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Cristina Checherita-Westphal, Tom Pesso

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

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Abstract

This paper investigates the interplay between discretionary fiscal policy and inflation in the euro area, emphasizing the role of public debt levels in modulating this relationship. It explores how fiscal expansions or contractions influence inflationary pressures, particularly under varying debt conditions. The analysis reveals that fiscal policy's effect on inflation is non-linear, with debt levels significantly affecting the inflationary outcome of fiscal measures. High debt levels tend to amplify the inflation response to fiscal expansions, a finding that holds under multiple analytical frameworks and robustness checks. This paper contributes to the empirical literature by highlighting the critical role of fiscal policy, especially in high-debt environments, and its implications for inflation dynamics in the euro area.

Keywords: fiscal policy, public debt, inflation, local projections.

JEL Codes: E31, E62, H63

Non-technical summary

Like other advanced economies, the euro area faced high inflation over the past few years. Notwithstanding the recent decline, especially in energy prices, inflation has proven more persistent than initially expected. These developments have triggered renewed discussions about the role of monetary and fiscal policies, as well as their interaction, in shaping inflation.

In this context, our paper adds to the empirical literature on the impact of fiscal policy on inflation, a topic that is still unsettled. Its contribution is to analyse the impact of discretionary fiscal policy on inflation in the euro area, using a relatively novel dataset for this purpose, and accounting for non-linearities with respect to the level of public debt. Furthermore, interactions between fiscal and monetary policy are explored as we control for non-linear effects of fiscal stimulus depending on the level of interest rates (and the position in the economic cycle). To the best of our knowledge, this is the first paper to explicitly analyse possible non-linear effects of fiscal stimulus shocks on inflation depending on the level of debt and accounting simultaneously for several state dependencies.

We use local projections, under two alternative non-linear methods, for a panel of 12 (initial) member countries of the euro area over the period 1999-2022. In terms of identification for the fiscal policy shock, we use three strategies. Most importantly, we employ in the baseline model a proxy for total discretionary fiscal policy measures from the Eurosystem Working Group of Public Finance (WGPF), based on a narrative, measure-by-measure approach on the revenue side and benchmarking the growth rate of three relevant expenditure categories to nominal potential growth.

Overall, we find evidence of higher inflationary effects of a fiscal stimulus in regimes of high(er) government debt, as well as lower effects in times of higher interest rates. 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. However, inflation expectations appear to rise only in the high-debt countries, which can help rationalise the higher response of inflation to fiscal policy in these countries.

Further research could attempt to better identify exogenous fiscal shocks (both consolidation and stimulus episodes) in a narrative approach, although this would stripe out a large part of

fiscal policy. To complement the current analysis related to households' inflation expectations, it would be beneficial to examine the impact on expert inflation expectations using data from the Consensus Forecast. Finally, given that different fiscal instruments are likely to have different (short-term) effects on inflation, further analysis should look deeper into the composition effects of a fiscal stimulus, accounting for debt non-linearities.

1 Introduction

Like other advanced economies, the euro area faced high inflation over the past few years. Since mid-2021 and until October 2022, when it reached 10.6%, euro area headline inflation had increased at a pace last seen in the 1970s and early 1980s, after having been below the ECB's 2% target for almost a decade. Notwithstanding the recent decline, especially in energy prices, inflation has proven more persistent than initially expected. These developments have triggered renewed discussions about the role of monetary and fiscal policies, as well as their interaction, in shaping inflation.

The relationship between inflation and public finances runs in both directions. First, on the impact of inflation on fiscal policies, several recent papers (Bańkowski et al. (2023a), Bańkowski et al. (2023b); Briodeau and Checherita-Westphal (2023)) show that the fiscal implications of an inflationary shock depend on several factors, such as: (i) the nature of the shock (externally generated supply side vs. an internal demand side shock); (ii) the structure and institutional arrangements governing the budget revenue and expenditure, for instance, the coverage of indexation rules; and (iii) the size of the inflation shock hitting public finances and (iv) the monetary policy reaction.

Second, fiscal policy affects the inflation outlook. In the theoretical literature, the conditions under which fiscal policy could influence the price determination process is subject to debate. The early monetarist view holds that inflation, in the sense of sustained increases in price levels, is solely determined by money growth, and fiscal policy plays no role unless it is money-financed. By contrast, according to the so-called fiscal theory of the price level, an unbacked fiscal policy expansion – a public debt increase that is not matched by (expected) higher future primary surpluses – implies that economic agents perceive that their real wealth has increased, leading to higher consumption and prices. More generally, if the present value of future primary surpluses is less than the amount of outstanding nominal debt, the equilibrium price level must increase (reducing the real value of debt) to assure fiscal solvency if an explicit sovereign default is excluded. Finally, in widely used macroeconomic models such as New Keynesian models, discretionary fiscal policy – in conjunction with monetary policy – can be an effective short-run macroeconomic stabilisation tool. A fiscal stimulus can lead to higher inflation and this is

especially the case in situations where monetary policy is constrained at the lower bound or in deep recessions, when fiscal policy can help prevent deflationary episodes.

This paper fits into the second workstream. It aims at bringing additional evidence to the empirical literature on the topic, which is unsettled. Its contribution is to analyse the impact of discretionary fiscal policy on inflation in the euro area, using a relatively novel dataset for this purpose, and accounting for non-linearities with respect to the level of public debt. Furthermore, interactions between fiscal and monetary policy are explored as we control for non-linear effects of fiscal stimulus depending on the level of interest rates (and the position in the economic cycle). To the best of our knowledge, this is the first paper to explicitly analyse possible non-linear effects of fiscal stimulus shocks on inflation depending on the level of debt and accounting simultaneously for several state dependencies.

The structure of the paper is as follows. After this short introduction to motivate our analysis, we present a literature review (section 2) and then describe the two main methodological approaches and their results (section 3). Section 4 investigates the possible channels through which fiscal policy shocks may have an impact on inflation, while the appendices present various other robustness checks. Section 5 concludes and outlines areas for further research.

2 Literature

The empirical literature on the impact of discretionary fiscal policy (shocks) on inflation is still unsettled. First, this strand of the literature is much more scarce compared to the one focusing on the "typical" (real output) fiscal multipliers. Second, the results are less conclusive in terms of the significance and sign of the effect. Where results are reported, several studies suggest either a no statistically significant or even a negative reaction of inflation in response to an expansionary fiscal shock, usually in the form of higher government spending (Perotti (2005), Mountford and Uhlig (2009), Nakamura and Steinsson (2014), Jørgensen and Ravn (2022)). This is at odds with the predictions of standard New Keynesian models. Other studies report positive responses of inflation to expansionary government spending shocks (Caldara and Kamps (2008), Ben Zeev et al. (2017), Ferrara et al. (2021)).

The *monetary policy stance*, including any endogenous response to the fiscal shock, is likely

to be a major factor shaping the ultimate reaction of inflation after the fiscal policy intervention. The literature on the *output* fiscal multiplier is rich in this respect, showing that the multiplier can go from negative to large positive values depending on the degree of monetary policy accommodation. For example Cloyne et al. (2023), which use the short-term interest rates for monetary policy changes and attempt to estimate the "endogenous" reaction of monetary policy to the fiscal shock, subsequently calculating how the output fiscal multipliers change according to this reaction. Hack et al. (2023) find a large variation in the government spending output multiplier (war spending in the US) according to the "systematic" reaction of monetary policy, identified based on the historical composition of hawks and doves in the FOMC. For similar results, see also the large literature on the output fiscal multiplier at the ZLB and Coenen et al. (2012) for results with large scale macroeconomic model simulations. However, the effect on inflation is rarely shown in the papers that compute state-dependent "output" fiscal multipliers.

