The fiscal sources of euro area inflation through the lens of the Bernanke-Blanchard model*

Dennis Bonam†, Mariana Montserrat Cerra Pacheco‡, and Cristina Checherita-Westphal§

July 17, 2025

Abstract

We estimate the contribution of discretionary fiscal policy measures to euro area inflation in the post-pandemic era using an extension of Bernanke and Blanchard (2024b)'s semi-structural model. Since the pandemic, aggregate discretionary measures had a modest yet progressively increasing positive contribution to inflation that partly worked through an indirect effect on wage growth and inflation expectations. However, net indirect taxes helped to contain inflationary pressures, both during the pandemic and energy crises. Fiscal policy, therefore, can be a powerful tool to smooth the inflationary effects of adverse supply shocks, yet may also increase inflation persistence if fiscal stimulus is not timely withdrawn.

JEL Classification: inflation, fiscal policy, semi-structural model

Keywords: C5, E32, E47, E62

*We thank, without implicating, participants of the ECB RCC2 Mini-Workshop on "Fiscal policy, EMU governance and monetary-fiscal interactions" and other internal ECB seminars, as well as participants of the joint IMF-ECB workshop on "Fiscal Policy and Sovereign Debt" for useful comments and suggestions, in particular Jacopo Cimadomo, Ettore Dorrucci, Domenico Giannone, Philip Lane, Carlos Montes-Galdon, Sebastian Schmidt and Leo von Thadden. We are also very grateful to Antoine Kornprobst for providing the updated dataset used in Arce et al. (2024) and to the Eurosystem's Working Group on Public Finance for allowing the use of the discretionary fiscal policy measures data at the country level to construct our proxy at the euro area aggregate. The views expressed are those of the authors and do not necessarily represent the views of the European Central Bank or the Nederlandsche Bank.

†De Nederlandsche Bank, d.a.r.bonam@dnb.nl.

‡European Central Bank, mariana_montserrat.cerra_pacheco@ecb.europa.eu.

§European Central Bank, cristina.checherita-westphal@ecb.europa.eu.

1 Introduction

Numerous studies show that the recent inflationary surge in the euro area has been driven by both supply- and demand-side factors.[1] The former refers, for example, to supply chain disruptions during and after the pandemic and the series of energy and other commodity price shocks following Russia's invasion of Ukraine, while demand shocks may have arisen from the release of pent-up demand after the pandemic and from expansionary fiscal and monetary policy responses to the pandemic and energy crises. A common finding across most studies is that supply shocks accounted for the lion share of the inflation surge, particularly in its initial phase, while the contribution of demand shocks to inflation was more contained yet may have gained in importance over time as economic recovery gradually unfolded.

We provide new evidence on the contribution of discretionary fiscal policy measures to inflation in the euro area, during and after the pandemic. To this end, we use the semi-structural model from Bernanke and Blanchard (2024b), which we augment with a measure that captures discretionary fiscal policy changes as estimated by fiscal experts within the Eurosystem. This series is constructed based on a narrative, country-specific and measure-by-measure approach on the revenue side and by benchmarking the growth of government consumption, government investment and discretionary transfers to nominal potential growth. The Bernanke-Blanchard model was originally built to investigate the drivers of US inflation and consists of four equations describing the dynamics of wage growth, inflation, short-term inflation expectations and long-term inflation expectations. In a joint effort by several central banks, the model has been used to analyze inflation dynamics in the pandemic era in various other economies, including the euro area (see Bernanke and Blanchard, 2024a). In their suggestions for further research and development of the model, the authors mention explicitly the incorporation of fiscal policy, which is the focus of our paper.

As a starting point, we estimate the model over the same sample that was used in the

[1] See, inter alia, Bańbura et al. (2023), Höynck and Rossi (2023), Pallara et al. (2023), Arce et al. (2024), Ascari et al. (2024b), Ascari et al. (2024a), De Santis (2024) and Giannone and Primiceri (2024).

replication exercise of the Bernanke-Blanchard model for the euro area by Arce et al. (2024), i.e. from 1999Q1 to 2023Q2, and using the same dataset. We then augment the Bernanke-Blanchard model by including our series on euro area discretionary fiscal measures in both the wage growth and inflation equations. As such, we allow for the possibility that the discretionary fiscal measures taken by euro area governments have both a direct impact on inflation, e.g. through indirect taxes and subsidies, and an indirect effect through, for example, aggregate demand.

Although our series of fiscal policy changes capture the behavior of discretionary policies, they clearly include an endogenous component that reflects governments' response to the pandemic and energy (and other) crises. The discretionary measures are therefore not fully exogenous, which also applies to many of the other 'shocks' included in the original Bernanke-Blanchard model (such as 'labor market tightness'). Nevertheless, compared to other proxies of discretionary fiscal measures commonly used in empirical studies on the effects of fiscal policy, such as the change in the (cyclically adjusted) primary or overall budget balance, our measure is much less prone to this endogeneity bias, as it does not include the impact of automatic stabilisers and other factors that are largely endogenous (like revenue windfalls/shortfalls or the large support to the financial sector granted during the previous economic and euro area sovereign debt crises). Another advantage of our measure of discretionary fiscal policy changes is its granularity which allows us to consider different types of fiscal policies, which is relevant for our purposes as fiscal policy may impact inflation through both the demand- and supply side of the economy, depending on the fiscal measure being used.

As a baseline, we focus on the contribution to inflation arising from changes in total discretionary fiscal measures, i.e. the sum of all changes in various types of government spending and revenue components. Next, we distinguish between measures that have a more direct impact on inflation, such as indirect taxes and subsidies that have been heavily deployed by governments in their fight against the energy crisis, and the remaining set

of discretionary measures that are likely to affect inflation indirectly through aggregate demand. This latter set of measures includes transfers and wage subsidies that played an instrumental role in the fiscal response to the pandemic crisis, as well as government consumption, government investment, and discretionary measures on direct taxation.[2]

We find that, since the pandemic crisis, the contribution of discretionary fiscal measures to euro area inflation has been modest yet became progressively more positive over time. This contribution of aggregate fiscal measures masks offsetting effects on inflation arising from different types of discretionary measures. In fact, when we distinguish between indirect taxes (net of subsidies) and other discretionary measures, we find that the contribution of the former to inflation has been considerably negative after the pandemic crisis. This result is in line with other model-based studies showing that 'unconventional' fiscal stimulus through cuts in net indirect taxes helped to temporarily lower inflation in the euro area (see Bańkowski et al., 2023, and Angelini et al., 2025). As the energy crisis subsided and these measures were being withdrawn, their direct negative impact on prices faded away or reversed. At the same time, the stimulative effects of these measures on consumption built up slowly over time. In contrast, the impact on inflation of discretionary fiscal measures other than net indirect taxes has been mostly positive since 2020, reaching a peak contribution to inflation of almost 1 p.p. in 2022.

Our estimates further show that discretionary fiscal measures have been a key driver of wage growth, and that wages were an important conduit for the impact of fiscal policy on inflation. Within the Bernanke-Blanchard model, wage growth and inflation are directly linked by, on the one hand, the pass-through of wage growth to inflation and, on the other hand, a 'catch-up' term that captures the possibility of workers revising upwards their wage demands when faced with higher-than-expected inflation. Moreover, to the extent that fiscal measures affect inflation and, in turn, inflation expectations, they also affect wage growth indirectly as wage demands adjust to changes in expected inflation. By affecting firms'

[2] An investigation of the impact of individual fiscal instruments is currently work in progress.

marginal costs, changes in wage growth may then partly pass through to prices, thereby further affecting inflation. Our findings on the importance of discretionary fiscal measures in driving wage growth is consistent with the large-scale support programs implemented by euro area governments during the pandemic in the form of job retention or short-time work schemes, which supported employment and preserved wages. These programs accounted for more than a quarter of the euro area fiscal packages in 2020 and remained in effect in 2021.[3] Apart from the direct effect on wages, these measures – together with other forms of social transfers to households – also contributed to higher private savings, which supported demand when the economy reopened, potentially increasing inflation persistence.

