EUROPEAN CENTRAL BANK

EUROSYSTEM

Fiscal policy and inflation: accounting for non-linearities in government debt

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*The views expressed in this presentation are those of the authors and do not necessarily reflect those of the ECB.

Motivation and aim of paper

Motivation:

- Renewed interest in the impact of fiscal policy on inflation
- Empirical literature not quite settled: ”price puzzle”
- Scarce pieces of evidence for the euro area (EA)
- Non-linear effects are under-explored

Aim:

- Study the impact of a fiscal stimulus on inflation for the EA by exploring non-linearities in:
  - ***Level of public debt-to-GDP,*** *as well as*
  - Monetary policy (MP) stance

  and controlling for the position in the economic cycle

Impact of a fiscal stimulus shock on inflation:

1. “Price puzzle”

- non-significant or negative impact: Perotti (2005), Mountford and Uhlig (2009), Nakamura and Steinsson (2014), Jorgensen and Ravn (2022)
- positive impact: Caldara and Kamps (2008), Ben Zeev and Pappa (2017), Ferrara et. al (2021),
    - Studies using NK model-based simulations (ECB 2023, 2025) and Bonam et al. (2025) extending the Bernanke-Blanchard (2023) model with fiscal policy – generally positive, but effects on impact (short-term) depend on the type of fiscal instrument
- More recent debate: possible effects of large build-up of defence spending?

2. Non-linearity with respect to public debt
Cevik and Miryugin** (2023), Corsetti et al. (2012), Eminidou et al. (2023)

3. Non-linearity with respect to monetary policy stance
Cloyne, Jorda, Taylor (2023), Hack, Istrefi and Meier (2023)

*papers focused on output multipliers
** paper uses mainly changes in primary balance for fiscal policy “shocks”

Role of public debt in inflation expectations

- Coibion et al. (2021) find in randomised control trial on ***U.S.*** households that news about future build-up of public debt leads households to anticipate higher inflation.

- Grigoli and Sandri (2023) find in randomised controlled trials in the ***US, UK and Brazil*** that households interpret high public debt as bad news for the economic outlook, leading to both higher inflation and unemployment expectations. Confidence in the central bank is found to considerably reduce the sensitivity of inflation expectations to public debt.

- Brandao-Marques et al. (2023) estimate that debt surprises raise long-term inflation expectations in ***emerging-market economies***, and the effect is larger for high-debt countries.

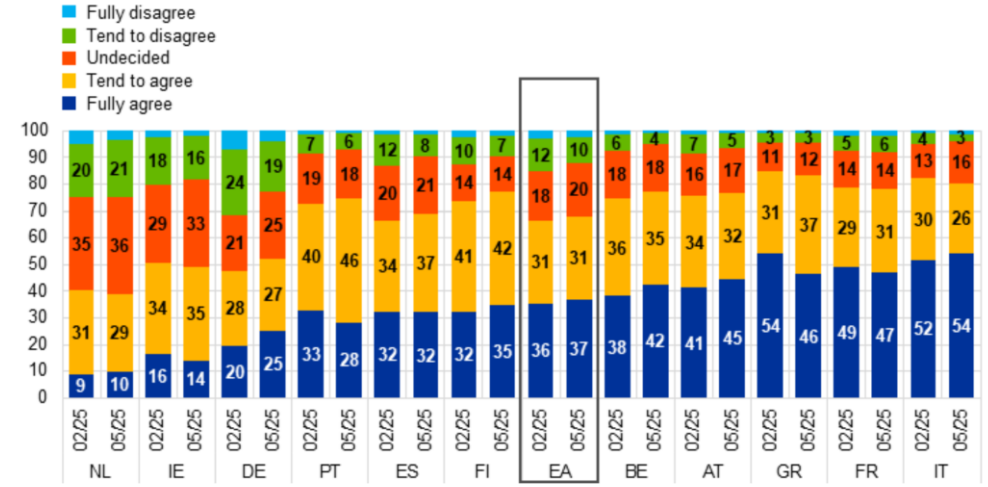
- Baumann et al. (2025) use data from the ECB Consumer Expectations Survey (CES) to assess **euro area** household expectations regarding the increase in defence spending and perceptions about public debt. Finds, inter alia, that consumers expect higher inflation associated with defence spending when they also view public debt as a major problem in their countries.

