04309	23.65779	27.28526	25.11741
6	-2682.43	65.12616	49.09426	23.73358	28.04732	25.46934
7	-2646.36	57.54557	55.18501	23.83617	28.83619	25.84808
8	-2602.32	67.79842	58.51123	23.87558	29.56188	26.16363
9	-2569.42	48.83438	68.14416	24.00332	30.3759	26.56752
10	-2521.18	68.91875*	70.71785	24.00933	31.06819	26.84967

Notes: * indicates lag order selected by the criterion LR: LR test (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion

Table 9: DIC results

Exogenous	
GEPU	6.20E+03
Time trend	6.18E+03*
Real Brent	6.22E+03
No Exogenous	6.22E+03

Notes: * indicates lag order selected by the criterion. All models include a constant.

B.3 Macroeconomic variables

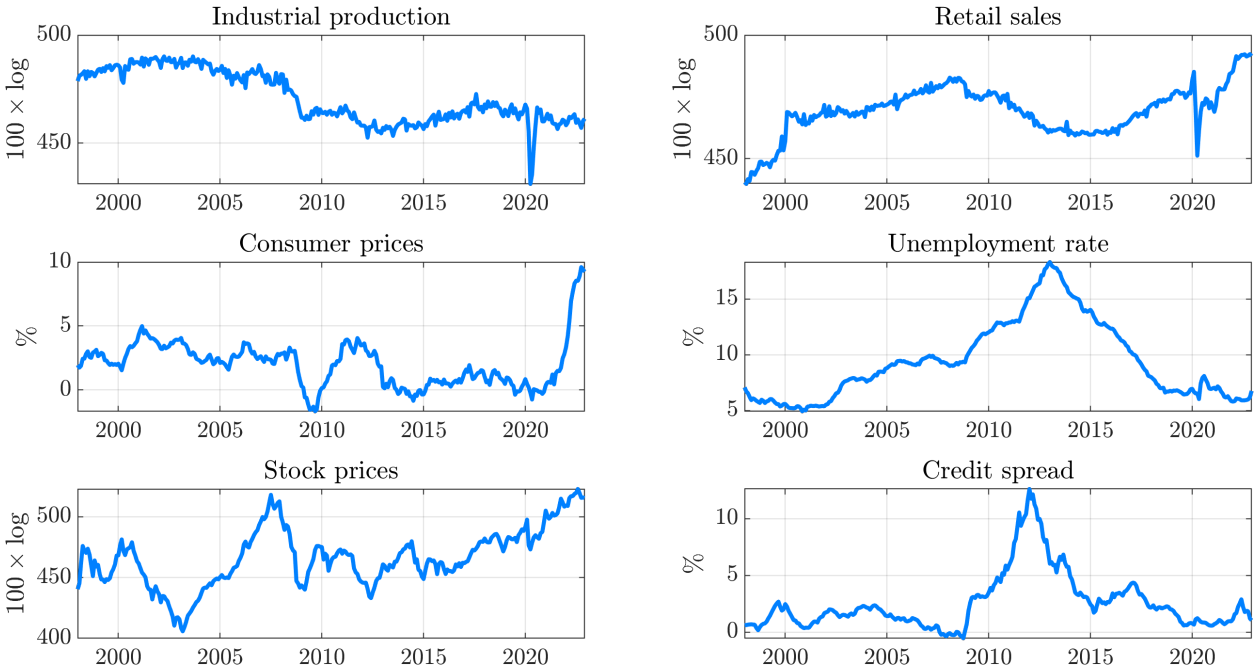

Figure 5: Macroeconomic time series used in the model

C Sensitivity analysis

C.1 Robustness: Russia invasion

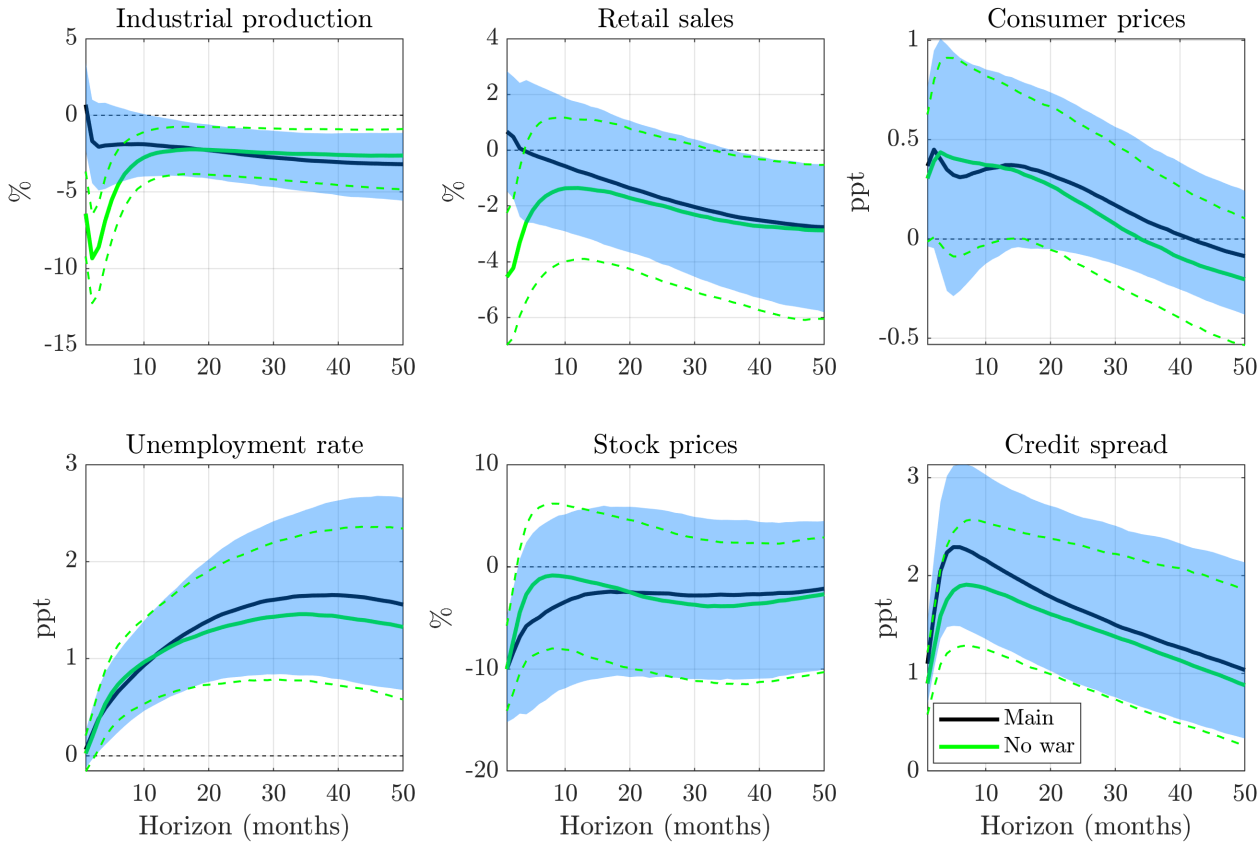

Figure 6: Model excluding Russian invasion

