

An economic policy uncertainty index for Portugal

International Economics, 2024

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October 2026

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Motivation

Policy uncertainty and the economy are determined simultaneously

- How does **policy uncertainty** affect the macroeconomy? A pressing question in rapidly evolving economic conditions
- Policymakers are in a **tug-of-war** between the need to implement economic policies and the uncertainty generated by the decision-making process
- From a policy standpoint, we need to quantify the macroeconomic consequences that arise from the process of policymaking
- The difficulty: **uncertainty and the economy are determined simultaneously**

Question

What are the effects of policy uncertainty shocks on the main macroeconomic variables in Portugal?

What the paper does

- **Builds an EPU index for Portugal:** monthly, from more than twenty Portuguese news sources, following Baker et al. (2016)
- **Estimates a Bayesian SVAR** with six variables: industrial production, retail sales, unemployment, consumer prices, stock prices and a credit spread
- **Identifies the EPU shock with an external proxy** (the index itself) through a correlation restriction, motivated by criticism of recursive identification (Kilian et al. 2022)
- Compares with **recursive ordering** and a **Bayesian IV-SVAR**; asks what the **pandemic** does to the results; runs a set of sensitivity checks

Preview of results

- **The index** rises with political crises, elections, a drought, the financial and euro area crises, the pandemic, and even a supermarket promotion; its highest spike is July 2013
- **Higher policy uncertainty** brings turmoil in financial markets (stock prices fall, credit spread widens) and a decline in economic activity (industrial production, retail sales, unemployment)
- **Variance shares** on impact range from about 10% (industrial production, retail sales, consumer prices) to about 44% (credit spread)
- **Recursive ordering**: similar signs and shapes, but the paper reports that it overstates the IRFs and understates the FEVD relative to the proxy approach
- **Pandemic**: including it noticeably reduces the impact of the EPU shocks

Related literature and contribution

1. **News-based EPU indices** that follow Baker et al. (2016), across many countries
 - **Europe:** Belgium (Algaba et al. 2020), Netherlands (Kok et al. 2015), Greece (Fountas et al. 2018; Hardouvelis et al. 2018), Ireland (Zalla 2017; Rice and Jonathan 2020), Spain (Ghirelli, Pérez, et al. 2019; Ghirelli, María Gil, et al. 2021), Denmark (Bergman and Worm 2021), Sweden (Armeliu et al. 2017), Croatia (Sorić and Lolić 2017)
 - **Asia-Pacific:** Hong Kong (Luk et al. 2020), Singapore (Istiak 2022; Feng 2014), Japan (Arbatli Saxegaard et al. 2022), China (Huang and Luk 2020), New Zealand (Ali et al. 2022)
 - **Emerging:** Pakistan (Choudhary et al. 2020), Colombia (Mauricio Gil and Silva 2018; Perico Ortiz 2022), Brazil (Ferreira et al. 2019)
2. **Identifying uncertainty shocks:** motivated by Kilian et al. (2022)'s criticism of recursive identification, use a proxy as in Piffer and Podstawski (2018)

Contribution

(i) A Portuguese EPU index from more than twenty news sources, starting in 1998; (ii) a methodological contribution: proxy identification of policy uncertainty shocks instead of a recursive ordering; (iii) evidence for real and financial variables in Portugal.

The EPU index

Index construction: Portuguese-language news, 22 sources, monthly from 1998

- Monthly data, January 1998 to March 2023, from Portuguese-language media outlets; the search is geographically limited to Portugal
- Sources listed in the paper's appendix:
 - 7 national newspapers, 5 business newspapers
 - 1 regional newspaper, 2 online newspapers
 - 4 magazines
 - 2 news agencies, 1 radio station
- Sources enter at **different dates**, from 1998 to 2021

Start	Examples
1998	Jornal de Notícias, Vida Económica, Reuters
2010–11	Diário de Notícias, Público
2013–14	Expresso, Visão Online, Dinheiro Vivo
2017–19	O Sol, Observador, ECO
2020–21	Sábado, TSF Online