Finally, our results support earlier findings from the literature that commodity price shocks and supply shortages together explain the bulk of the recent inflation surge in the euro area, while demand-side factors, which in the model are captured by changes in labor market tightness and (in our paper also through) discretionary fiscal policy, played a more limited role. In this respect, our findings are consistent with those from Arce et al. (2024) for the euro area, as well as with those from Bernanke and Blanchard (2024b) for the US. Our main contribution, therefore, is to show that, in addition to the relevance of supply-side factors, fiscal policy also played a non-negligible role in shaping inflation dynamics in the euro area. Moreover, we show that distinguishing between different types of fiscal measures is important, as some measures contributed negatively to inflation, while others contributed positively, and that wage growth played an important role in transmitting the indirect effects of fiscal policy on inflation. From that perspective, our results suggest that a well-calibrated set of fiscal policy instruments can smooth the inflationary effects of adverse supply shocks and could therefore complement monetary policy in ensuring price stability.

The rest of the paper is structured as follows. Section 2 presents a brief literature review on related studies focusing on the euro area. In Section 3, we provide an overview of the original Bernanke-Blanchard model and show how we extend the model by including

[3]For more details on job retention schemes specifically and euro area governments' support during the pandemic more generally, see Haroutunian et al. (2021).

discretionary fiscal measures. Section 4 presents the main empirical results, while Section 5 presents several the robustness results.

2 Brief literature review

With respect to fiscal policy, since it typically consists of many different measures that could affect inflation through both the supply- and demand side of the economy, it is not straightforward to assess the extent to which fiscal policy contributed to the recent rise in inflation. Currently, there is very limited empirical evidence on the relative contribution of fiscal policy to inflation dynamics in the euro area, compared to other drivers of inflation. Ascari et al. (2024a) use a Bayesian VAR on euro area data over the period 2002Q1 to 2023Q4 and find that expansionary fiscal policy shocks have been an important driver of inflation during the recent inflationary episode, that the contribution of these shocks increased gradually over time and persisted even during the disinflation period.[4]

Recent model-based investigations of the impact of fiscal policy on inflation in the euro area, compared to a counterfactual of 'no fiscal policy change', point to a substantial degree of fiscal support to the economy, especially during the pandemic crisis.[5] Using proxies for discretionary fiscal policy measures adopted by euro area governments since the pandemic crisis – disaggregated by main fiscal instruments – such analyses find overall some upward effects on inflation from fiscal policy (Bańkowski et al., 2023, and Angelini et al., 2025). So-called 'non-conventional' energy and inflation compensatory fiscal measures adopted in response to the energy crisis, following Russia's invasion of Ukraine, are found to have reduced inflation in 2022, but also increased its persistence due to the eventual reversal of the measures and because the impact of income support measures on inflation only gradually developed over time.

[4]The authors include 6 variables in their BVAR model (real GDP growth, HICP inflation, shadow rate, GSCPI, real Brent oil price, primary budget deficit), identify the shocks using sign restrictions, and apply the Lenza-Primiceri method used to adjust the residual covariance matrix.

[5]This fiscal support also led to higher deficits and government debt levels, which in many countries and at the euro area aggregate, are still above pre-pandemic levels and continue increasing.

Furthermore, several recent papers find evidence of fiscal stimulus shocks having a positive effect, not only on inflation, but also on inflation expectations. This effect is particularly pronounced in times of high public debt or when the monetary policy stance is relatively more expansionary (Cevik and Miryugin, 2025; Eminidou et al., 2023; Checherita-Westphal and Pesso, 2024).

3 Extending the Bernanke-Blanchard model

In this section, we first provide a brief overview of the original model proposed by Bernanke and Blanchard. We then discuss how we extend the model with discretionary fiscal policy measures and the data that we used to estimate the model.

3.1 A brief overview of the original Bernanke-Blanchard model

The original Bernanke-Blanchard model (henceforth referred to as the BB model) is a semi-structural model consisting of four equations which describe the dynamics of four endogenous variables: (1) wage growth, (2) inflation, (3) short-term inflation expectations, and (4) long-term inflation expectations. The model is a reduced-form representation of a more structural model of wage- and price-setting by households and firms that takes into account various interdependencies between the endogenous variables. The equations for wage growth and inflation include product- and labor market shocks that are likely to be relevant drivers of inflation. As we will explain in more detail below, it is in this part of the model where we introduce our series of discretionary measures.

$$\begin{aligned}\pi_{w,t} = c_w + \sum_{k=1}^{4} \rho_{w,k}\pi_{w,t-k} + \sum_{k=1}^{4} \beta_k v u_{t-k} + \sum_{k=1}^{4} \delta_{w,k}\pi^e_{t-k} \\ + \kappa_w A_{t-1} + \sum_{k=1}^{4} \alpha_k cu_{t-k} + \iota_w D_t + u_{w,t}.\end{aligned} \tag{1}$$

The wage growth equation is shown in Equation (1) and relates nominal wage growth, $\pi_{w,t}$, to a measure of labor market tightness, vu_t, short-term inflation expectations, π_t^e, labor productivity, A_t, and a 'catch-up' term, cu_t, that captures the impact of higher-than-expected inflation on workers' wage demands. All these factors are expected to drive wages upward. A tighter labor market prompts firms to raise wages to attract or retain workers. Higher inflation expectations push workers to demand higher wages to maintain their purchasing power. Increased labor productivity raises the marginal product of labor, lifting equilibrium wages. Additionally, when inflation exceeds expected inflation, workers seek compensation for lost real income, with the strength of this catch-up effect depending on workers' bargaining power and the size of the inflation surprise. The variable D_t (in the decompositions later on labelled as "Lockdown") is a dummy that equals 1 in the second and third quarters of 2020 and zero otherwise, and is included to absorb some of the heightened volatility in wage growth observed at the height of the pandemic. The wage growth equation features a rich lag structure, allowing wage growth to depend on past values of itself and of the explanatory variables. Underlying the fact that all explanatory variables enter with a lag is the assumption wages adjust only gradually due to fixed wage contracts. In the long run, nominal wages are assumed to move one-to-one with expected inflation, as workers eventually anticipate inflation accurately, ensuring real wages remain stable. This assumption implies a vertical long-run Phillips curve, i.e. $\sum_{k=1}^{4} \rho_{w,k} + \sum_{k=1}^{4} \delta_{w,k} = 1$.[6]

$$\begin{aligned}\pi_t = c_p &+ \sum_{k=1}^{4} \rho_{p,k}\pi_{t-k} + \sum_{k=0}^{4} \mu_k \pi_{w,t-k} + \sum_{k=0}^{4} \eta_k \pi_{EN,t-k} + \sum_{k=0}^{4} \xi_k \pi_{F,t-k} \\ &+ \sum_{k=0}^{4} \chi_k \text{shortage}_{t-k} + \kappa_p A_t + u_{p,t}.\end{aligned} \tag{2}$$

The inflation equation, shown in Equation (2), relates inflation, π_t, to wage growth, energy and food price inflation (relative to wage growth), $\pi_{EN,t}$ and $\pi_{F,t}$, supply shortages, shortages$_t$, and productivity growth. Higher wages raise firms' marginal costs, prompting

[6] All our results are robust to relaxing the homogeneity constraint that implies the vertical long-run Phillips curve.

