LORENZO MORI

University of Padova

FISCAL SHOCKS AND THE SURGE OF INFLATION

March 2025

Marco Fanno Working Papers – 318

DIPARTIMENTO DI SCIENZE ECONOMICHE E AZIENDALI 'MARCO FANNO'

UNIVERSITÀ DEGLI STUDI DI PADOVA

FISCAL SHOCKS AND THE SURGE OF INFLATION*

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Abstract

Using a structural vector autoregression, I document the dominant role of fiscal policy in the recent surge of inflation in the United States. The comovement of output, prices, and primary deficit yields unique restrictions that allow me to identify the causal effects of an exogenous fiscal stimulus. I show that fiscal policy has long been a key driver of inflation—no chronicle of US inflation can omit the role of fiscal shocks. Yet, its outsized influence in the recent surge reflects the sheer, unprecedented scale of fiscal interventions. In the Euro Area, inflation also has a fiscal component, with the timing of interventions explaining its lag behind the United States. I show that a model with monetary and fiscal policy interactions – where Ricardian equivalence fails due to households' finite planning horizon – can account for fiscal inflation in the recent period.

Keywords: *Fiscal shocks, inflation surge, structural VAR models, DSGEs with policy interactions.*

JEL Classification: *C3, E3, E5.*

*First version online: September 2, 2024. I am indebted to Efrem Castelnuovo and Francesco Furlanetto for their invaluable guidance and support. For helpful comments and suggestions, I thank Ivan Petrella (discussant), Jonas Arias, Guido Ascari, Regis Barnichon, Christian Bayer, Marco Bassetto, Drago Bergholt, Francesco Bianchi, Saki Bigio, Hilde C. Bjørnland, Maximilian Boeck, Dennis Bonam, Marco Brianti, Giacomo Candian, Cristiano Cantore, Ambrogio Cesa-Bianchi, Marcelo dos Santos, Carlo Galli, Luca Gambetti, Andrea Gazzani, Domenico Giannone, Giulia Gitti, Massimo Giuliodori, Mikhail Golosov, Klodiana Istrefi, Mathias Klein, Dimitris Korobilis, Michele Lenza, Nicolò Maffei-Faccioli, Francesca Monti, Gert Peersman, Giovanni Pellegrino, Facundo Piguillem, Frank Portier, Giorgio Primiceri, Tiziano Ropele, Juan Rubio-Ramírez, Alessia Russo, Frank Schorfheide, Andra Smadu, seminar participants at Norges Bank, Banco de España, Banque de France, Banca d'Italia, Bank of England, University of Glasgow, Universidad Carlos III de Madrid, University Milano-Bicocca, Padova Macro Talks 2024, and at the 17th UniTo-CCA PhD Workshop in Economics. The figures of this paper are best appreciated on screen or when printed in color.
Email: lorenzo.mori.1@phd.unipd.it

1 Introduction

When it comes to explaining the recent surge of inflation, the conventional view is as follows: the global pandemic triggered a combination of adverse demand and supply shocks, initially depressing output and prices. Subsequently, a series of unfavorable supply shocks, such as commodity price hikes and global supply chain disruptions, led to a roller coaster of inflation (e.g., Bernanke and Blanchard, 2024a,b; Dao, Gourinchas, Leigh, and Mishra, 2024). This view has recently been challenged by empirical estimates that point to demand factors as the primary drivers of the inflation surge. Giannone and Primiceri (2024) and Figure 1 make this point for the United States. Estimating a bivariate vector autoregression (VAR) on output and inflation that distinguishes demand and supply forces using conventional sign restrictions – demand shocks induce a positive comovement between the two variables, while supply forces generate a negative comovement – delivers a clear result: the data strongly supports demand-driven inflation.[1] Demand forces put downward pressure on inflation when the pandemic hit in March 2020 and triggered the inflation run-up that characterized the subsequent years. Supply shocks played only a secondary role.

Which demand shock stood out the most? Demand disturbances encompass a combination of monetary and fiscal shocks, along with pent-up demand from the post-pandemic reopening and the depletion of excess savings accumulated during the restrictions. Understanding the sources of inflation is not only central to policy debates but also essential for developing structural models with empirically relevant impulse-propagation mechanisms and designing optimal stabilization policies. In this paper, I provide empirical evidence showing that fiscal shocks were the primary driver of the inflation surge. This finding stands in stark contrast to traditional business-cycle models where fiscal components are practically absent, and underscores the need to develop models that account for the significant impact of fiscal decisions on inflation determination (e.g., Bianchi, Faccini, and Melosi, 2023; Smets and Wouters, 2024; Angeletos, Lian, and Wolf, 2024b). As advocated by Blinder (2022), to understand inflation, we need theories of monetary *and* fiscal policies.

I estimate a VAR model that decomposes the demand contribution to inflation of Figure 1 into three disturbances: fiscal, monetary, and non-policy demand shocks (e.g., pent-up shocks or shocks to any other component of aggregate demand). This decomposition is achieved by employing a set of sign restrictions embedded in conventional New Keynesian narratives and

[1]The restrictions I employ are unambiguously supported by economic theory and follow directly from the existence of an upward-sloping supply curve and a downward-sloping demand curve. I estimate a bivariate VAR with the year-on-year growth rate of real GDP and GDP deflator over the sample 1970Q1-2023Q4. See Section 2 for more details.

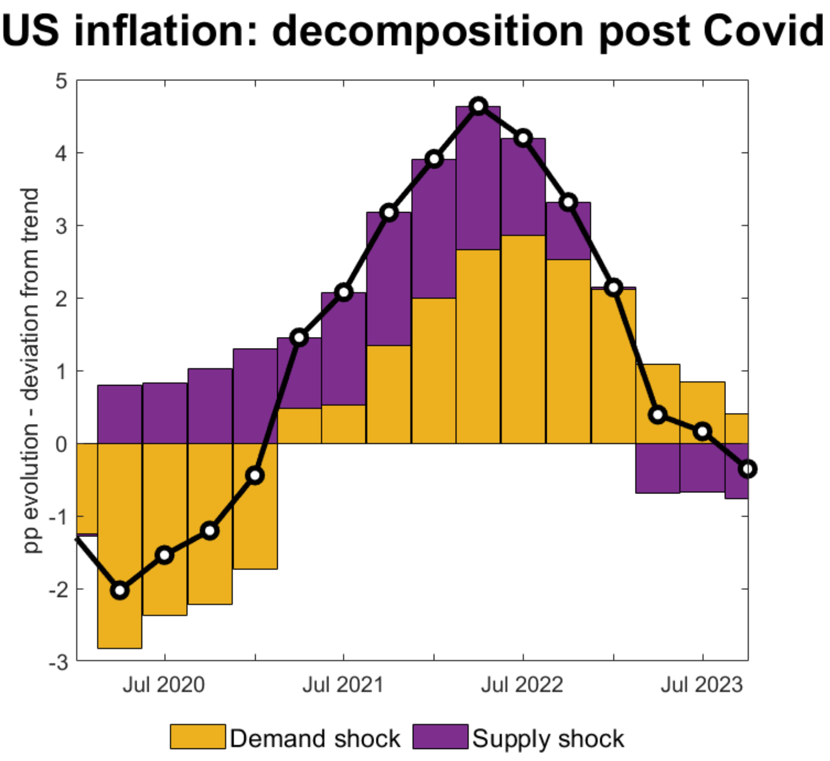

Figure 1: Historical decomposition of U.S. inflation (in deviation from the deterministic trend) into demand and supply forces using a bivariate VAR with sign restrictions. Variables included: GDP and GDP deflator (both in year-on-year growth rate). Demand shocks: positive impact effect on both variables. Supply shocks: opposite impact effect on the variables. Sample 1970:I-2023:IV. Posterior median.

incorporated into a battery of micro-funded macroeconomic models that feature a violation of Ricardian equivalence (e.g., Gabaix, 2020; Bianchi et al., 2023; Angeletos, Lian, and Wolf, 2024a; Smets and Wouters, 2024; HANK models such as Kaplan, Moll, and Violante, 2018). The critical identifying assumption that enables the differentiation of fiscal shocks from other demand shocks is that, in response to expansionary fiscal shocks, the primary deficit, output and inflation comove *positively*. The government transfers resources to the agents, creating primary imbalances. Households then spend part of these resources, generating an economic boom that fuels inflation. In contrast, expansionary non-fiscal shocks imply a negative comovement between the deficit and real activity: during expansions, tax revenues increase due to a larger tax base, while transfers decrease due to automatic stabilizers.

In essence, my identification strategy exploits the endogenous nature of the government's primary balance that systematically responds to non-fiscal business cycle shocks.[2] The use of the primary deficit as an indicator of fiscal stance has the advantage of accounting for move-

[2]Specifically, I assume that: i) positive fiscal shocks lead to increases in output, inflation, and the fiscal deficit; ii) positive monetary shocks (easings) expand output and inflation while reducing fiscal deficit (generating surpluses); iii) positive non-policy shocks expand output and prices, generate a monetary tightening, and reduce fiscal deficit; iv) adverse supply shocks have inflationary effects while depressing output.

ments not only in government spending but also in taxes and transfers – which represented the bulk of the Covid-related budgetary intervention.[3] To the best of my knowledge, I am the first to employ this novel identification strategy to document the role of fiscal shocks in explaining inflationary dynamics, particularly in the post-Covid period.

With these restrictions at hand, I first estimate a structural VAR for the US economy to identify three distinct demand shocks (monetary, fiscal, and residual demand), in addition to a supply shock. My identification strategy delivers empirical evidence that aligns well with historical events and established narratives. For instance, the model detects expansionary fiscal shocks corresponding with the tax cuts implemented by Presidents Ford, Reagan, and Bush, as well as the fiscal stimuli enacted by Bush-Obama during the Great Recession and Trump-Biden during the Covid pandemic. Notably, the VAR captures the unprecedented scale of fiscal interventions during the pandemic, viewing the CARES Act (Trump, 2020) and the ARP Act (Biden, 2021) as exceptionally large fiscal shocks, consistent with a ”war-type” fiscal stimulus perspective (Hall and Sargent, 2022). Similarly, the remaining shocks behave as expected during key events, such as the Volcker intervention for monetary shocks, recessionary periods for non-policy demand shocks, and major global disruptions for supply shocks (e.g., the OPEC embargo and collapse or Russia's invasion of Ukraine).[4]

Main results: Expansionary fiscal shocks were the dominant drivers of the inflation surge in the US. The $2.2 trillion CARES Act initially put upward pressure in 2020, preventing deflation and supporting a still-collapsing real economy. Following this, the $1.8 trillion ARP Act of early 2021 fueled the rise in inflation. Fiscal shocks accounted for a 4 percentage point increase in inflation, representing more than half of the inflationary episode. Monetary policy, instead, was very tight at the beginning of 2020 when the Federal Reserve (Fed) hit the zero lower bound. However, my analysis suggests that the Fed's lack of reaction during the subsequent recovery – marked by a sequence of positive non-policy demand shocks – contributed positively to the rise in inflation. This positive contribution was somewhat curtailed starting in mid-2022, when the Fed implemented vigorous tightening measures. Adverse supply shocks positively impacted inflation initially, but a supply reversal mitigated this at the beginning of 2021. A second wave of adverse supply shocks from late 2021, driven by the supply chain crisis

[3] Conventional methods, instead, focus on single components of the government intervention. See for instance Ramey (2011) for spending, Romer and Romer (2010) for taxes, and Romer and Romer (2016) for transfers.

[4] Reassuringly, the underlying monetary policy rule in my VAR features a contemporaneous positive response of the policy rate to inflation and output, which is in line with conventional wisdom (see, e.g., Taylor, 1993). Hence, my VAR specification is not subject to the concerns raised by Arias, Caldara, and Rubio-Ramírez (2019), who point out that sign-restriction VARs are often associated with a counterintuitive representation of systematic monetary policy.

and Russia's invasion of Ukraine, once again exerted upward pressure on prices. This pattern is also consistent with the evolution of the global supply chain index of Benigno, di Giovanni, Groen, and Noble (2022). However, these supply effects are ultimately overshadowed by the more substantial impact of demand forces.

Taking a longer historical perspective, I show that fiscal inflation has been a pervasive feature of the US economy over the past fifty years, particularly during the 1970s: Chronicles of US inflation dynamics cannot ignore the role of fiscal policy. However, it has never contributed as significantly to US inflation as it has in the post-Covid period. Fiscal inflation after Covid has been huge, as fiscal shocks during this period were unprecedentedly large.

I further show that fiscal inflation is not a US-specific phenomenon. Fiscal shocks contributed to the inflation surge in the Euro Area as well. However, significant differences emerge when comparing fiscal policies in the US and in the Euro Area. While expansionary fiscal shocks dominated the first phase of the Covid crisis in the US (2020-2021), the exogenous fiscal stimulus in Europe was delayed and relatively smaller. The VAR interprets the initial rise in deficits in the Euro Area as a systematic response to other shocks, i.e., a counter-cyclical fiscal policy of a government that reacts to a negative output gap. Strong fiscal shocks are detected starting from 2021, and fiscal inflation peaked in late 2022 (vs. mid-2021 in the US), accounting for a two percent rise in Euro Area inflation. The different timing of exogenous fiscal interventions can help explain the fact that the Euro Area inflation lagged behind the US inflation and aligns with the view that while the US 2020-2021 fiscal policy broadly boosted demand and immediately increased inflation by raising household income above pre-Covid levels, the Euro Area's policy focused on job preservation and income maintenance, causing delayed inflation effects (see Tenreyro, 2023).

In the last part of the paper, I show that the primary role of fiscal inflation during the recent episode can be explained through the lens of a state-of-the-art model with monetary and fiscal policy interaction à la Angeletos et al. (2024a). In such a setting, Ricardian equivalence fails because of the agents' finite planning horizon (OLG-type structure), and fiscal stimulus boosts output and inflation. In a calibrated version of this model, I find that fiscal shocks can trigger inflationary effects in the ballpark of the ones estimated in the VAR. Important elements for the model to match my VAR-based empirical evidence are: i) a relatively steep New Keynesian Phillips curve, ii) a relatively short planning horizon for the agents (due to finite lives), and iii) a relatively weak fiscal adjustment in response to debt accumulation. Finally, I use the model to address the following question: What would have happened if, given the fiscal shock estimated in the data, the Fed had responded more aggressively? I show that, in the presence of a fiscal shock with slow fiscal adjustment and agents with finite planning horizons, a more aggressive monetary policy would have acted as a "bad" vaccine – initially suppressing inflation but at the cost of increasing its persistence over time due to positive wealth effects.

Connection with the literature: I closely connect with recent contributions documenting the dominant role of demand shocks for US (and global) inflation. Eickmeier and Hofmann (2022), Ascari, Bonomolo, Hoeberichts, and Trezzi (2023), Bergholt, Canova, Furlanetto, Maffei-Faccioli, and Ulvedal (2024), Fosso (2024), Aastveit, Bjørnland, Cross, and Kalstad (2024), and Giannone and Primiceri (2024) estimate empirical models to distinguish between demand and supply contributions. They all find demand forces to matter more than supply ones. My results confirm this empirical evidence. I contribute by documenting that fiscal shocks, which none of the mentioned studies explicitly identifies, dominate in the inflation accounting. My identification approach leverages the comovement of output, prices, and primary deficits in response to fiscal shocks as unique identification restriction. This is reminiscent of Bianchi and Melosi (2017), who use the comovement between deficit and output growth to identify fiscal shocks at the zero lower bound, within a Markov-switching VAR framework.[5] However, I also impose restrictions on prices, limit them to the impact effects (rather than extending over five quarters), and focus the contribution of fiscal shocks around specific events, rather than on their impulse response functions only. Forni and Gambetti (2010) propose a sign-restriction approach in a large-dimensional dynamic factor model to identify government spending ("G") shocks, imposing restrictions on a much wider set of variables.[6] Unlike this paper, they focus on spending multipliers, not inflation dynamics. In addition, my focus is on a broader fiscal shock encompassing spending, taxes, and transfers (and not just "G" shocks).

Compared to Giannone and Primiceri (2024), I show that the dominant role of demand forces is confirmed when the empirical model includes pandemic observations. This suggests that their results are not driven by the exclusion of observations in which supply-related disruptions were potentially more relevant than ever before (as opposed to what is argued, for instance, in Giles, 2024). In addition, I show that a simple model with monetary and fiscal policy interactions with conventional New Keynesian mechanisms can account for the amount of fiscal inflation that is present in the data. In this regard, my results are complementary to the model-based relevance of fiscal shocks found by di Giovanni, Kalemli-Özcan, Silva, and Yıldırım (2023), Fornaro (2024) (who focus on the relevance of supply constraints for the in-

[5] See also Pappa (2009) for a similar identification approach to study the transmission of fiscal shocks in the labor market, using annual data.