Another important state dependency for the fiscal multiplier, which is the focus of our project, is the state of public finances, usually captured by the level of public debt. In terms of the output multiplier, this strand of the empirical literature is also relatively rich. It generally finds lower multipliers (fiscal policy is, ceteris paribus, less effective for real output stabilization) in regimes of high public debt (weak public finances). See, inter-alia, Ilzetzki et al. (2013), Corsetti et al. (2012), Nickel and Tudyka (2014), Huidrom et al. (2020) for samples of (mainly) advanced OECD economies. Fotiou (2022) concludes that when debt is high, fiscal consolidation based on expenditure (vs. taxes) is much less costly in terms of output and can stabilise debt. On the other hand, Eminidou et al. (2023) find that the result of lower multipliers in regimes of high debt holds only when one exploits the time variation in debt, while the opposite is true for the cross-country variation, which is more important in the euro area. These contrasting results are explained by the possibility of more severe private sector credit constraints in the high public debt economies, which (paradoxically) could be relieved by more fiscal stimulus. This explanation is, however, not supported by the findings of another paper (Pinardon-Touati (2023)), which uses micro and macro (French administrative) data over 2006-2018 and finds that when local government spending is financed through debt, this crowds out private loans, which in turn reduces the output multiplier. The underlying channels here could be stronger Ricardian effects, higher credit risk (spreads) feeding into higher sovereign

yields and higher uncertainty. For instance, Huidrom et al. (2020) document empirically in a sample of 34 countries (19 advanced and 15 emerging and frontier market economies) the importance of two channels through which weaker fiscal positions affect the output multiplier of a government consumption shock: (i) the Ricardian channel, with households reducing consumption in anticipation of (stronger) future fiscal adjustments; (ii) interest rate channel (credit risk), with the fiscal stimulus from a weak fiscal position heightening investors' concerns about sovereign credit risk, raising economy-wide borrowing cost and reducing private domestic demand.

As regards the response of inflation to an expansionary fiscal policy shock in regimes of high debt, two forces can be at play. On the one hand, the traditional Keynesian aggregate demand channel would imply higher inflationary pressures, assuming no monetary policy reaction, though possibly less strong in the high vs. low debt regimes given the weaker effectiveness of fiscal policy. On the other hand, in regimes of high debt, a further stimulus may trigger higher inflation through: (i) wealth effects as predicted by the fiscal theory of the price level, (ii) a possibly higher degree of monetary policy accommodation, as posit by the fiscal dominance literature, or (iii) people's beliefs as suggested in recent survey studies. For instance, Grigoli and Sandri (2023) find in randomized 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 also found to considerably reduce the sensitivity of inflation expectations to public debt. For the US, Coibion et al. (2021) find that information about the current debt or deficit levels has little impact on inflation expectations, but news about future (higher) debt leads households to anticipate higher inflation in the short and long run. All in all, according to Ferrara et al. (2021), the negative reaction of inflation after a positive government spending shock found in some studies arises because the recursive identification strategy used usually fails to capture the changing nature of government spending in the US, which shifted from alternating tax- and debt- financing to be steadily debt-financed since the end of the 1990s. This hints at debt as a potential source of non-linearities.

Overall, the very few studies that report the reaction of inflation to a fiscal shock depending on the level of public debt tend to find somewhat higher inflation in regimes of high debt, especially at longer horizons (not on impact). For instance, among the papers that focus on

output multipliers, but report also on inflation impacts, Corsetti et al. (2012) check for state-dependency in regimes of weak public finances (debt larger than 100% of GDP or deficit larger than 6%) for a sample of 17 advanced economies over 1975-2008. They report that inflation and the interest rate follow similar patterns as in a scenario with sound public finances, but their responses are more pronounced: after a positive government spending shock, the initial decline in inflation and the subsequent peak are larger, while the monetary stance (short-term interest rate) is looser throughout. However, the results are weakly, if at all, statistically significant. Eminidou et al. (2023) find higher inflation and inflation expectations after a positive government spending shock in euro area countries with high debt.

A recent IMF working paper (Cevik and Miryugin (2023)), which is the closest in scope to our analysis, focuses specifically on the topic of fiscal policy shocks and inflation, including state-dependency in a large sample of 139 developed and developing countries over the period 1970-2021. Their main conclusion is that inflation increases in response to an expansionary fiscal policy. This impact is dependent on the fiscal space (larger at higher levels of public debt), type of monetary policy and exchange rate regimes (lower in countries with inflation targeting and more flexible exchange rates), and the position in the business cycle (larger inflation if the economy is in a recessionary state before the shock occurs, which could also be explained by a more accommodative monetary policy). Compared to this study, our analysis accounts better for discretionary fiscal policy (endogeneity issues), state-dependency for advanced economies (euro area) and the simultaneity of various states.

3 Empirical strategy and results

We study the dynamic impact of discretionary fiscal policy on inflation in a sample of mature euro area economies (the first 12 members of the euro area, EA-12) over the period 1999-2022, with robustness checks across a wider sample of advanced economies.

We first analyse empirically the dynamic impact of fiscal policy, dependent on the level of debt, using the local projection method (Jordà (2005)), while controlling for the state of the economy and the monetary policy stance. In a second step, we go further in testing the robustness of the non-linear effects in debt and perform a joint analysis of various potential

state dependencies by using the local projections method with the Kitagawa-Blinder-Oaxaca (KBO) decomposition as proposed in Cloyne et al. (2023).

In the following, we will first describe the identification strategy used in the baseline specifications and robustness checks and then detail our two main empirical strategies.

3.1 Identification strategy

For fiscal policy shocks, we use in the baseline model a proxy for total discretionary fiscal policy measures (henceforth DM) from the Eurosystem Working Group of Public Finance (WGPF), based on a narrative, measure-by-measure approach on the revenue side and benchmarking the growth rate of three relevant expenditure categories (government consumption, investment and discretionary transfers) to nominal potential growth. In more detail, on the revenue side, changes in the tax and social security contributions in each year t are documented measure-by-measure and the ex-ante budget costs (i.e, excluding second round macro effects), as estimated by WGPF experts, are used for the aggregation. On the expenditure side, the method records a measure as discretionary stimulus (consolidation) when the respective fiscal item (government consumption, investment and fiscal transfers) in nominal terms at year t is above (below) the level that would have prevailed if the item in t-1 had grown in t at the same rate as nominal potential GDP. On the expenditure side, the proxy on fiscal transfers excludes the spending on unemployment benefits, which respond directly to current cyclical fluctuations (apart from the ex-ante fiscal impact of specific changes in legislation), as well as the (large and temporary) capital transfers to financial institutions, granted starting with 2007 in response to the financial and euro area sovereign debt crisis. These proxies for discretionary fiscal policy measures are regularly used in the ECB/Eurosystem macroeconomic forecasting models to evaluate the impact of fiscal assumptions on growth and inflation[1]. For the purpose of our project, we go beyond and transform the variables in real terms (dividing by GDP deflator) and then normalise to real GDP in the preceding year. In this way, we make the variables comparable across countries and mitigate endogeneity concerns resulting from reverse causation and simultaneity.

[1] For more details on the size of measures and their composition across five broad instruments (government consumption, government investment, fiscal transfers, indirect taxes, and direct taxes and social security contributions) at the euro area aggregate level over the recent years see Checherita-Westphal (2023).

Variants of this proxy and of the related database have been used in several papers[2], but to the best of our knowledge this is the first time the database is used in a research paper to systematically investigate the impact of fiscal policy on inflation.

Our measure covers both stimulus and consolidation episodes, on an annual basis. In this respect, compared with other papers (e.g., Guajardo et al. (2014), which uses only consolidation episodes, it does not truncate the fiscal shock variable and covers both aspects of fiscal policy. Moreover, compared with a recent paper on the same topic (Cevik and Miryugin (2023)), which uses changes in the overall budget balance or cyclically adjusted balance, our measure nets out the endogenous macroeconomic effects from the fiscal shock in a superior way. First, it does not include the automatic stabilisers that can be a large component in the change of the headline budget balances. Second and, most importantly, it is not affected by the so-called revenue windfalls or shortfalls and other factors beyond the typical cyclical fluctuations that can impact substantially the cyclically-adjusted balance and other proxies often used in the literature to capture the discretionary fiscal policy.

This being said, our proxy does not distinguish the endogenous (in response to the cycle) from the exogenous fiscal policy measures (independent from the cycle, hence pure fiscal shocks)[3]. While the discretionary fiscal policy is in practice largely endogenous and remains important from a monetary policy perspective for the determination of inflation, for purposes of identification in this exercise, we go further and purge this measure from past and expected contemporaneous output developments (henceforth DM "purged"). We broadly follow the method in Corsetti et al. (2012) and regress the DM variable for individual countries on the first two lags of real GDP growth, the first two lags of output gap and the first lag of the OECD composite leading indicator (CLI), which proxies for the government pre-budget expectations with respect to next-year growth. The CLI is a real-time measure with a track record of

[2] See, for instance, Agnello and Cimadomo (2012), which investigates how discretionary fiscal policies on the revenue side (only) have reacted to economic fluctuations across a (larger) sample of European Union 27 countries over 1998-2008. Their results suggest that, overall, legislated changes in taxes and social security contributions have responded in a strongly pro-cyclical way to the business cycle, while commonly used cyclical-adjustment methods point to acyclicality. Attinasi and Klemm (2014) investigate the growth effects of discretionary fiscal policy measures in a sample of 18 EU countries over the period 1998-2011. They find that fiscal consolidation can be a drag on economic growth in the short term, although some specific budget categories are not found to be statistically significant. Their dynamic specifications suggest that consolidation reduces growth mainly in the year of fiscal adjustment.