price increases to maintain profit margins. However, the extent of this pass-through depends on factors like market competition and firms' ability to absorb costs into their profit margins. Supply shortages, e.g. due to supply chain disruptions or rising shipping costs, may also drive up prices, especially when an economy relies heavily on global supply chains. Energy and food price hikes directly affect the aggregate consumption price level, as energy and food are part of the household's consumption basket. These commodity shocks can also have indirect effects, such as cost-driven price increases by firms or wage demands aimed at preserving purchasing power. To separate the direct from these second-round effects on inflation of commodity price shocks, energy and food prices are deflated by nominal wages. Higher productivity growth, in contrast, reduces marginal costs and therefore is expected to lower prices. Like the wage growth equation, the inflation equation includes lagged values of both dependent and independent variables, and assumes a vertical long-run Phillips curve, i.e. $\sum_{k=1}^{4} \rho_{p,k} + \sum_{k=0}^{4} \mu_k = 1$, ensuring price growth aligns one-to-one with wage growth over time.

$$\pi_t^* = \sum_{k=1}^{4} \rho_{\pi^*,k} \pi_{t-k}^* + \sum_{k=0}^{4} \Gamma_k^* \pi_{t-k} + u_{\pi^*,t}. \tag{3}$$

$$\pi_t^e = \sum_{k=1}^{4} \rho_{\pi^e,k} \pi_{t-k}^e + \sum_{k=0}^{4} \Upsilon_k \pi_{t-k}^* + \sum_{k=0}^{4} \Gamma_k \pi_{t-k} + u_{\pi^e,t}, \tag{4}$$

The equation describing long-term inflation expectations, Equation (3), relates long-term inflation expectations, π_t^*, to their own lags and actual inflation. Equation (3) will help assess how strongly inflation expectations are anchored, which will depend both on the persistence in long-term inflation expectations and their sensitivity to actual inflation. Finally, the dynamics of short-term inflation expectations are described by Equation (4), which relates short-term inflation expectations, π_t^e, to actual inflation and long-term inflation expectations. Equation (4) reflects how agents are likely to predict inflation in the short term based on recent inflation developments, while also anchoring their expectations partly on some long-run value they believe inflation will eventually converge to. The assumption of a long-run

Phillips curve implies that $\sum_{k=1}^{4}\rho_{\pi^e,k}+\sum_{k=1}^{4}\Upsilon_k+\sum_{k=1}^{4}\Gamma_k=1$ and $\sum_{k=1}^{4}\rho_{\pi^*,k}+\sum_{k=0}^{4}\Gamma_k^*=1$.

3.2 Model extension with discretionary fiscal measures

In our effort to extend the BB model, we take a parsimonious, yet theoretically grounded, approach. We keep the size of the system the same at four equations, to maintain the tractability of the original model, and simply add an additional term that captures discretionary fiscal measures to two equations: the wage growth equation and the inflation equation. Specifically, let dm_t denote a series of fiscal discretionary measures. The wage growth and inflation equations in the extended BB model are then given by Equations (5) and (6):

$$\begin{aligned}\pi_{w,t} &= c_w + \sum_{k=1}^{4}\rho_{w,k}\pi_{w,t-k} + \sum_{k=1}^{4}\beta_k v u_{t-k} + \sum_{k=1}^{4}\delta_{w,k}\pi^e_{t-k} \\ &\quad + \kappa_w A_{t-1} + \sum_{k=1}^{4}\alpha_k cu_{t-k} + \iota_w D_t + \sum_{k=1}^{5}\omega_{w,k}dm_{t-k} + u_{w,t},\end{aligned} \tag{5}$$

$$\begin{aligned}\pi_t &= c_p + \sum_{k=1}^{4}\rho_{p,k}\pi_{t-k} + \sum_{k=0}^{4}\mu_k\pi_{w,t-k} + \sum_{k=0}^{4}\eta_k\pi_{EN,t-k} + \sum_{k=0}^{4}\xi_k\pi_{F,t-k} \\ &\quad + \sum_{k=0}^{4}\chi_k \text{shortage}_{t-k} + \kappa_p A_t + \sum_{k=0}^{4}\omega_{p,k}dm_{t-k} + u_{p,t}.\end{aligned} \tag{6}$$

In keeping with the spirit of the original BB model, in which wage growth is affected only by lagged values of the various shocks, we assume that discretionary measures have no contemporaneous effect on wage growth, yet only a lagged effect. Moreover, and in contrast to the BB model, we allow five, instead of four, lags of the discretionary measures to enter the wage growth equation to capture the fact that fiscal policy often faces substantial implementation delays and restrictions that cause its impact on the economy to develop only slowly over time.[7] In the inflation equation, discretionary measures do enter contemporaneously,

[7]While allowing discretionary measures to enter the wage growth inflation contemporaneously does not qualitatively affect our results, using 4 instead of 5 lags does have more material implications. With just 4 lags, the model suggests a weaker contribution to inflation from discretionary fiscal measures, especially when the sample is extended to 2024Q3 as done in one of our robustness exercises. This suggests that not taking proper account of the potentially long lags of fiscal policy transmission may result in a significant

just like the other explanatory variables in that equation, and also enter with 5 lags.[8]

Inclusion of the discretionary fiscal measures in the inflation equation helps to capture the impact on inflation of fiscal measures that have both direct price effects, such as indirect taxes and energy subsidies that reduce the marginal cost of energy consumption, as well as indirect effects that arise through their impact on aggregate demand, such as government consumption and transfers to households. Both these direct and indirect effects may also operate through wage growth, which is why the discretionary measures are included in the wage growth equation. For some fiscal measures, this 'wage channel of fiscal policy' is more evident, for example when the government introduces wage subsidies and job-retention schemes or raises public employment that affect wage growth and inflation more directly. For other fiscal measures, the wage channel may capture the indirect impact of fiscal policy on wage growth through their impact on inflation expectations. For instance, in the event of an increase in energy prices, when governments announce a reduction in the VAT on energy consumption, workers may adjust downwards their expectations on the impact of the energy price shock on consumer price inflation, which may cause them to lower their short-term inflation expectations and, in turn, moderate their wage demands (see e.g. D'Acunto et al., 2018). This dampening effect on wage growth could then also work to partly offset the impact of the energy price shock and dampen price pressures, which further helps to reduce (short- and long-term) inflation expectations and wage growth.

3.3 Data

We use quarterly data for the euro area aggregate that covers the period 1999Q1 to 2023Q2. Our main variable of interest, i.e. the discretionary fiscal policy measures, is a proxy based on estimates from the Eurosystem's Working Group of Public Finance (WGPF).[9] This annual series is constructed based on a narrative, country-specific and measure-by-measure approach

underestimation of the macroeconomic effects of fiscal policy.

[8]Experimenting with alternative lag structures for the inflation equation does not significantly alter our main results.