[6] They impose restrictions on government expenditure, GDP, industrial production, CPI, GDP deflator, policy rate, government primary deficit, and tax receipts.

flationary effects of fiscal stimulus) and Bianchi et al. (2023) (who estimate a ”fiscal theory of the price level” – FTPL – model to study the importance of unfunded fiscal shocks). The FTPL, which predicts that inflation adjusts to ensure the sustainability of real debt conditional on the macroeconomic policies in place, has been proposed to interpret the recent Covid-related inflation burst (see Anderson and Leeper, 2023; Barro and Bianchi, 2024). Instead, the model I work with predicts a substantial inflation increase following a fiscal shock because of its expansionary effect. Therefore, my DSGE-related exercise offers a different interpretation of the recent inflation surge that is possibly complementary to the one associated with the FTPL.[7]

Other papers have found evidence in favor of a significant role of supply forces, see for instance Smets and Wouters (2024), Bai, Fernández-Villaverde, Li, and Zanetti (2024), Ascari, Bonam, and Smadu (2024). Differently, I find that supply shocks' role is limited compared to demand shocks (and fiscal shocks in particular). This is in line with the reasoning of Giannone and Primiceri (2024), who argue that in presence of a flat demand schedule (as is expected in economies where Central Banks have established a strong reputation as inflation targeters), shifts in the supply curve reduce output but do not significantly drive inflation. For inflation to rise, macroeconomic policies must offer an unusually high degree of accommodation to these adverse supply shocks, ultimately resulting in an upward shift of the demand curve (see also Gagliardone and Gertler, 2024). Finally, the finding that supply *shocks* were not the primary cause of inflation does not imply that supply *factors* (such as capacity constraints) were irrelevant. As argued by Comin, Johnson, and Jones (2023), when capacity constraints bind, firms set prices to equate demand to their capacity, rather than targeting their optimal unconstrained markup over marginal costs. Therefore, tight capacity likely amplified the impact of demand shocks during the post-pandemic recovery and indirectly fueled the inflation takeoff. A similar parallel can be drawn regarding the role of commodity price hikes in explaining the inflation surge, as advocated by Bernanke and Blanchard (2024b). It is indeed known that commodity prices are in large driven by demand forces (e.g., Kilian, 2009; Delle Chiaie, Ferrara, and Giannone, 2022), making the dramatic price swings during the pandemic compatible with the dominant role of demand shocks.

Outline: Section 2 presents the empirical setup and additional evidence on the credibility of the identification strategy. Section 3 presents the main empirical results on fiscal inflation. In Section 4, I interpret the fiscal inflation during Covid through the lens of a structural model. In Section 5, I take stock of the main results from a global perspective. Section 6 concludes.

[7]For deeper comparisons between such mechanisms, see Leeper (1991), Bassetto (2002), Cochrane (2023), Angeletos et al. (2024b).

2 Empirical Setup and Identification

I use a structural VAR identified with sign restrictions to disentangle between demand (fiscal, monetary, and non-policy) and supply shocks. I unpack the demand factors into multiple sub-components while abstracting from separating the supply forces, as the evidence in Figure 1 indicates that the simplest and most transparent method for disentangling demand and supply during Covid points to demand shocks as the primary drivers of the inflation surge.[8] The VAR includes the US year-on-year real GDP growth, year-on-year GDP deflator inflation, the federal funds rate (replaced with the shadow federal funds rate of Wu and Xia (2016) during the zero lower bound periods), and the primary deficit as a share of trend GDP – computed as in Ramey and Zubairy (2018). The variable selection and transformation are similar to that of Bianchi and Melosi (2017).[9] I estimate a quarterly VAR featuring four lags on the sample 1970:I-2023:IV using a standard Minnesota prior, whose tightness is chosen as in Giannone, Lenza, and Primiceri (2015). Since the massive increase in volatility that occurred during the acute phase of the pandemic is likely to distort standard inference, I allow for temporary increases in volatility in the VAR residuals as in Lenza and Primiceri (2022).

I assume that the economy can be described by the following reduced-form linear VAR system:

$$y_t = C + B_1 y_{t-1} + \ldots + B_p y_{t-p} + s_t u_t$$

$$u_t \sim N(0, \Sigma),$$

where y_t is an $n \times 1$ vector containing the variables described above, modeled as a function of a constant term, their own past values, and forecast errors ε_t. The factor s_t is used to scale up the residual covariance matrix during the period of the pandemic, as in Lenza and Primiceri (2022).[10] As standard in the VAR literature, I assume invertibility, i.e., that the structural shocks

[8] I show in the robustness checks that my results are not driven by the identification of too many (few) demand (supply) shocks. When I identify more supply shocks, I find very similar results.

[9] See Figure A1 for the time-series plot of the data and the data sources. I compute the US primary deficit using the NIPA Table 3.2. (Federal Government Current Receipts Receipts and Expeditures), following the definition of Bianchi and Melosi (2017). The measure of trend GDP is obtained by fitting a sixth-degree polynomial for the log GDP series. The use of the deficit-to-trend GDP ratio focuses on variations in the numerator of the ratio (i.e., the primary deficit), and not the denominator (i.e., GDP). However, the results remain virtually unchanged when I rescale the primary deficit series by GDP. Differently from Bianchi and Melosi (2017), I use the deficit-to-GDP ratio as a measure of fiscal stance, instead of the deficit-to-debt ratio. This choice is standard in the literature (e.g., Ramey and Zubairy, 2018; Antolín-Díaz and Surico, 2024) and will have a direct counterpart in the model presented in Section 4. Given that the estimation of my VAR is aimed at producing historical decompositions, I follow the prescription of Kilian and Lütkepohl (2017) and estimate a VAR on stationary variables.

[10] More precisely, s_t is equal to 1 before the time period in which the epidemic begins (2020:I), which is denoted by t^*. As in Lenza and Primiceri (2022), I assume that $s_{t^*} = \bar{s}_0$, $s_{t^*+1} = \bar{s}_1$, $s_{t^*+2} = \bar{s}_2$, and $s_{t^*+j} = 1 + (\bar{s}_2 - 1)\rho^{j-2}$, where $\theta = [\bar{s}_0, \bar{s}_1, \bar{s}_2, \rho]$ is a vector of unknown coefficients, which is estimated via Bayesian

	Fiscal	Monetary	Residual demand	Supply
GDP growth	+	+	+	-
Inflation	+	+	+	+
Policy rate		-	+	
Primary deficit / GDP	+	-	-	

Table 1: Restrictions used for each variable (in rows) to identified shocks (in columns).

ε_t can be written as a linear combination of u_t:[11]

$$u_t = A\varepsilon_t$$

with $\varepsilon_t \sim N(0, I)$, where I is an identity matrix and where A is a non-singular parameter matrix. The variance-covariance matrix has thus the following structure $\Sigma = AA'$. Given that the variance-covariance matrix is symmetric, $n(n-1)/2$ further restrictions are needed to derive A from this relationship. I achieve identification of A by means of sign restrictions (Uhlig, 2005; Canova and De Nicolò, 2002), which I implement using the conventional algorithm proposed by Arias, Rubio-Ramírez, and Waggoner (2018).

Table 1 describes the restrictions used in my baseline VAR. I impose the minimum set of restrictions to achieve identification, and I restrict only the shocks' impact effects – following the recommendation of Canova and Paustian (2011). To achieve (set) identification, I assume that: i) positive fiscal shocks lead to increases in output, inflation, and the fiscal deficit;[12,13] ii)

techniques.

[11] As emphasized by Ramey (2011), the timing of fiscal shocks is crucial in identifying their effects, given that government decisions may be anticipated. This could potentially violate the assumption of invertibility. However, I show in the robustness check section that results are extremely similar when augmenting the VAR specification with real-time professional forecasts of government spending growth as in Auerbach and Gorodnichenko (2012) and Forni and Gambetti (2016). Those forecasts are presumably a very good proxy for agents' expectations about the conduction of future fiscal policy. Similar results are also found when augmenting the VAR specification with macroeconomic principal components identified as in McCracken and Ng (2020). These results are consistent with the analysis of Perotti (2011), who shows that fiscal effects estimated with conventional VARs are similar to those obtained through models designed to address non-invertibility concerns.

[12] Implicitly, the positive contemporaneous comovement between deficit and output excludes the possibility of very large fiscal multipliers on impact, as in such extreme cases the resulting boom could increase income and taxes enough to offset deficits within the same quarter. However, very high multipliers are inconsistent with the existing evidence from linear models, as reviewed by Ramey (2016). High multipliers in the short-run, although not necessarily on impact, are found by Auerbach and Gorodnichenko (2012), Caggiano, Castelnuovo, Colombo, and Nodari (2015), and Bernardini, De Schryder, and Peersman (2020) using non-linear models. However, such results are not unquestionable and may not be robust to alternative computations of the multipliers (Ramey, 2019). For a non-linear analysis pointing to symmetric and low spending multipliers, see Ramey and Zubairy (2018).

[13] The inflationary effects of fiscal shocks I assume are in line with New Keynesian models that feature a violation of Ricardian equivalence (and FTPL-type models). Bouscasse and Hong (2023) scrutinize the effects of multiple prominent identification strategies for fiscal shocks and find inflationary effects for most of them – see also my Section 3. Fiscal inflation is also found in an event study setting by Hazell and Hobler (2024) and by using difference-in-differences methods by Jordà and Nechio (2023). Alternative settings in which fiscal shocks do

positive monetary shocks (easings) expand output and inflation while reducing fiscal deficits (generating surpluses);[14] iii) positive residual demand shocks expand output and prices, generate a monetary tightening, and reduce fiscal deficits; iv) inflationary (adverse) supply shocks generate contractions in output. Most of the signs are standard, while the restriction of the primary deficit to demand shocks (which are crucial to distinguish fiscal shocks from non-fiscal demand shocks) deserves more attention. I assume that a positive fiscal shock – say an increase in transfers – is followed by an *increase* in primary deficits (scaled by trend GDP, that does not respond to cyclical shocks) and by a standard demand-driven boom: output expands, and so does inflation. In contrast, favorable non-fiscal demand shocks that boost output and inflation, such as monetary policy or other non-policy residual shocks, generate a *decrease* in primary deficits (i.e., primary surpluses), given that tax revenues rise during expansions via an increase of the tax base, while transfers decrease via automatic stabilizers. These restrictions are satisfied in a battery of micro-funded macroeconomic models (e.g., Gabaix, 2020; Bianchi et al., 2023; Angeletos et al., 2024a; Smets and Wouters, 2024; Kaplan et al., 2018; more in general models that incorporate frictions to break the Ricardian equivalence for fiscal policy), where the government follows a conventional fiscal rule in which the primary balance respond endogenously to output fluctuations.

3 Shocks, Business Cycles, and Inflation

In this section, I present the results derived from the estimation of the baseline model for the US economy. To set the stage, I first present some moments of the structural VAR (shocks' series and impulse responses). Then, I use those moments to decompose the recent US inflation surge into its components. Finally, I extend the analysis to the Euro Area.

Impulse responses and shocks: Figure 2 shows the responses of the macroeconomic variables to the (unit-variance) identified shocks (I report the corresponding forecast error variance decomposition in Figure A2 in the Appendix). Fiscal shocks generate temporary fiscal imbalances but are not the primary drivers of fiscal deficits. Exogenous fiscal stimuli explain only 11% of the forecast errors of primary deficits, with the remaining 89% attributed to non-fiscal business shocks. This result is not surprising but lies at the heart of my identification strategy: like interest rates, the fiscal deficit is an endogenous variable that systematically re-

not result in inflation can be found in the work of Jørgensen and Ravn (2022) and Klein and Linnemann (2023).

[14] These effects are also consistent with the evidence of Breitenlechner, Geiger, and Klein (2024), using high-frequency identification for monetary policy shocks.

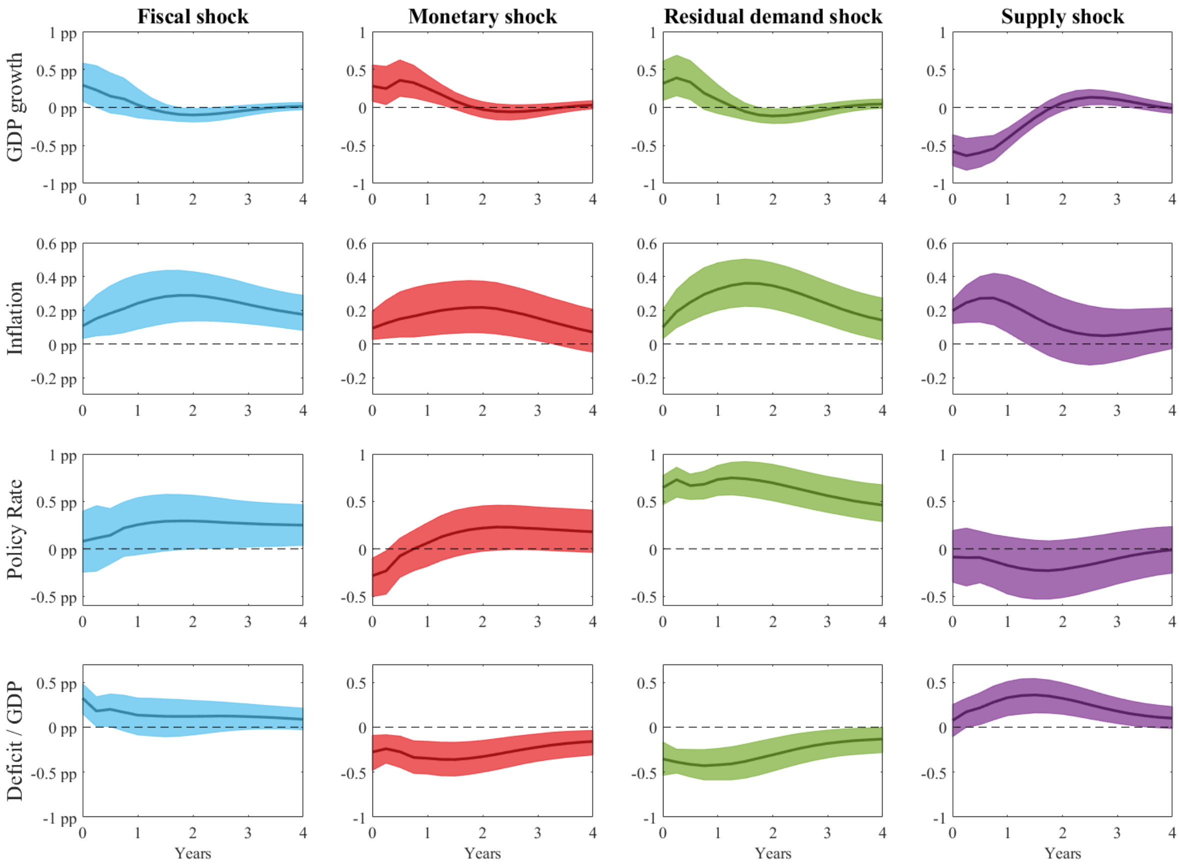

Figure 2: Impulse responses for the baseline model to one-standard-deviation shocks. Continuous lines represent the posterior median at each horizon, and the shaded areas indicate the 16th and 84th percentiles of the impulse responses.

sponds to cyclical shocks (rising in recessions and falling in expansions). Hence, distinguishing the exogenous component (fiscal shocks) from the endogenous one is crucial. In response to fiscal shocks, real GDP rises temporarily while inflation increases persistently, displaying a hump-shaped response that lasts over four years. This persistent inflationary effect aligns with findings from alternative identification approached for fiscal shocks, as I document in the next section. Such an effect is also consistent with the ”US empirical facts” documented in Forni, Gambetti, Granese, Sala, and Soccorsi (2024), who find that demand shocks tend to have much more persistent impacts on inflation than on real activity. The demand-driven economic boom triggers a systematic response from the Fed, leading to policy hikes that result in a close to zero response of the real interest rate.

Monetary policy shocks exhibit conventional effects. A unit-variance policy easing initially lowers the policy rate, which then rises quickly and becomes tighter relative to its initial level after about two years, consistent with the results of the instrumental variables (proxy VAR) methods (see Caldara and Herbst, 2019). This shock causes GDP growth to rise for about a year, with inflation returning to its pre-shock level after approximately three years. The economic boom positively impacts the government's budget, reducing primary deficits for four years. In addition, Table A1 in the Appendix shows that the underlying policy rule implies a positive response of the policy rate to inflation. Therefore, the estimated monetary policy shocks are not associated with counterintuitive systematic response to macroeconomic fluctuations by the Fed (see Arias et al., 2019).[15] Interestingly, when I compare the Fed's responsiveness to inflation in my VAR that includes Covid with a VAR that excludes the pandemic (1970:I-2019:IV), I find evidence that the Fed has been more accommodative during Covid than it was before. Similar effects are also generated by the residual demand shocks, with the relevant distinction that the unexpected demand-side boom is met by a systematic tightening operated by the Fed.

Finally, supply shocks produce the typical stagflationary effects lasting about two years. The Fed faces a policy trade-off and remains mostly inactive – "looking through" the inflationary effects, consistent with recent evidence on identified oil supply shocks (see, e.g., Kilian and Lewis, 2011; Mori and Peersman, 2025). As documented in Figure A2 in the Appendix, supply shocks are extremely relevant for output fluctuations, accounting for more than half of the (long run) forecast error variance of the GDP growth rate. In contrast, demand shocks explain 84% of the inflation volatility – which points to a relatively steep Phillips Curve.