C.2 Robustness: Oil price

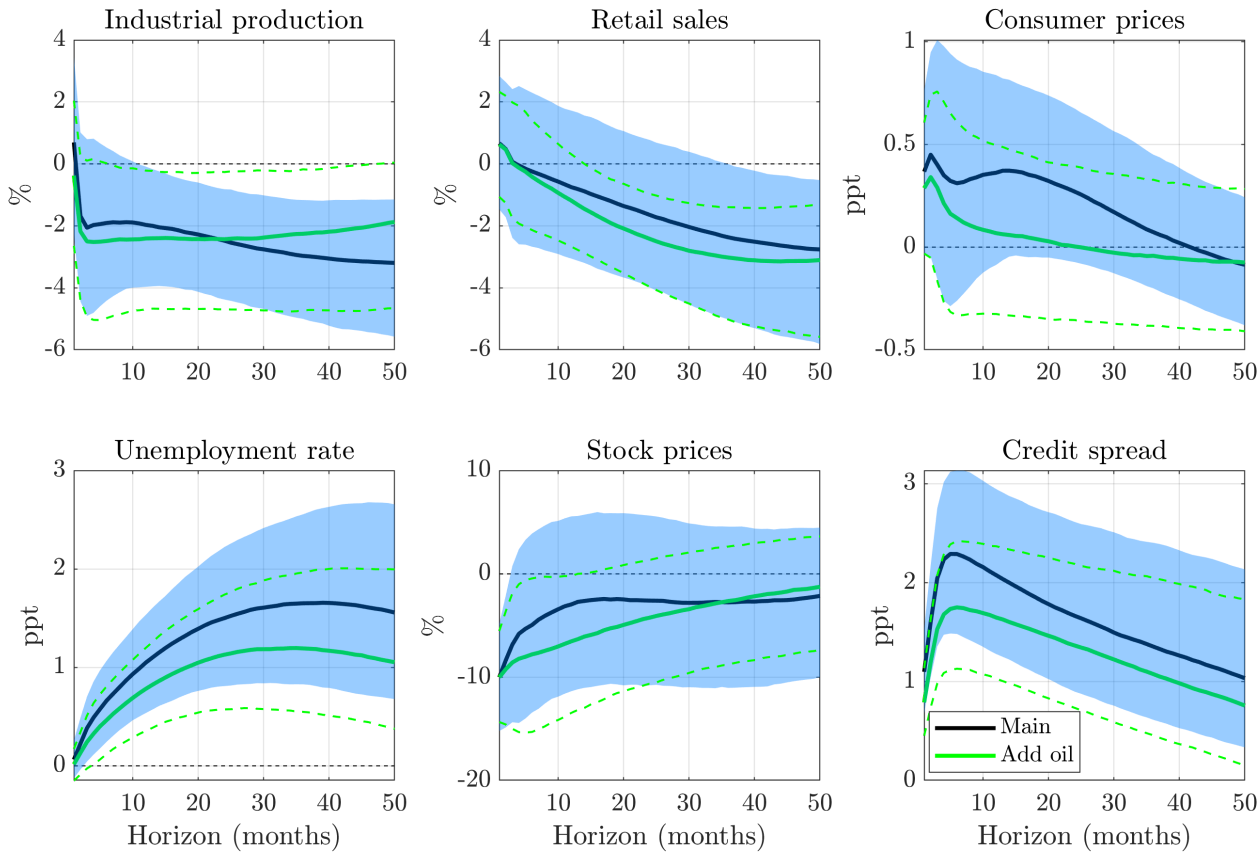

Figure 7: Model including real Brent price

C.3 Robustness: GEPU index

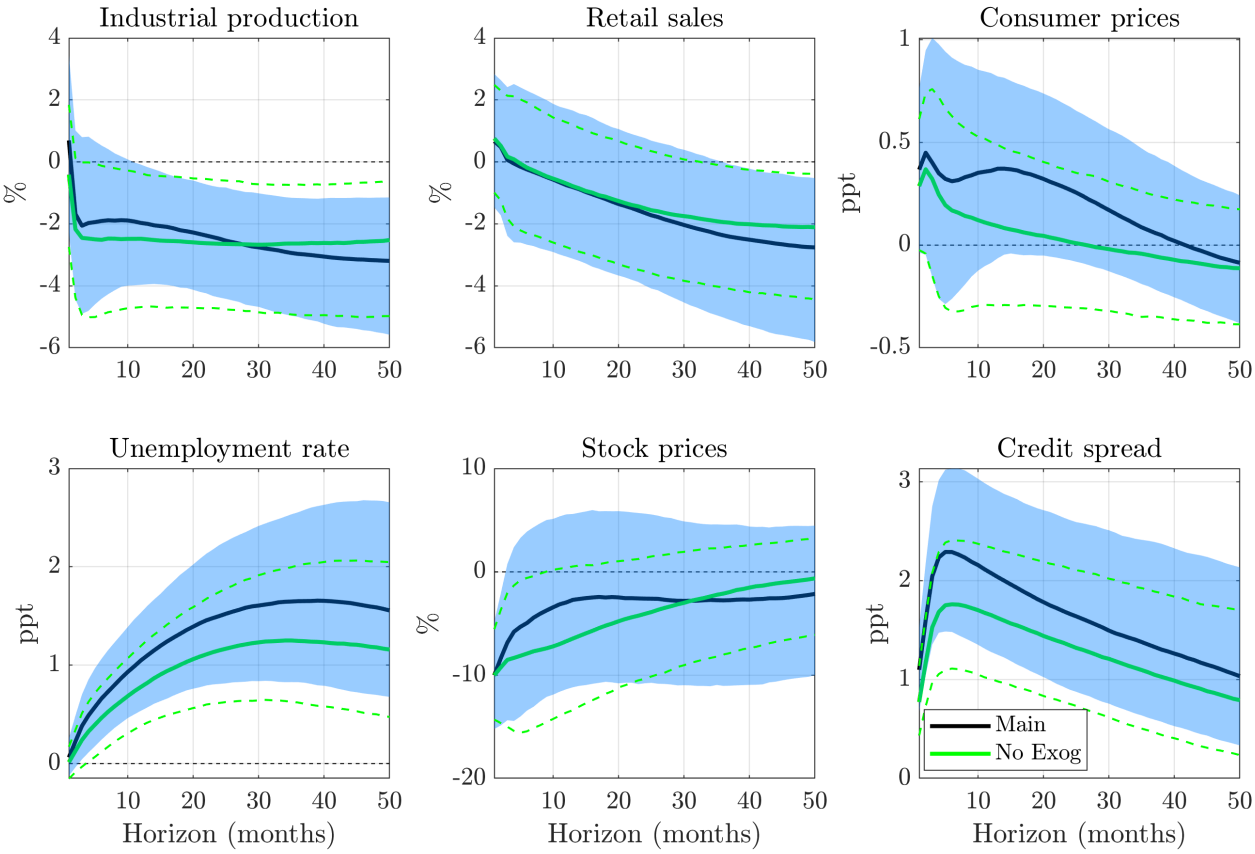

Figure 8: Model without GEPU

C.4 Robustness: 1 lag

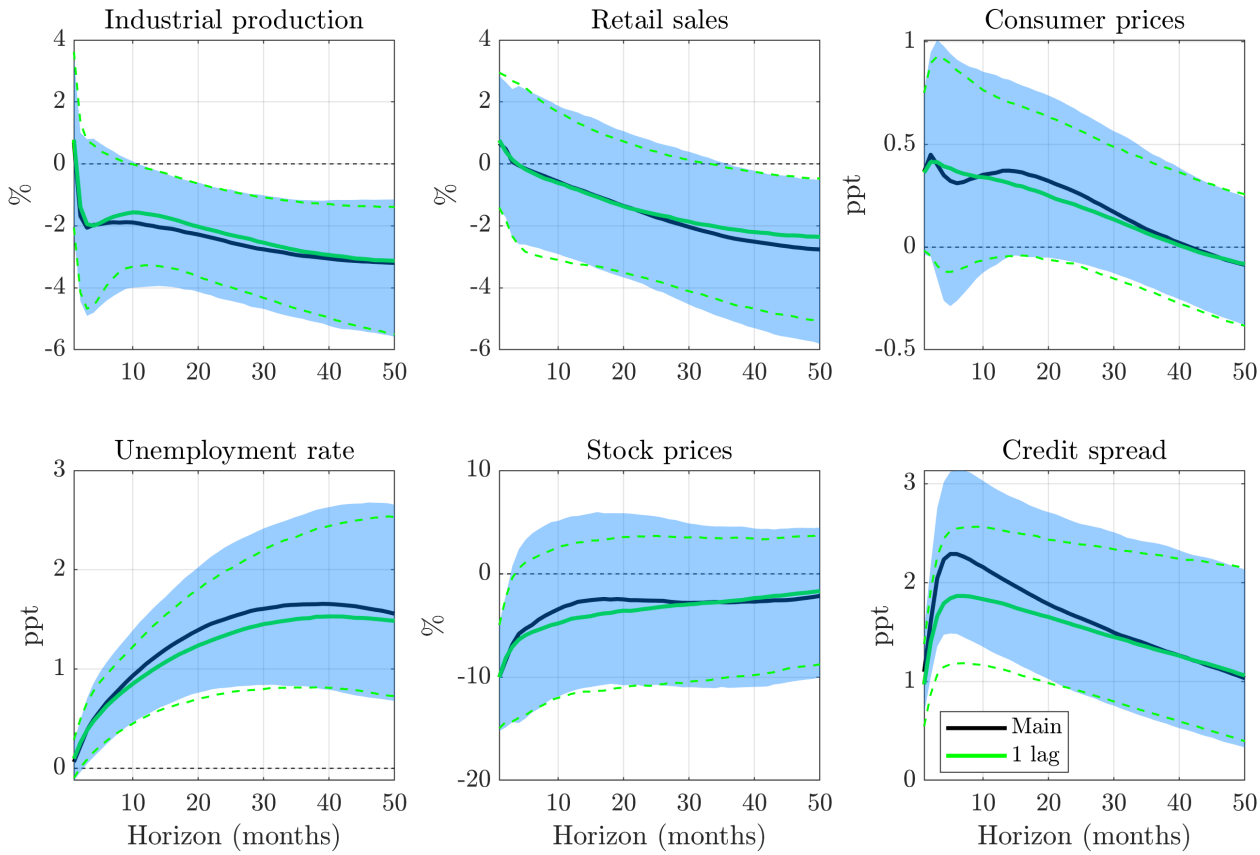

Figure 9: Results from a BVAR(1) selected by SC