All sources

An article counts if it mentions the economy, policy and uncertainty

Uncertainty (U)

incerto/a, incerteza, instabilidade, instável, indefinição, indecisão, risco/s

Economy (E)

económico/a, economia

Policy (P)

Parlamento, Palácio de São Bento, governo, ministério das finanças, Comissão Europeia, déficit, orçamento, imposto/s, legislação/ões, norma/s, normativa/o, regulação/ões, regulamento/s, lei/s

- The search keeps articles with **at least one keyword from each of the three categories** (E, P and U)
- Search in Portuguese, geographically limited to Portugal

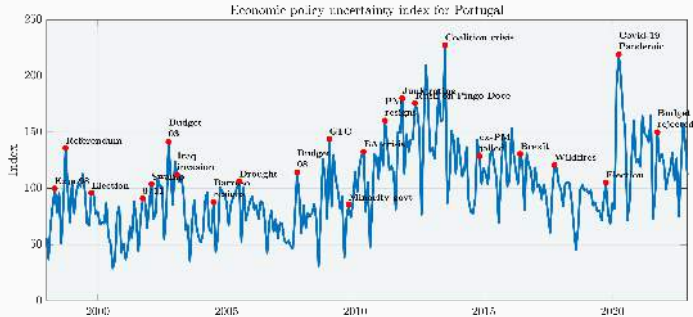
From article counts to an index with mean 100

Following the procedure of Baker et al. (2016), for outlet i and month t :

1. **Share** of articles with the keywords: $X_{it} = \frac{\text{matching articles}_{it}}{\text{all articles}_{it}}$
2. **Standardize** by the outlet's standard deviation σ_i : $Y_{it} = \omega_i X_{it} / \sigma_i$, where ω_i is a weight that mitigates the influence of newspapers with fewer articles
3. **Average** across the N outlets: $Z_t = \frac{1}{N} \sum_i Y_{it}$
4. **Rescale** to a mean of 100: $I_t^{EPU} = Z_t \times \frac{100}{M}$, with M the mean of Z_t over time

The index is a standardized, outlet-averaged share of articles on economic policy uncertainty

The index rises with political crises, the financial crisis and the pandemic



Notes: Monthly EPU index for Portugal, mean 100; labels mark major events.

- Increases in the Great Financial Crisis and the euro area crisis; **highest spike in July 2013**, a coalition crisis during austerity; another rise at the onset of COVID-19
- It also picks up a public rush on a hypermarket chain's 50% discount; the paper's check is the match with dated events

Macro method

Identification: an external proxy and a correlation restriction

Bayesian VAR with n endogenous variables and p lags; structural shocks η_t :

$$y_t = \mathcal{B}_1 y_{t-1} + \cdots + \mathcal{B}_p y_{t-p} + \mathcal{C} x_t + \varepsilon_t, \quad \varepsilon_t \sim \mathcal{N}(0, \Sigma), \quad \varepsilon_t = \mathcal{D} \eta_t, \quad \Sigma = \mathcal{D} \mathcal{D}'$$

The policy uncertainty shock is the first shock $\eta_{1,t}$; the goal is its impact vector d_1 , the first column of $\mathcal{D}$. With an external variable S_t (the EPU index), not assured to be exogenous:

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

- The restriction keeps the correlation between the shock and the proxy **above a threshold**
- The proxy may correlate contemporaneously with other shocks; all variables may respond on impact
- Given d_1 , **IRFs** and **FEVDs** follow directly

Specification: six monthly variables, Bayesian estimation

Endogenous variables (monthly)

- Industrial production index (IPI)
- Retail sales
- Unemployment rate
- Consumer prices, annual inflation rate
- Stock prices
- Credit spread: 10-year government bond yield minus 90-day interbank rate