Fiscal shocks' identification – external validation using IVs: To identify structural disturbances, I assume that expansionary fiscal shocks lead to increases in output and inflation, consistent with standard New Keynesian mechanisms. However, alternative identification methods—such as narrative approaches—do not rely on this assumption. A natural question, then, is whether these alternative methods yield the same co-movement of output and inflation conditional on fiscal shocks. If they do, this would provide strong external validation for my approach.[16] In Figure 3, I report the estimated effects of fiscal shocks obtained using leading identification approaches for transfer shocks (Romer and Romer, 2016), government spending shocks (Ramey, 2011; Ben Zeev and Pappa, 2017), and tax shocks (Mertens and Ravn,

[15] Given that I estimate a linear VAR, such "active" response of the Fed to inflation has to be considered a historical average over the sample, see Bianchi and Melosi (2017) and Bianchi and Ilut (2017) for models that allow for regime switches.

[16] Another natural question is why not use these alternative methods to study the role of fiscal policy in inflation directly. There are at least three reasons for my choice to rely on sign restrictions instead: (i) reliable and uncontroversial narrative evidence is generally scarce and costly to obtain; (ii) narrative shock series are typically available only for the US (whereas my approach can be easily extended to other countries at no additional cost) and are rarely updated (most are unavailable for the Covid period); (iii) while my approach offers a comprehensive decomposition of economic fluctuations into mutually exclusive and jointly exhaustive shocks, narrative methods provide only partial identification. Moreover, when narrative methods are used together, they require additional identification restrictions (Arias, Rubio-Ramírez, and Waggoner, 2021), such as sign or zero restrictions.

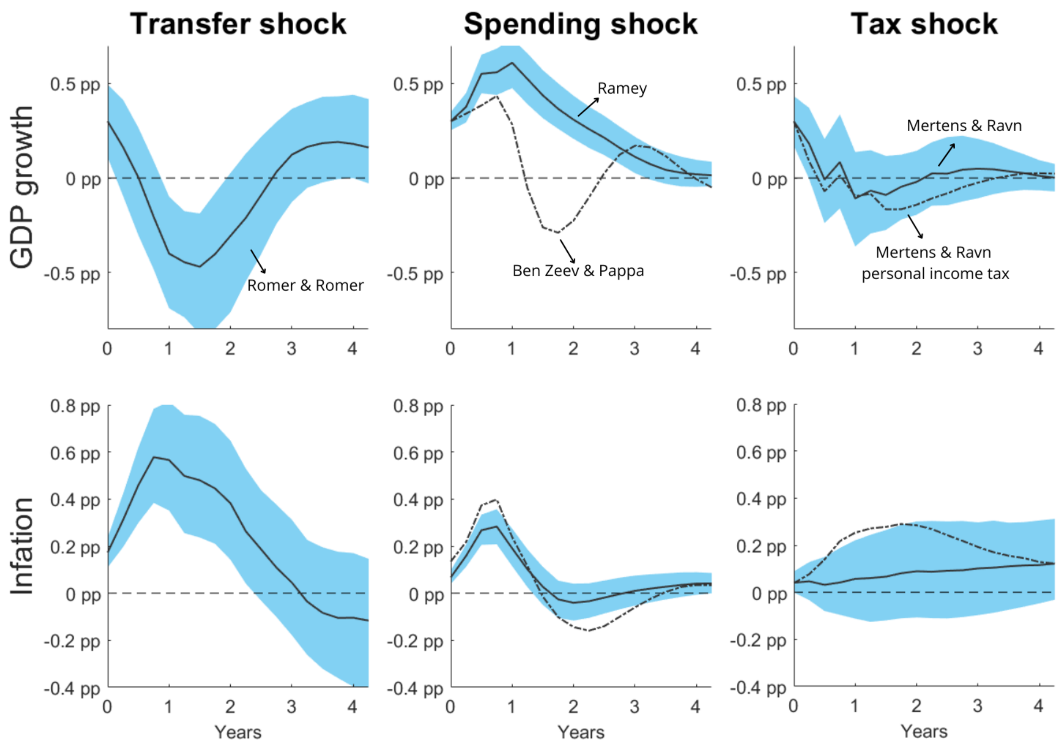

Figure 3: Impulse responses of GDP growth and inflation to a battery of fiscal shocks identified in the literature. Shocks are normalized to generate a positive effect of 0.3 percentage points on GDP growth (i.e., the impact response in my baseline VAR). Continuous and dash-dotted lines represent the posterior median at each horizon, and the shaded areas indicates the 16th and 84th percentiles of the impulse responses.

2013).[17] Overall, while results vary across identification approaches (and understanding these differences is beyond the scope of this exercise), a common takeaway emerges: conditional on expansionary fiscal shocks, output and inflation move together, and the inflationary effects tend to be persistent. This evidence strongly supports my identification assumptions, reinforcing the credibility of my results.

External validation for identification – a look at the identified shocks: Before proceeding, I also verify whether my identified shocks match the conventional view about macroeconomic shocks around key historical events. In Figure 4, I present the time series of the identified shocks, plotted as a four-quarter moving average with 68% posterior bands. Examining the fiscal shocks, I find that exogenous interventions correspond with major fiscal decisions (e.g.,

[17] To estimate these effects, I incorporate the externally identified shock series (downloaded from Valerie Ramey's webpage) into a recursive VAR with flat priors, following the recommendation of Plagborg-Møller and Wolf (2021) to reduce noninvertibility concerns. I estimate my baseline VAR—augmented with these shock series—over the sample period 1970–2023, where the external series are available. Given that Ramey (2016) has shown that the approaches of Ramey (2011) and Ben Zeev and Pappa (2017) yield poor identification in my sample, I estimate VARs on the periods analyzed in their papers (starting in 1939 and 1948, respectively). As the primary deficit variable is not available is not available prior 1947, I exclude such variable in the VAR with the shock of Ramey (2011).

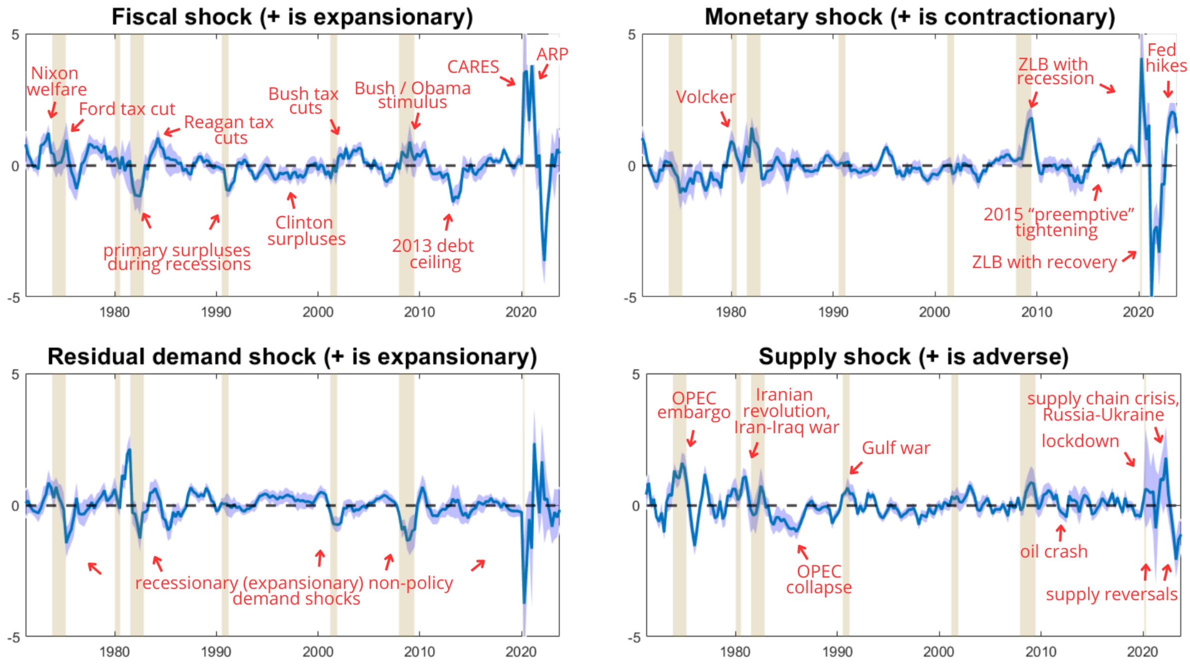

Figure 4: Historical evolution of the shocks (plotted as four-quarter moving averages with 68% posterior bands).

Blinder, 2022). For instance, significant positive shocks are identified during: i) the Nixon administration in the early 1970s, associated with welfare programs; ii) years when tax cuts were implemented by Presidents Ford (1975), Reagan (mid-1980s), and Bush (2001); iii) periods of heavy fiscal stimuli, such as during the Great Recession under Presidents Bush and Obama (2008-2010), and Covid-19 under Presidents Trump and Biden (2020-2021). Among these, the Covid-related interventions are particularly noteworthy for their unprecedented magnitudes, aligning with the interpretation of fiscal stimulus during those years as ”war-type” packages (Hall and Sargent, 2022). Significant contractionary shocks are observed during: i) the early 1980s and 1990s recessions, where the US government ran primary surpluses despite the recessionary times; ii) the Clinton administration, characterized by a persistent sequence of primary surpluses that temporarily stabilized the US debt-to-GDP ratio; iii) the 2013 debt ceiling crisis that triggered a federal government shutdown.

Turning to the monetary shocks, I find contractionary shocks in: i) the Volcker intervention of 1979-1981; ii) the zero lower bound periods during the Great Recession and at the beginning of the pandemic (early 2020) – times when a standard Taylor-type rule would have called for more expansionary policies, which were not implementable due to the bound;[18] iii) the so-called preemptive tightening in 2015, which is ex-post seen as an intervention that hampered the economy's ability to reach full employment (Steinsson, 2024); iv) the period starting from

[18]Notice that contractionary shocks during the Great Recessions are also found using high-frequency instrumental variable methods to identify monetary policy shocks, see for instance Miranda-Agrippino and Ricco (2021).

mid-2022, where the Fed vigorously tightened in response to the inflation surge. Interestingly, the period from mid-2020 to mid-2020 is interpreted as a vastly expansionary monetary phase.

Residual demand shocks are relatively straightforward to interpret. They generally take positive values during expansionary periods and negative values during recessions, capturing non-policy demand shocks.

Finally, supply shocks align well with the conventional view. Adverse supply shocks are detected around major oil-related supply disruptions, such as the OPEC embargo (1973), the Iranian revolution (1978-1979), the Iran-Iraq war (1980), and the Gulf War (1990). More recently, they were also identified during the initial phase of the pandemic (early 2020), characterized by lockdowns and supply disruptions, as well as during the second phase of the pandemic, marked by a second wave of the supply chain crisis. The Russian invasion of Ukraine (2022) is another instance of significant adverse supply shocks.

How do my shocks compare with existing external evidence? In Figure A3, I document that my identified shocks exhibit a strong correlation with well-established measures from the literature. Notably, the correlation between my fiscal shocks and the IMF cyclically adjusted fiscal impulse – a comprehensive measure of the U.S. fiscal stance, net of business cycle dynamics, available only at an annual frequency – is 0.87. This provides further validation of the robustness of my identification strategy.

Decomposing the US 2020-2023 inflation surge: Equipped with the identification of shocks and of their effects, I am now ready to decompose the recent inflation surge. This analysis is presented in Figure 5, where I plot the effects of the macroeconomic shocks that have impacted the US economy since 2019:IV, hence excluding pre-pandemic shocks.[19] More precisely, I compare the actual evolution of inflation (in black) with the counterfactual evolution that would have occurred if fiscal, monetary, residual demand, or supply shocks had occurred in isolation starting from 2019:IV. The decomposition reveals that the majority of the inflation surge has been driven by fiscal shocks, with 68% confidence intervals provided for their contribution. Fiscal shocks alone raised the pre-Covid inflation level of 1.5% to about 5.3% by mid-2021 (for a total contribution of almost 4 percentage points). This rise in fiscal inflation corresponds to the stimulus measures introduced by the Trump administration (CARES Act, 2020:I) and was further amplified by the subsequent stimulus from the Biden administration

[19] Bergholt et al. (2024) demonstrate that the behavior of the deterministic component in conventional VARs can lead to ”whimsical” repercussions on historical decomposition analysis. To address this, I adopt one of their proposed methods by computing a large number of historical decompositions, each corresponding to a different parameter draw. I then derive the point-wise median historical decomposition at each point in time, as outlined in their Section 6.2.

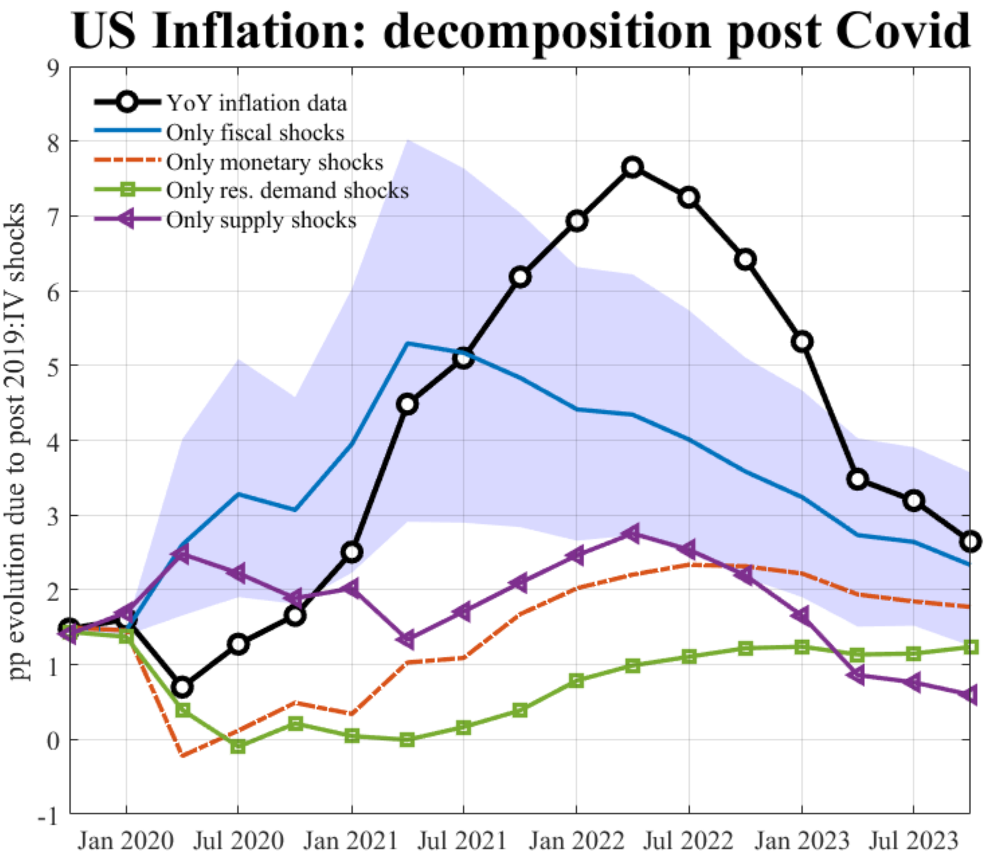

Figure 5: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks.

(ARP Act, 2021:I). Starting from mid-2021, the influence of fiscal shocks waned, contributing to a decrease in inflation.

What was the overall dimension of the exogenous fiscal stimulus? I find that fiscal shocks over the period 2020:I-2021:IV moved the (quarterly) primary deficit to GDP ratio by a total of 16 percentage points (see Figure A4 in the Appendix), which is in line with the massive amount of resources employed in the US through the extraordinary spending bills enacted during the pandemic (see Anderson and Leeper, 2023 for a detailed accounting).

Fiscal inflation peaked in 2021, while overall US inflation reached its maximum level in 2022. Other shocks account for this disconnect. During the initial phase of the Covid crisis (2020), the US economy was affected by adverse monetary and residual demand shocks (depressing inflation), as well as supply shocks (fueling inflation). As shown in Figure 5, these shocks largely offset each other, leaving fiscal shocks as the dominant driver. However, as the fiscal contribution began to fade in late 2021, a combination of expansionary monetary and residual demand shocks (due to a weak reaction from the Fed and pent-up demand effects), along with continued adverse supply shocks (global supply chain crisis and the Russian invasion of Ukraine), kept inflation high. Finally, the reversal of supply shocks and the tightening measures implemented by the Fed from mid-2022 onwards contributed to bringing inflation closer to the target.

Robustness: In the Appendix, I show that the dominant role of fiscal shocks in explaining the US inflation surge is a robust finding.