C.5 Robustness: 10 lags

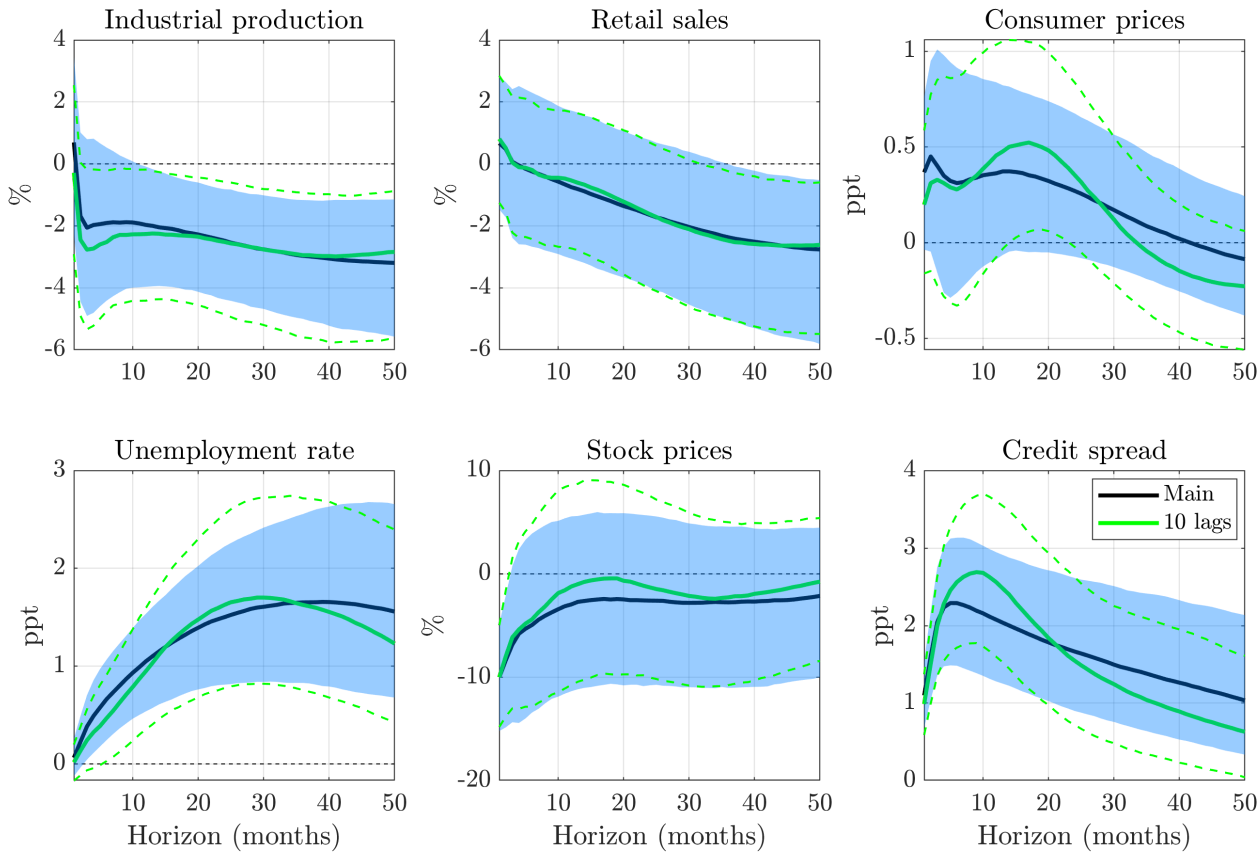

Figure 10: Results from a BVAR(10) selected by LR test

C.6 Robustness: flat-diffuse prior

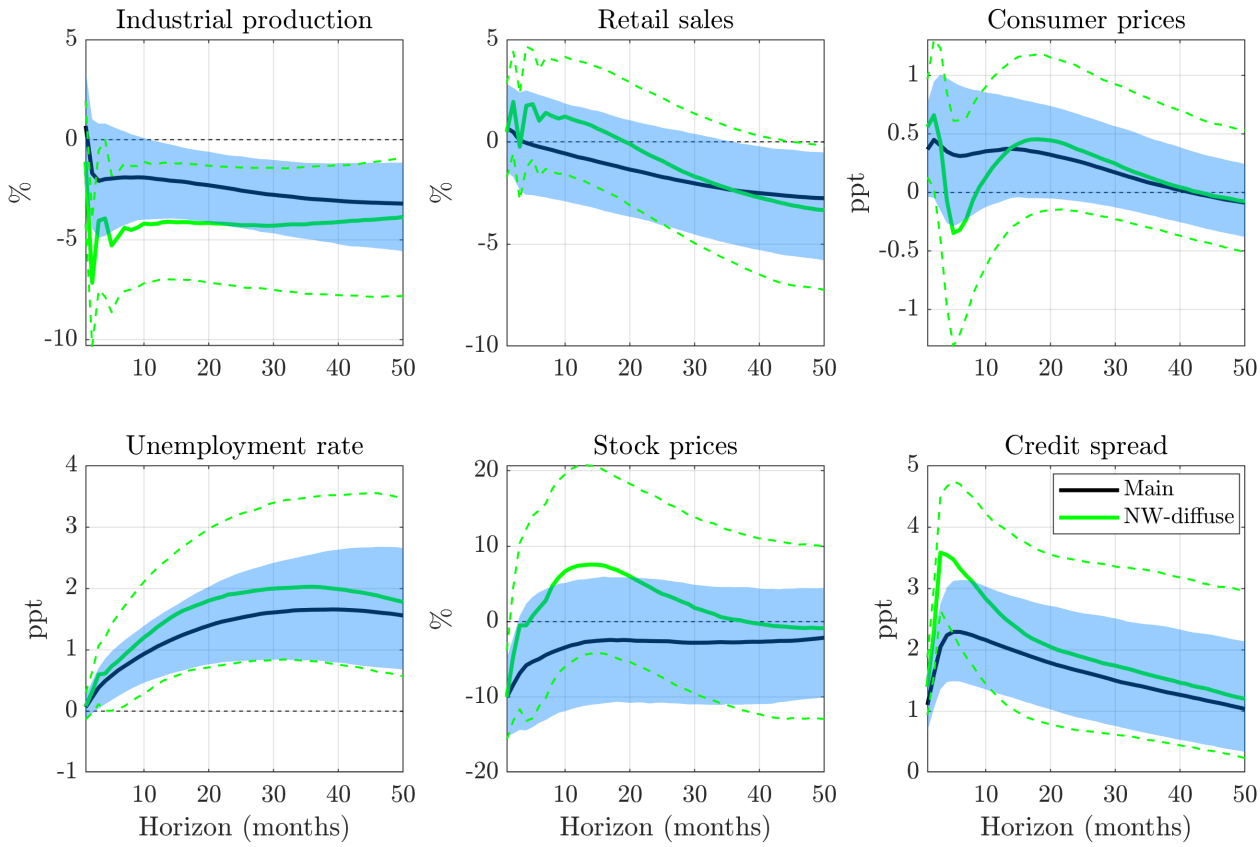

Figure 11: BVAR with NW-diffuse prior

C.7 Robustness: diffuse prior