Literature review - Baumann et al. (2025) on the euro area

Household expectations and views over time and by country

c) View on whether level of public debt major problem

(percentage of respondents)

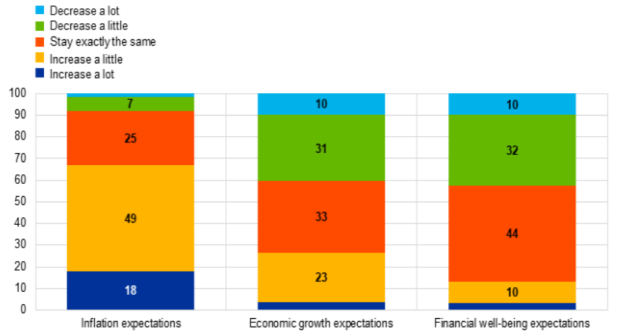


Source: Baumann, Checherita-Westphal, Kocharkov, Osterloh (2025), "Higher defence spending and its impact on household expectations", Box in ECB Economic Bulletin Issue 5 using ECB Consumer Expectations Survey.
Notes RHS chart: Data for the euro area aggregate (weighted data of survey responses in the 11 euro area countries covered by the CES, shown in LHS chart).
Panel a): respondents were asked how any additional spending on defence in the country they currently live in would affect prices of goods and services, economic growth and their household's financial well-being. "Inflation" refers to the change in prices of goods and services.
Panel c) breaks down the results of panel a) according to whether respondents agree or disagree that the government debt level is a major problem in the country they currently live in (as shown in LHS chart by country). For panel c): the panel a) categories "Increase a lot" / "Increase a little and "Decrease a lot" / "Decrease a little" are combined into "Increase" and "Decrease" respectively. The latest observations are for May 2025.

Household expectations about the effects of increased defence spending

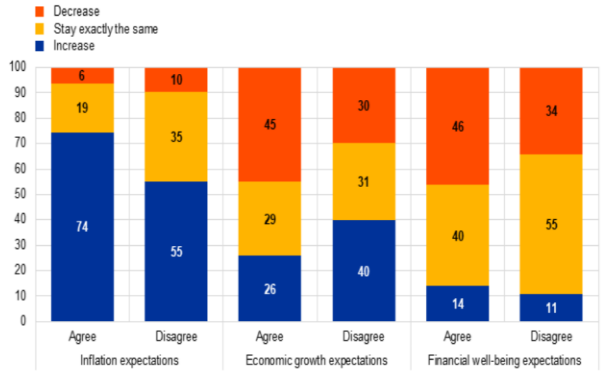
a) Expected effect of increased defence spending on inflation, economic growth and financial well-being

(percentages of respondents)



c) Expected effect of increased defence spending by view on public debt

(percentages of respondents)



Data and methodology

Data:

- 12 EA countries (first 12 EA members), 1999 – 2022
- alternative exercise: 16 countries OECD, 1978 - 2014

Methodology - two main approaches of state-dependent local projections

- ✓ (A) Ramey and Zubairy (2018): 2 regimes
- ✓ (B) Cloyne, Jorda, Taylor (2023): multiple state-dependences, continuous

Identification strategies for the fiscal “shock”/discretionary fiscal policy

Trade-off in the literature on the macroeconomic relevance of pure (rare) “exogenous” fiscal shocks vs. broader scope of discretionary fiscal policy measures

I1: Discretionary fiscal policy measures (DM) according to Eurosystem-WGPF/ECB estimates

- free from automatic stabilizers and non-discretionary cyclical elements
- DM aggregated at country level from five main fiscal instruments (measure-by-measure on the revenue side from WGPF “Fiscal Questionnaires” and benchmarking to nominal potential growth on the expenditure side)
- Covers both consolidation and stimulus effects, but does not distinguish exogenous vs. endogenous measures
- DM already used in papers on cyclical/output effects (only), incl. Agnello & Cimadomo (2012) and Attinasi & Klemm (2014)

I2: Alternative 1: «DM purged» a la Corsetti et. al (2012)

- purge DM from past and expected output developments
  - regress DM for individual countries on the first two lags of real GDP growth and the lagged value of the OECD composite leading indicator, which proxies the government pre-budget expectations with respect to next-year growth

Robustness checks: Exogenous fiscal consolidations for OECD countries

- use shocks (truncated to consolidation only) from Guajardo et. al (2014), extended with Alesina et. al (2019)

Baseline framework and accounting for non-linearities

Standard local projections (Jorda, 2005) for horizons h=0, ..., 4, with Driscoll and Kraay standard errors

$$\frac{cpi_{t+h} - cpi_{t-1}}{cpi_{t-1}} = \mu_h x_{i,t} + \beta_h g_{i,t} + \alpha_i + \delta_t \qquad (1)$$

where $g_{i,t}$ is the government fiscal policy shock, $x_{i,t}$ includes two lags of:

- Inflation
- shadow interest rate (Wu and Xia (2017), Wu and Xia (2020))
- output gap (Eurosystem estimates)

Country and year fixed effects used throughout.

Note: the Wu-Xia shadow rate is collinear with year fixed effects in levels; it is therefore used only as a monetary-policy state variable in the continuous state-dependent specification.