First, I observe similar levels of fiscal inflation when using alternative inflation measures, as shown in Figure A5 for CPI and PCE inflation. Second, considering different sample periods, the results remain consistent (Figure A6). I analyze both a longer sample period (1961-2023, which coincides with the period considered by Blinder, 2022); and shorter periods (1984-2023, starting with the so-called Great Moderation, and 2002-2023, which aligns with the period later considered for the Euro Area). Third, I find that my results are confirmed also when identifying additional supply shocks. Given that energy shocks have been proposed as a possible explanation of the inflation surge (e.g., Bernanke and Blanchard, 2024b), in Figure A7, I augment my baseline specification with the CPI energy inflation index and use it to decompose my generic supply shock into a non-energy and an energy supply disturbances.[20] Again, I find an unchallenged role of fiscal shocks in the inflation decomposition.

As emphasized by Ramey (2011), the timing of fiscal shocks is crucial in identifying their effects, given that government decisions may be anticipated. To account for expectations not already captured by the VAR, I incorporate real-time professional forecasts of government spending growth (leading to a so-called expectation-augmented VAR; Perotti, 2011). Following Auerbach and Gorodnichenko (2012), I splice the Greenbook forecasts (available since 1966) with the Survey of Professional Forecasters (available since 1982) to create a continuous forecast series from 1966 to the present.[21] This series consists of forecasts made at time t for one-quarter-ahead government spending growth. I include this series in the VAR to address concerns about the VAR's informational sufficiency, following the approach of Forni and Gambetti (2016). As a further check, I augment the baseline VAR specification with the first principal component identified in the quarterly database for macroeconomic research of McCracken and Ng (2020) to extend the VAR's information set.[22] As shown in Figure A8 and

[20] I assume that averse non-energy supply shocks are stagflationary, moving GDP growth and inflation in opposite directions, and have zero impact effect on energy inflation. Adverse energy supply shocks are stagflationary, moving GDP growth and inflation in opposite directions and positively affecting energy inflation too. See Ascari et al. (2023) for a similar approach.

[21] For the early part of the sample, I use the series provided in the replication codes of Auerbach and Gorodnichenko (2012), updated from 2009 using the Survey of Professional Forecasters data.

[22] In line with the predictability tests proposed by Forni and Gambetti (2014), I regress the median fiscal shock series on the first four (lagged) principal components (given the presence of Covid, I use heteroscedasticity-robust standard errors). I find evidence of predictability driven by the first factor. When regressing the shocks on the (lagged) factors one at a time, the only one that has significant predictive power is indeed the first, while

Figure A9, even in these alternative specifications, fiscal inflation remains dominant during the Covid inflation surge (note that in these cases, a slight decrease in the importance of the shocks is expected, since the VAR models include five variables but only four identified shocks. The four shocks no longer account for all of the cyclical volatility, as shocks are no longer jointly exhaustive).[23] Moreover, I find nearly identical results when imposing sign restrictions on responses delayed by two quarters, allowing the impact effects – especially on the primary deficit – to remain unrestricted, mitigating concerns about fiscal foresight (Figure A10).

Finally, as noted by Jørgensen and Ravn (2022), under some identification strategies for spending shocks (e.g., Blanchard and Perotti, 2002), inflation does not increase—or can even decrease—in response to a fiscal expansion, because such shocks foster productivity gains that push prices downward. To account for this possibility, I estimate an extended version of my baseline model that allows for two types of fiscal shocks. While both generate a positive comovement of output and the primary deficit, one has demand-type effects (i.e., inflation increases) and the other operates through supply-side channels (i.e., inflation decreases). Even in this extended framework, I continue to find a robust role for inflationary fiscal shocks in the post-pandemic period (Figure A11).

US inflation chronicles: 1970-2023: Has fiscal inflation always been as dominant as in the post-Covid inflation run-up? I delve deeper into this question in Figure 6, where I present the historical decomposition for the entire sample. Fiscal inflation (and "disinflation") has consistently been a feature of the US economy: Chronicles of US inflation dynamics cannot ignore the role of fiscal policy. However, fiscal inflation has never been as dominant in US inflation as during the post-Covid inflation episode. The inflation episodes of the 1970s and 1980s are in large explained by the loose fiscal policy of the time (for instance, President Nixon's welfare programs in the early 1970s – culminated with his famous sentence "[I am] now a Keynesian in economics" – or the President Ford and Carter fiscal expansions in the following years). However, supply factors were significantly more important during that period than in recent times. Yet, it is well documented that supply disturbances only (such as oil-market shocks) cannot fully explain the inflationary dynamics in those years (Barsky and Kilian, 2001; Kil-

the others remain insignificant regardless of whether I use one, two, three, or four lags. Thus, I incorporate this factor when extending the VAR model.

[23] In unreported checks, I find that this dominant role holds even when augmenting my VAR with the fiscal defense news shocks of Ramey (2011). However, this analysis comes with two caveats. First, Ramey's index is only available up until 2015 (Ramey and Zubairy, 2018), so I must set the missing observations to zero. Second, the zeros in the index during Covid imply that the method of Lenza and Primiceri (2022) is no longer applicable, as it assumes a common volatility rescaling across all observables. Consequently, I estimate the VAR without adjustment in this case, which could lead to estimation issues.

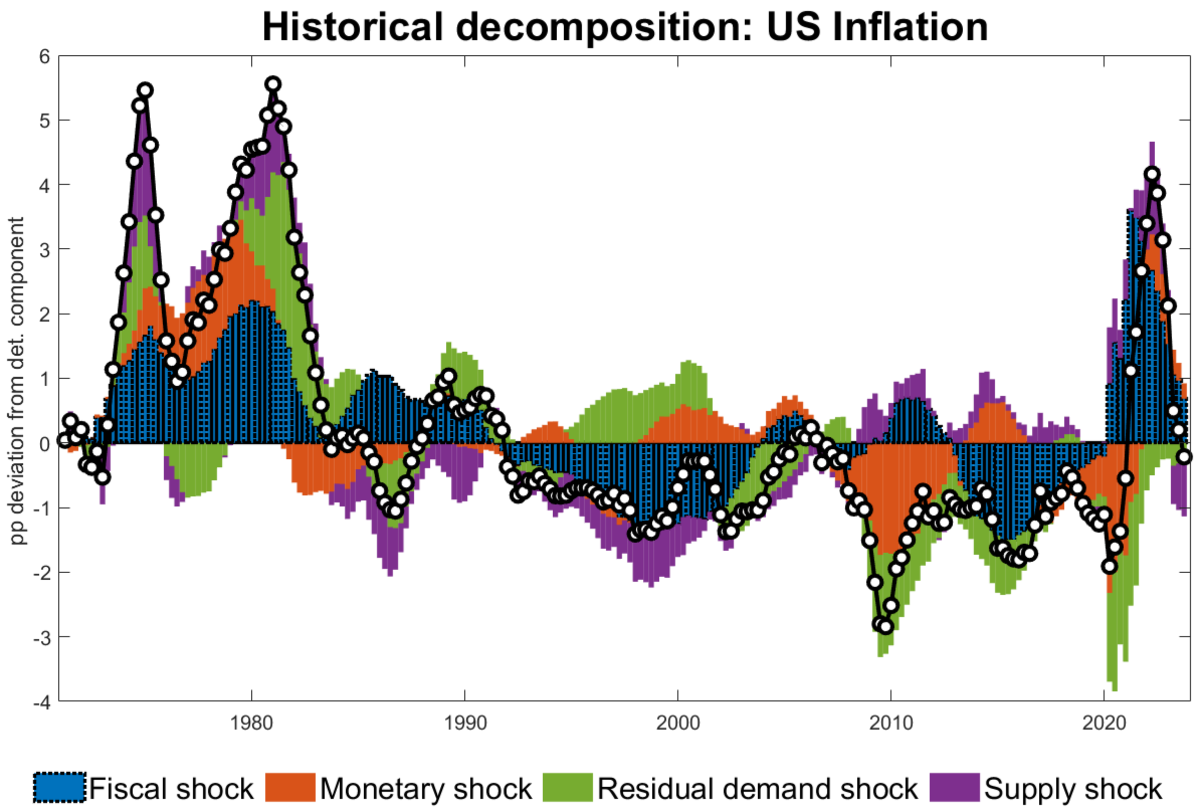

Figure 6: Historical decomposition of US inflation is presented in deviation from the deterministic component (initial conditions).

ian, 2009; Baumeister and Hamilton, 2019): My results support this view. Loose monetary policy also played a role until the Volcker intervention in 1979, which helped bring inflation back to target alongside tighter fiscal policies and supply reversals.[24] Another notable period is the 1990s, when tight fiscal policy kept inflation low and stable. This aligns with the fiscal discipline imposed by President Clinton, under whose administration the US government ran primary surpluses and stabilized the debt-to-GDP ratio. Finally, the Great Recession and its aftermath were characterized by a somewhat expansionary fiscal stance during the crisis and relatively tight fiscal policy during 2011-2013. Hence, fiscal shocks help explain the missing disinflation and inflation periods following the Great Recession. This result is consistent with Fed Chair Ben Bernanke's comments, who noted: "*After enacting President Obama's stimulus package in February 2009, Congress had shifted into austerity mode... This headwind was no soft breeze... Tight fiscal policies were arguably offsetting much of the effect of our monetary efforts*" (Bernanke, 2015, p. 504). My VAR estimates fully support this interpretation.

[24]This result is consistent with the view that the policy intervention of Volcker as a large anti-inflationary shock to monetary policy, rather than a change in the monetary policy rule (Antolín-Díaz and Rubio-Ramírez, 2018). Such interpretation – which is consistent with the findings of Sims and Zha (2006) – also legitimizes the use of a linear VAR, which would be questionable in the presence of a regime change in policies.

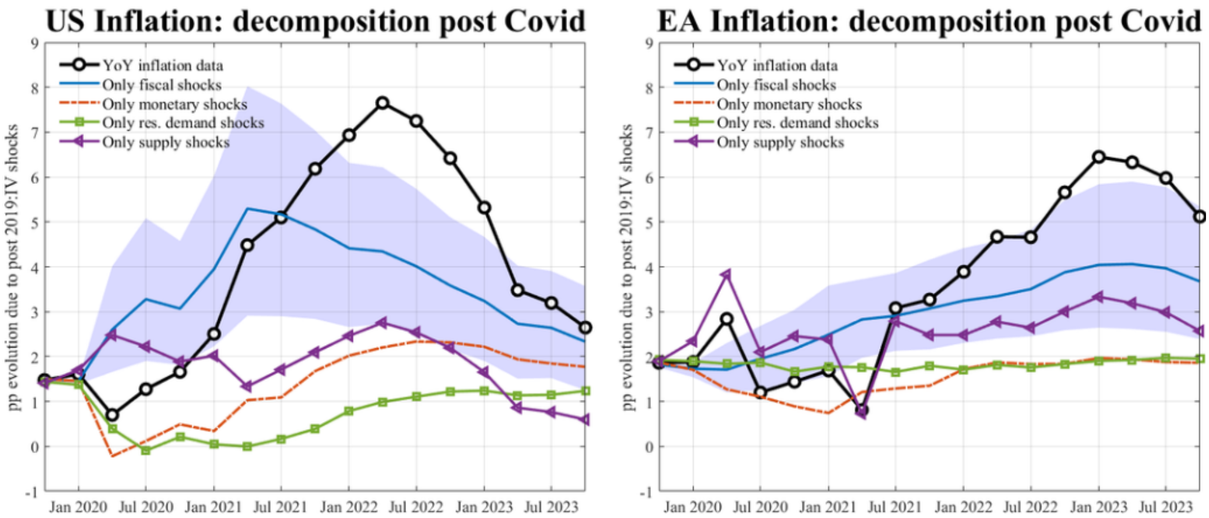

Figure 7: Cumulative contribution of post 2019:IV shocks in the US (left panel) and Euro Area (right panel). I report 68% posterior bands for the contribution of fiscal shocks.

Decomposing the Euro Area inflation surge: Is fiscal inflation a US-specific phenomenon? To address this question, I estimate a similar VAR for the Euro Area using comparable variables. The VAR is estimated using the same methods and restrictions as before, but the sample now runs from 2002:I to 2023:IV due to data availability of the European primary deficit.[25] Results are shown in Figure 7, where I report the US decomposition again for comparison.

A few results emerge. First, fiscal inflation is present in the Euro Area too. Fiscal shocks are responsible for an overall increase in inflation of about two percentage points (more than a third of the inflation increase). However, they are not as dominant as in the case of the US. For instance, supply shocks in the Euro Area mattered more than in the US, as their effect on inflation is comparable with the one of fiscal stimulus. This result is consistent with the differing scale of energy shocks across regions, with the US, for instance, being largely unaffected by the increase in European gas prices in late 2022 due to the war in Ukraine (see e.g., Böck and Zörner, 2024; Alessandri and Gazzani, 2025).

When it comes to fiscal shocks, another difference with respect to the US is the *timing*. While in the US, fiscal shocks drove inflation up significantly starting from early 2020, fiscal inflation in the Euro Area is somewhat delayed, reaching its peak in late 2022. This is consistent with the view that while the US 2020-2021 fiscal policy was a more widespread demand stimulus, increasing aggregate household income well above its pre-Covid trend and hence generating inflation immediately, in the Euro Area, fiscal policy primarily aimed at preserving

[25] I consider the following standard variables: i) year-on-year growth rate for real GDP for the Euro Area (Fred; `CLVMEURSCAB1GQEA19`); ii) year-on-year GDP deflator inflation for the Euro area (ECB Data Portal); iii) Krippner (2013)'s shadow rate; iv) primary deficit of the Euro Area scaled by trend GDP (ECB Data Portal and own computations following Ramey and Zubairy, 2018).

jobs and maintaining incomes, resulting in delayed effects on inflation (see Tenreyro, 2023). This difference in timing helps explain why inflation in the Euro Area lagged behind that in the US, a dynamic stressed by Giannone and Primiceri (2024).

4 A Model for post-Covid Deficits and Inflation

Having empirically established the role of fiscal shocks in the post-Covid inflationary episode, I now show that a New Keynesian micro-funded model with monetary and fiscal policy interactions can account for that. In this sense, the model serves to i) demonstrate that, given the unprecedented dimension of the fiscal stimulus during the pandemic, the size of fiscal inflation I find in the data is compatible with the one that would be generated a laboratory economy featuring New Keynesian mechanisms; ii) show under which conditions this happens. I work with the model recently proposed by Angeletos et al. (2024a), whose linearized dynamics I briefly describe here.[26]

Aggregate demand: The economy consists of a continuum of non-altruistic households. Each household survives from one period to the next with probability $\omega \in (0, 1]$, where $1 - \omega$ represents the mortality rate (in the spirit of Blanchard, 1985). When a household dies, a new one replaces it. Finite lives are effectively a proxy for the short-time horizon of agents' financial planning (Castelnuovo and Nisticò, 2010). As a result, agents deviate from Ricardian equivalence in a flavor like Heterogeneous Agent New Keynesian (HANK) models, creating a tractable framework in which fiscal policy becomes relevant for macroeconomic outcomes.[27] Households have standard preferences over consumption and hours worked, receive income from labor and dividends, pay taxes, and can save or borrow through a risk-free nominal annuity. They contribute to a social fund, ensuring equal wealth and consumption across cohorts in steady state and guaranteeing a steady-state real interest rate of $R^{ss} = \beta^{-1}$, where $\beta \in (0, 1)$ is the discount factor. The aggregate demand function can be written as:

$$y_t = (1 - \beta\omega) \left(d_t + E_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k (y_{t+k} - t_{t+k}) \right] \right) - \gamma E_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k r_{t+k} \right] \tag{1}$$

[26] I log-linearize around a zero inflation deterministic steady state. Variables are in log-deviations from the economy's deterministic steady-state, with the exception of fiscal and wealth variables, which are measured in terms of absolute deviations from the steady state, scaled by steady-state output.

[27] Unlike HANK models (Kaplan et al., 2018; Bilbiie, 2008; Debortoli and Galí, 2024; Auclert, Rognlie, and Straub, 2024), the framework I use abstracts from inequality and its cyclical dynamics – while preserving individual risk. This choice reflects my focus on inflation and its drivers rather than the distributional effects of shocks. Moreover, evidence suggests that cyclical inequality plays a quantitatively limited role in amplifying business cycles (Bilbiie, Primiceri, and Tambalotti, 2024; Bayer, Born, and Luetticke, 2024).

where y_t is real aggregate income; d_t is the real value of public debt (that is also real household wealth by market clearing condition); t_t is real net taxes (net of transfers; hence, the primary surplus); $\gamma = \sigma\beta\omega - (1-\beta\omega)\beta\frac{D^{ss}}{Y^{ss}}$; r_t is the expected real rate of interest; σ is the elasticity of intertemporal substitution; D^{ss}/Y^{ss} is the steady-state wealth-to-income (or debt-to-GDP) ratio. This aggregate schedule generalizes the permanent-income hypothesis (i.e., the case when $\omega = 1$). The introduction of finite lives ($\omega < 1$) generates two important effects: i) consumers discount future disposable income (and interest rates) at a higher rate than the interest rate faced by the government and more heavily than in the permanent income benchmark ($\beta\omega$ vs. β); and ii) they front-load spending and have a larger marginal propensity to consume ($1-\beta\omega$ vs. $1-\beta$).