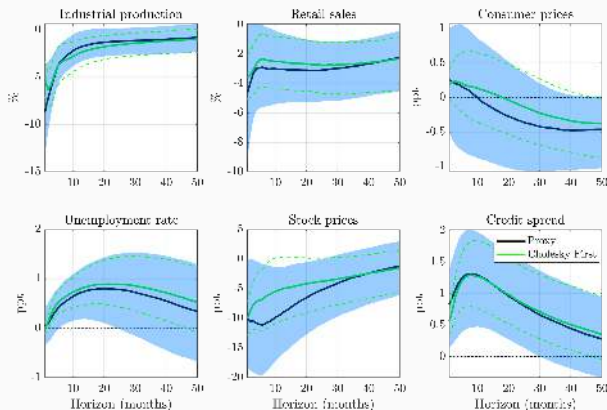
Estimation and presentation

- Bayesian, with an independent Normal–Wishart prior (Dieppe et al. 2016)
- The shock is normalized to a **10% drop in share prices** on impact
- IRFs: posterior median, **68% credibility bands**
- Quarterly variables such as GDP are not emphasized; the paper refers to Manteu and Serra (2017)

Data sources Series Hyperparameters

Results

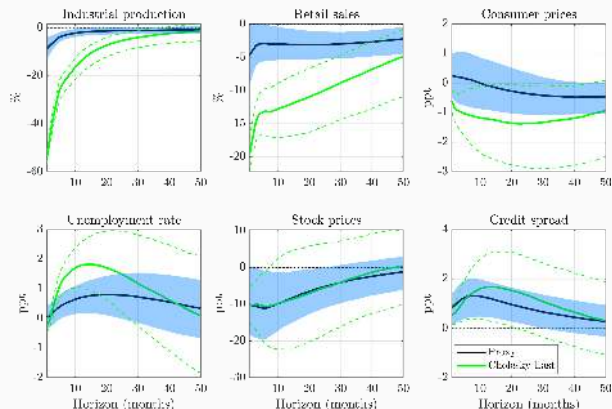
Policy uncertainty shock: activity falls, unemployment and credit spread rise



Notes: 10% drop in stock prices on impact. Black: proxy median; blue: 68% bands; green: recursive, EPU first.

- **Industrial production:** significant, immediate fall (about 9% on impact, read from the figure)
- **Retail sales:** not significant on impact, then a sluggish, persistent fall
- **Unemployment** rises
- **Consumer prices:** no significant change
- **Stock prices** drop on impact; **credit spread** widens

Recursive identification with the index last departs sharply from the proxy



Notes: Black: proxy; green: recursive ordering, EPU last. Same normalization and bands.

- EPU **first** (previous slide): same signs and shapes as the proxy, different magnitudes
- EPU **last**: much larger responses of industrial production and retail sales (read from the figure); the paper concludes this ordering does not yield reliable estimates
- A **Bayesian IV-SVAR** (Caldara and Herbst 2019) gives similar results to the proxy

Bayesian IV figure

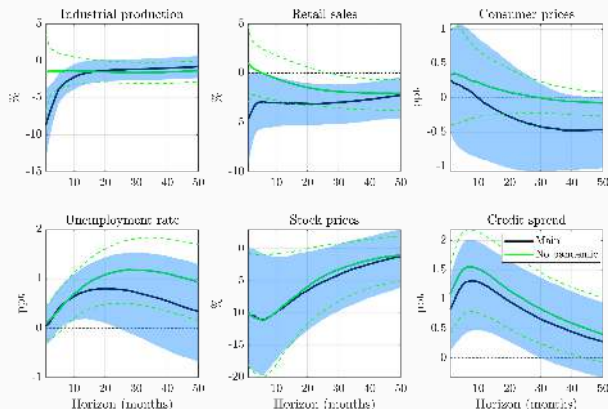
On impact: 44% of credit-spread and 28% of stock-price variance

Horizon (months)	IPI	Retail sales	CPI	Unemployment	Stock prices	Credit spread
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: Median share of forecast error variance (%) due to the economic policy uncertainty shock.