State-dependent local projections (A) (Ramey and Zubairy, 2018) for horizons h=0, ..., 4 with DK standard errors, accounting for regimes of high and low(er) public debt (common threshold across countries at 90% of GDP)

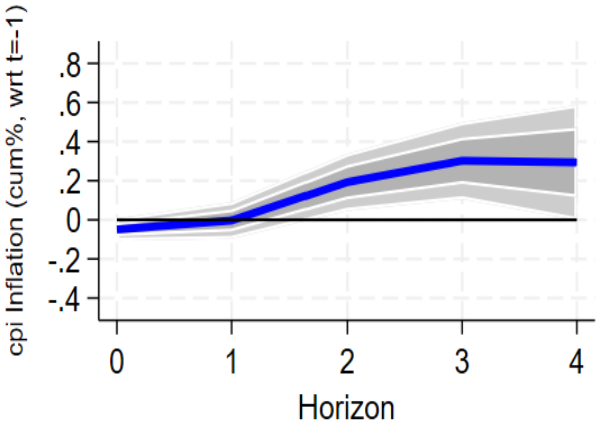
$$\frac{cpi_{t+h} - cpi_{t-1}}{cpi_{t-1}} = \mathbb{1}(d_{t-1} > 90)(\mu_h^{high} x_{i,t} + \beta_h^{high} g_{i,t}) \qquad (2)$$
$$+\mathbb{1}(d_{t-1} \leq 90)(\mu_h^{low} x_{i,t} + \beta_h^{low} g_{i,t}) + \alpha_i + \delta_t$$

Note: The specification is implemented as a baseline low-debt regime plus interactions for the high-debt regime, avoiding redundant regime dummies.

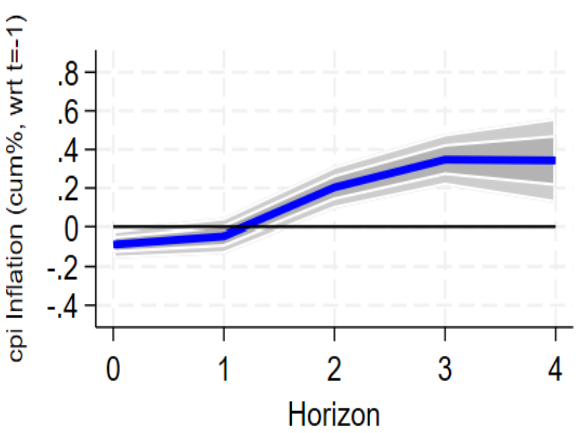
Results: accounting for non-linearities (A)

Impulse response function (IRF) of the cumulative change in inflation to 1% GDP fiscal stimulus using identification strategy 1 (Eurosystem DM)

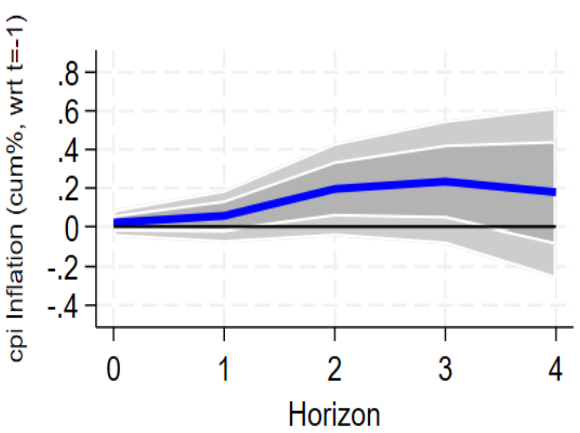
a) Linear effect across sample



b) Regime of high public debt



c) Regime of low public debt

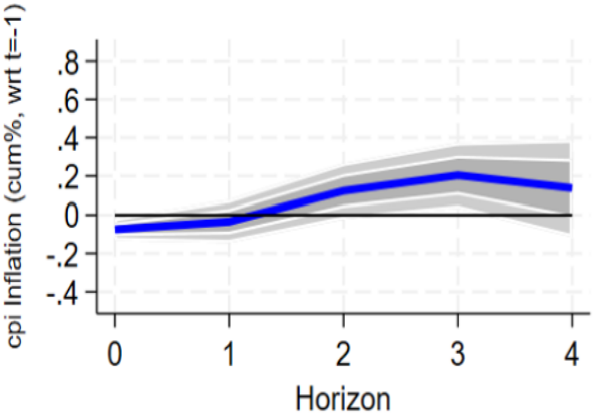


Notes: Shaded areas are 68% (dark) and 90% (light) confidence intervals. Results using non-linear method (A) in panels b and c for sample of 12 EA countries over 1999-2022. Regimes of high (low) debt defined according to common debt-to-GDP ratio threshold at time t-1 > 90% (respectively <= 90%)