Aggregate supply: I consider an hybrid New Keynesian Phillips Curve (NKPC) to replicate the empirical evidence on the persistence of inflation (see also Galí and Gertler, 1999). The Hybrid NKPC takes the form of:

$$\pi_t = \kappa y_t + \xi\beta\pi_{t-1} + (1-\xi)\beta E_t[\pi_{t+1}] \tag{2}$$

where π_t is inflation, κ is the slope of the NKPC, $\xi \in [0,1]$ parameterizes the degree of backward-lookingness in price-setting.

Monetary policy: The monetary authority implements the following relation between the (expected) real interest rate and real output:

$$r_t = \phi_y y_t \tag{3}$$

or, equivalently, $i_t = E_t[\pi_{t+1}] + \phi_y y_t$. In my benchmark simulations, I will assume $\phi_y = 0$. Such monetary policy is "neutral" in the sense that the real rate is kept fixed in response to (say) a fiscal shock, keeping constant the government's cost of borrowing (see also Woodford, 2011). This rule is also a very good approximation of the empirical monetary policy response to fiscal shocks I estimate in the VAR (Figure 2). However, for comparison, I will also show results when using Taylor-type monetary rules.

Fiscal policy: The government issues one-period riskless nominal debt and set primary deficits (transfers minus taxes). It faces a (linearized) flow real budget constraint that can be written as:

$$d_{t+1} = \frac{1}{\beta}(d_t - t_t) + \frac{D^{ss}}{Y^{ss}}r_t - \frac{D^{ss}}{Y^{ss}}(\pi_{t+1} - E_t[\pi_{t+1}]) \tag{4}$$

The government is finally assumed to adhere to the following fiscal rule:

$$t_t = \tau_y y_t + \tau_d (d_t + \epsilon_t^f) - \epsilon_t^f \tag{5}$$

The primary surplus t_t (or equivalently, the primary deficit $-t_t$) is determined by exogenous shocks and endogenous outcomes. First, and as assumed in the VAR, it systematically responds to output fluctuations, given that the government finances its fiscal plans via a proportional tax $\tau_y \in [0, 1)$ on income (a canonical tax base channel): when aggregate output increases by one dollar – say in response to demand disturbances that can be added to the model – tax revenue increases by τ_y dollars. Second, there is a time-varying lump-sum component, which includes both any initial fiscal stimulus (exogenous one-off deficit shock, ϵ_t^f) and any subsequent tax hikes used to bring government debt back to steady-state. $\tau_d \in (0, 1)$ is a scalar that parameterizes the speed of fiscal adjustment in response to debt accumulation (i.e., the fraction of the adjustment that happens contemporaneously). Hence, a deficit today is followed by future surpluses. In a permanent income model, such a stimulus policy would not generate any effect due to standard Ricardian effects. However, when $\omega < 1$, a deficit today repaid by future surpluses represents a transfer from future to current generations, hence stimulating aggregate demand and generating inflation via conventional Keynesian mechanisms. The induced boom is large when τ_d is small (i.e., in presence of a very delayed fiscal adjustment), since people perceive that the fiscal stimulus will be repaid back by agents in the future, with a very low probability of the current generations being alive. Second, the higher the slope of the Phillips curve is, the higher the transmission through inflation.

Accounting for Covid inflation: Is the model consistent with the dominant role of fiscal shocks in the recent inflation surge? I now demonstrate that a reasonably calibrated version of the model can indeed explain the amount of fiscal inflation I find empirically in the VAR – about a 4 percentage point increase in year-on-year US inflation. Specifically, I show that the inflation responses generated by fiscal shocks of a similar magnitude to those predicted by the VAR are in line with my findings in Figure 5. As detailed below, three conditions must coexist for the model to replicate the VAR: i) a relatively steep New Keynesian Phillips curve with some backward-looking price setting, ii) a relatively short planning horizon for the agents (discounting of future outcomes), and iii) a relatively weak fiscal adjustment in response to debt accumulation.

I consider two benchmark specifications calibrated in the spirit of Angeletos et al. (2024a). All the calibrated parameters are reported in Table 2. Both parametrizations share: i) a rel-

Parameter	Description	Value	Target
Consumer spending			
ω	OLG survival rate	0.865	Angeletos et al., 2024a; Castelnuovo and Nisticò, 2010
Policy			
τ_d	Tax feedback	0.026	Auclert et al., 2020
ϕ_y	Response to output	0	Woodford, 2011
Phillips curve			
κ	NKPC slope	0.006; 0.019	Hazell et al., 2022; Cerrato and Gitti, 2022
ξ	Back.-lookingness	0.288	Barnichon and Mesters, 2020
Rest of the model			
σ	EIS	1	Standard
β	Discount factor	0.99	Standard
τ_y	Tax rate	0.33	Angeletos et al., 2024a
D^{ss}/Y^{ss}	Gov't debt	1.04	Angeletos et al., 2024a

Table 2: Model calibration and relative sources.

atively short-time horizon of agents' financial planning ($\omega = 0.865$, as in the calibration of Angeletos et al., 2024a and as estimated by Castelnuovo and Nisticò, 2010); ii) a relatively slow fiscal adjustment ($\tau_d = 0.026$, as the preferred estimate in Auclert et al., 2020, quarterly analogue); and iii) a neutral monetary policy ($\phi_y = 0$). However, while one has a rather flat Phillips curve ($\kappa = 0.006$, as estimated in Hazell et al., 2022), the second one has a relatively steeper Phillips curve ($\kappa = 0.019$, consistent with the one estimated in Cerrato and Gitti, 2022).[28]

I show the responses to a one-off fiscal shock in the two calibrations in the left panel of Figure 8. I calibrate the fiscal shock's size to align with the overall exogenous fiscal stimulus that I find in the VAR analysis (16 percent of GDP). Both calibrations exhibit significant fiscal inflation. However, while the one with a relatively steep Phillips curve predicts a level of fiscal inflation very similar to my empirical analysis (4.5 percentage points), the parametrization with a flat Phillips curve substantially underestimates it (1.5 percentage points). As expected, for the model to explain the fiscal inflation during Covid, an essential element is some degree of price flexibility. Reassuringly, such a feature is consistent not only with the responses to demand shocks I find in the VAR analysis, but also with the stream of literature that finds a relatively steep Phillips curve (e.g., McLeay and Tenreyro, 2019; Barnichon and Mesters, 2020; Bergholt,

[28] There is significant empirical disagreement about the slope of the Phillips curve. The calibration of the slope coefficient I consider are still on the lower end of the empirical evidence; see Furlanetto and Lepetit (2024) for a complete review.

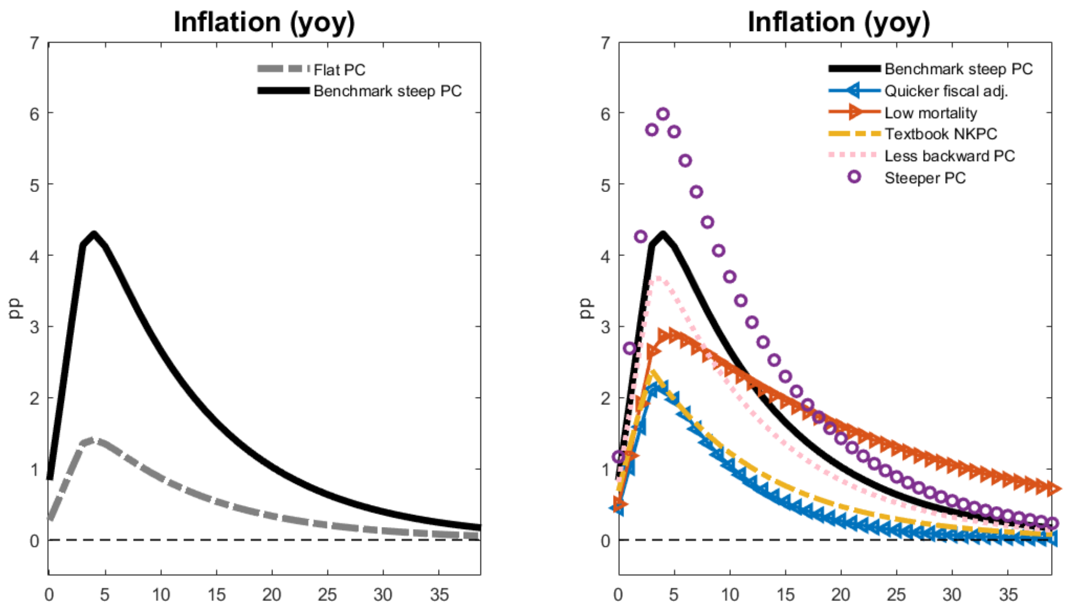

Figure 8: Left panel: inflation (year-on-year) impulse responses to a date-0 one-off 16% deficit shock in the two benchmark specifications (flat vs. steep Phillips curve). Right panel: perturbation of the benchmark specification with steep Phillips curve.

Furlanetto, and Vaccaro-Grange, 2024) that has also likely increased in the aftermath of the pandemic (Cerrato and Gitti, 2022; Benigno et al., 2022).

What are the additional assumptions that lie at the core of fiscal inflation? I document multiple perturbations in the right panel of Figure 8. Two important determinants of fiscal inflation are the relatively low fiscal adjustment in response to debt accumulation and the relatively short horizon of the agents. Versions of the model with a low mortality rate ($\omega = 0.95$) or very strong fiscal adjustment ($\tau_d = 0.085$, i.e., the upper bound considered in Auclert et al., 2020), imply a lower – but still substantial – level of fiscal inflation. As ω rises, the model converges to a quasi-permanent income agent model characterized by low discounting and a low marginal propensity to consume, thereby mitigating fiscal shocks' expansionary and inflationary effects. Similarly, when the fiscal deficit is repaid very quickly, the intergenerational transfer mechanism is substantially dampened, hence reducing the inflationary effects. However, particularly in the context of Covid spending, it is difficult to imagine that agents anticipated a rapid fiscal adjustment in response to debt accumulation (Anderson and Leeper, 2023). Therefore, a model with sluggish fiscal adjustment appears to be a more reasonable description of the recent inflationary episode. Another relevant feature of the model is the degree of backward-lookingness of the Phillips curve. Backward-lookingness is relevant since, when present, it makes inflation today depend more on the current output gap than on the future output gap. Since the model embeds front-loaded spending, this implies that the initial inflation response is larger in the presence of some degree of inertia in price setting. Indeed, in the presence of a textbook version of the Phillips curve ($\xi = 0$), the model has a hard time fully accounting for the empirical level of fiscal inflation, given the assumed slope of the Phillips curve. However, fiscal inflation is still very relevant in an intermediate parametrization with less backward-lookingness ($\xi = 0.233$, Galí and Gertler, 1999). Finally, if one assumes an even steeper Phillips curve ($\kappa = 0.027$; Galí and Gertler, 1999), fiscal inflation is substantially higher. All in all, I conclude that reasonably calibrated versions of the model are broadly consistent with my empirical evidence.[29]

The role of monetary policy – mistakes vs. trade-offs? What is the role of monetary policy for the transmission of fiscal shocks? And, more importantly, what would have happened during the last inflation surge had the Fed responded more aggressively? With the benchmark model at hand, I answer these questions in Figure 9, where I show the implied transmission of a same-sized fiscal shock under the baseline monetary rule (in which the central bank pegs the real interest rate by responding one-to-one to inflation expectations) vs. an alternative Taylor-type rule where it responds more than one-to-one to inflation ($i_t = \phi_\pi \pi_t$ where $\phi_\pi = 1.4$).[30] Initially, a hawkish monetary policy would have dampened the inflationary response, as the higher real rate would have triggered the usual intertemporal substitution effect, prompting agents to postpone consumption and thereby lowering current inflation. Yet, in the medium run, a more aggressive monetary policy response would have had the undesirable effect of making inflation more persistent, driven by the wealth consequences of higher interest rates. Specifically, in response to a deficit shock combined with a more hawkish stance, government debt – agents' financial wealth – balloons as borrowing costs rise more than in the benchmark scenario, while output growth is relatively dampened. As interest payments increase, agents experience a positive wealth effect. Even though higher debt effectively carries the promise of higher future primary surpluses to stabilize it (as fiscal policy is passive, given the fiscal rule), agents with finite planning horizons discount these future fiscal burdens heavily and hence demand remains elevated, – loosely speaking, they expect that future generations will shoulder the eventual tax increases. Consequently, this wealth effect supports output and, in turn, sustains inflation in the medium run, making it more persistent. This exercise underscores the importance of monetary and fiscal policy coordination. In the presence of a fiscal shock with

[29] Understanding what specific combination of parameters best aligns with the empirical analysis is beyond the scope of this exercise and would require bringing the model to the data. However, estimating a bare-bones model such as the one I consider here would not be appropriate, as it does not feature the elements proven essential for matching U.S. business cycle dynamics (e.g., Smets and Wouters, 2007).

[30] In the specific scenario of relatively low fiscal adjustment and active monetary policy that I consider, monetary policy cannot be too hawkish if the model is to preserve equilibrium uniqueness (unlike a canonical permanent-income-agent model).

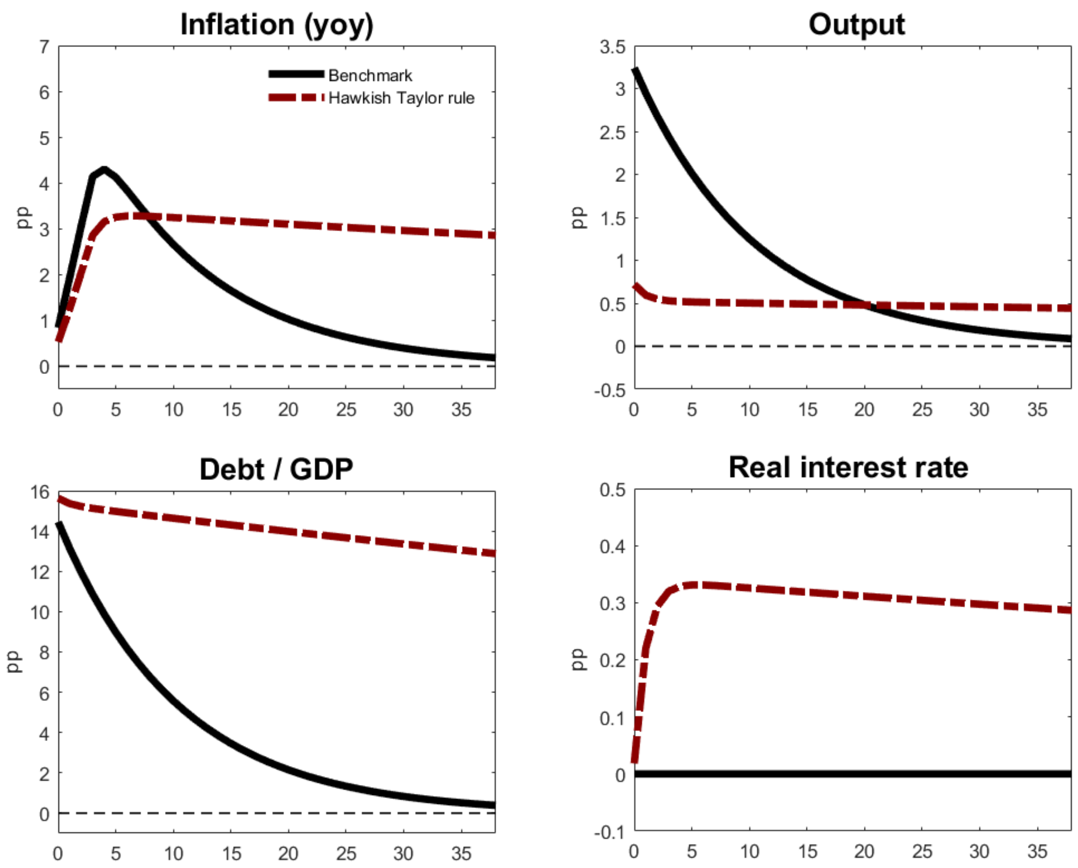

Figure 9: Left panel: impulse responses to a date-0 one-off 16% deficit shocks. Black lines: benchmark monetary rule. Red lines: more hawkish Taylor rule.

slow fiscal adjustment (and agents' finite planning horizons), an aggressive monetary policy acts as a "bad" vaccine – initially dampening inflation at the cost of making it more persistent over time. Conditional on such shocks, monetary authorities therefore face significant trade-offs, and out-of-sync monetary and fiscal policies can have dire consequences.