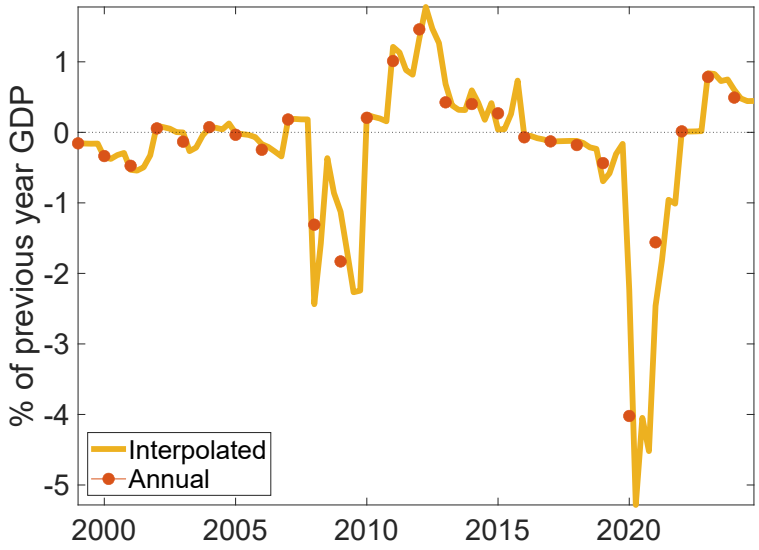
[9]See also Checherita-Westphal and Pesso (2024) for another recent study using this variable.

on the revenue side and by benchmarking the growth rate of three relevant expenditure categories, i.e. government consumption, government investment and discretionary transfers, to nominal potential growth. More specifically, on the revenue side, changes in taxes and social security contributions in each year t are documented measure-by-measure and then aggregated using the ex-ante budgetary costs (i.e. excluding second-round macroeconomic effects) as estimated by WGPF experts. On the expenditure side, the method involves classifying a measure as discretionary fiscal stimulus (consolidation) when the expenditure item in nominal terms at year t is above (below) the level that would have prevailed if the item in t-1 had grown at the same rate as nominal potential GDP. The proxy on fiscal transfers excludes 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 that were granted from 2007 onwards in response to the global financial and euro area sovereign debt crisis. These proxies for discretionary fiscal policy measures are regularly used in the ECB/Eurosystem macroeconomic forecasting and simulation models to evaluate the impact of fiscal assumptions on growth and inflation.[10] The discretionary measures are calculated at the country level and, for the purpose of the present paper, are aggregated at the euro area level.

To estimate the extended BB model with quarterly data, we convert the annual series for the discretionary measures to a quarterly frequency using an interpolation based on the quarterly time profile of the primary budget balance. Specifically, for each year, we calculate the annual sum of the primary balance and the weight of each quarterly observation within that year. We then use these weights to distribute the discretionary measures over the different quarters within the corresponding year. Figure 1 plots the annual and quarterly interpolated total discretionary fiscal measures for the euro area aggregate. The figure shows that the amount of discretionary fiscal loosening during the pandemic crisis has been around

[10]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) and Angelini et al., 2025.

Figure 1: Aggregate discretionary fiscal measures, euro area



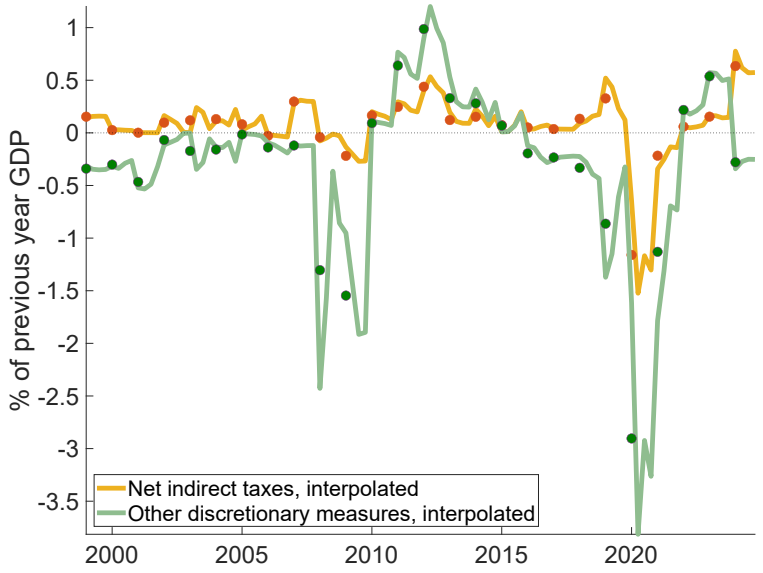
Source: Eurosystem/ECB Database on discretionary fiscal policy measures and own calculations. Negative (positive) numbers denote fiscal stimulus (tightening).

twice as large as that observed during the global financial crisis, reaching an unprecedented peak of 5% of GDP in 2020Q2 and 4% of GDP in 2022. Given its enormous size, this change in the fiscal stance clearly warrants a thorough investigation into how fiscal policy might have affected inflation.

In addition to examining the impact of the overall sum of discretionary measures, we also distinguish between different types of measures. In particular, we isolate from the overall measures those measures that can be labeled as indirect taxes, net of subsidies. Doing so may be important for our purposes, as net indirect taxes are likely to affect prices more directly compared to other discretionary measures. Figure 2 plots the annual and quarterly interpolated series for the net indirect taxes and for the rest of the discretionary measures. The figure shows that, in the past two decades, discretionary changes in net indirect taxes have been much less common than discretionary changes in other fiscal measures yet became more pronounced during the pandemic crisis.

For the remaining variables, we follow closely Arce et al. (2024). Wage growth is measured by the annualized quarter-on-quarter growth rate of negotiated wages. Note that negotiated wages are less likely to be distorted by job retention schemes employed during

Figure 2: Net indirect taxes and other discretionary fiscal measures, euro area



Source: Eurosystem/ECB Database on discretionary fiscal policy measures and own calculations. Negative (positive) numbers denote fiscal stimulus (tightening).

the pandemic crisis than alternative wage measures, such as compensation per employee. Inflation is measured by the annualized quarter-on-quarter growth rate of the harmonized consumer price index (HICP). Data on short- and long-term inflation expectations are taken from Consensus Economics and the Survey of Professional Forecasters and measured by, respectively, the 1-year and 6-to-10-year ahead inflation forecasts. Labor market tightness is measured by the vacancy-to-unemployment ratio (backcasted using the European Commission's labor shortage indicator), which is likely to be a better gauge of labor demand pressures than the (more commonly used) unemployment rate, especially in times of large sectoral shifts and when matching efficiency within the labor market deteriorates. Energy and food price inflation are measured by the energy and food price components of the HICP and are deflated by the nominal wage to separate the direct effects from the second-round effects of commodity price shocks. Productivity growth is calculated as the eight-quarter moving average of gross value added per hour worked. Supply shortages are captured by the Global Supply Chain Pressure Index constructed by the Federal Reserve Bank of New York. Finally, the catch-up term is defined as the difference between average inflation over the past

Table 1: Description and sources of data

Variable	Description	Source
π_w	Negotiated wages, annualized q-o-q growth rate	ECB
π	HICP, annualized q-o-q growth rate	ECB
π^e	1-year ahead inflation forecast	CE
π^*	5-year ahead inflation forecast	SPF
vu	Vacancy-to-unemployment ratio, z-score	ECB
cu	Surprise inflation, $\frac{1}{4}\sum_{k=1}^{4}\pi_{t-k} - \pi^e_{t-k}$	Own calculations
A	GVA-to-employment ratio, 8-quarter MA of quarterly change	ECB
π_{EN}	HICP energy	ECB
π_F	HICP food (including alcohol and tobacco)	ECB
shortage	Global Supply Chain Pressure Index, z-score	NYF
dm	Discretionary fiscal measures, % of GDP from previous year	ECB

Notes: ECB = European Central Bank; CE = Consensus Economics; SPF = Survey of Professional Forecasters; NYF = Federal Reserve Bank of New York.

four quarters and short-term inflation expectations from the previous year. A summary of the data and their sources is provided in Table 1.