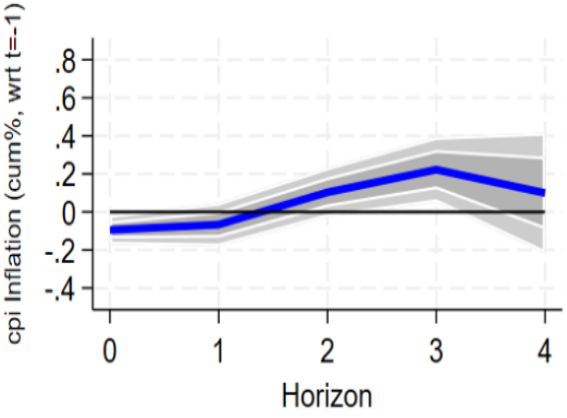
Results: accounting for non-linearities (A)

Impulse response function (IRF) of the cumulative change in inflation to 1% GDP fiscal stimulus using identification strategy 2 (DM “purged”)

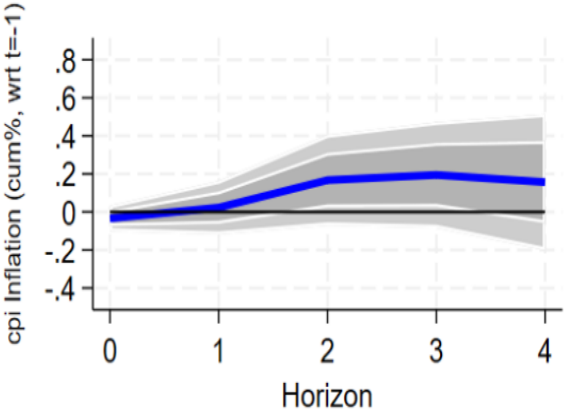
a) Linear effect across sample



b) Regime of high public debt



c) Regime of low public debt



Notes: Shaded areas are 68% (dark) and 90% (light) confidence intervals. Results using non-linear method (A) in panels b and c for sample of 12 EA countries over 1999-2022. Regimes of high (low) debt defined according to common debt-to-GDP ratio threshold at time t-1 >90% (respectively <= 90%)

Empirical method B: framework and results

State-dependent local projections (B) (Cloyne, Jorda, Taylor, 2023): multiple state-dependences, continuous debt regime, for horizons h=0, ..., 4 with DK standard errors:

- So-called "Local projection method with Kitagawa-Blinder-Oaxaca decomposition" (KBO henceforth)

$$\frac{cpi_{t+h} - cpi_{t-1}}{cpi_{t-1}} = \mu_h x_{i,t} + \beta_h g_{i,t} + \alpha_i + \delta_t \qquad (3)$$

$$+ \beta_h^{d} g_{i,t}(x_{i,t}^{d} - \bar{x}^{d}) \quad \text{(debt)}$$

$$+ \beta_h^{OG} g_{i,t}(x_{i,t}^{OG} - \bar{x}^{OG}) \quad \text{(output gap)}$$

$$+ \beta_h^{-r} g_{i,t}^{-}(x_t^{r} - \bar{x}^{r}) + \beta_h^{+r} g_{i,t}^{+}(x_t^{r} - \bar{x}^{r}) \quad \text{(shadow interest rate)}$$

- ***Non-linear effects*** of 1% of GDP fiscal stimulus on inflation with KBO decomposition (at h=4)

		Debt	Interest rate +DM	Interest rate -DM	Output gap
HICP Infl.	DM	0.22**	0.19*	-0.39*	-0.08**
		(0.13)	(0.27)	(0.39)	(0.04)
	DM purged	0.21*	-0.32*	-0.57*	-0.07*
		(0.14)	(0.40)	(0.37)	(0.04)
Core Infl.	DM	0.36***	-0.04	-0.57***	-0.12***
		(0.11)	(0.21)	(0.28)	(0.05)
	DM purged	0.28***	-0.87***	-0.77**	-0.09*
		(0.13)	(0.34)	(0.40)	(0.06)

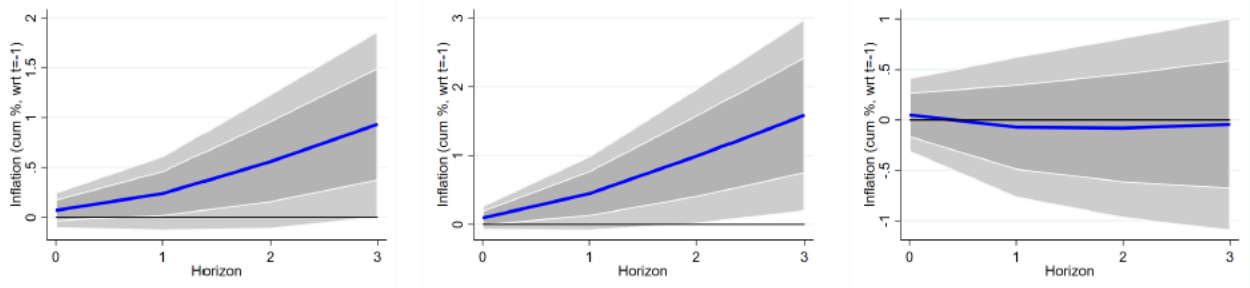
✓ 1% of GDP fiscal stimulus in a country with the debt ratio *higher* by 1 st. dev. (about 35 pp of GDP) than the mean brings about 0.2 pp more headline inflation and 0.3-0.4 pp more core inflation.