- **Financial variables** react immediately: credit spread 43.85% and stock prices 27.57% at $h = 1$, then slowly declining
- **Real variables**: IPI and retail sales shares grow with the horizon (IPI 10.01 to 17.32%); the **unemployment** share rises from 13.23% to 39.92% at 24 months
- The paper reads the unemployment pattern as firms recalibrating their workforce after the production change

Excluding the pandemic: larger unemployment and credit-spread responses



Notes: Black: main; green: without the pandemic period. Same normalization and bands.

- **Unemployment** and **credit spread**: larger without the pandemic (peaks about 1.2 vs 0.8 ppt and 1.55 vs 1.3 ppt, read from the figure)
- **Industrial production** and **retail sales**: smaller early response without the pandemic; stock prices similar
- The paper's reading: in extraordinary events like COVID-19, other factors take precedence over policy uncertainty

Sensitivity: the paper finds the results consistent across specifications

- **Identification:** recursive ordering (EPU first, last); Bayesian IV-SVAR
- **Sample and shocks:** Russian invasion excluded; pandemic excluded
- **Additional variables:** real Brent oil price; global EPU index of Baker et al. (2016)
- **Lags:** 3 and 12 lags
- **Priors:** NW-diffuse, normal-diffuse, sum-of-coefficients; VAR-OLS
- **Hyperparameters:** grid-search optimum; S_0 as identity
- **Deterministic terms:** cubic trend; no constant

Paper's assessment

The tests bolster confidence in the resilience of the primary analysis.

Reading the backup figures: magnitudes and persistence do change in some panels, e.g. when the global index is added or the constant is removed.

Robustness figures

Conclusion

Limits: what the paper flags

- **Proxy:** the external variable is not assured to be exogenous; identification rests on a correlation restriction with a threshold
- **Identification choice:** the recursive alternative with the index last does not yield reliable estimates; with the index first, it seems to exaggerate the impact, though with similar signs and shapes
- **Sample:** narrowing the sample (pandemic excluded) may give divergent results; the paper reads the pandemic as a period where other factors take precedence
- **Scope:** quarterly variables such as GDP are not the focus (covered by Manteu and Serra (2017))

Conclusion

1. A new **EPU index for Portugal** from more than twenty news sources, built with the method of Baker et al. (2016)
2. In a proxy SVAR, higher policy uncertainty brings **turmoil in financial markets and a decline in economic activity**
3. The **recursive ordering** overstates the IRFs and understates the FEVD relative to the proxy approach (the paper's finding)
4. **The pandemic** noticeably reduces the impact of EPU shocks in the sample

Policy uncertainty matters for activity and financial conditions in Portugal, and how it is identified matters for how much

Thank you! hmorao@phd.iseg.ulisboa.pt

Backup: robustness

Backup

News sources behind the index

Source	Type	From
Jornal de Notícias	National newspaper	1998-01
Correio da Manhã	National newspaper	2008-12
Diário de Notícias	National newspaper	2010-05
Público	National newspaper	2010-11
Expresso	National newspaper	2013-09
Jornal I	National newspaper	2013-12
O Sol	National newspaper	2017-01
Vida Económica	Business newspaper	1998-01
Diário Económico	Business newspaper	1998-02
Jornal de Negócios	Business newspaper	2011-10
Dinheiro Vivo	Business newspaper	2014-04

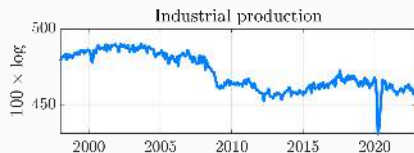
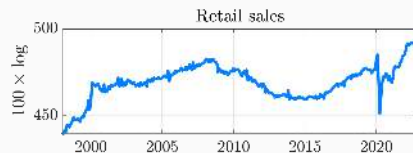
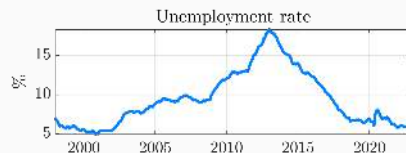
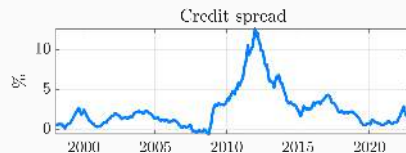
Source	Type	From
O Jornal Económico	Business newspaper	2017-07
Açoriano Oriental	Regional newspaper	2010-06
Observador	Online newspaper	2017-07
ECO	Online newspaper	2019-02
Visão Online	Magazine	2013-05
Exame	Magazine	2013-09
Executive Digest	Magazine	2019-11
Sábado	Magazine	2020-05
Reuters	News agency	1998-01
Agência Lusa	News agency	2001-02
TSF Online	Radio	2021-09