4 Results

4.1 Estimation results

As a starting point, we use the same sample, i.e. from 1999Q1 to 2023Q2, that was used by Arce et al. (2024), who estimated the original BB model on euro area aggregate data. Such a comparison helps to better identify the added value of extending the model with discretionary fiscal measures. Tables 2 and 3 report the estimated coefficients of both the original and extended BB model for, respectively, the wage growth and inflation equation.[11]

We find that overall discretionary fiscal policy measures (labeled as DM) have a negative and statistically significant impact on both wage growth and inflation. The size of this overall impact seems relatively modest: an increase by 1 percentage point of GDP in discretionary measures (which constitutes a fiscal tightening) reduces wage growth by 0.16 p.p. and inflation by 0.01 p.p. When disaggregating the discretionary measures, we find a much

[11]The coefficient estimates for the short- and long-term inflation expectations equations are reported in Tables 4 and 5 the Appendix.

stronger (and more significant) impact from both net indirect taxes (NIT) and the rest of the discretionary measures (RESTDM) on wage growth and inflation. Extending the BB model with discretionary measures helps to improve the fit of the wage growth equation, especially when using the disaggregated measures, as evidenced by the higher adjusted R^2. For inflation, however, the disaggregation of discretionary measures results in the coefficients on both subgroups to become insignificant. Moreover, adding discretionary measures does little to improve the model fit of the inflation equation (which is not too surprising, given that the adjusted R^2 for the baseline BB model already stands very high at 0.96). Note, however, that wage growth has a substantial and significant effect on inflation in all three model specifications. Therefore, it seems that, in the euro area and over the sample period that we consider, discretionary fiscal measures affected inflation directly, but also indirectly through its effect on wages.

With regards the other driving forces of wage growth and inflation, we find very similar results as in Arce et al. (2024). For the wage growth equation, we find a flat Phillips curve, a significant impact arising from short-term inflation expectations and a negligible role for surprise inflation and labor productivity growth. For the inflation equation, we find a significant relationship with commodity prices, a significant role for supply shortages and an insignificant contribution from productivity growth. Hence, augmenting the BB model with our series of discretionary fiscal measures does not seem to change the overall conclusions from earlier studies that point to the importance of supply-side factors in driving inflation dynamics in the euro area. At the same time, it reveals how fiscal policy has been an important driver as well and suggests that wage growth is likely to have been an important conduit through which fiscal policy impacts inflation. To quantify the contribution of discretionary measures to inflation while taking into account these, and other, interdependencies between the endogenous variables, we now turn to the model-implied historical shock decompositions and impulse response functions.

Table 2: Wage growth equation, 1999Q1-2023Q2

		Dependent variable: wage growth							
		L. Wage growth	Labor market tightness	Catch-up variable	Short-term inflation exp.	Prod. growth	DM	NIT	REST DM
Baseline without DM	Sum of coefficients	0.309	0.873	0.066	0.691	0.075			
	p(sum)	0.126	0.566	0.595	0.001	0.288			
	p(joint)	0.285	0.147	0.003	0.000	0.288			
	Adjusted R^2	0.651							
With overall DM	Sum of coefficients	0.187	0.285	0.007	0.813	0.096	-0.158		
	p(sum)	0.360	0.862	0.958	0.000	0.173	0.090		
	p(joint)	0.194	0.070	0.001	0.000	0.173	0.002		
	Adjusted R^2	0.716							
With disaggregated DM	Sum of coefficients	0.180	-0.164	0.041	0.820	-0.227		0.017	-0.227
	p(sum)	0.429	0.923	0.752	0.001	0.253		0.970	0.242
	p(joint)	0.195	0.152	0.001	0.000	0.253		0.367	0.001
	Adjusted R^2	0.728							
	Obs.	89							

Notes: DM = discretionary measures; NIT = net indirect taxes; RESTDM = discretionary measures minus net indirect taxes. p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 3: Inflation equation, 1999Q1-2023Q2

	Dependent variable: inflation									
		L. Inflation	Wage growth	Energy price	Food price	Shortage	Prod. growth	DM	NIT	REST DM
Baseline without DM	Sum of coefficients	0.687	0.313	0.038	0.013	0.216	0.073			
	p(sum)	0.000	0.060	0.040	0.872	0.034	0.213			
	p(joint)	0.001	0.115	0.000	0.000	0.050	0.213			
	Adjusted R^2	0.964								
With overall DM	Sum of coefficients	0.386	0.614	0.049	0.153	0.164	-0.011	-0.010		
	p(sum)	0.078	0.006	0.011	0.116	0.163	0.873	0.905		
	p(joint)	0.158	0.011	0.000	0.000	0.044	0.873	0.034		
	Adjusted R^2	0.968								
With disaggregated DM	Sum of coefficients	0.387	0.613	0.048	0.153	0.187	-0.011		0.186	-0.006
	p(sum)	0.111	0.013	0.025	0.143	0.133	0.881		0.550	0.966
	p(joint)	0.250	0.031	0.000	0.000	0.088	0.881		0.707	0.246
	Adjusted R^2	0.965								
	Obs.	90								

Notes: DM = discretionary measures; NIT = net indirect taxes; RESTDM = discretionary measures minus net indirect taxes. p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

4.2 Model-based simulations

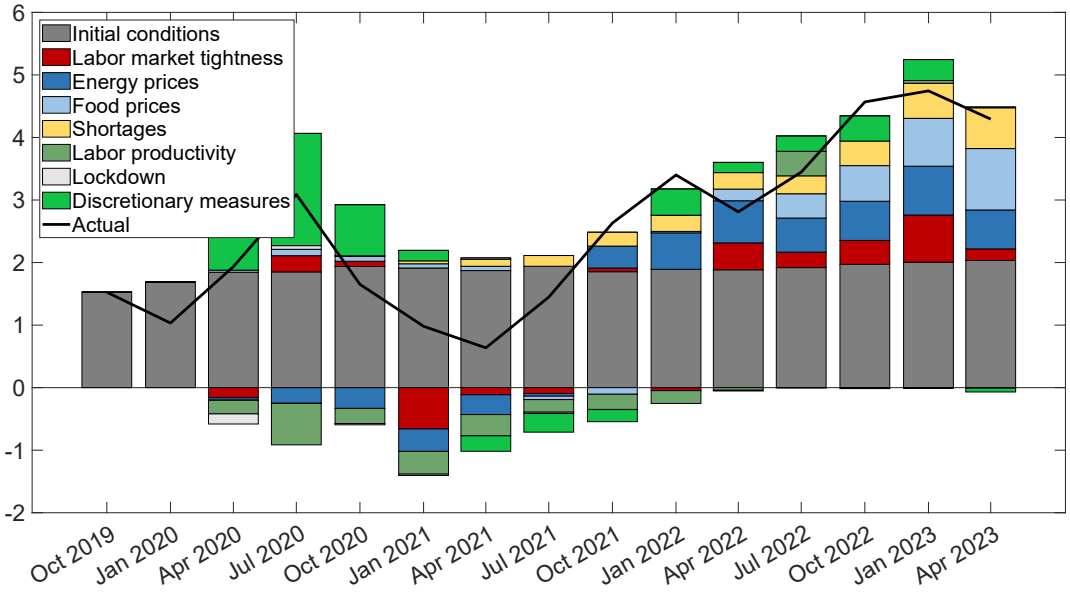
Figures 3 through 6 show the decompositions of the endogenous variables of the extended BB model into the various sources over the post-pandemic period.[12] These decompositions take into account the full dynamic and general equilibrium effects inherent in the model. For example, changes in discretionary measures may impact inflation indirectly through their effect on wage growth. As realized inflation partly affects inflation expectations, discretionary measures may then have a further knock-on effect on wages as these are also influenced by changes in inflation expectations.

Figure 3 shows that discretionary measures have been a particularly important driver of wage growth in the midst of the pandemic (green bars). This is not surprising, given the wide use of wage subsidies, and job retention schemes more generally, that supported wage growth during that time, even as labor market conditions deteriorated. As the economy recovered from the pandemic and fiscal support was gradually being rolled back, improved labor market conditions became a relatively more important driver of wage growth dynamics in the euro area (red bars). Note that, during the energy crisis, relative energy and food prices were putting substantial upward pressure on wages.