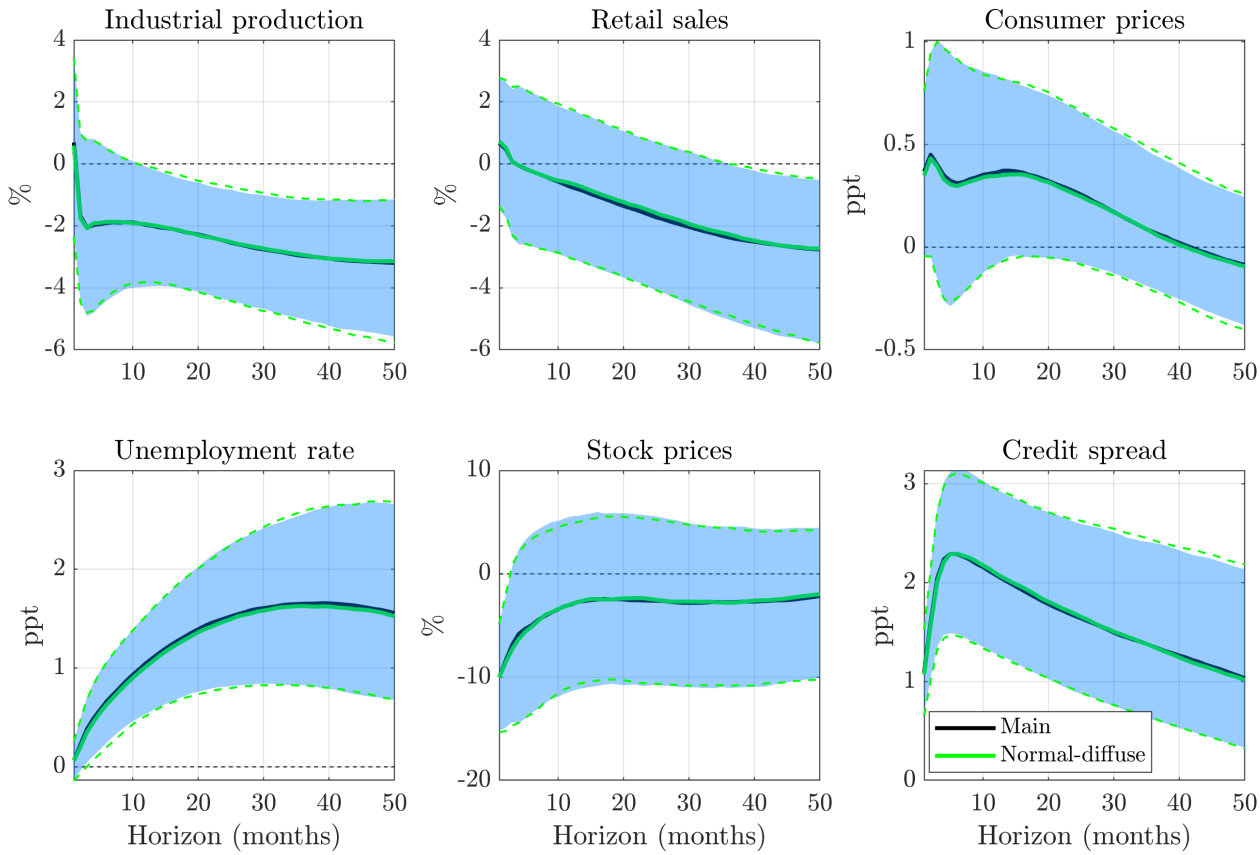

Figure 12: BVAR with normal-diffuse prior

C.8 Robustness: sum-of-coefficients

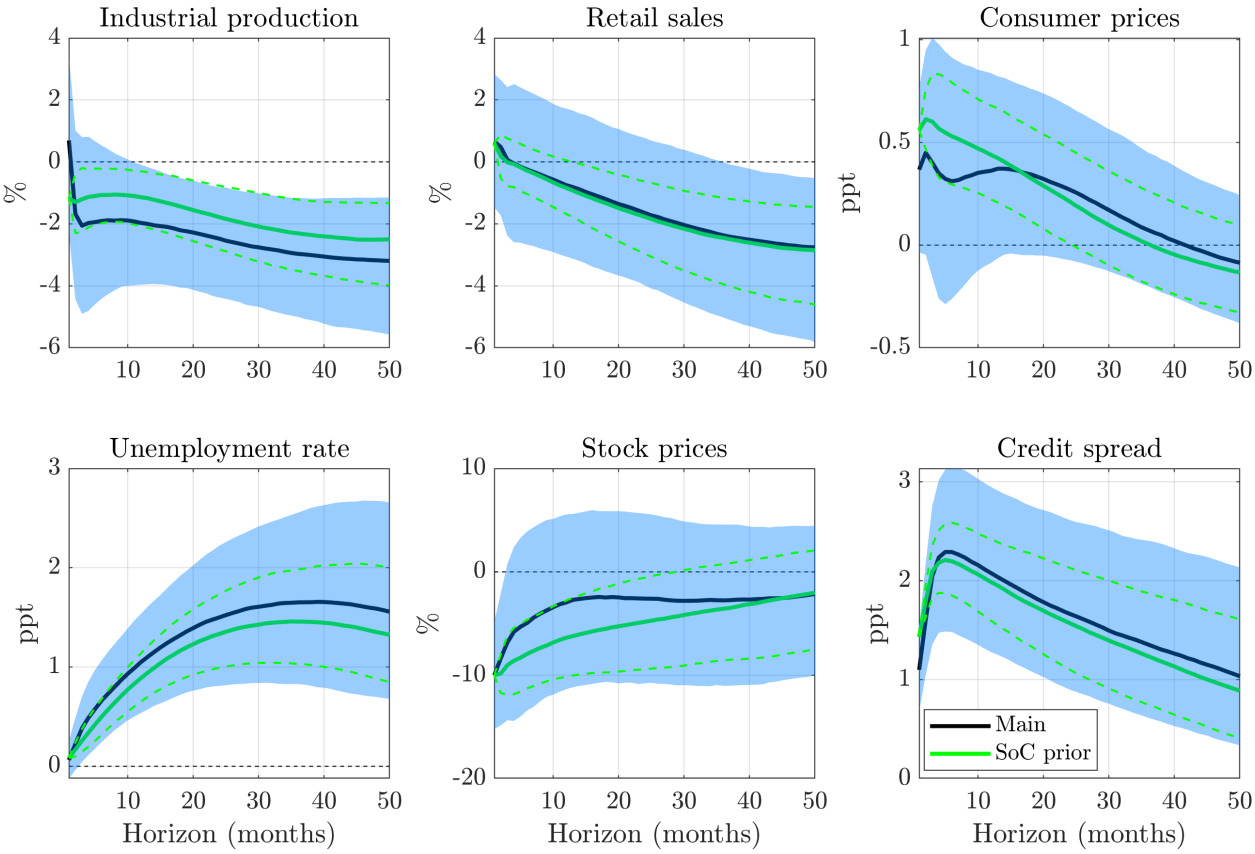

Figure 13: BVAR with sum-of-coefficients prior

C.9 Robustness: VAR

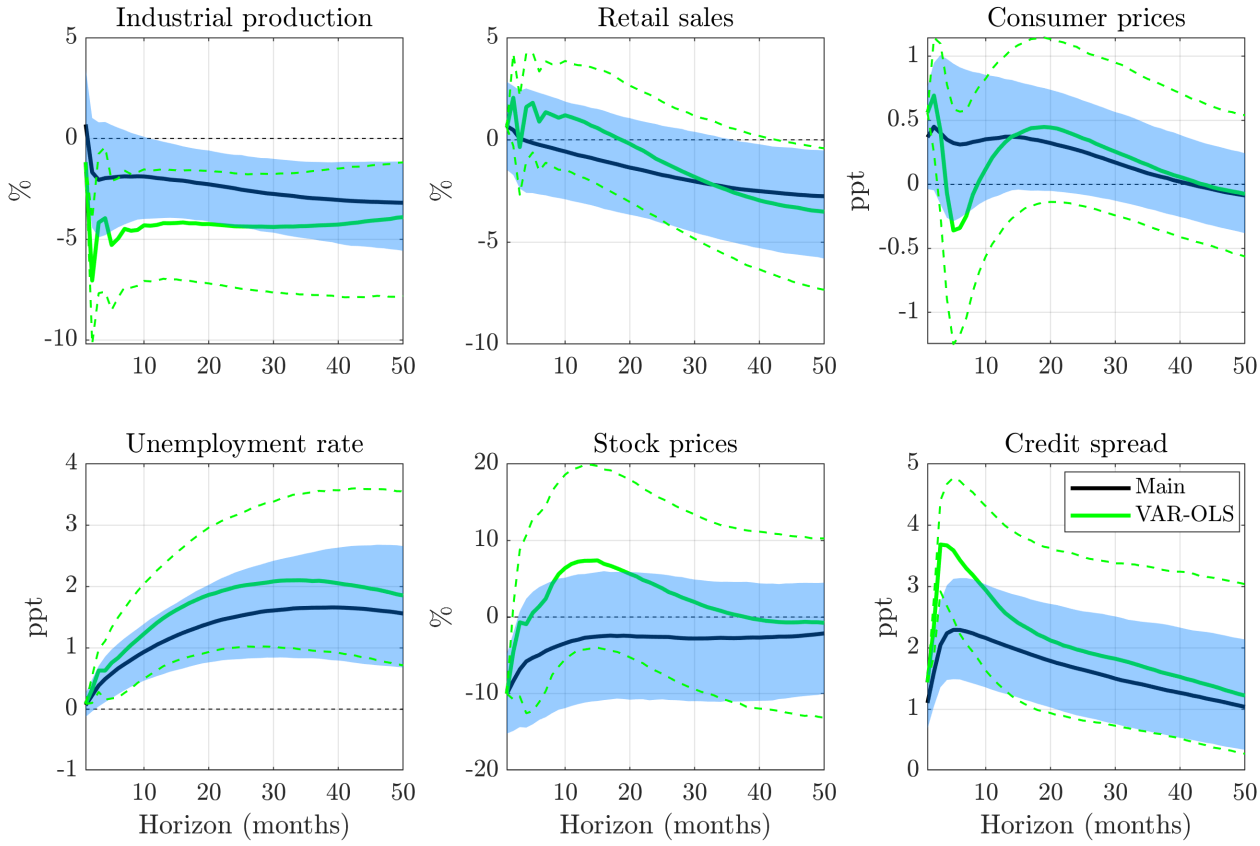

Figure 14: The model is estimate as VAR using λ_1=1 and λ_2=2