Notes: All sources run to March 2023, except Diário Económico (to May 2016). Start dates as listed in the paper's appendix.

Data description and sources

Label	Description	Source
epu_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

Macroeconomic series used in the model



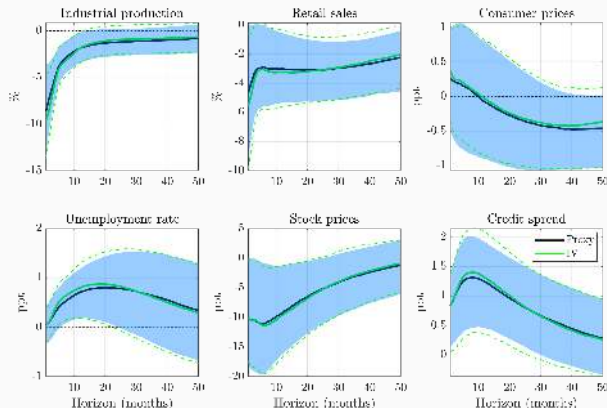
Notes: Monthly series; industrial production, retail sales and stock prices in $100 \times \log$, the others in percent.

Hyperparameters

	Value	Description	Observation
ρ	1	autoregressive coefficients	used in all models
λ_1	0.1	overall tightness	changed in some robustness checks
λ_2	0.5	cross-variable weighting	changed in one robustness check
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 one robustness check

Notes: Values for the benchmark model, as in the paper's hyperparameter table.

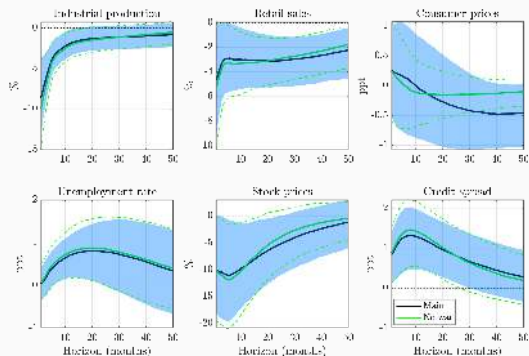
Bayesian IV-SVAR versus the proxy



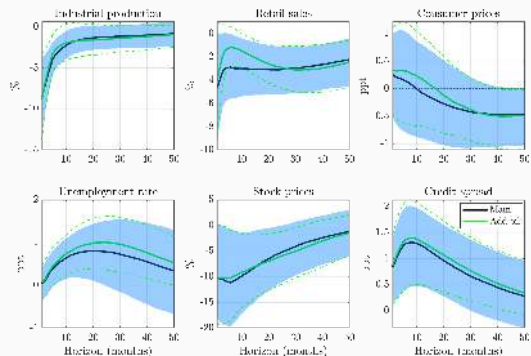
Notes: Black: proxy, blue: 68% bands; green: Bayesian IV-SVAR (Caldara and Herbst 2019).

The paper reports that the IV-SVAR yields results similar to the proxy approach.

Robustness 1/7: Russian invasion and oil price

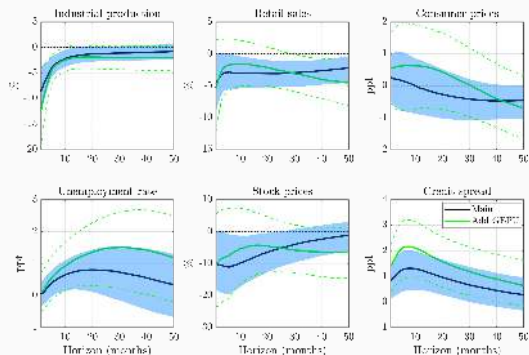


Notes: Main vs. model excluding the Russian invasion ("No war").