5 Taking Stock

My main empirical result, based on VAR estimates, is that exogenous fiscal stimulus played a significant role in the inflation surge in the US and the Euro Area. I then analyzed fiscal inflation through the lens of a canonical New Keynesian model, where inflationary pressures arise through aggregate demand channels. However, the VAR is somehow agnostic about the exact transmission mechanisms that generate fiscal inflation. The so-called "fiscal theory of the price level" (FTPL) offers a different perspective on fiscal spending's role in the recent inflation surge. FTPL posits that extraordinary fiscal spending without an increase of expected future surpluses must be followed by prolonged inflation to stabilize an otherwise unsustainable path of real debt (see Cochrane, 2023 and his discussion on the fundamental "observational

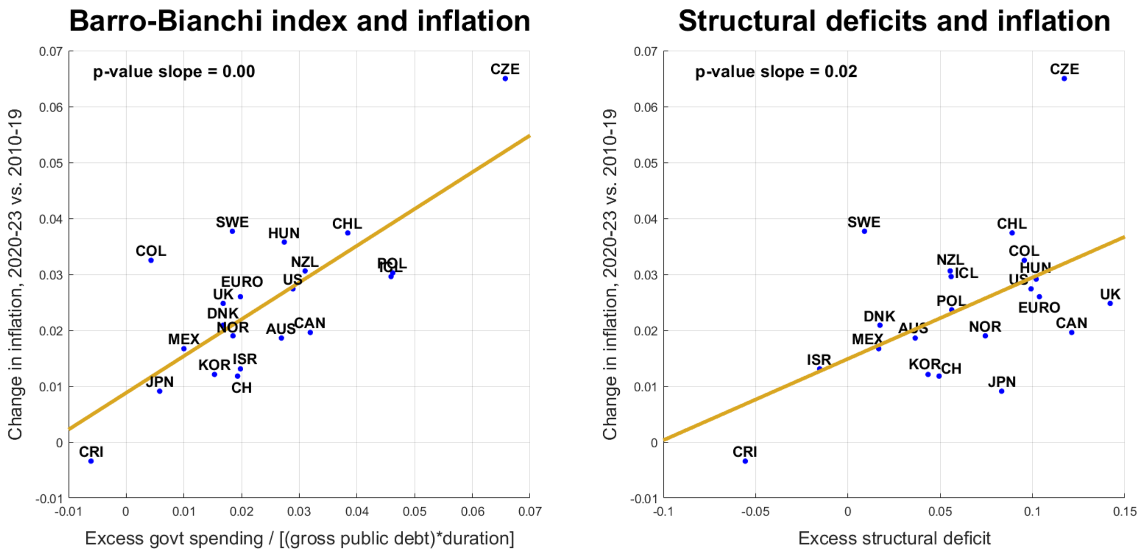

Figure 10: Left panel: correlation between the "Barro-Bianchi" index and inflation. Right panel: correlation between the excess structural deficit and inflation. The sample is 21 economies, where the Euro Area is considered as an aggregate. The vertical axis has the change in the headline CPI inflation rate (the average rate for 2020-2023 minus that for 2010-2019) net of the estimated border dummy effect.

equivalence" challenge of distinguishing models using time series methods). Recognizing that inflation was a global phenomenon, Barro and Bianchi (2024) applied the FTPL framework to inflation data from various OECD countries to test its explanatory power for the global inflation spike. Under the assumptions that i) the entire path of government deficits during the pandemic was known from the outset, and ii) output and real interest rates remained unaffected by monetary and fiscal shocks (implying inflation is not driven by changes in real variables, as in a flexible price model), they demonstrated that FTPL predicts a clear positive correlation between a composite government spending variable—excess spending divided by the debt-to-GDP ratio and debt duration—and inflation. They find strong evidence of this correlation in the data, as shown in Figure 10 (left panel).[31] What about the predictions of conventional New Keynesian models like the one I used? These models imply a correlation between exogenous fiscal deficits – shocks – and inflation. To test this, in Figure 10 (right panel), I correlate country-specific excess structural deficits (estimated by the IMF) with observed inflation rates.[32] The data clearly supports the presence of conventional New Keynesian mechanisms as well: countries with larger structural deficits experienced more pronounced inflation spikes.

[31] I used the same data and transformations of Barro and Bianchi (2024), focusing on headline inflation. Like them, I treated the Euro Area as a single economy and included a dummy variable for Hungary and Poland, which were significantly impacted by Russia's invasion of Ukraine due to their proximity to the conflict areas. Unlike them, I do not include Norway in the dummy variable, given its level of energy independence.

[32] Structural (cyclical-adjusted) deficits, calculated by the IMF, estimate the fiscal deficit under current policies if output were at its potential level, filtering out business cycles and automatic stabilizers. Excess structural deficits are the sum of structural deficits from 2020 to 2022 relative to 2019 as the base year. Notably, Barro and Bianchi (2024) conducted a similar exercise but used non-adjusted primary deficits, which can react to non-fiscal shocks and hence may not reflect the true fiscal policy stance of a country.

Taking stock, evidence points to a significant role of fiscal shocks in the recent inflation surge, regardless of whether we interpret monetary and fiscal policy effects through the lens of FTPL or New Keynesian mechanisms. This influence extends beyond the US and Euro Area. It is possible that both mechanisms were at play during this inflation episode, and determining which was more dominant – and where – is an exciting direction for future research (see also Bianchi et al., 2023, Smets and Wouters, 2024).[33]

6 Conclusions

I estimate a VAR with sign restrictions to document the dominant role of fiscal shocks in the post-pandemic US inflation surge. Identification is achieved by exploiting the unique comovement of output, prices, and primary deficits in response to fiscal shocks. Fiscal shocks drove the US inflation rate from 1.5% in early 2020 to 5.3% in 2021, with inflation (measured by the GDP deflator) peaking at 7.7%. In the inflation accounting, fiscal disturbances overshadow supply and other demand shocks, such as monetary policy disturbances. Fiscal inflation (and ”disinflation”) has been a pervasive feature of the US economy over the past fifty years – no chronicle of US inflation can omit the role of fiscal shocks. However, it was never as dominant as in the post-Covid episode. Unprecedentedly large fiscal shocks generated extraordinary fiscal inflation in the last years. I also show that fiscal stimulus was important in the Euro Area, though to a more limited extent and with some delay, which helps explain why inflation in the Euro Area lagged behind that of the US. Overall, my empirical analysis: i) supports the need to put fiscal shocks at the center of the current macroeconomic agenda; ii) highlights the need for a deeper understanding of their effects and transmission channels; iii) calls for macroeconomic analysis of optimal fiscal policy to gain a better understanding of optimal debt management and the role of fiscal and monetary policy after the implementation of massive fiscal packages.

In the second part of the paper, I show that a calibrated version of a state-of-the-art New Keynesian model with monetary and fiscal policy interactions – where Ricardian equivalence fails due to agents' finite planning horizon – can deliver a degree of fiscal inflation similar to that observed in the data, given the size of the empirically estimated shocks. The essential features required for the model to match the data are: i) a relatively steep New-Keynesian Phillips curve, ii) a relatively short planning horizon for the agents, and iii) a relatively weak fiscal adjustment in response to debt accumulation. Considering and estimating a larger-scale

[33] Distinguishing between the two transmission mechanisms is particularly challenging, as New Keynesian models with non-Ricardian households – such as the one I considered – with sufficiently slow fiscal adjustment predict inflation levels comparable to those of the FTPL (Angeletos et al., 2024b).

model incorporating these mechanisms would be valuable to see whether the data supports them, delivering results in line with the empirical evidence. I plan to extend the analysis in this direction in the future.

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7 APPENDIX

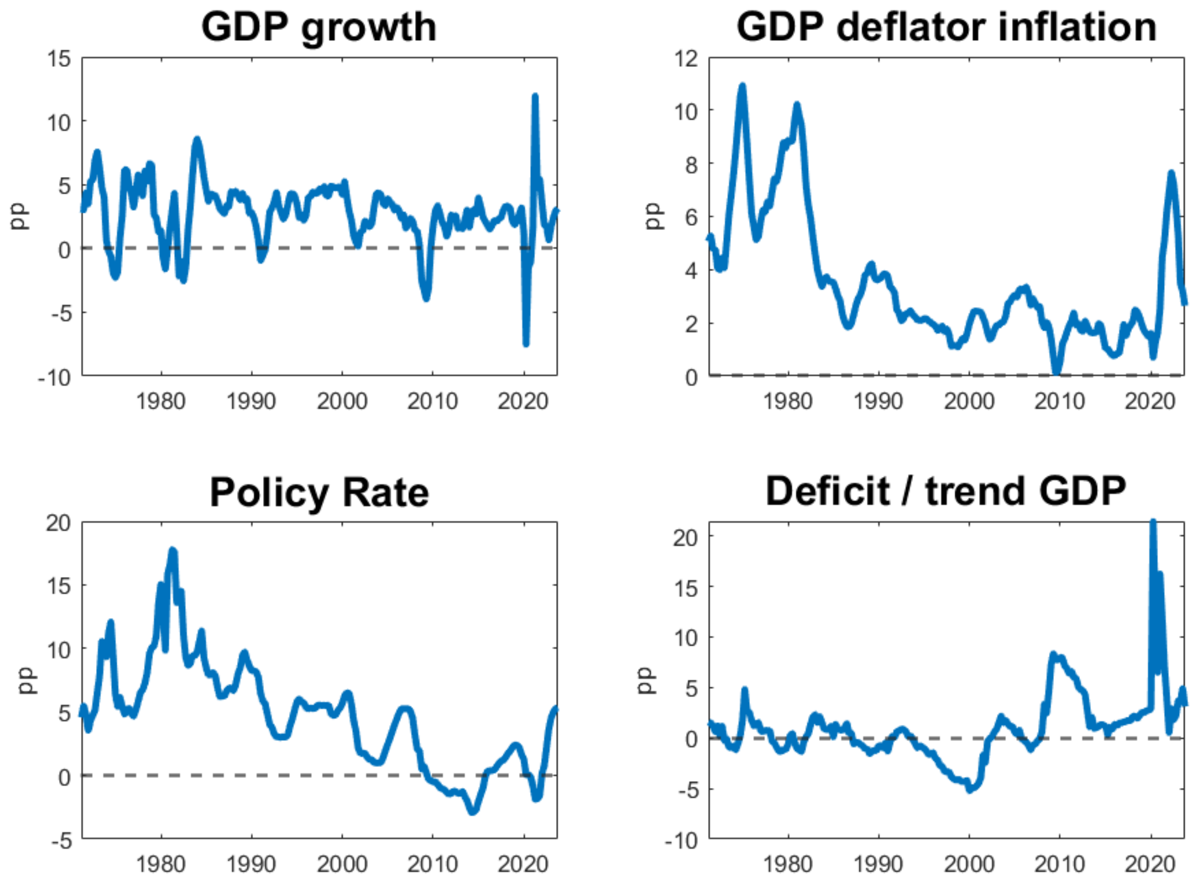

Figure A1: Data used in the baseline VAR (1970:1-2023:IV). Sources. Real GDP growth: Fred (`GDPC1_PC1`); GDP deflator inflation: Fred (`GDPDEF_PC1`); policy rate: Fred (Federal Funds Effective Rate – `FEDFUNDS`), replaced with the shadow rate of Wu and Xia (2016) during the periods 2009:I-2015:IV and 2020:IV-2022:1; primary deficit-to-trend GDP ratio: primary deficit calculated using NIPA Table 3.2. (Federal Government Current Receipts and Expenditures), trend GDP as in Ramey and Zubairy (2018). Following Bianchi and Melosi (2017) (see their Appendix C), government purchases are computed as the sum of consumption expenditure (L24), gross government investment (L44), net purchases of non-produced assets (L46), minus consumption of fixed capital (L47). Transfers are given by the sum of net current transfer payments (L25-L18), subsidies (L35), and net capital transfers (L45-L41) (the series of capital transfer receipts shows an abnormal variation in 2017:IV. The receipts surged from \$23 billion in 2017:III to \$957 billion, which is significantly out of scale compared to historical fluctuations. They then reverted to \$24 billion in 2018:I. Therefore, I imputed the value for 2017:IV as the average of the preceding and following quarters. However, while this affects the evolution of the deficit series, such change does not materially affects the results of the VAR). Tax revenues are given by the difference between current receipts (L40) and current transfer receipts (L18).

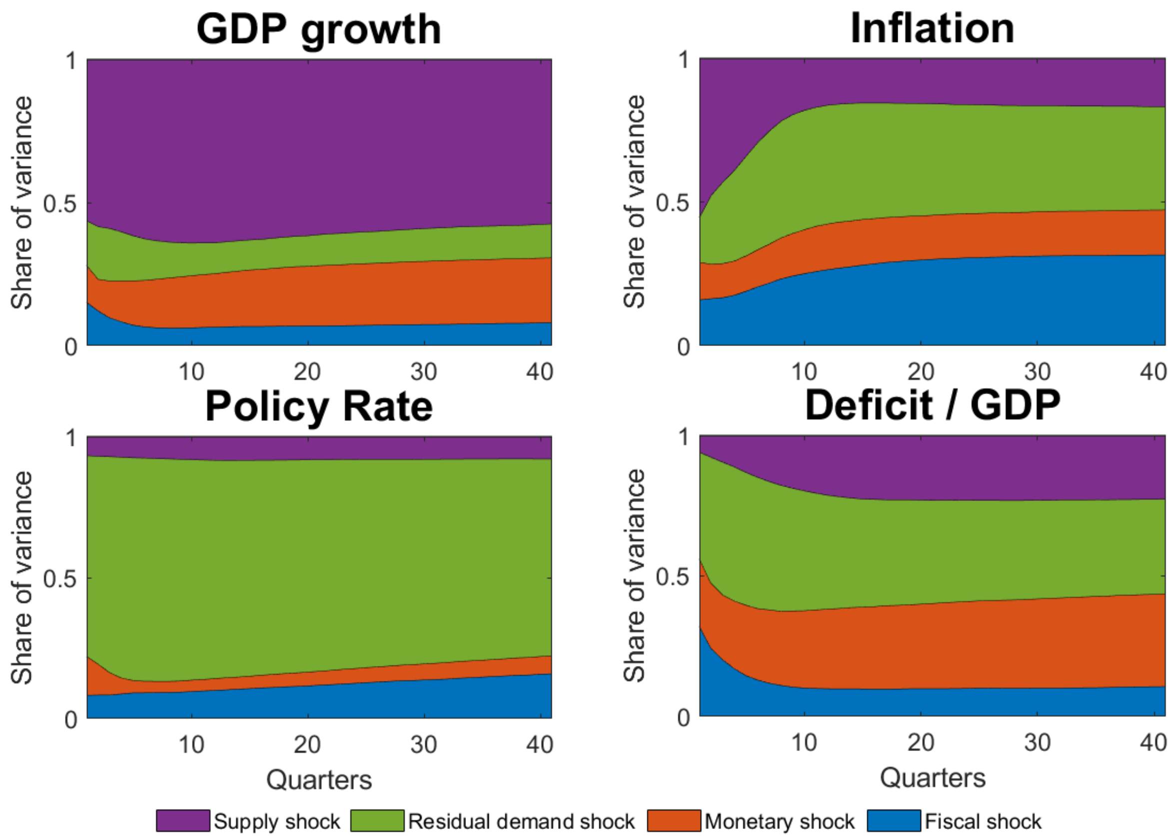

Figure A2: Forecast error variance decomposition (posterior median).

	Baseline Sample Including Covid	
Coefficient	Monetary response to y	Monetary response to π
Median	0.54	1.45
68% Interval	[0.22; 1.04]	[0.64; 3.02]
	Excluding Covid	
Coefficient	Monetary response to y	Monetary response to π
Median	0.53	1.56
68% Interval	[0.20; 1.05]	[0.72; 3.11]

Table A1: Posterior median estimates of selected contemporaneous coefficients in the monetary policy equation under my identification strategy (see also Arias et al., 2019). The 68% posterior probability intervals are reported in brackets.