[3] As pointed out in Agnello and Cimadomo (2012), for their period of analysis (1998-2008), the WGPF legislative measures on the revenue side seemed to have responded in a strongly pro-cyclical way to the business cycle

predicting changes in economic activity, especially cyclical turning points, several months in advance. As such, it seems well suited to capture expectations about the growth outlook held by policymakers and the public. As discussed in Corsetti et al. (2012), correct identification hinges on the hypothesis that government spending does not react to simultaneous output fluctuations. As discussed in their work, the timing of fiscal policy decisions is generally constrained by data availability and the budget process, which prevents immediate responses to output shocks[4].

Finally, in a third identification alternative, for robustness checks, we use the exogenous consolidation (only) episodes from Guajardo et al. (2014) and Alesina et al. (2019), for a sample of 16 OECD countries over the period 1978-2014.

3.2 Empirical strategy 1

We first analyse empirically the dynamic impact of fiscal policy on inflation, dependent on the level of debt, using the local projection (LP) method (Jordà (2005)), while controlling for the state of the economy and the monetary policy stance. This choice is motivated by the robustness of LP methods in estimating impulse response functions, particularly under potential model misspecification as highlighted in Olea Montiel et al. (2024). LPs maintain more accurate confidence intervals when underlying model assumptions are compromised but also reduce the susceptibility to errors that VAR methods may exhibit under similar conditions. Moreover, LPs offer greater flexibility in choosing lag lengths without compromising result integrity, an advantage over VARs, where inappropriate lag choices can introduce significant biases and undermine the reliability of the inference. However, we are aware that this choice exposed our estimates to potential biases inherent in LP methodologies as discussed by Herbst and Johannsen (2024)[5].

To start with, we estimate the linear impact of the fiscal shocks on inflation without debt-

[4] For a more thorough discussion of these issues, refer to Corsetti et al. (2012).

[5] Our study employs local projections (LP) across 23 time observations per country and a cross-section of 12 countries, exposing it to potential biases as discussed by Herbst and Johannsen (2024). However, the coefficients we estimate deviate significantly from unit roots, which may mitigate some of the specific biases outlined in their analysis which focuses on high persistence usually present in monthly/quarterly data.

dependency, as given in equation 1 for each horizon h=0,..,4:

$$\frac{cpi_{i,t+h} - cpi_{it-1}}{cpi_{i,t-1}} \times 100 = \mu + \alpha^h(L)x_{it} + \beta^h g_{it} + \delta_t + a_i + \varepsilon_{it} \quad (1)$$

where the dependent variable is the cumulative headline or core inflation at horizon t+h (after the fiscal shock occurring in t), here cpi denoting the consumer price index, t refers to the time period (years) and i refers to the country; a_i denotes country fixed effects; δ_t time fixed effects, g_{it} is the government (fiscal) policy shock, x_{it} is a set of controls comprising two lags of inflation and two lags of the (common) euro area shadow interest rate, and the current value for the output gap to account for the state in the economy cycle as in Jordà and Taylor (2016), Cloyne et al. (2023). In this analysis, we employ Driscoll–Kraay standard errors to handle the potential issues of cross-sectional dependence and heteroscedasticity that are typical in panel data involving multiple countries over time. This approach is particularly suitable given our panel structure and the dynamic nature of fiscal policy impacts, ensuring robust inference despite the presence of autocorrelation and spatial correlation across country-specific observations.

This follows a fiscal policy shock-augmented Phillips curve model of inflation, as well as the specifications in Jordà and Taylor (2016) and Cloyne et al. (2023) to explain variation in real output. The shadow (short-term nominal) interest rate for the euro area is used as a proxy for the monetary policy stance[6]. Output gap estimates up to 2022 are taken from the Eurosystem's June 2023 macroeconomic projection database.

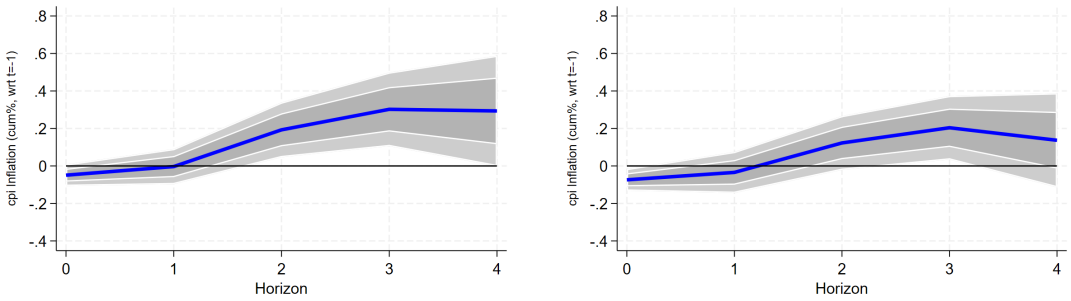
The results (Figure 1) indicate that inflation tends to rise following an expansionary fiscal policy shock, with the results being significant (both statistically and economically) between the third and fourth years after the shock (h=2, 3), with relatively muted effects in the short term. The statistical significance is somewhat weaker with the variable "Purged" DM shock.

Further, to account for potential nonlinearities in the level of debt using state-dependent local projections (Ramey and Zubairy (2018)), we define the states of high (low/lower) debt according to the debt-to-GDP ratio (d_{t-1}) being above (below or equal to) 90% [7]. We then

[6] We take the shadow interest rate from Wu and Xia (2018) and Wu and Xia (2020). It is publicly available on the author's website.

[7] Debt thresholds of around 90-100 percent of GDP are widely seen as risky for advanced economies and have been found in the literature to be associated, on average, with lower growth. For a reference relevant to

Figure 1: Linear impact of fiscal policy on inflation



(a) DM fiscal shock **(b)** "Purged" DM fiscal shock

Notes: Panel (a) shows the linear IRFs of cum. change in the balance indicator of inflation expectation to 1% GDP fiscal stimulus for the identification strategy relying on DM proxy. Panel (b) shows the linear effect obtained when using the identification strategy relying on the "Purged" DM proxy. The blue line corresponds to the point estimates. Shaded areas are 68% (dark) and 90% (light) confidence intervals.

interact our fiscal policy shock and controls with the resulting dummy variable and estimate equation 2 below for each horizon h=0,..,4:

$$\frac{cpi_{i,t+h} - cpi_{i,t-1}}{cpi_{i,t-1}} \times 100 = \mathbb{1}\left[d_{t-1} > 90\right]\left(\mu^h_{high} + \alpha^h_{high}(L)x_{it} + \beta^h_{high}g_{it}\right) \tag{2}$$
$$+ \mathbb{1}\left[d_{t-1} \leq 90\right]\left(\mu^h_{low} + \alpha^h_{low}(L)x_{i,t} + \beta^h_{low}g_{i,t}\right) + \delta_t + \alpha_i + \varepsilon_{it}$$

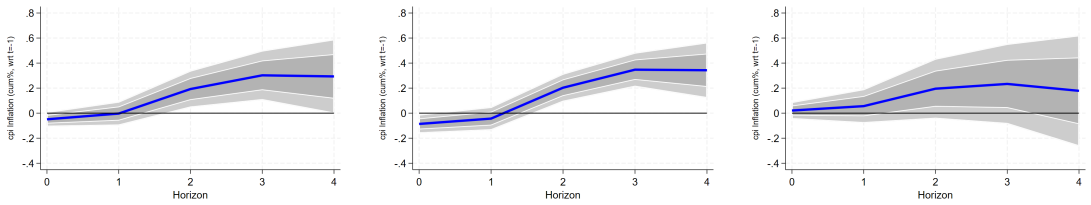
Figures 2 and 3 illustrate the results in terms of headline inflation for the linear and non-linear specifications, with the initial DM measure for the fiscal shock (Figure 2) and the purged DM (Figure 3).

The results indicate that inflation (both headline shown here and core shown in the Appendix) tends to rise following an expansionary fiscal policy shock, particularly when the economy carries a high debt burden before the shock. Specifically, five years after a +1% of GDP fiscal stimulus, economies with high starting levels of debt witness an additional +0.4 pp cumulative headline inflation. As before, the most significant impact tends to manifest between the third and fourth years after the shock (h=2, 3), but this is shown to originate from the high debt countries. For the low debt countries, the effect is weaker and mostly not statistically significant. For the

euro area countries in the context of debt sustainability analysis, see Bouabdallah et al. (2017) and the related literature cited therein.