Discretionary fiscal measures also played a non-trivial role in driving inflation dynamics, see Figure 4. In the years following the pandemic, the contribution of discretionary measures became progressively more positive, with an average contribution to inflation of around 0.4 p.p. in 2021 and almost 1 p.p. in 2022. Thereafter, the fiscal contribution to inflation declined to an average of 0.3 p.p. in 2023. This time profile is consistent with the hump-shaped response of economic aggregates to fiscal shocks, as shown by **?** among others, and closely resembles the dynamic contribution of fiscal shocks to euro area inflation in recent years shown by Ascari et al. (2024a). As discussed earlier, the impact of fiscal policy on

[12] For comparison purposes, we plot the decompositions of all endogenous variables for the original BB model without discretionary measures in Figures 13 to 16 in the Appendix.

Figure 3: Sources of euro area wage growth



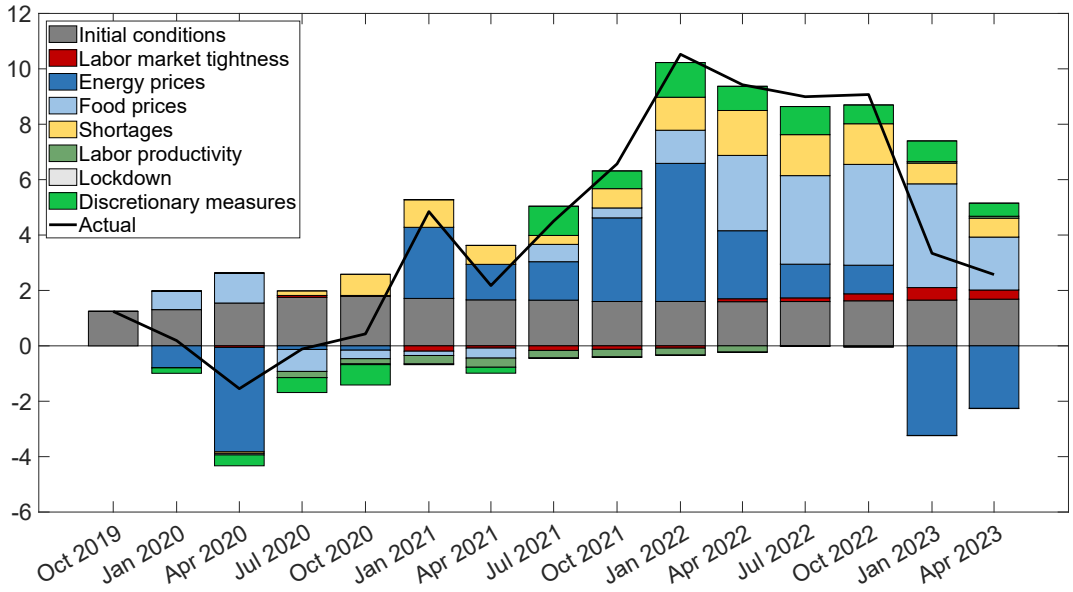
Notes: The figure shows a decomposition of the sources of wage growth, based on the solution of the extended BB model. Bars show the contributions of the various shocks in each quarter. Effects of equation residuals are omitted. The grey bars (initial conditions) show predicted values in the absence of shocks from 2020Q1 onward.

inflation is likely to have been amplified by the wage channel, which works through the interaction between wage growth, realized inflation and inflation expectations as implied by the model. Indeed, Figure 5 shows a notable contribution from discretionary fiscal measures on short-term inflation expectations in the years following the pandemic. However, as shown by Figure 6, long-term inflation expectations have remained remarkably stable, even as realized inflation reached historically high levels. The limited role of both discretionary measures and the other shocks in driving long-term inflation expectations confirms the strong anchoring of inflation expectations in the euro area.

Our results show that, overall, discretionary fiscal policy measures have been an important driver of euro area inflation. However, they do not overturn the conclusions from the results of the original BB model that commodity prices have been the dominant source of the recent inflation surge and that demand-side factors played a smaller, yet increasingly more important, role.

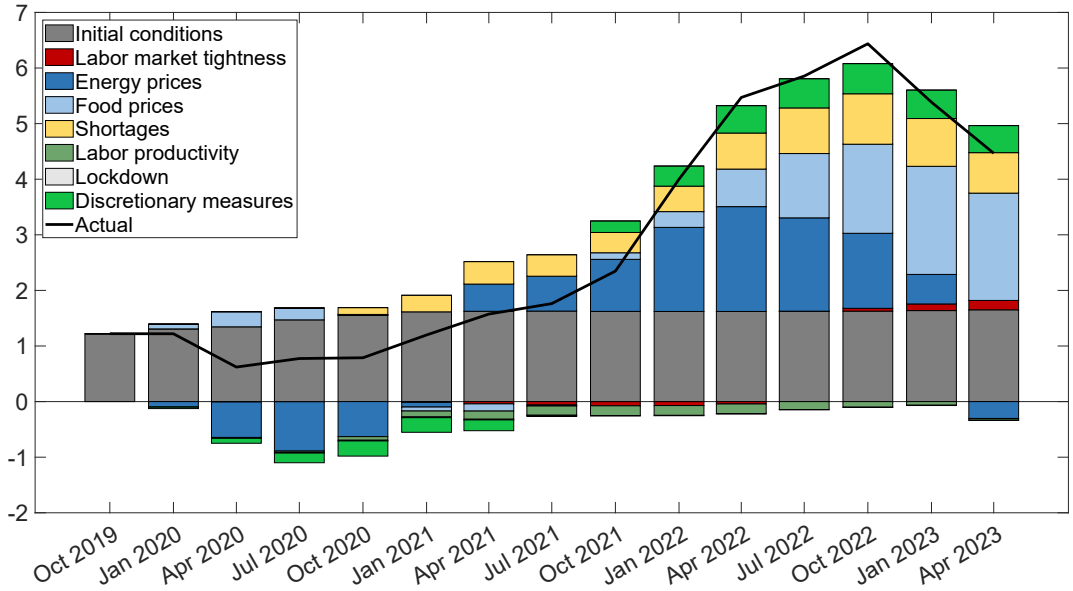
Figures 7 and 8 show the decomposition of euro area wage growth and inflation, respectively, as implied by the BB model featuring disaggregated discretionary fiscal measures (to

Figure 4: Sources of euro area inflation



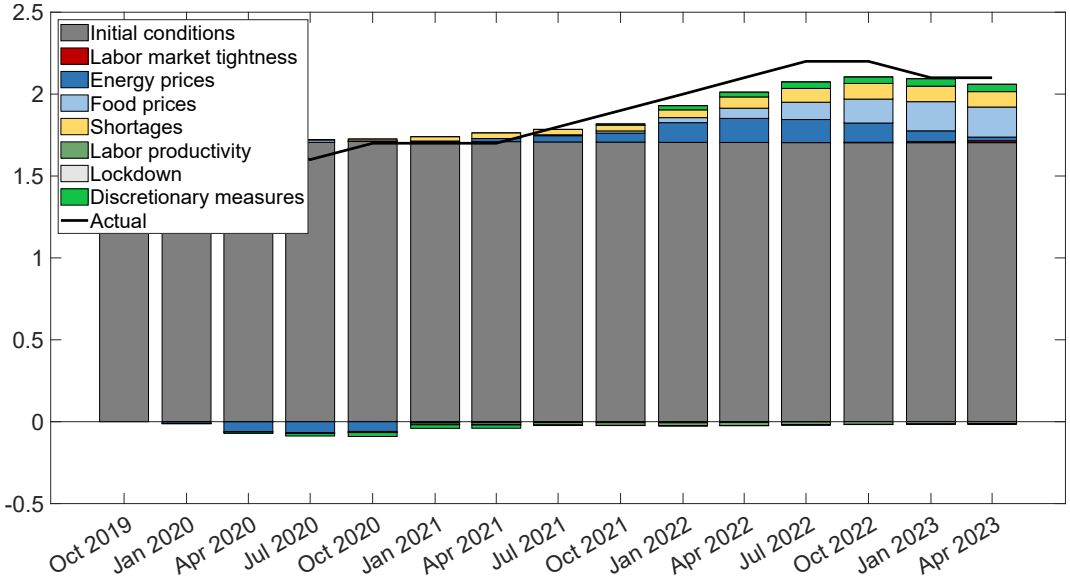
Notes: See notes under Figure 3.