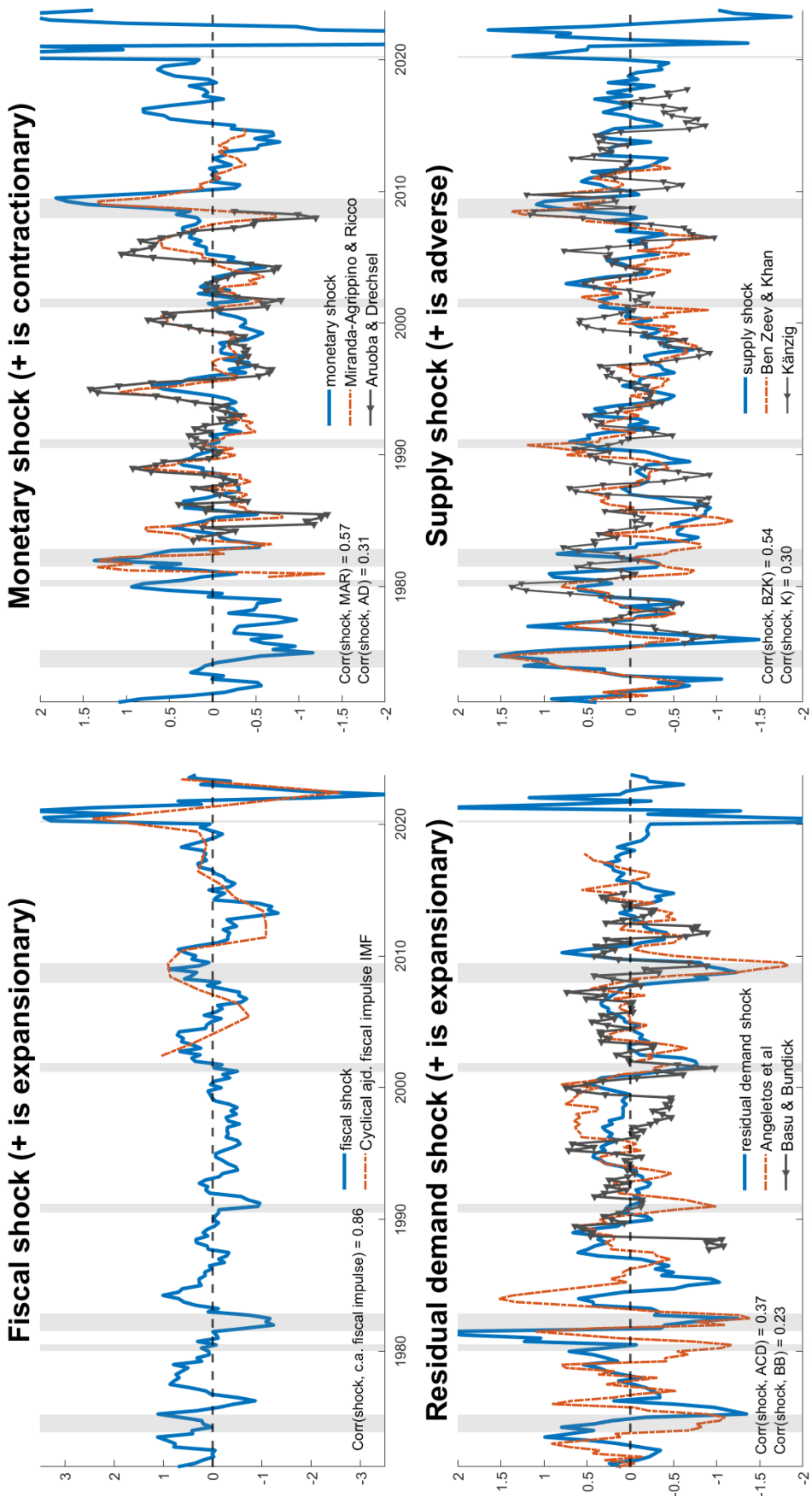

Figure A3: Comparison of the estimated structural shocks with existing disturbances. Fiscal shocks: cyclically adjusted fiscal impulse (IMF Fiscal Monitor – annual change in cyclically adjusted primary deficit). Monetary policy shocks: Miranda-Agrippino and Ricco (2021) and Aruoba and Drechsel (2024). Residual demand shocks: Angeletos et al. (2020) and Basu and Bundick (2017). Supply shocks: Ben Zeev and Khan (2015) and Känzig (2021).

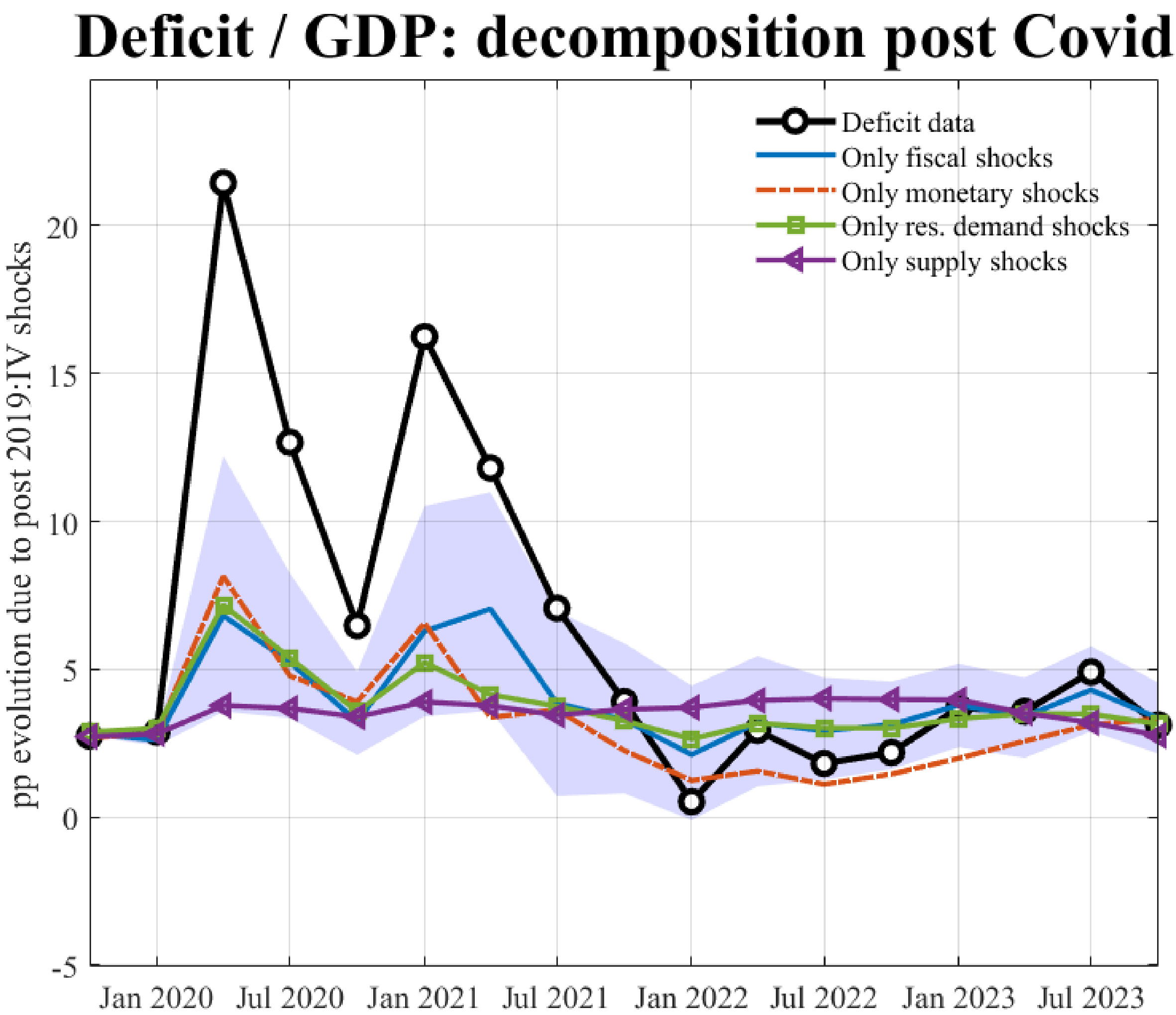

Figure A4: Cumulative contribution of post 2019:IV shocks for US deficit to GDP ratio. I report 68% posterior bands for the contribution of fiscal shocks.

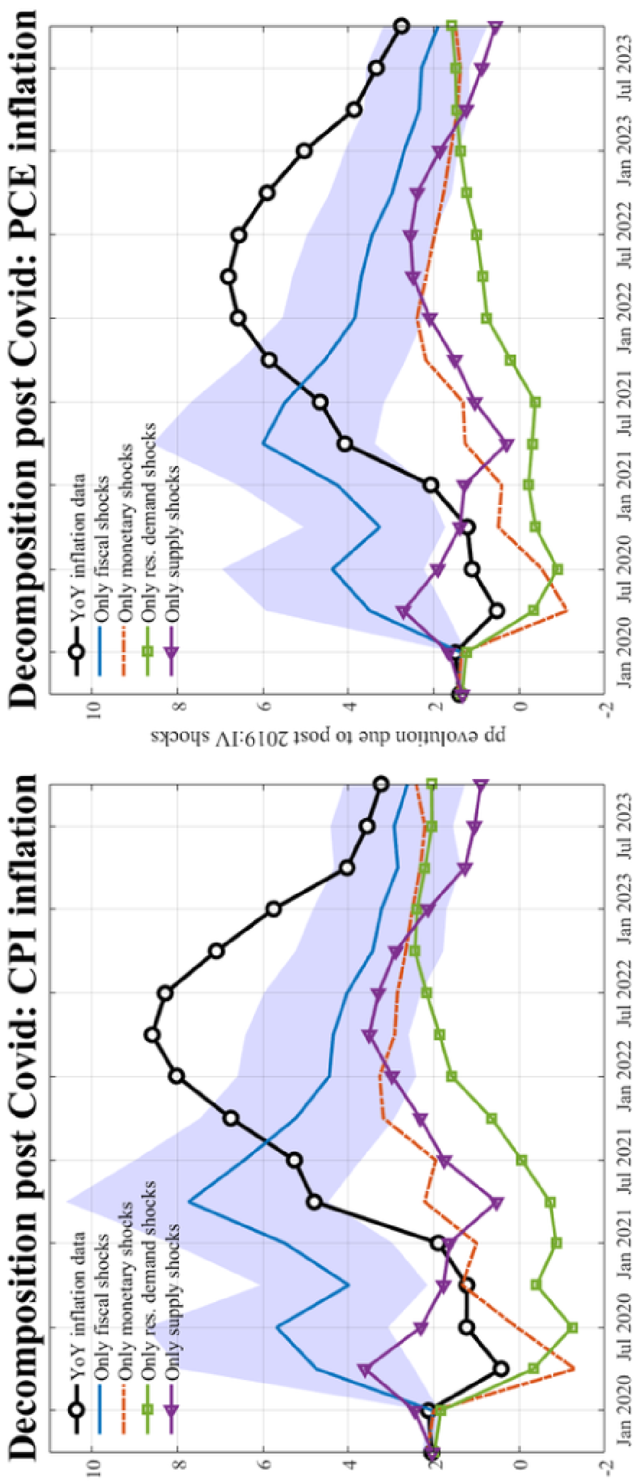

Figure A5: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. Robustness check using CPI and PCE inflation.

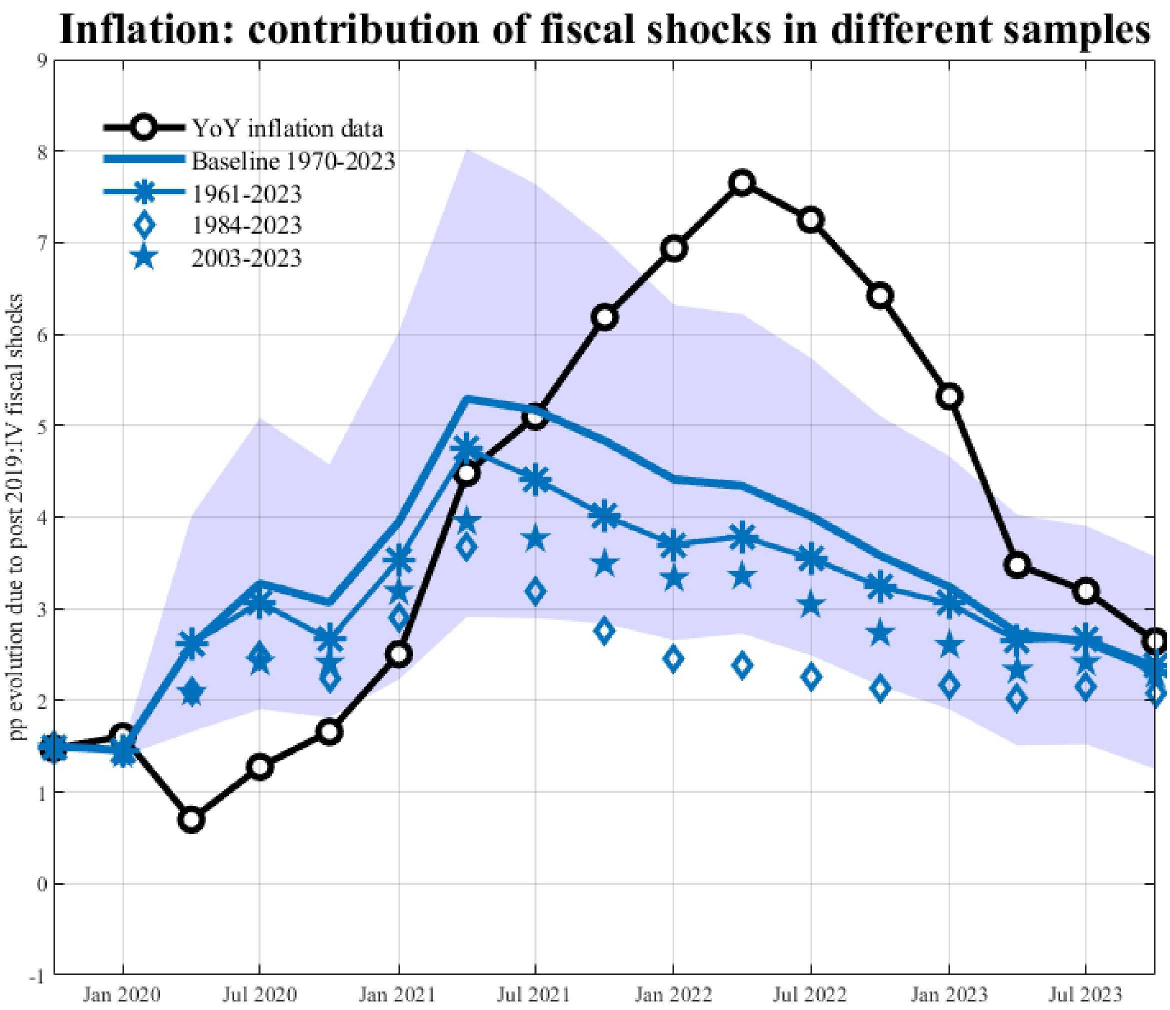

Figure A6: Cumulative contribution of post 2019:IV fiscal shocks. I report 68% posterior bands for the contribution of fiscal shocks. VAR estimated over different samples: i) baseline (1970:1-2023:IV); ii) longer sample (1961:I-2023:IV; which coincide with the period considered by Blinder, 2022); iii) Great Moderation sample (1984:I-2023:IV); iv) a short sample that coincides with the one considered for the Euro Area (2002:I-2023:IV).

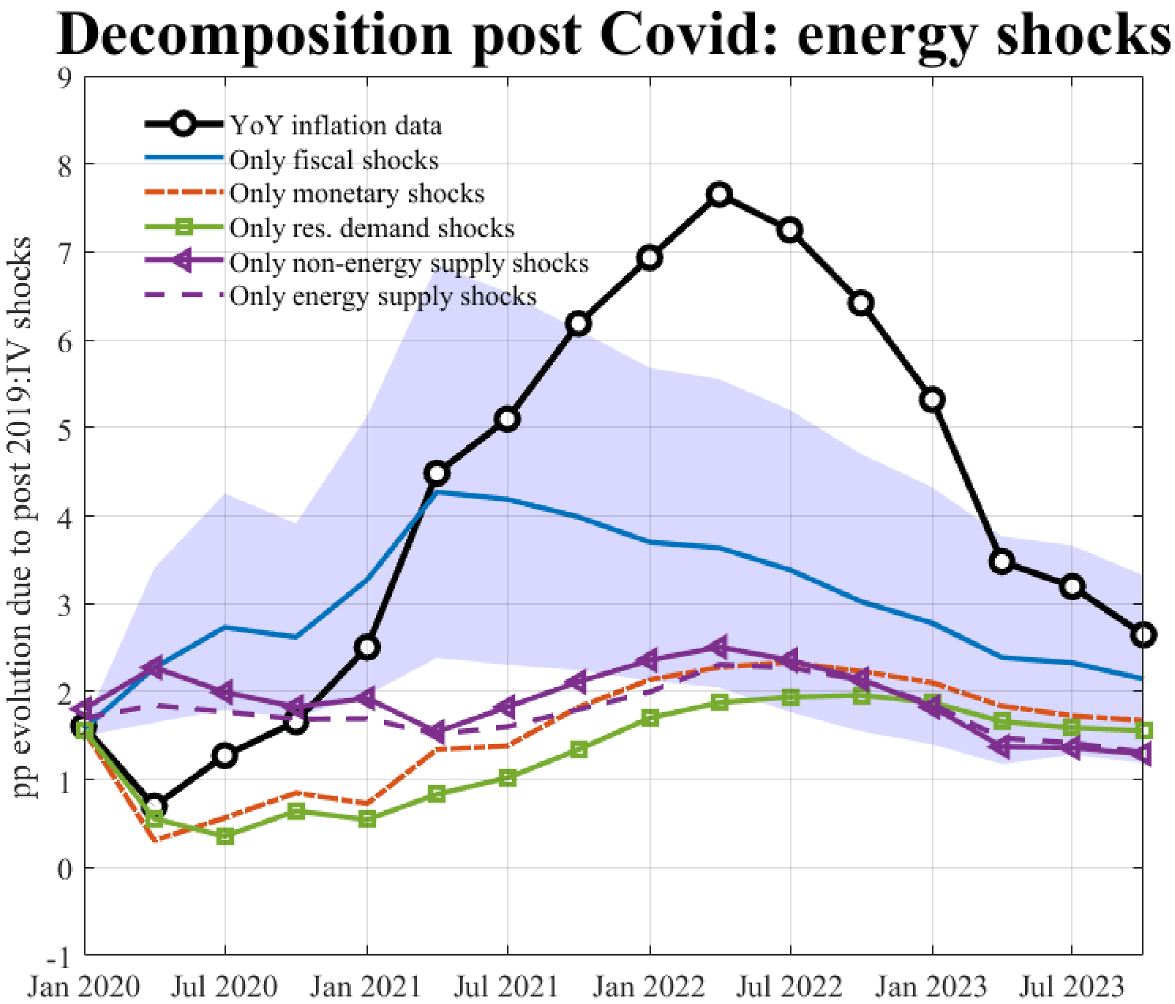

Figure A7: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. The baseline VAR is augmented with energy CPI inflation. Adverse non-energy supply shocks are stagflationary, moving GDP growth and inflation in opposite directions, and have zero impact effect on energy inflation. Adverse energy supply shocks are stagflationary, moving GDP growth and inflation in opposite directions, and have a positive effect on energy inflation too.