✓ For the interaction with the monetary policy stance, the impact of a 1% of GDP fiscal stimulus (DM purge) on headline (core) inflation is by 0.3 (0.9) pp lower when short-term rates are 1 standard deviation (about 3¾ pp) above the mean.

Notes: The table shows nonlinear effects (coefficients of the interaction terms in debt, shadow interest rate and OG) for the fiscal shocks identified as DM or DM purged. Standard errors in parenthesis. Significance level *68%, **90%, ***95%. For the debt ratio at the sample mean (around 70% of GDP), a 1% of GDP fiscal stimulus brings about 0.2 pp higher cumulative core inflation 4 years after shock ($beta_h$)

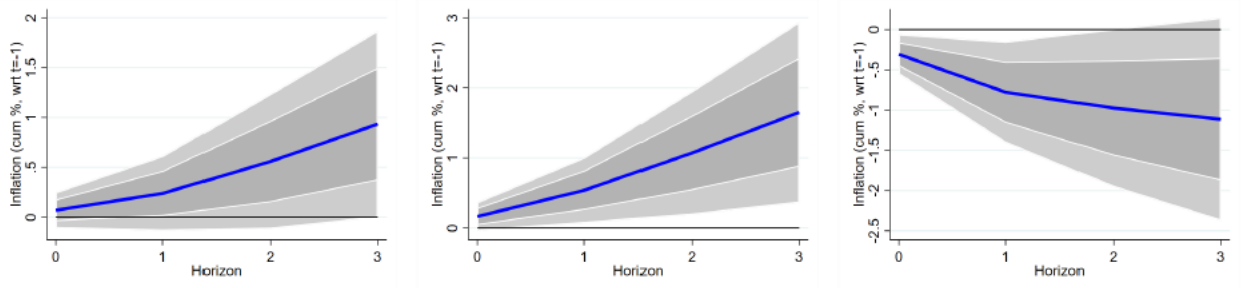
Robustness checks: 3rd identification technique, empirical method A (OECD sample)

Figure 16: Impact of fiscal policy on HICP inflation (Debt threshold = 70%)



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Figure 17: Impact of fiscal policy on HICP inflation (Debt threshold = 60%)



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Notes: Results using non-linear method (A) for a sample of 16 OECD countries over the period 1978-2014 with consolidation only as exogenous shocks defined as in Guajardo et. al (2014) and extended in Alesina et. al (2019).

The first figure shows results for the debt threshold at 70%, while the second figure for the debt threshold at 60%.

Panel (a) shows the linear IRFs of cum. change in GDP to 1% GDP fiscal stimulus (***inverted sign to maintain consistency with the previous results given that the dataset in this case refers only to consolidation episodes***). Panel (b) and (c) show the nonlinear IRFs. The blue line corresponds to the point estimates. Shaded areas are 68% (dark) and 90% (light) confidence intervals.

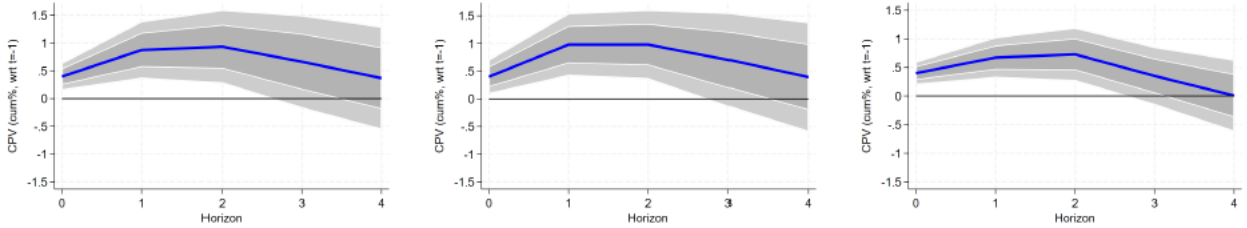
Investigating the possible economic channels

Use a New Keynesian Phillips Curve framework to further investigate the inflation links to economic activity and inflation expectations.