Figure 5: Sources of euro area short-term inflation expectations



Notes: See notes under Figure 3.

Figure 6: Sources of euro area long-term inflation expectations

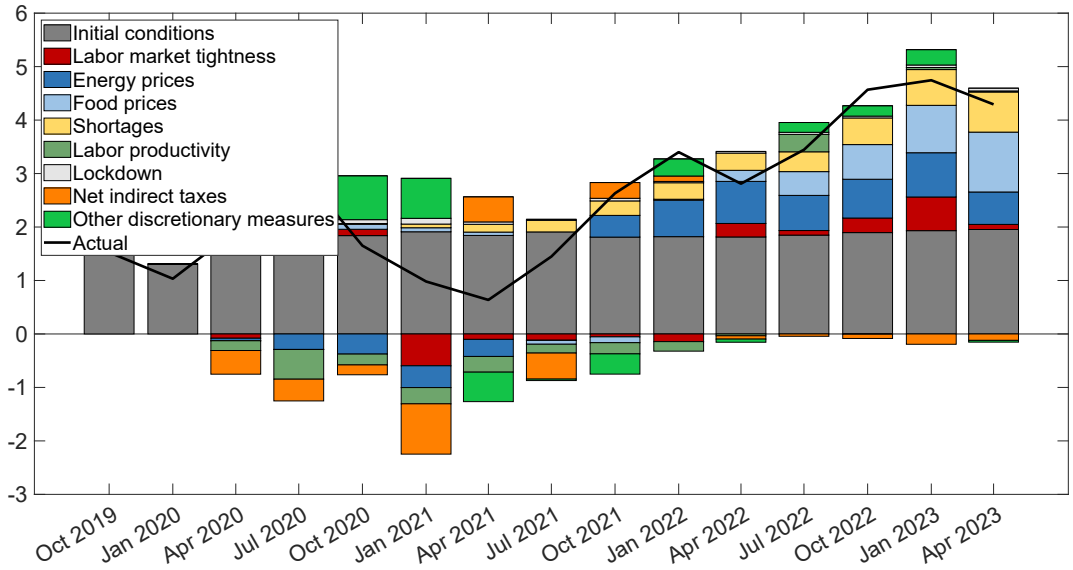


Notes: See notes under Figure 3.

preserve space, we relegate the corresponding decompositions for the other two endogenous variables to Figures 17 and 18 in the Appendix). Compared to Figures 3 and 4, these figures paint a more nuanced picture on the inflationary consequences of fiscal policy, showing that net indirect taxes contributed negatively to both wage growth and inflation in the post-pandemic years (orange bars), thereby offsetting partly the positive contributions arising from other discretionary measures during that time (green bars). These results imply that, while fiscal policy exerted an overall positive effect on inflation, some measures that impacted prices more directly, such as changes in VAT, also helped smooth out and contain the inflation profile over time, most notably by containing wage growth. Seen from that perspective, fiscal policy, when calibrated correctly, can be a powerful complement to monetary policy in the pursuit for macroeconomic stability when the economy faces large adverse supply shocks, as a myriad of different types of discretionary fiscal measures can be deployed to address different kinds of macroeconomic challenges.

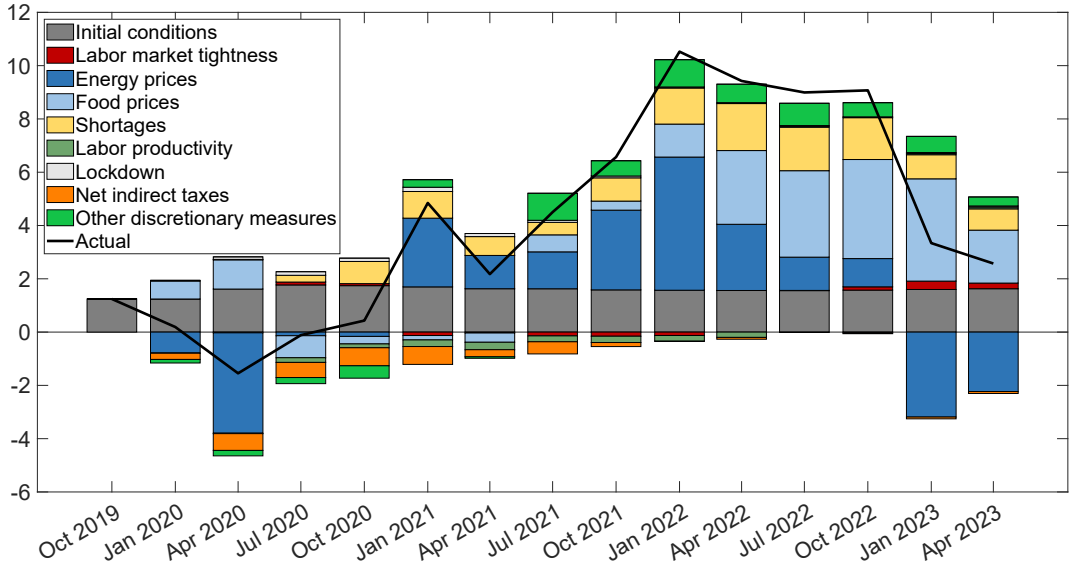
The distinct nature of the inflationary impact of net indirect taxes compared to that of other discretionary measures is made even more clear when examining the model implied impulse response functions to a shock to these two types of discretionary measures. Specif-

Figure 7: Sources of wage growth and disaggregated discretionary measures



Notes: See notes under Figure 7.

Figure 8: Sources of inflation and disaggregated discretionary measures



Notes: See notes under Figure 7.

ically, we set all (endogenous and exogenous) variables to zero and assume a stationary AR(1) process for the discretionary measures, while assuming, for illustrative purposes, an autocorrelation coefficient of 0.9. We then simulate the full model dynamic responses of the endogenous variables to a negative (i.e. fiscal easing) shock to the discretionary measures of 1% of GDP, while maintaining the other exogenous variables constant at zero. These responses are plotted in Figure 9.[13]