C.10 Robustness: Hyperparameters

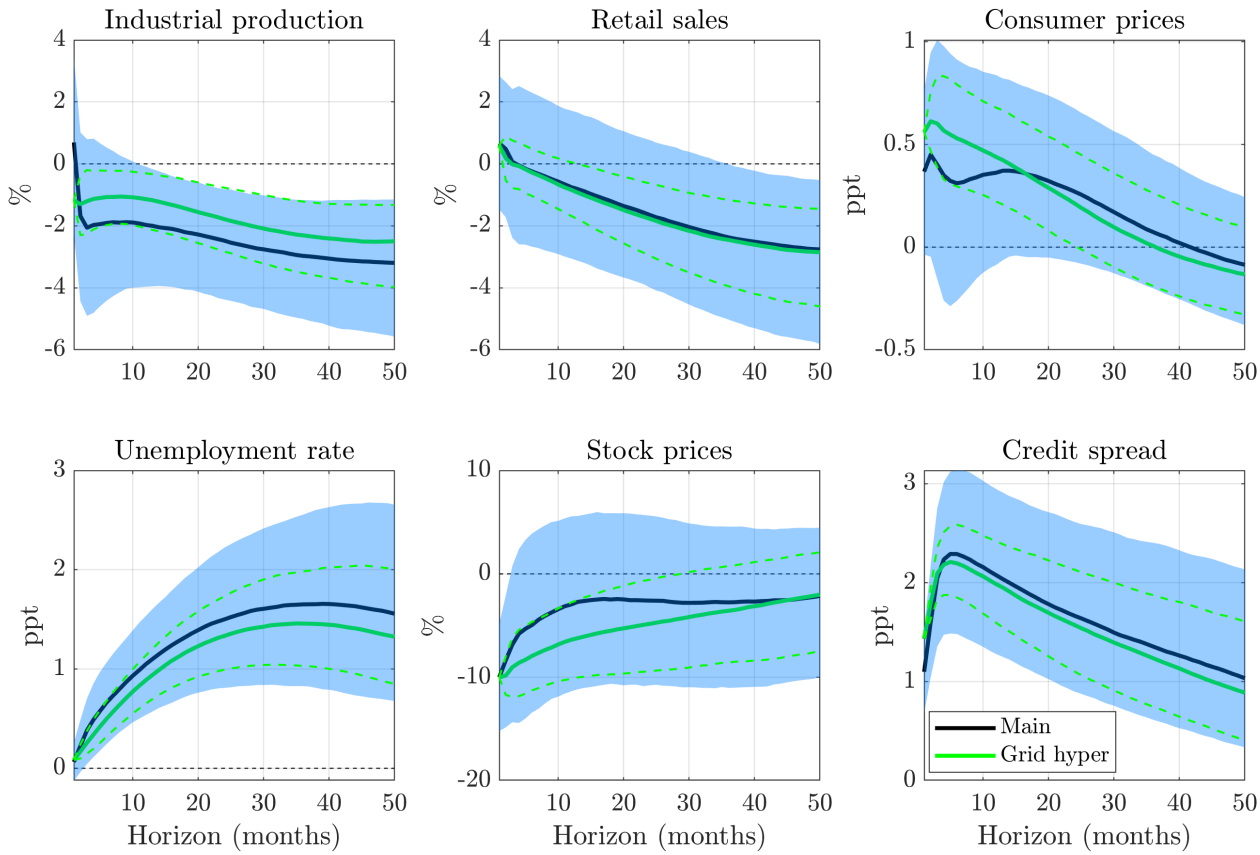

Figure 15: BVAR with hyperparameters optimized by grid search

C.11 Robustness: identity S_0 matrix

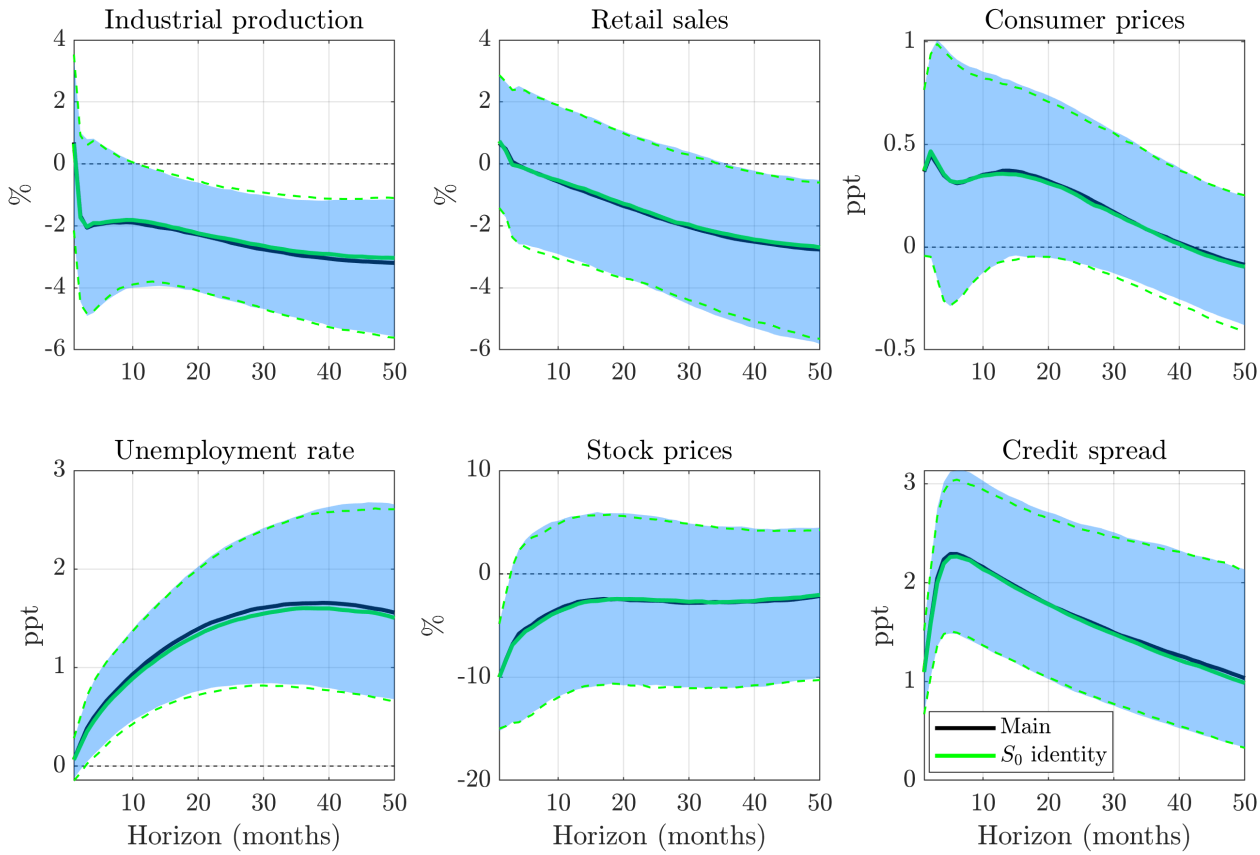

Figure 16: BVAR with S_0 as identity

C.12 Robustness: dummy prior