- **Private Consumption**
- **Inflation Expectations**
  - ✓ From EU Business and Consumer Survey - extensive dataset on economic perceptions and expectations of roughly 32,000 consumers across the European Union, with a particular focus on inflation, covering fully the period and the 12 euro area countries of our sample.
  - ✓ Data comparable across EU member states by using a harmonized questionnaire and consistent data collection methods.
  - ✓ Analyse the impact of fiscal policy on two different measures of inflation expectations:
    - ✓ (i) ***"balance indicator"*** (increases when there are more respondents expecting higher inflation or less respondents expecting deflation or no change in the price level)
    - ✓ (ii) PP: indicator exclusively related to share of people expecting inflation to increase

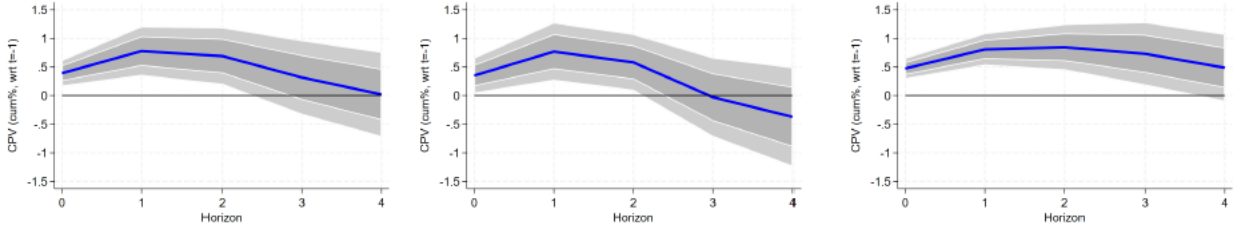
Private consumption: impact of 1% GDP fiscal stimulus shock – method A

Figure 4: Impact of fiscal policy - using the DM proxy - on Private Consumption



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Figure 5: Impact of fiscal policy - using the "Purged" DM proxy - on Private Consumption

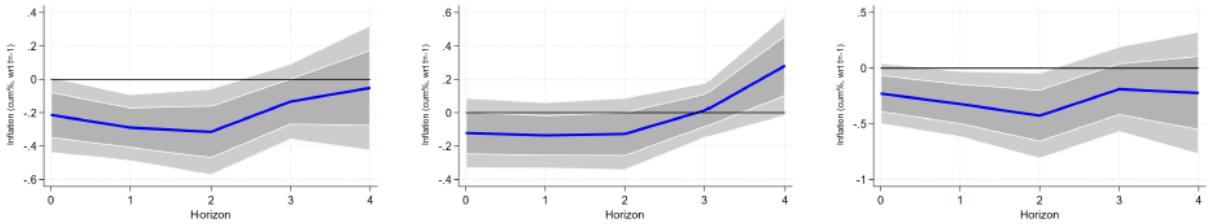


(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Notes: Shaded areas are 68% (dark) and 90% (light) confidence intervals. Results using non-linear method (A) in panels b and c for sample of 12 EA countries over 1999-2022 . Regimes of high (low) debt defined according to common debt-to-GDP ratio threshold at time t-1 >90% (respectively <= 90%)

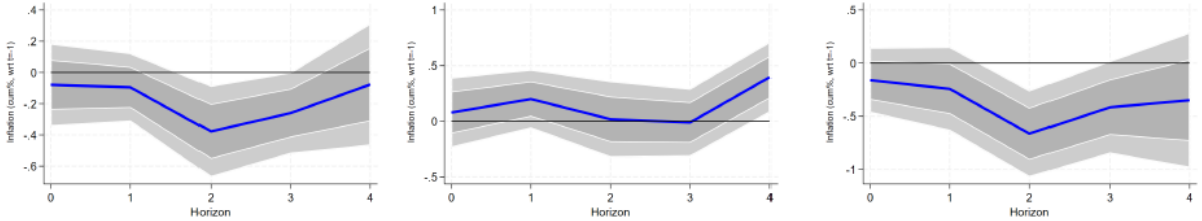
Inflation expectations: impact of 1% GDP fiscal stimulus shock – method A

Figure 6: Impact of fiscal policy - using the DM proxy - on Inflation Expectations (Balance Indicator)



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Figure 7: Impact of fiscal policy - using the "Purged" DM proxy - on Inflation Expectations (Balance Indicator)



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Notes: Shaded areas are 68% (dark) and 90% (light) confidence intervals. Results using non-linear method (A) in panels b and c for sample of 12 EA countries over 1999-2022 . Regimes of high (low) debt defined according to common debt-to-GDP ratio threshold at time t-1 >90% (respectively <= 90%)

Further robustness checks and future work

Results remain overall robust:

- ✓ For the EA-12 sample excluding years 2021 and 2022 (to mitigate reverse causation)
- ✓ For core inflation
- ✓ (with method A) for “IMF/Alesina sample” of 16 OECD countries over the period 1978-2014 for exogenous shocks (consolidation only).