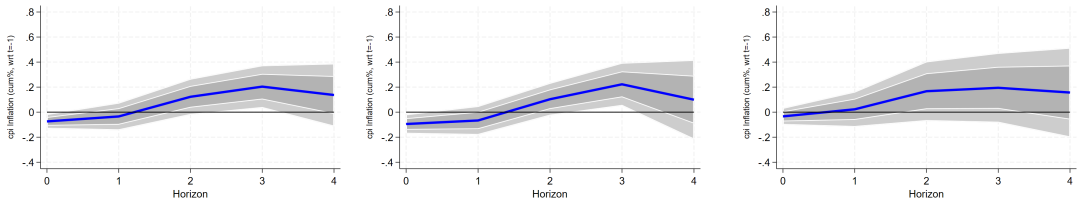
core inflation (Appendix, subsection 6.1), the economic impact (size of the coefficient) in the high debt countries is also found to be much larger than in the low debt countries, albeit the statistical significance drops when using the the purged measure of the fiscal shock. Similar results are obtained with the 3rd identification strategy for the panel of OECD countries (see Appendix, subsection 6.4). Finally, results remain robust when we remove from our sample the years 2021-2022, when euro area governments adopted discretionary fiscal policy measures specifically targeted to lower energy prices and inflation in general (see results in Appendix, subsection 6.2). Such packages were particularly large in terms of fiscal cost in 2022, in response to the energy price shoot-up following Russia's war on Ukraine[8].

Figure 2: Impact of fiscal policy - using the DM proxy - on inflation



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

Figure 3: Impact of fiscal policy - using the "Purged" DM proxy - on inflation



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

Notes: Figure 2 shows results for the identification strategy relying on the DM proxy, while Figure 3 for the "Purged" DM. Panels (a) show the linear IRFs of the cumulative change in the price level to 1% GDP fiscal stimulus. Panels (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.

[8] For more details, see Bankowski et al. (2023a) and follow-up ECB analyses on the topic.

Acknowledging the endogeneity of the debt-to-GDP ratio to fiscal shocks, we also note its relative persistence and slow adjustment to the shock, especially when the latter is rather moderate as in our sample. Hence, the maximum shock in our data being only around four times its standard deviation mitigates the concerns raised in Gonçalves et al. (2024), where values around ten were considered problematic. Moreover, while the average debt ratio increases over our sample period, the results broadly hold for a debt threshold of 70 percent of GDP (about the median of the sample, entailing a more stable grouping of countries). Finally, we go beyond exogenous debt thresholds in the second part of our analysis by accounting for nonlinearity in debt in a continuous way.

3.3 Empirical strategy 2

In a second step, we go further in testing the robustness of the non-linear effects in debt. While previous studies commonly explore a single state dependency at a time, our approach involves a joint analysis of various potential state dependencies to confirm the presence of the non-linear effect in debt. To this end, we use the local projections method with the Kitagawa-Blinder-Oaxaca (KBO) decomposition as proposed in Cloyne et al. (2023) and described in equation (3). This allows to assess any changes in the inflation effects of a fiscal stimulus shock according to the debt level (in this specification, as a continuous variable) when accounting simultaneously for the indirect effects of the fiscal shock interaction with the state of the economy (output gap, x_{it}^{OG}), and the euro area-wide monetary policy stance (proxied by the shadow interest rate, $x_{i,t}^{r}$).

$$\begin{aligned}\frac{cpi_{i,t+h} - cpi_{i,t-1}}{cpi_{i,t-1}} \times 100 = \mu^h x_{it} + \beta^h g_{it} + \delta_t + a_i + \beta_{debt}^h g_{it} \left(x_{it}^{debt} - \bar{x}^{debt}\right) \\ + \beta_r^{h,+} g_{it}^{+} \left(x_{i,t}^{r} - \bar{x}^{r}\right) + \beta_r^{h,-} g_{it}^{-} \left(x_{it}^{r} - \bar{x}^{r}\right) \\ + \beta_{og}^h g_{it} \left(x_{it}^{OG} - \bar{x}^{OG}\right) + \varepsilon_{it}\end{aligned} \tag{3}$$

As explained in Cloyne et al. (2023), relative to the usual specification of a local projection, the only difference is the additional KBO term $\beta_{state}^h \left(x_{it}^{state} - \bar{x}^{state}\right) g_{it}$ for each state (debt

level, shadow interest rate or output gap). This term is equal to zero when the country-specific observable x_{it}^{state} coincides with $\bar{x}^{state}$ the sample average[9]. This ensures that the linear estimate remains interpreted as the effect of the shock "on average". On the contrary, when x_{it}^{state} does not coincide with the sample average, β_{state}^{h} captures the effect of having the state variable above or below the sample average. As discussed in Cloyne et al. (2023), by adding the various interaction terms, this specification allows for better control of neglected estimation biases, as policy interventions can modify how other variables influence the (inflation) outcomes.

It is important to note that in this exercise, we do not capture the endogenous reaction of monetary policy to the fiscal shock as done in Cloyne et al. (2023). Instead, we account only for the monetary policy *stance*, hereby defined as the state of monetary policy in the period before the occurrence of the fiscal shock. Crucially, we allow the interaction term to depend on the sign of the fiscal policy shock. In other words, we independently estimate the non-linear impact of a fiscal stimulus ($\beta_r^{h,+}$) and fiscal consolidation ($\beta_r^{h,-}$) depending on the predetermined monetary policy stance. This approach allows us to account for the effect of monetary policy stance more precisely than using a single parameter β_r^h. With only one parameter, if a fiscal stimulus proves more inflationary under a more expansionary monetary policy, it would also imply that a fiscal contraction is more disinflationary under the same stance. We believe this is not necessarily true, and using two parameters allows us to address this issue effectively.

As shown in Table 1, the finding of non-linear effects of a fiscal shock on inflation according to the debt-to-GDP ratio is robust to a horse-race with additional relevant state-dependencies and remains surprisingly stable. The effects are somewhat stronger (both statistically and economically) for core inflation. According to the KBO specification, a 1% of GDP fiscal stimulus in a country with government debt at around 70% of GDP (sample mean) brings about 0.1 pp higher cumulative HICP inflation (0.2pp core inflation) after 4 years (linear effect β^4), but 0.2pp more headline inflation (0.3-0.4 core inflation) when debt is higher by 1 standard deviation (about 35 pp of GDP) (see nonlinear effects β_{debt}^4 in Table 1).

When considering instead the interaction with the monetary policy stance, the negative

[9] For output gap we consider the average as the country-specific sample average as in Cloyne et al. (2023). For debt we take the full sample average. This follows from the fact that we are interested in the heterogeneous implications of a high debt level relative to the eurozone average. For the shadow interest rate, both averages coincide.

Table 1: Non-linear effects of 1% of GDP fiscal shock (stimulus) on inflation with the KBO decomposition

		Debt	Interest rate		Output gap
			+DM	-DM	
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)

Notes: The table shows nonlinear effects at h=4 (β_s^4) of an additional standard deviation in the state for the different identification strategies. Standard errors in parenthesis. Significance level *: 68%, **: 90%, ***: 95%. In the column -DM, we report $(-1) \times \beta_r^{h,-}$ to facilitate interpretation and comparison with the results for fiscal stimulus (+DM): with this adjustment, both coefficients should be interpreted the same way in the table.

coefficient implies that a higher shadow interest rate than the average would reduce the impact of fiscal stimulus or fiscal consolidation[10]. For example, consider the results using the "purged" DM. The effect of a fiscal stimulus equivalent to 1% of GDP (as shown in column DM+) on headline inflation is 0.3 percentage points lower in a scenario where short-term interest rates are one standard deviation higher than the average (by approximately 3.75 percentage points). Conversely, in the case of a fiscal consolidation of 1% of GDP (indicated as -DM), headline inflation decreases by 0.6 percentage points in a scenario where short-term interest rates are one standard deviation higher than the average. When using discretionary measures directly, there are notable differences in the effects of a fiscal stimulus compared to fiscal consolidation, with stronger (both statistically and economically) effects in the latter case. However, these differences diminish when using the "purged" DM, especially when it comes to the effects on core inflation. Moreover, the outcomes from the "purged" DM align more closely with the theoretical expectation that a context with higher interest rates tends to be more deflationary.

Regarding the non-linearities with respect to the level of the output gap (last column of Table 1), here our results are less intuitive but coincide with the results obtained by Cevik and

[10] In the column -DM (fiscal consolidation), we report $(-1) \times \beta_r^{h,-}$ to facilitate interpretation and comparison with the results for fiscal stimulus (+DM): with this adjustment, both coefficients should be interpreted the same way in the table.