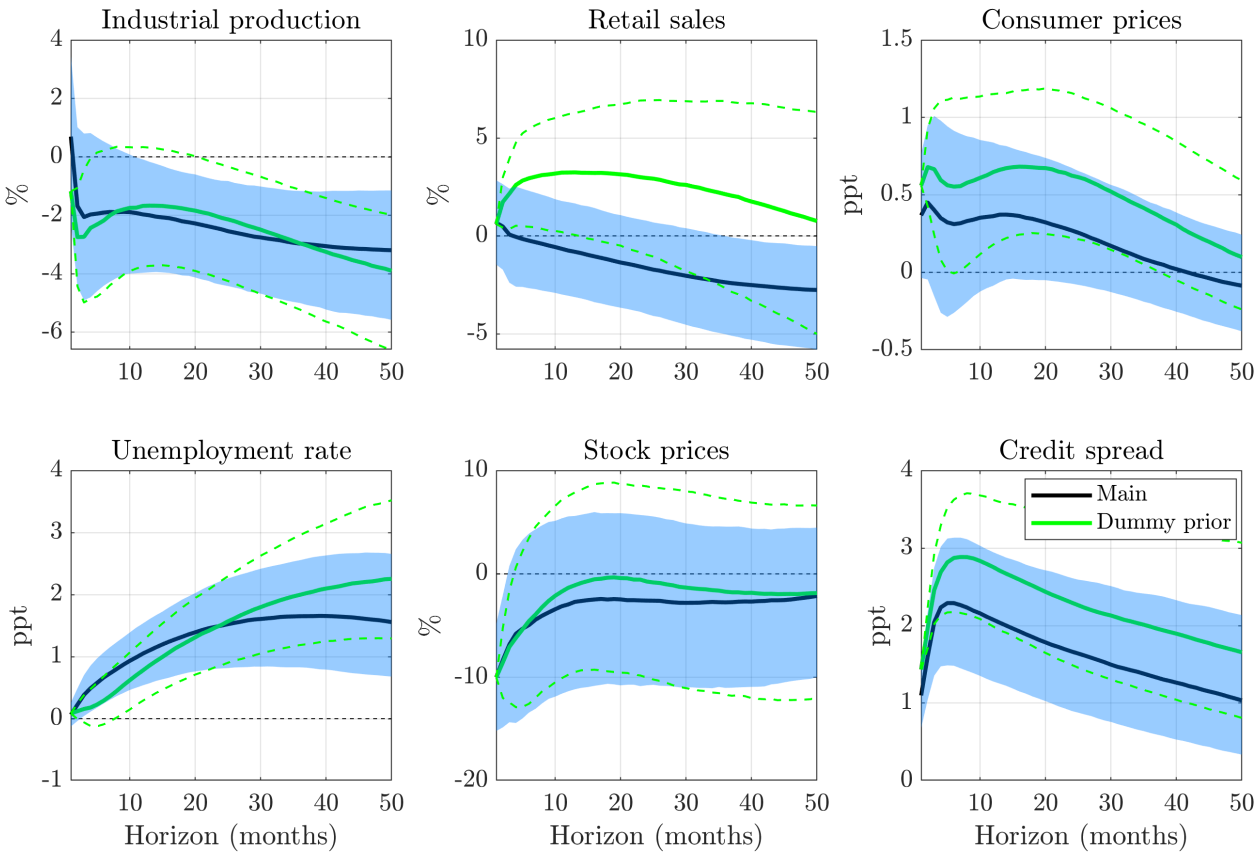

Figure 17: BVAR with dummy prior

C.13 Robustness: trend

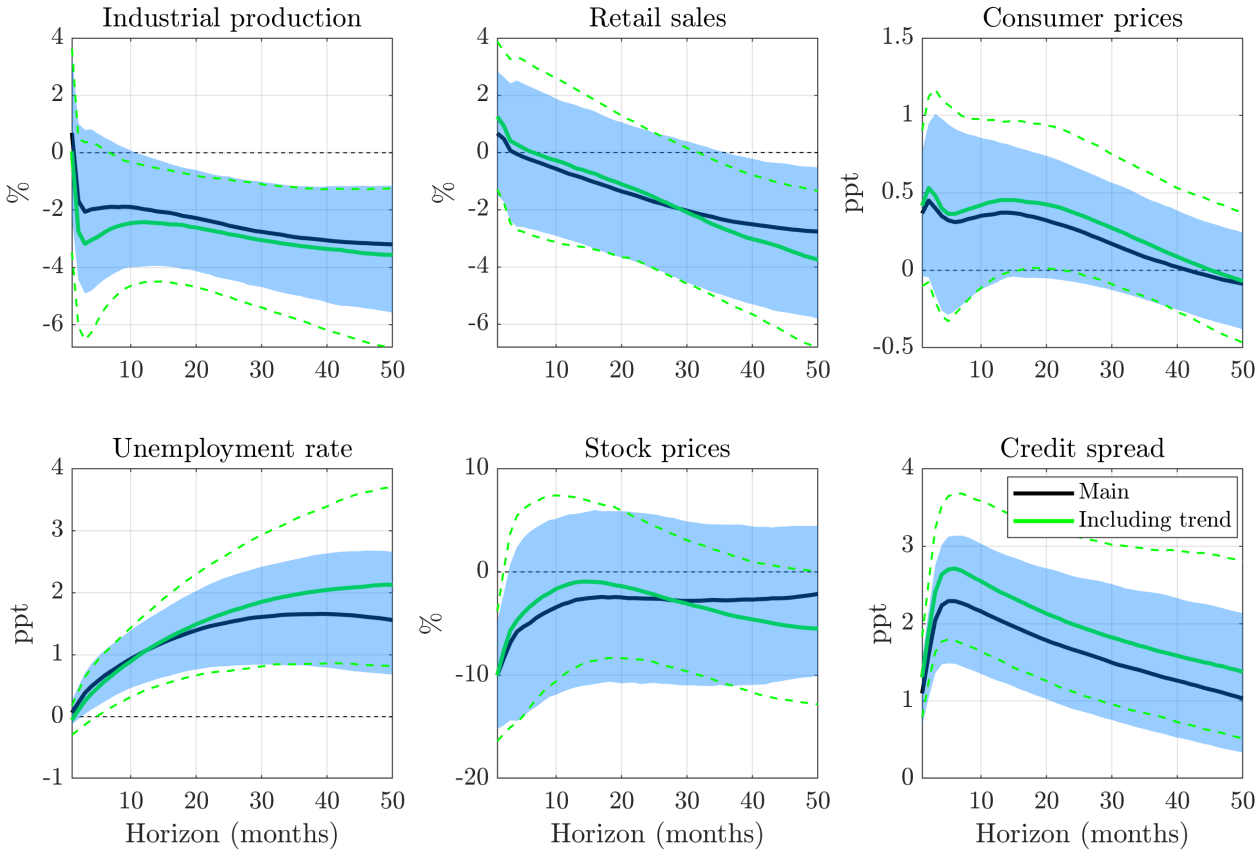

Figure 18: BVAR with linear trend

C.14 Robustness: EPU index by Gunnemann

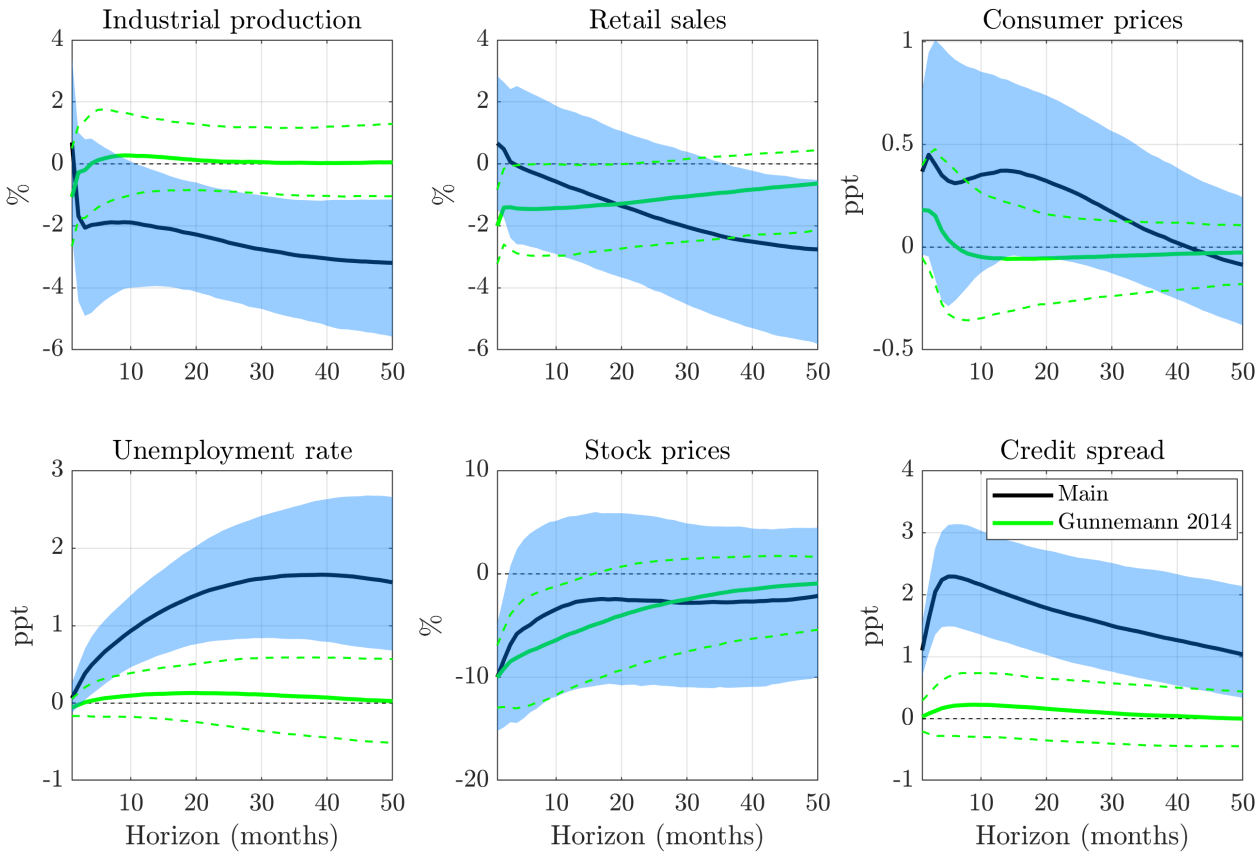

Figure 19: BVAR using alternative EPU index