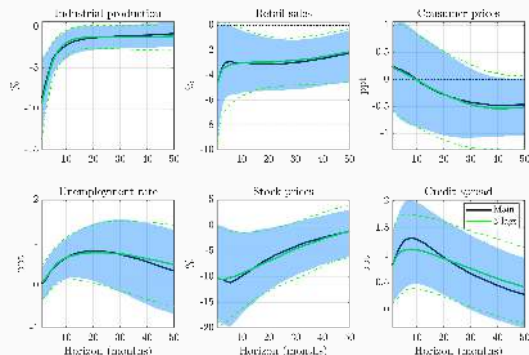


Notes: Main vs. model including the real Brent price ("Add oil").

Robustness 2/7: global EPU index and 3 lags

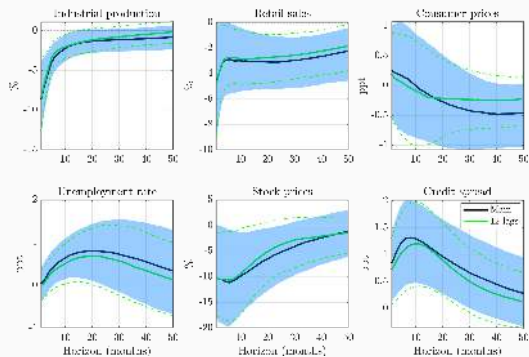


Notes: Main vs. model including the Global Economic Policy Uncertainty index ("Add GEPU").

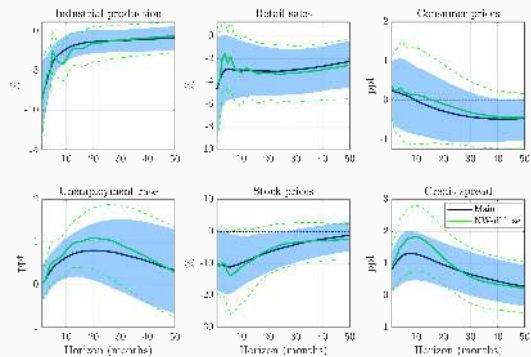


Notes: Main vs. BVAR with 3 lags.

Robustness 3/7: 12 lags and NW-diffuse prior

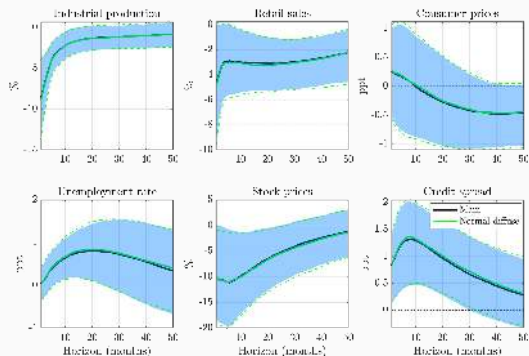


Notes: Main vs. BVAR with 12 lags.

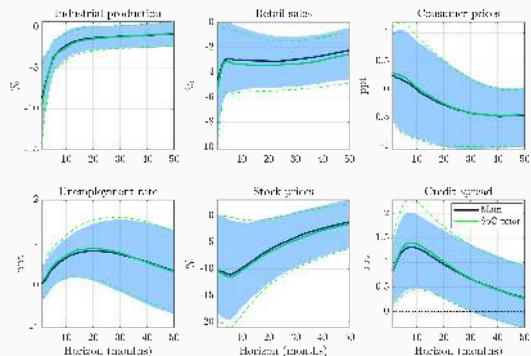


Notes: Main vs. BVAR with NW-diffuse prior.