Miryugin (2023)[11]. We find that a fiscal stimulus has some disinflationary effects when the output gap is above its mean, albeit the statistical and, especially the economic significance of such effects are very weak, particularly with the DM purged fiscal shock. Indeed, the differences are close to zero when the DM purged proxy, which is more relevant in this case, is used. Cevik and Miryugin (2023) suggests that these patterns may be due to the slack typically seen in labour and product markets during recessions. In such scenarios, boosting government spending or cutting taxes can stimulate demand while the supply side of the economy is depressed and consequently raises prices. However, these results might also arise due to caveats related to the use of ex-post output gap measures, which already reflect the effects of monetary policy (despite the fact that in this type of regression, we control for all dependency states simultaneously).

To conclude, we find evidence of higher inflationary effects of a fiscal stimulus in regimes of high(er) government debt, as well as lower effects in times of higher interest rates.

4 Investigating the potential economic channels

In the previous sections, we have shown the presence of nonlinearities in the debt level when assessing the impact of fiscal policy on inflation. This necessitates a deeper exploration of the underlying economic channels that could explain such findings. To ground our investigation, we think through the framework of a linear New Keynesian Phillips Curve (NKPC), which links inflation to economic activity and inflation expectations. The standard form of the NKPC can be expressed as:

$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa y_t + u_t$$

where π_t denotes the inflation rate at time t, $E_t[\pi_{t+1}]$ represents the expected future inflation, y_t is the output gap, β is the discount factor, κ captures the sensitivity of inflation to the output gap, u_t is a cost-push shock.

Following this framework, the nonlinear impact of fiscal policy on inflation could be driven by the heterogeneous impact on inflation expectations or in economic activity depending on the country's level of debt. In the New Keynesian framework, economic activity is demand-driven, suggesting that changes in consumption play a crucial role in driving economic activity. In

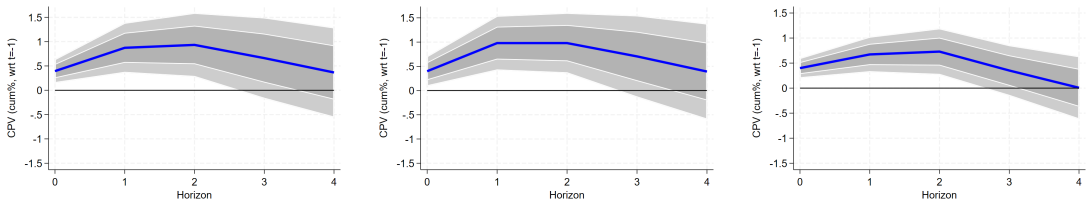
[11] Figure 6, page 13-14, in their paper

this section, we evaluate two key channels: private consumption[12] and inflation expectations. We will analyze how these factors contribute to the nonlinear effects observed in our earlier analysis.

4.1 Private Consumption

When we investigate the impact of a fiscal stimulus shock on the cumulative growth of private consumption we find in general positive effects in both debt regimes (Figure 3 and Figure 4). However, in the low debt regime, the uncertainty around the responses is more limited. Moreover, with the "purged" DM shock, the positive effect of the stimulus on the cumulative growth of private consumption is more persistent and robust in the low debt countries, while it turns negative (albeit not statistically significant) in the high debt countries. While private consumption appears to be a regular keynesian channel in explaining the positive effects of fiscal stimuli on inflation, it does not seem to explain the differential impact according to the level of public indebtedness. For this, we turn to the next channel, consumers' inflation expectations.

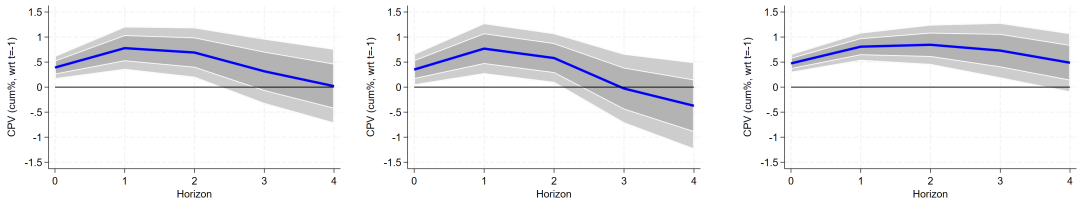
Figure 4: Impact of fiscal policy - using the DM proxy - on Private Consumption



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

[12] Surprisingly, when we investigate the impact of our fiscal policy shock on GDP growth, we do not find statistically significant effects for our period of analysis (see Appendix, subsection 6.3). Nonetheless, for inflation dynamics (changes in the consumer price index), the channel of private consumption is likely to be especially relevant from a demand component perspective. An ambiguous impact on GDP can be explained if part of the stimulus spills over to other economies through the external (import channel) channel given the openness of these economies or/and given financial market reaction leading to increased cost of financing for firms and increased uncertainty.

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: Figure 4 shows results for the identification strategy relying on the DM proxy, while Figure 5 for the "Purged" DM. Panel (a) shows the linear IRFs of the cumulative change in private consumption to 1% GDP fiscal stimulus. 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.

4.2 Inflation expectations

This subsection explores the effects of fiscal policy shocks on inflation expectations at the national level. To this end, we employ data from the Business and Consumer Surveys, integrated within the Joint Harmonised EU Programme of Business and Consumer Surveys. This extensive dataset comprises the 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. The methodology used in the survey ensures that data is comparable across EU member states by using a harmonized questionnaire and consistent data collection methods. It is important to keep in mind that, diverging from the expected inflation measures often informed by experts or financial market indicators, consumer inflation expectations incorporate a broader spectrum of societal views on inflation. These expectations have been proven to significantly deviate from the traditional rational expectations hypothesis typically applied to expert forecasts. They are nonetheless crucial to the determination of current inflation from a demand perspective, as pointed out in a recent paper by D'Acunto et al. (2024), suggestively entitled "Why Survey-Based Subjective Expectations are Meaningful and Important". Reis (2024) also concludes that, despite the typical disagreement found in household surveys, important information is contained in it, especially at the tails of inflation realisations. Moreover, inflation expectations surveys of firms (CEOs or the "supply side") unveil that firms behave more like households in disagreement and uncertainty and less like

professional forecasters, which points to the importance of these surveys.[13]

In the EU Business and Consumer Survey, participants are asked to answer the following question on inflation expectations:

Question	"Over the next 12 months, do you expect that consumer prices will...?"
Answers	PP. Increase more than before P. Increase at the same rate as before E. Increase at a slower rate than before M. Stay about the same MM. Fall

We analyse the impact of fiscal policy on two different measures of inflation expectations taken from this survey. The first one is the balance indicator generated by the European Commission by aggregating the answers to reflect the changes in the different categories available. The second measure we use is the one exclusively related to people expecting inflation to increase (PP), and we report the results in the Appendix, subsection 6.5.

The balance score is defined to increase when there are more respondents expecting higher inflation or fewer respondents expecting deflation or no change in the price level. A higher positive score suggests that a greater number of people anticipate inflation to rise relative to deflation or no inflation. Formally, it is defined as follows:

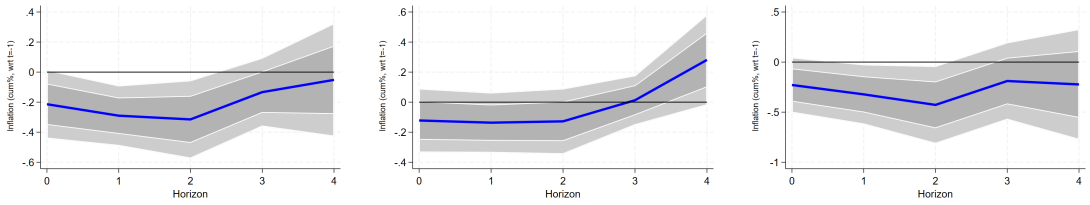
$$\text{Balance} = \underbrace{PP + \frac{P}{2}}_{\text{higher and equal infl.}} - \underbrace{(\frac{M}{2} + MM)}_{\text{no infl. and disinflation}}$$

The linear estimates presented in panels (a) of Figures 6 and 7 indicate that a fiscal stimulus initially has a negative impact on the balance indicator but becomes negligible by the fourth year post-shock. This would suggest that, on average, a fiscal stimulus is associated with lower household inflation expectations. However, when exploring the variation in effects across countries with differing debt levels, some notable differences emerge. The negative impact on inflation expectations seems to originate from the low debt countries. In contrast, for countries

[13] For additional results on disagreement (inflation perceptions of different groups of consumers) and disagreement between households/firms' and professional forecasters' inflation expectations, see Fofana et al. (2024).