Future work to look deeper into the composition effects of a fiscal stimulus (by instrument), accounting for debt non-linearities

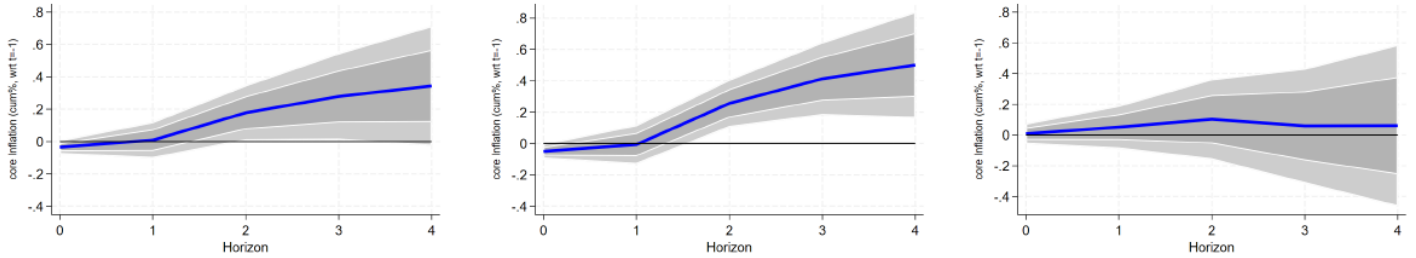
Main conclusions

- Paper adds to the empirical literature on the impact of fiscal policy on inflation, topic that is still unsettled.
- Using two main methodological approaches, underpinned by three identification strategies, we find evidence of larger inflationary effects of a fiscal stimulus in regimes of high(er) government debt for EA-12 sample over 1999-2022
  - ✓ and lower effects in times of high(er) interest rates
- The main channel for such effects seems to be that of inflation expectations.
  - ✓ When we investigate the impact of a fiscal stimulus shock on private consumption we find in general positive effects in both debt regimes, albeit more persistent and robust in the low debt countries.

BACKGROUND SLIDES

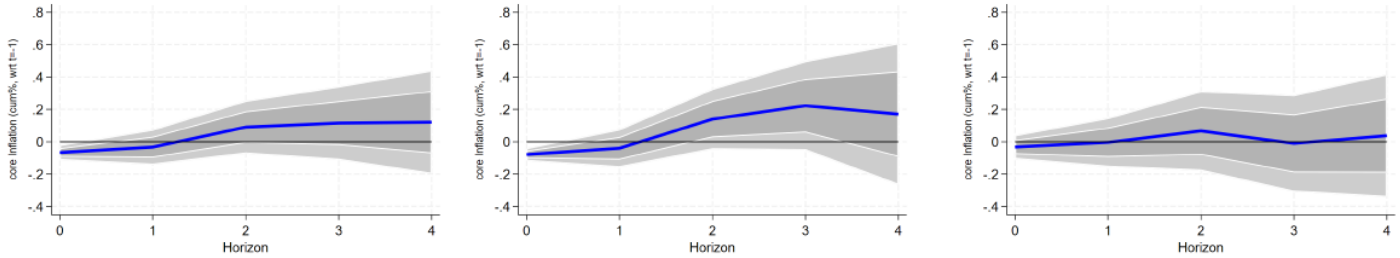
Robustness checks: impact of 1% of GDP fiscal stimulus shock on core inflation

Figure 8: DM: impact of fiscal policy on Core inflation



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

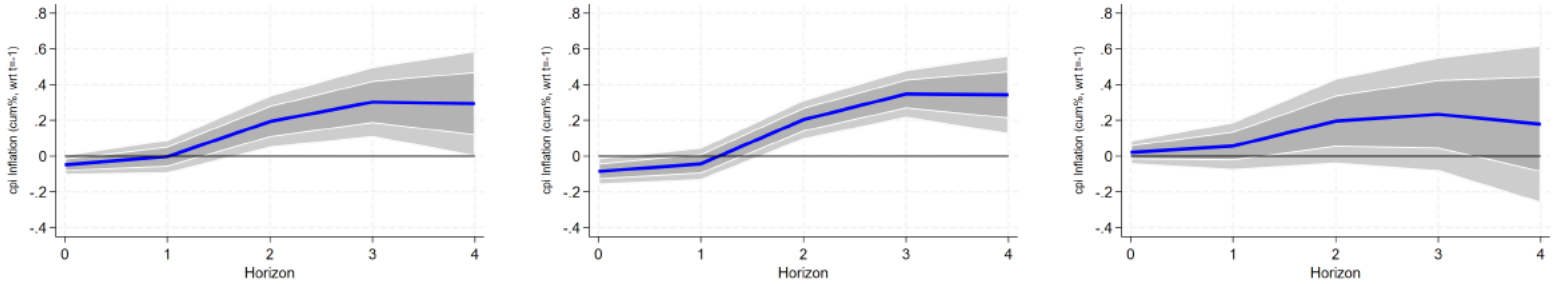
Figure 9: "Purged" DM: impact of fiscal policy on Core inflation