Robustness 4/7: normal-diffuse and sum-of-coefficients priors

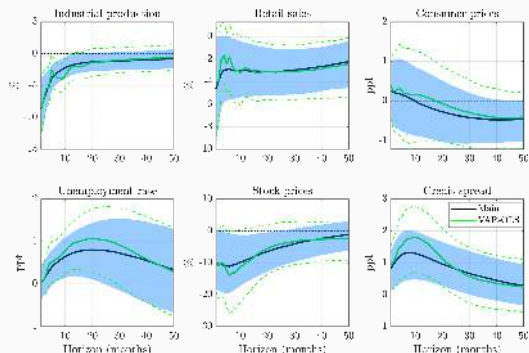


Notes: Main vs. BVAR with normal-diffuse prior.

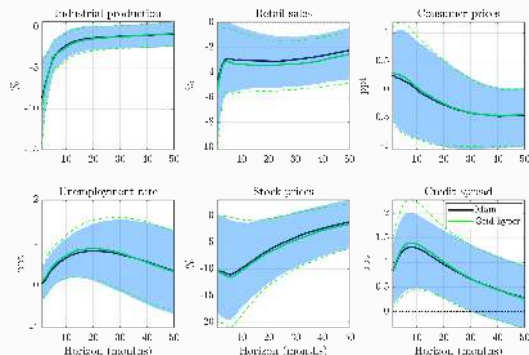


Notes: Main vs. BVAR with sum-of-coefficients prior ("SoC prior").

Robustness 5/7: VAR-OLS and grid-search hyperparameters

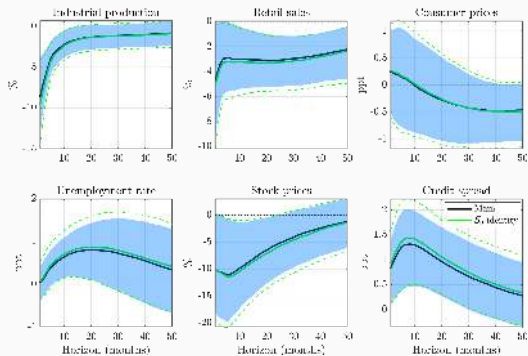


Notes: Main vs. the model estimated as a VAR ("VAR-OLS").

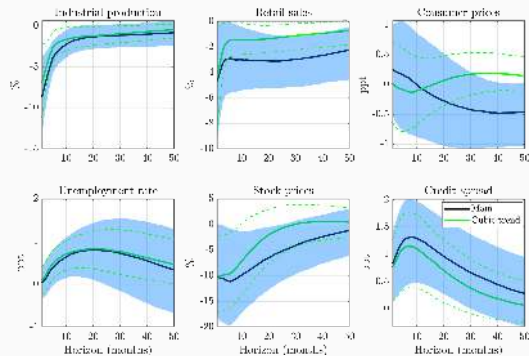


Notes: Main vs. BVAR with hyperparameters optimized by grid search ("Grid hyper").

Robustness 6/7: identity S_0 and cubic trend

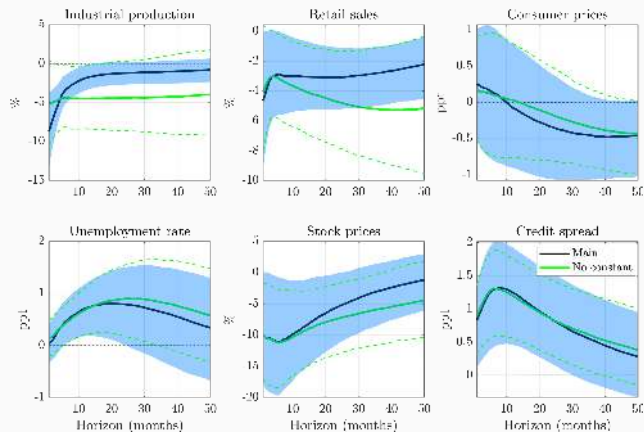


Notes: Main vs. BVAR with S_0 as identity.



Notes: Main vs. BVAR with a cubic trend.

Robustness 7/7: no constant



Notes: Main vs. BVAR without a constant ("No constant").

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