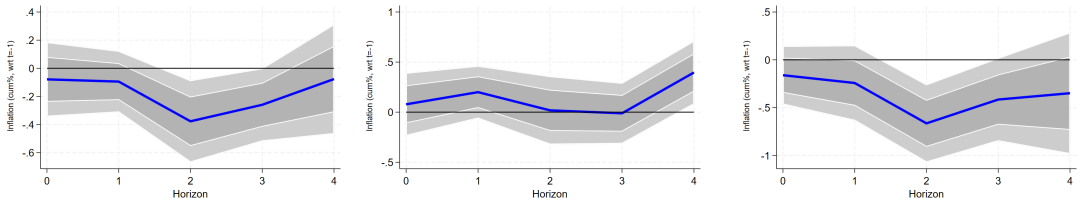
with high debt, a fiscal stimulus appears to heighten the 12-month-ahead inflation expectations over the longer run (by the fourth year following the shock). There is also a notable short-term divergence: in low debt countries, a fiscal stimulus tends to lower inflation expectations immediately and remains so up to the third year post-shock. Conversely, in high debt countries, the impact on inflation expectations is either marginally significant or slightly positive, as shown in panel (b) of Figures 6 and 7, depending on the identification strategy used.

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: Figure 6 shows results for the identification strategy relying on the DM proxy, while Figure 7 for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in the balance indicator of inflation expectation to 1% GDP fiscal stimulus. 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.

Concentrating on our primary method of identification, which utilizes the "Purged" DM proxy (Figure 7), the influence of fiscal stimulus on inflation expectations manifests with a lag, becoming noticeable only from the second year onward. This delayed response of inflation expectations is in line with the findings by Eminidou et al. (2023) who, using the same survey data, find higher inflation expectations after a positive government spending shock, statistically significant only at longer horizons of 8 quarters (when accounting for cross-country variation in euro area countries with high debt). Similarly, Chen et al. (2022), find that the cross-section

average of individual forecasts of expectations in survey data tends to under-react to shocks initially, but overreact in the medium-term.

Overall, these findings underscore the potential significance of debt levels in influencing how 12-month-ahead household inflation expectations respond to fiscal policy: inflation expectations appear to rise only in the high-debt countries. The observed heterogeneity in inflation expectations responses to fiscal policy across different debt contexts provides a plausible explanation for our primary results, suggesting that the predetermined debt levels are a crucial factor in shaping the inflation responses after fiscal interventions.

5 Conclusions and areas for future research

This paper adds to the empirical literature on the impact of fiscal policy on inflation, a topic that is still unsettled. Its contribution is to analyse the impact of discretionary fiscal policy on inflation in the euro area, using a relatively novel dataset for this purpose, and accounting for non-linearities with respect to the level of public debt. Furthermore, interactions between fiscal and monetary policy are explored as we control for non-linear effects of fiscal stimulus depending on the level of interest rates (and the position in the economic cycle). Using two main methodological approaches, underpinned by three identification strategies, we find evidence of higher inflationary effects of a fiscal stimulus in regimes of high(er) government debt, as well as lower effects in times of higher interest rates. 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. However, inflation expectations appear to rise only in the high-debt countries which can help rationalise the higher response of inflation to fiscal policy in the high-debt countries.

To the best of our knowledge, this is the first paper to explicitly analyse possible non-linear effects of fiscal stimulus shocks on inflation depending on the level of debt and accounting simultaneously for several state dependencies. Caveats to the analysis relate to the remaining endogeneity of the fiscal shock so that the paper stops short of unveiling pure causation.

Further research could attempt to better identify exogenous fiscal shocks (both consolidation and stimulus episodes), although this would also stripe out a large part of what fiscal policy

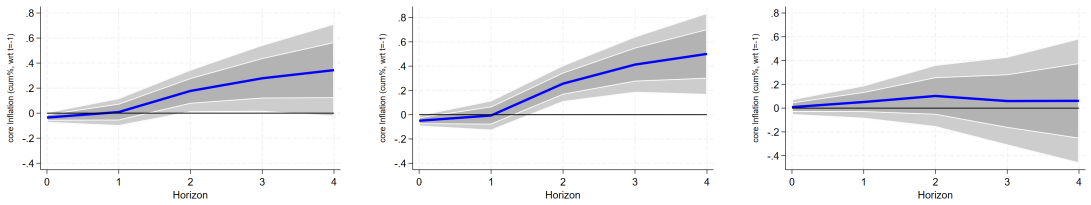
is about. As regards the dependency states with respect to the output gap, robustness checks could involve the use of real-time measures and the possibility to distinguish (as done for monetary policy stance) the effects of fiscal stimulus vs. fiscal consolidation shocks. To complement the analysis related to household inflation expectations, it would be beneficial to examine the impact on expert inflation expectations using data from the Consensus Forecast. Finally, given that different fiscal instruments are likely to have different (short-term) effects on inflation (e.g., a fiscal stimulus involving lower indirect taxes or higher subsidies can lead to lower and not higher inflation on impact), further analysis should look deeper into the composition effects of a fiscal stimulus, accounting for debt non-linearities.

6 Appendix

6.1 2 regimes analysis for core inflation

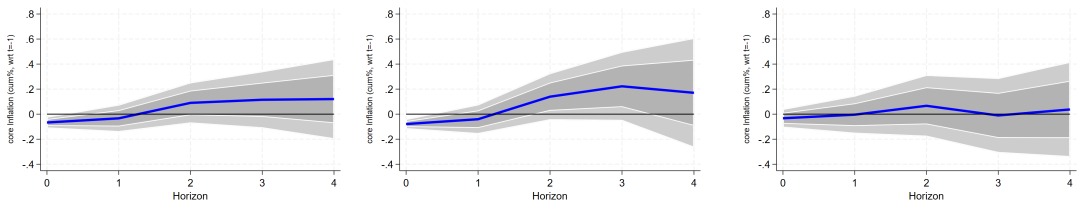
In this subsection, we report the equivalent of Figure 2 and Figure 3 for core inflation instead of HICP inflation.

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

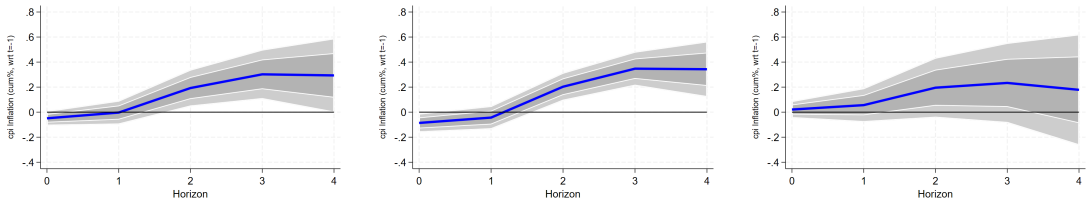
Notes: The first figure shows results for the identification strategy relying on the DM proxy, while the second figure for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in the core price level to 1% GDP fiscal stimulus for the identification strategy relying on the "Purged" DM proxy. 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.

6.2 Robustness check: 2 regimes analysis excluding 2021 and 2022

In this subsection, we report the main results excluding the data for 2021 and 2022. This robustness check is important as those years witnessed fiscal discretionary measures that are particularly endogenous the dynamic of inflation and jeopardize the quality of our identification strategy.

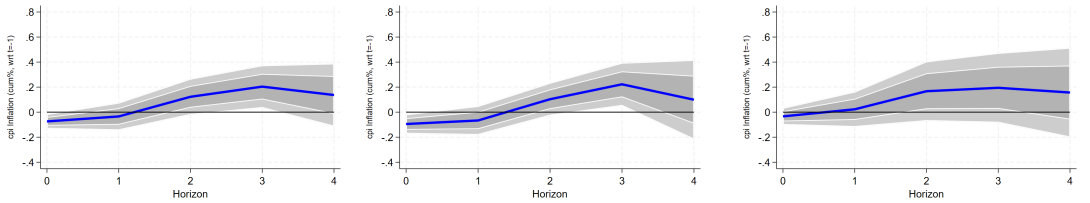
6.2.1 HICP inflation

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)

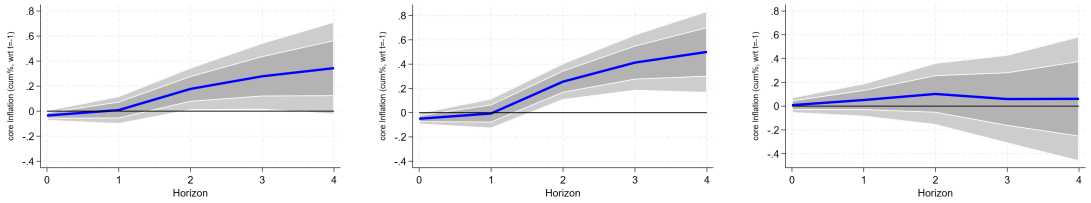


(a) Linear **(b)** Nonlin. - High debt country **(c)** Nonlin. - Low debt country

Notes: The first figure shows results for the identification strategy relying on the DM proxy, while the second figure for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in the price level to 1% GDP fiscal stimulus. 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.