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

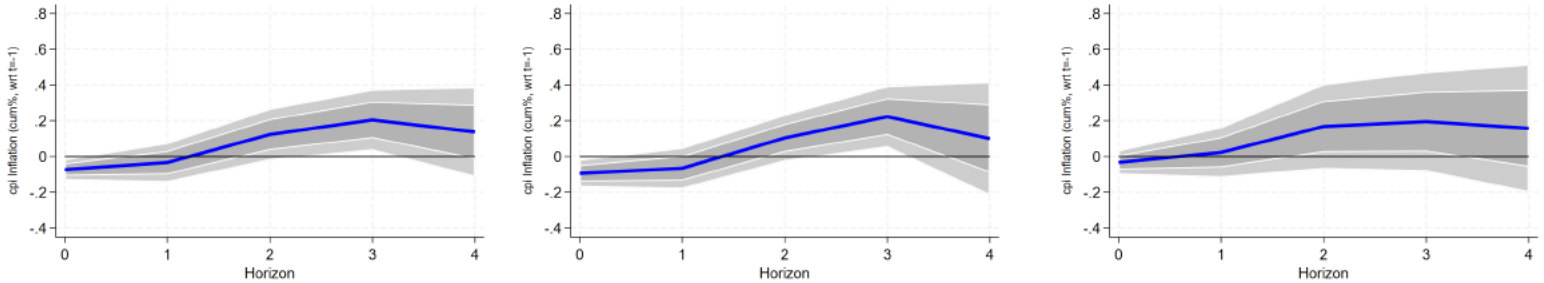
Robustness checks: exclude years 2021-22 to mitigate reverse causation

Figure 10: DM: impact of fiscal policy on inflation (excl. 2021 and 2022)



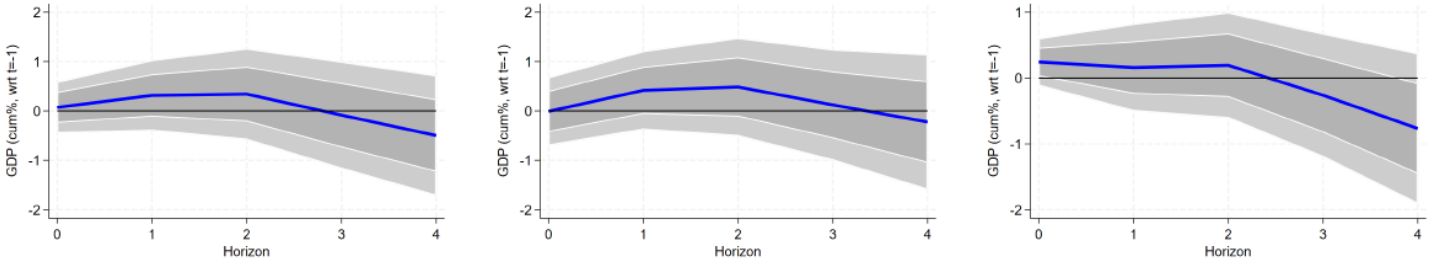
(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Figure 11: "Purged" DM: impact of fiscal policy on inflation (excl. 2021 and 2022)



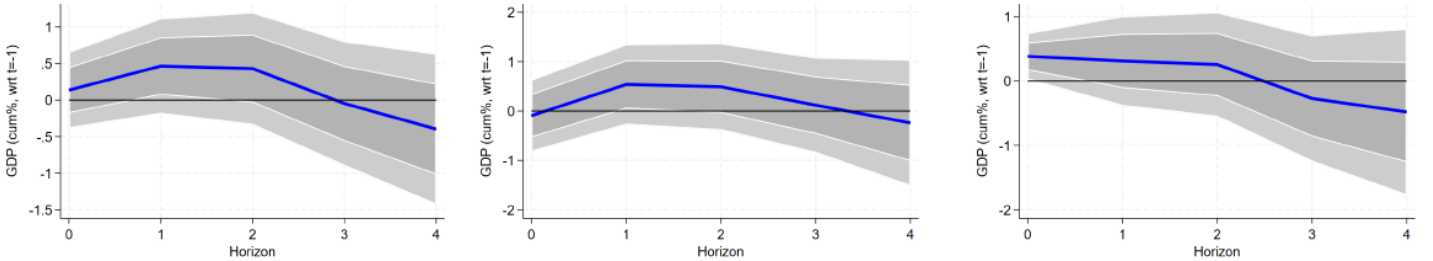
Robustness checks: impact of fiscal stimulus shock on GDP

Figure 14: DM: impact of fiscal policy on GDP



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country

Figure 15: "Purged" DM: impact of fiscal policy on GDP



(a) Linear (b) Nonlin. - High debt country (c) Nonlin. - Low debt country