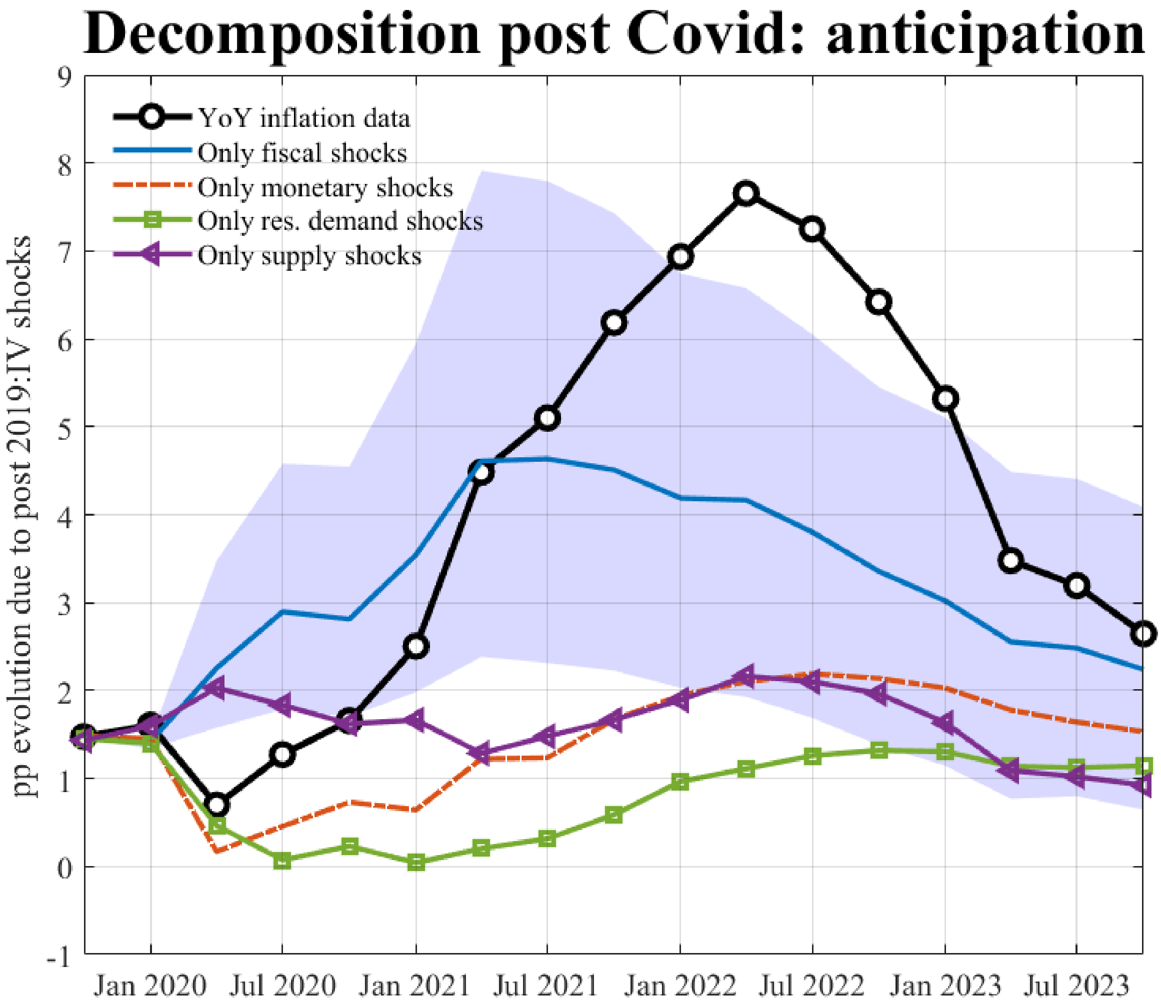

Figure A8: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. Professional forecasters expectation series included in the VAR.

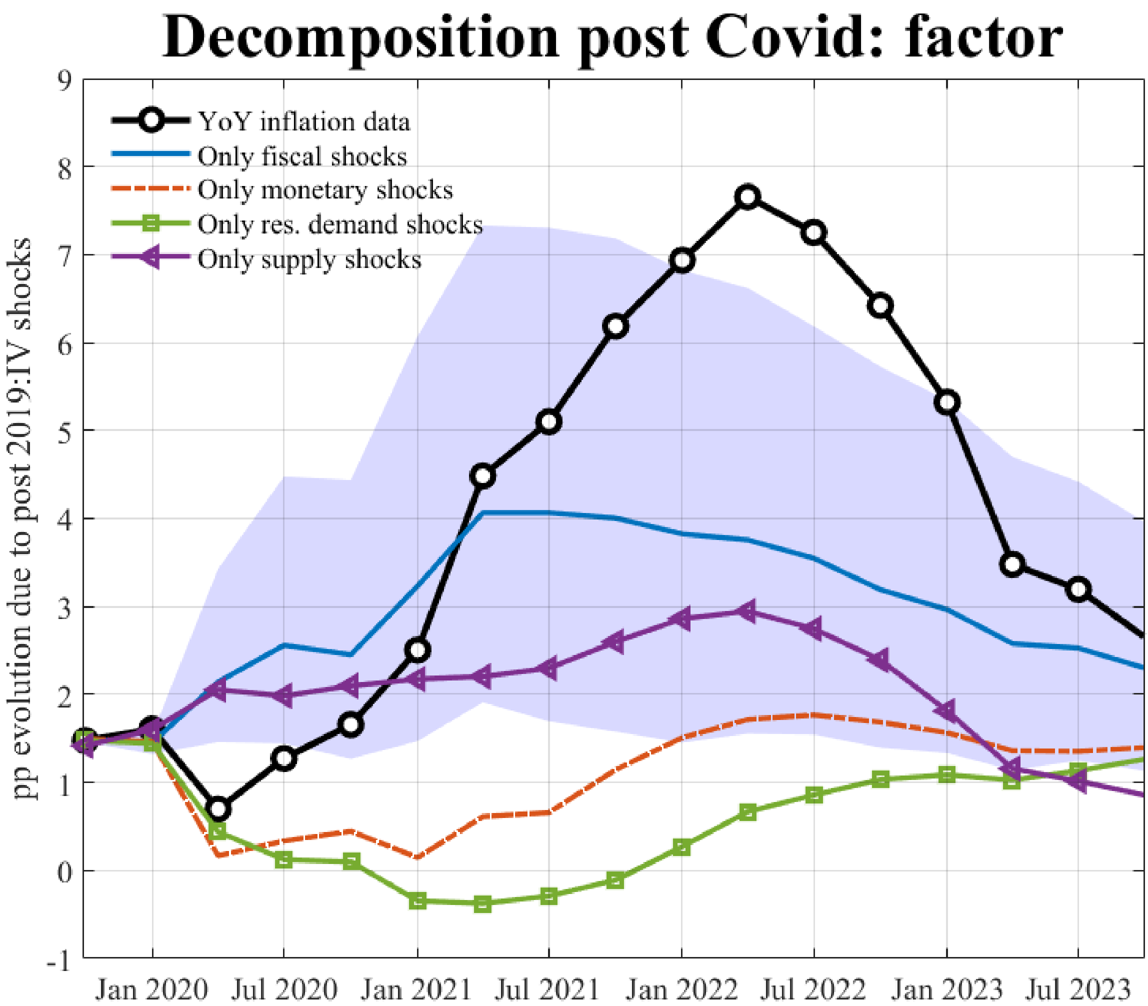

Figure A9: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. First principal component of McCracken and Ng (2020)'s dataset included in the VAR (using the quarterly vintage "2024-08").

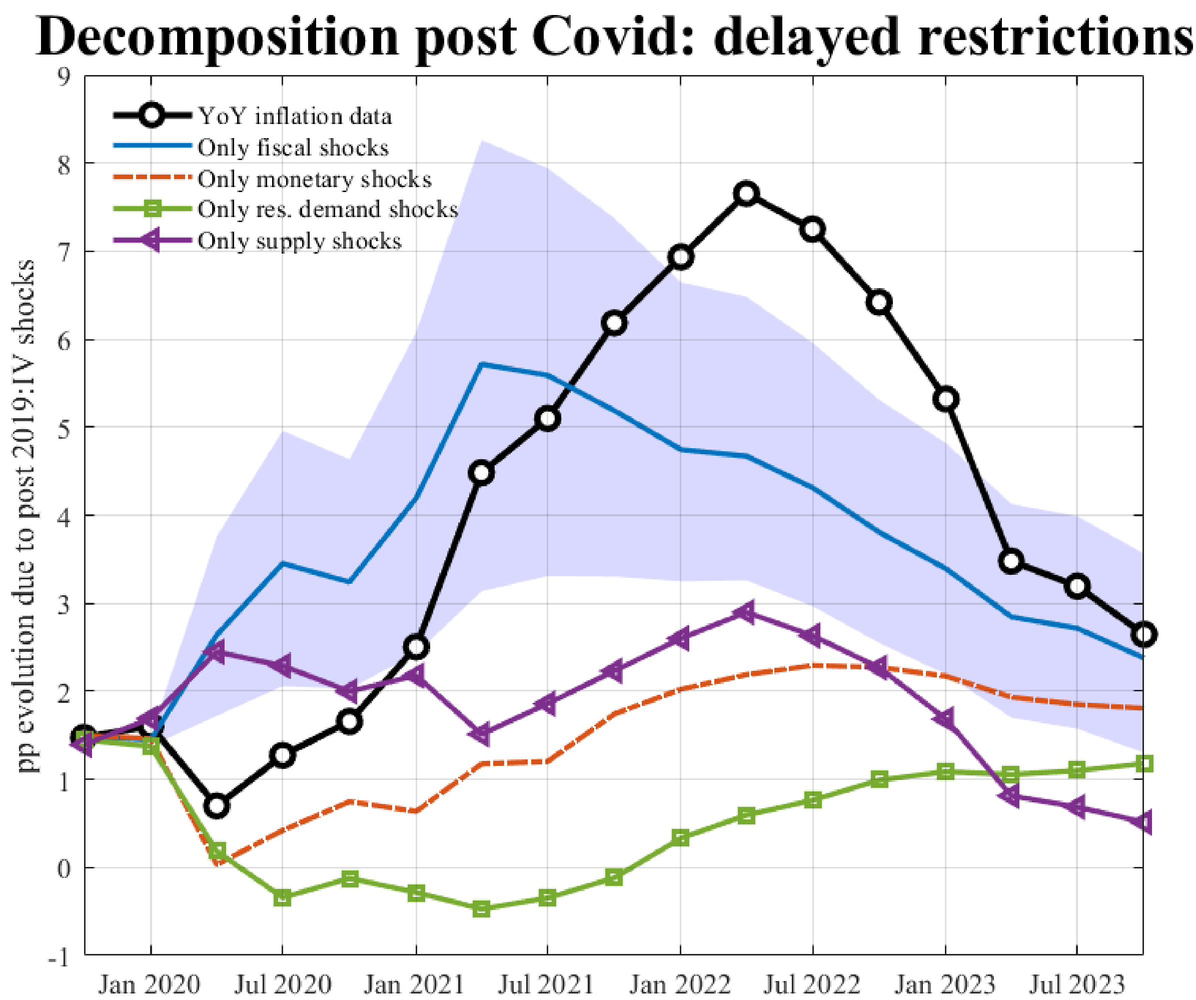

Figure A10: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. Sign restrictions on responses delayed by two quarters.

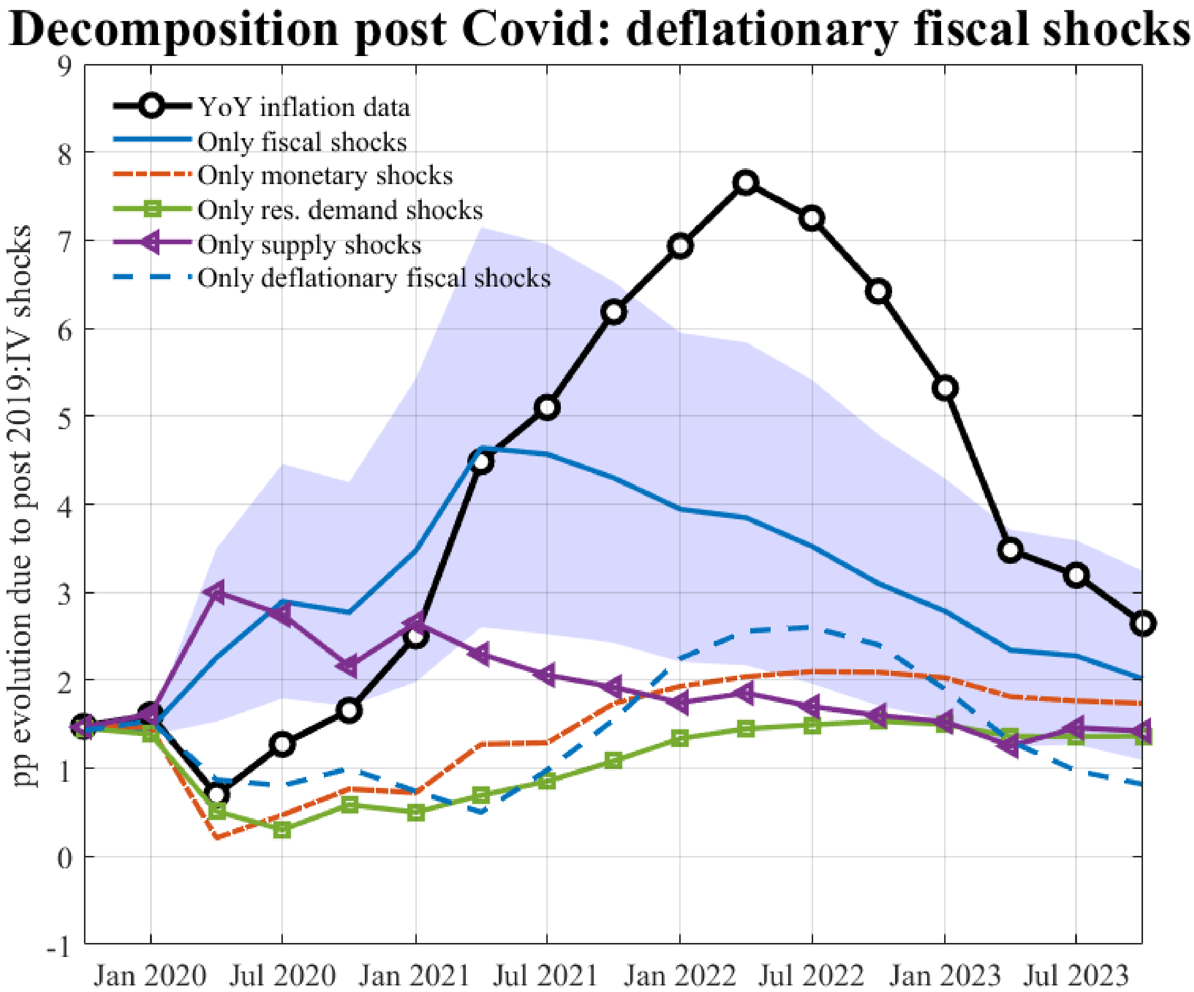

Figure A11: Cumulative contribution of post 2019:IV shocks. I report 68% posterior bands for the contribution of fiscal shocks. Identification of baseline fiscal shocks along with ”deflationary fiscal shocks”. Sign restrictions are described in Table A2.

	Fiscal	Monetary	Residual demand	Supply	Fiscal deflationary
GDP growth	+	+	+	-	+
Inflation	+	+	+	+	-
Policy rate		-	+		
Primary deficit / GDP	+	-	-	+	+
TFP					

Table A2: Restrictions used for each variable (in rows) to identified shocks (in columns). Augmented specification that also identifies "deflationary fiscal shocks." Following Jørgensen and Ravn (2022), I include in the VAR the total factor productivity (TFP) series provided by the Federal Reserve Bank of San Francisco (https://www.frbsf.org/research-and-insights/data-and-indicators/total-factor-productivity-tfp/). To distinguish "deflationary fiscal shocks" from supply shocks, I assume that recessionary non-fiscal supply shocks generate primary imbalances through automatic stabilizers.