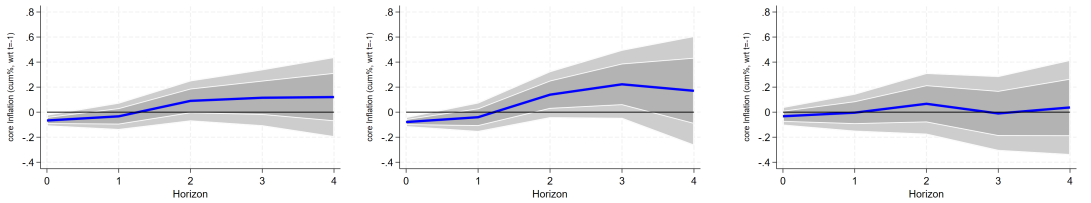
6.2.2 Core inflation

Figure 12: DM: impact of fiscal policy on Core inflation (excl. 2021 and 2022)



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

Figure 13: "Purged" DM: impact of fiscal policy on Core inflation (excl. 2021 and 2022)



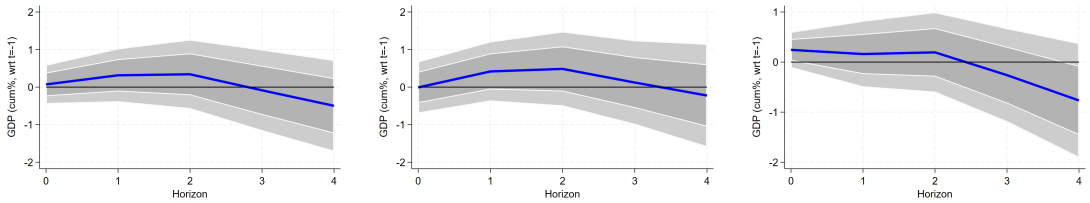
(a) Linear **(b)** Nonlin. - High debt country **(c)** Nonlin. - Low debt country

Notes: The first figure shows results for the identification strategy relying on the DM proxy, while the second figure for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in the core price level to 1% GDP fiscal stimulus. 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.

6.3 GDP

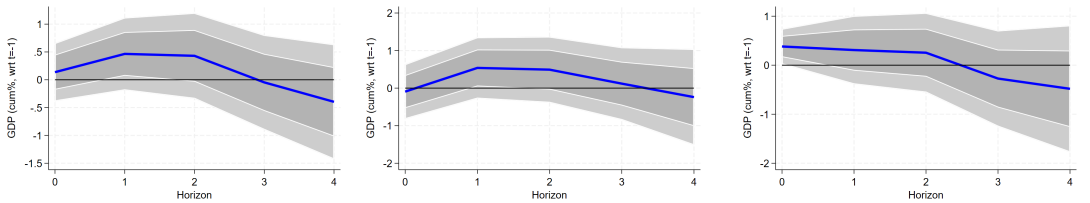
Here, we investigate the impact of a fiscal stimulus shock on the cumulative growth of GDP. The specification utilized in this exercise closely follows the one present in Cloyne et al. (2023).

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



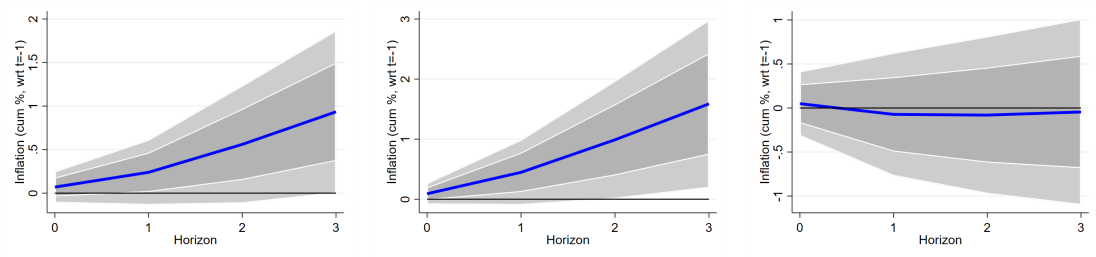
(a) Linear **(b)** Nonlin. - High debt country **(c)** Nonlin. - Low debt country

Notes: The first figure shows results for the identification strategy relying on the DM proxy, while the second figure for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in GDP to 1% GDP fiscal stimulus. 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.

6.4 3rd identification strategy

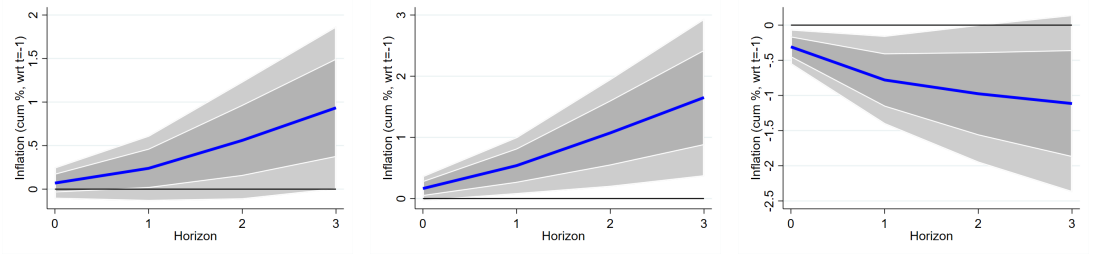
When applying the identification strategy used in Guajardo et al. (2014) and Alesina et al. (2019), some adjustments were made to align with the dataset's specifications. Firstly, instead of using the Eurosystem's output gap in the regression, we adopted the one used in Jordà and Taylor (2016), computed via an HP filter analysis. This approach ensures our methodology is consistent with the existing literature when using these datasets. Secondly, as the dataset only contains fiscal consolidations, we multiply the shock by (-1) to ensure straightforward comparability of the below charts with our main results. Finally, we modified the debt-to-GDP ratio threshold for defining debt states from 90% to 70% and 60% for robustness check. This adjustment is based on the observation that debt levels in this sample are uniformly lower. The 70% threshold matches the 75th percentile of debt levels in this sample, accurately representing higher debt scenarios. Conversely, a 90% threshold would correspond to the 85th percentile, which would limit our ability to effectively analyze countries with high debt levels due to the constraints of the sample size.

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%)



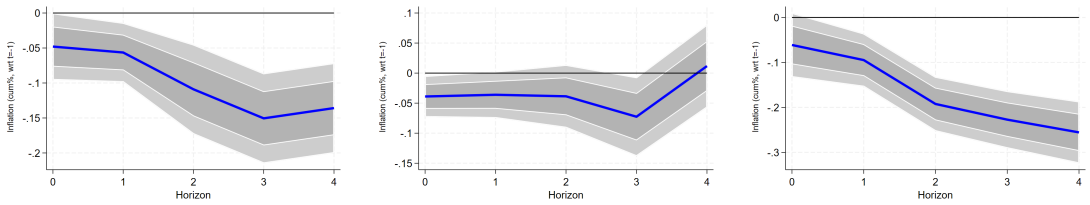
(a) Linear **(b)** Nonlin. - High debt country **(c)** Nonlin. - Low debt country

Notes: 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.

6.5 Inflation expectation: (PP) expecting higher inflation

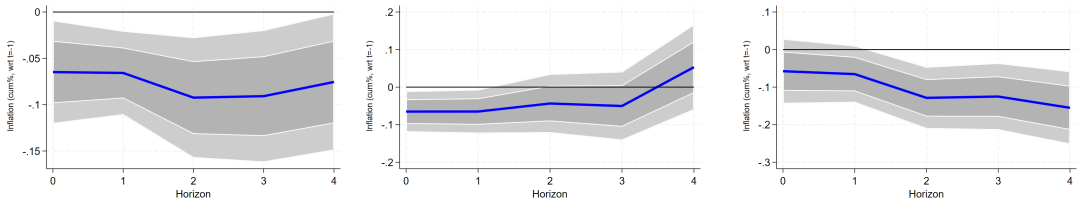
As a robustness check, we examined the effect of fiscal policy on households anticipating higher inflation (PP). The findings align closely with the dynamics previously identified in our main analysis regarding inflation expectations (subsection 4.2, Figures 6 and 7).

Figure 18: DM: impact of fiscal policy on Inflation expectation (PP)



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

Figure 19: "Purged" DM: impact of fiscal policy on Inflation expectation (PP)



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

Notes: The first figure shows results for the identification strategy relying on the DM proxy, while the second figure for the "Purged" DM. Panel (a) shows the linear IRFs of cum. change in the PP indicator of inflation expectation to 1% GDP fiscal stimulus. 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.

References

Agnello, L. and Cimadomo, J. (2012). Discretionary Fiscal Policies over the Cycle: New Evidence Based on the ESCB Disaggregated Approach. *29th issue of the International Journal of Central Banking*.

Alesina, A., Favero, C., and Giavazzi, F. (2019). Effects of Austerity: Expenditure- and Tax-Based Approaches. *Journal of Economic Perspectives*, 33(2):141–162.

Attinasi, M. G. and Klemm, A. (2014). The Growth Impact of Discretionary Fiscal Policy Measures. *ECB Working Paper*, 2014(N°1697).

Bańkowski, K., Bouabdallah, O., Checherita-Westphal, C., Freier, M., Jacquinot, P., and Muggenthaler, P. (2023a). Fiscal policy and high inflation. *ECB Economic Bulletin*, 2023(2).

Bańkowski, K., Checherita-Westphal, C. D., Jesionek, J., and Muggenthaler, P. (2023b). The Effects of High Inflation on Public Finances in the Euro Area. *ECB Occasional Paper*, 2023(N°332).

Ben Zeev, N., Pappa, E., and Vicondoa, A. (2017). Emerging economies business cycles: The role of commodity terms of trade news. *Journal of International Economics*, 108:368–376.

Bouabdallah, O., Checherita-Westphal, C. D., Warmedinger, T., De Stefani, R., Drudi, F., Setzer, R., and Westphal, A. (2017). Debt Sustainability Analysis for Euro Area Sovereigns: A Methodological Framework. *ECB Occasional Paper*, 2017(N°185).

Briodeau, C. and Checherita-Westphal, C. (2023). Inflation and fiscal policy: Is there a threshold effect in the fiscal reaction function? *ECB Working Paper*, 2023(N°2880).

Caldara, D. and Kamps, C. (2008). What are the effects of fiscal policy shocks? A VAR-based comparative analysis. *ECB Working Paper*, 2008(N°877).

Cevik, S. and Miryugin, F. (2023). It's Never Different: Fiscal Policy Shocks and Inflation. *IMF Working Paper*, 2023(N°98).

Checherita-Westphal, C. (2023). The impact of discretionary fiscal policy measures on real gdp growth from 2020 to 2022, box 2 in the article "the role of supply and demand in the post-pandemic recovery in the euro area". *ECB Economic Bulletin*, 2023(Issue 4).

Chen, J., Gornicka, L., and Zdarek, V. (2022). Biases in Survey Inflation Expectations: Evidence from the Euro Area. *IMF Working Paper*, 2022(N°205).

Cloyne, J., Jordà, Ò., and Taylor, A. (2023). State-Dependent Local Projections: Understanding Impulse Response Heterogeneity. Technical Report w30971, National Bureau of Economic Research, Cambridge, MA.

Coenen, G., Erceg, C. J., Freedman, C., Furceri, D., Kumhof, M., Lalonde, R., Laxton, D., Lindé, J., Mourougane, A., Muir, D., Mursula, S., de Resende, C., Roberts, J., Roeger, W., Snudden, S., Trabandt, M., and in't Veld, J. (2012). Effects of Fiscal Stimulus in Structural Models. *American Economic Journal: Macroeconomics*, 4(1):22–68.

Coibion, O., Gorodnichenko, Y., and Weber, M. (2021). Fiscal Policy and Households' Inflation Expectations: Evidence from a Randomized Control Trial. *NBER Working Paper Series*, 2021(WP 28485).

Corsetti, G., Meier, A., Müller, G. J., and Devereux, M. B. (2012). What determines government spending multipliers? *Economic Policy*, 27(72):521–565.

D'Acunto, F., Charalambakis, E., Georgarakos, D., Kenny, G., Meyer, J., and Weber, M. (2024). Household Inflation Expectations: An Overview of Recent Insights for Monetary Policy. *NBER Working Paper Series*, 2024(WP 32488).

Eminidou, S., Geiger, M., and Zachariadis, M. (2023). Public debt and state-dependent effects of fiscal policy in the euro area. *Journal of International Money and Finance*, 130:102746.

Ferrara, L., Metelli, L., Natoli, F., and Siena, D. (2021). Questioning the puzzle: Fiscal policy, real exchange rate and inflation. *Journal of International Economics*, 133:103524.

Fofana, S., Patzelt, P., and Reis, R. (2024). Household Disagreement about Expected Inflation. *CEPR Discussion Paper*, 2024(N°18956).

Fotiou, A. (2022). Non-linearities in fiscal policy: The role of debt. *European Economic Review*, 150:104212.

Gonçalves, S., Herrera, A. M., Kilian, L., and Pesavento, E. (2024). State-dependent local projections. *Journal of Econometrics*, page 105702.

Grigoli, F. and Sandri, D. (2023). Public debt and household inflation expectations. *IMF Working Paper*, 2023(N°66).

Guajardo, J., Leigh, D., and Pescatori, A. (2014). Expansionary Austerity? International Evidence. *Journal of the European Economic Association*, 12(4):949–968.

Hack, L., Istrefi, K., and Meier, M. (2023). Identification of Systematic Monetary Policy. *ECB Working Paper*, 2023(N°2851).

Herbst, E. P. and Johannsen, B. K. (2024). Bias in local projections. *Journal of Econometrics*, 240(1):105655.

Huidrom, R., Kose, M. A., Lim, J. J., and Ohnsorge, F. L. (2020). Why do fiscal multipliers depend on fiscal Positions? *Journal of Monetary Economics*, 114:109–125.

Ilzetzki, E., Mendoza, E. G., and Végh, C. A. (2013). How big (small?) are fiscal multipliers? *Journal of Monetary Economics*, 60(2):239–254.

Jordà, Ò. (2005). Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, 95(1):161–182.

Jordà, Ò. and Taylor, A. M. (2016). The Time for Austerity: Estimating the Average Treatment Effect of Fiscal Policy. *The Economic Journal*, 126(590):219–255.

Jørgensen, P. L. and Ravn, S. H. (2022). The inflation response to government spending shocks: A fiscal price puzzle? *European Economic Review*, 141:103982.

Mountford, A. and Uhlig, H. (2009). What are the effects of fiscal policy shocks? *Journal of Applied Econometrics*, 24(6):960–992.

Nakamura, E. and Steinsson, J. (2014). Fiscal Stimulus in a Monetary Union: Evidence from US Regions. *American Economic Review*, 104(3):753–792.

Nickel, C. and Tudyka, A. (2014). Fiscal Stimulus in Times of High Debt: Reconsidering Multipliers and Twin Deficits. *Journal of Money, Credit and Banking*, 46(7):1313–1344.

Olea Montiel, J. L., Plagborg-Møller, M., Quian, E., and Wolf, C. K. (2024). Double Robustness of Local Projections and Some Unpleasant VARithmetic. *Working Paper*, 2024.

Perotti, R. (2005). Estimating the Effects of Fiscal Policy in OECD Countries. *CEPR Discussion Paper*, 2005(N°4842).

Pinardon-Touati, N. (2023). The Crowding Out Effect of Local Government Debt: Micro- and Macro-Estimates. *Columbia University, mimeo*.

Ramey, V. A. and Zubairy, S. (2018). Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data. *Journal of Political Economy*, 126(2):850–901.

Reis, R. (2024). Baltic central banks' invited lecture series: Lecture on measurement of inflation expectations. Tallinn, April 2024.

Wu, J. C. and Xia, F. D. (2018). The negative interest rate policy and the yield curve. *BIS Working Paper*, 2018(N° 703).

Wu, J. C. and Xia, F. D. (2020). Negative interest rate policy and the yield curve. *Journal of Applied Econometrics*, 35(6):653–672.

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Cristina Checherita-Westphal
European Central Bank, Frankfurt am Main, Germany; email: Cristina.Checherita-Westphal@ecb.europa.eu

Tom Pesso
Universitat Pompeu Fabra, Barcelona, Spain; Barcelona School of Economics, Barcelona, Spain; email: tom.pesso@upf.edu

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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