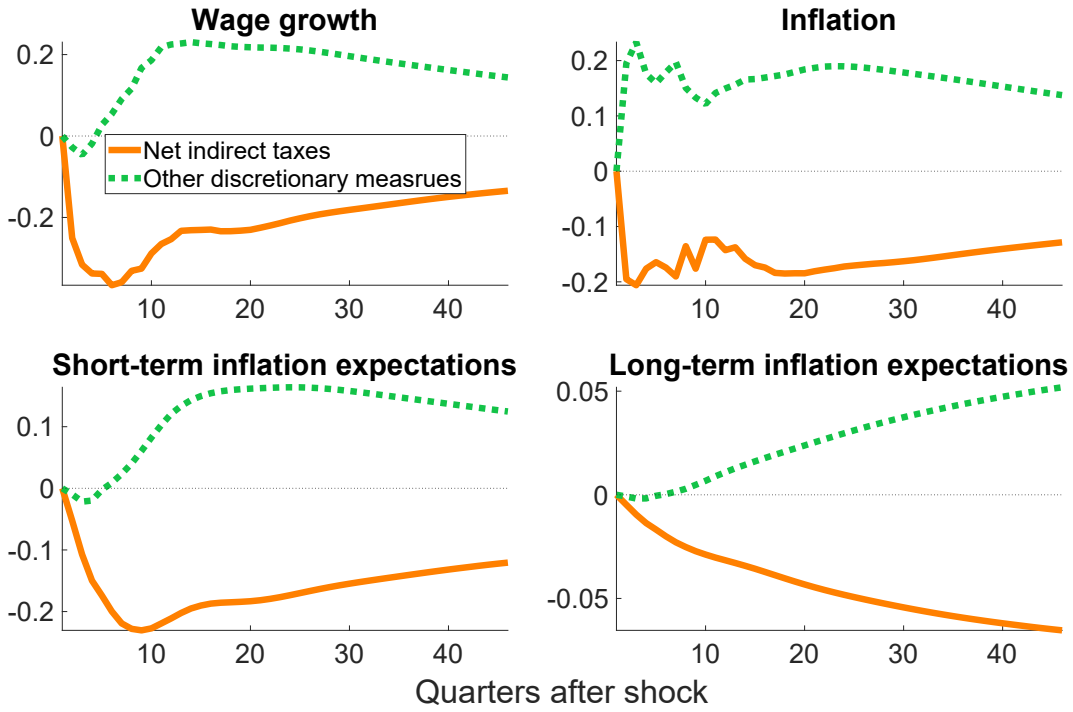
Inflation responds immediately to the fiscal expansion, falling abruptly after a cut in net indirect taxes, while rising following an expansion in discretionary measures other than net indirect taxes. The change in inflation has a delayed effect on short-term inflation expectations, which in turn affect wage growth, both directly and indirectly via changes in surprise inflation and the catch-up effect. The strong similarity in the time profiles of short-term inflation expectations and wage growth suggests that the former is a key driver of the latter. Therefore, this result offers a key new insight into the wage channel of fiscal policy: fiscal shocks not only drive wage growth through their effect on labor market conditions, but also by affecting short-term inflation expectations. The fiscal-induced change in wage growth then further pushes inflation up or down, depending on the nature of the fiscal shock, which amplifies the overall impact of discretionary measures on inflation. The stronger is the pass-through from wage growth to inflation, the greater will be this amplification effect. While long-term inflation expectations respond in tandem with the other endogenous variables to both fiscal shocks, their strong degree of anchoring prevents them from deviating much from their steady-state level.

5 Robustness and areas for future work

In this section, we briefly discuss the results from several robustness exercises. The first and most straightforward exercise is to extend the dataset up to 2024Q3, the latest quarter for which all data is available at the time of writing. Figure 10 shows the shock decomposition

[13]For completeness, we also show the responses to the other shocks in Figure 19 in the Appendix.

Figure 9: Responses to a negative shock to discretionary measures

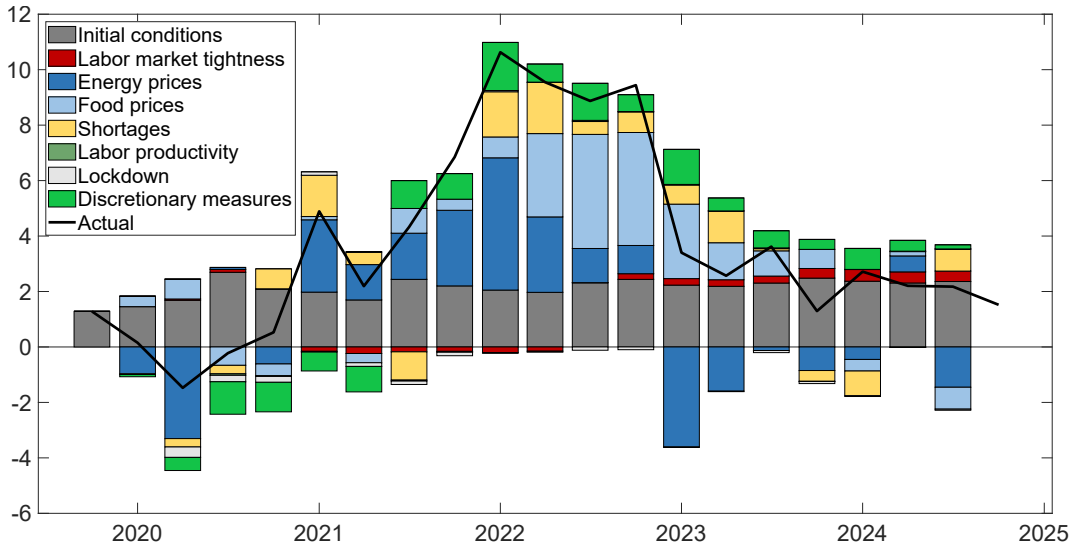


Notes: The figure shows the model implied responses to a negative shock to net indirect taxes and other discretionary measures of 1% of GDP, under the assumption that these shocks follow an AR(1) process with an autocorrelation coefficient set to 0.9. The zero line corresponds to the steady state, at which all (endogenous and exogenous) variables are set to zero.

for inflation using this extended dataset (to preserve space, we move the figures of the decompositions of the other endogenous variables to the Appendix, see Figures 20 to 22). The results are both qualitatively and quantitively very similar to our main results shown in Figure 4, with the contribution of overall discretionary measures on inflation becoming progressively more positive following the pandemic crisis, and gradually declining towards the end of the sample. Tables 6 and 7 further show that the coefficient estimates for the wage growth and inflation equations also do not change much when the model is estimated with this longer sample. If anything, these estimates point to a slightly stronger relationship between, on the one hand, discretionary fiscal measures and, on the other hand, wage growth and inflation.

Next, we estimate the model using pre-COVID data to avoid the unusual residual volatility observed during the pandemic years that may bias our results. The results, shown in Figure 11, show again that our main results hold up, with discretionary measures having

Figure 10: Sources of inflation using data until 2024Q3



Notes: See notes under Figure 7.

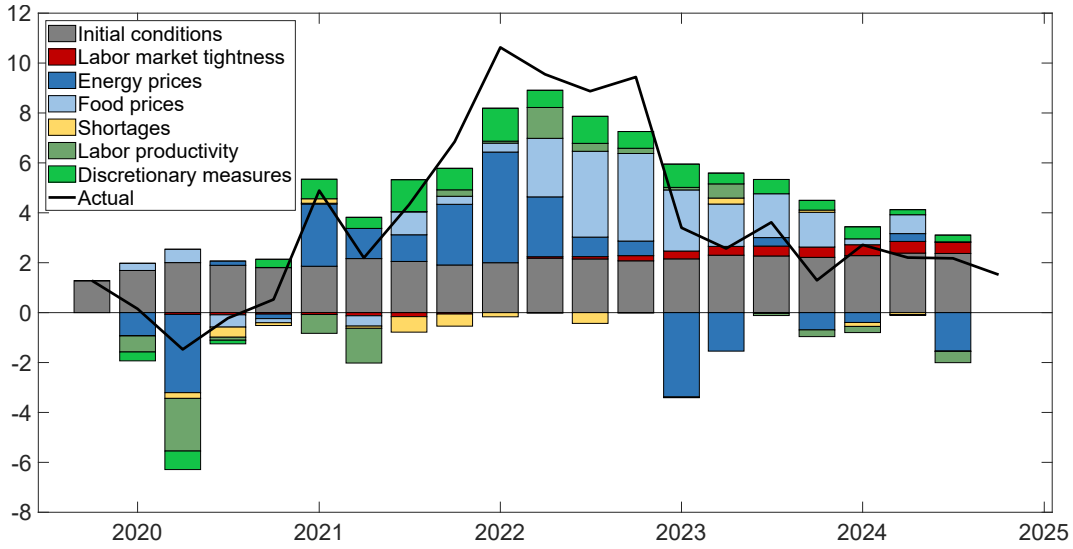
a positive and non-trivial contribution to inflation. A striking difference with our baseline results is that the contribution to inflation stemming from fluctuations in supply shortages becomes negligible, which may be due to the fact that, before the large global supply chain disruptions that occurred during the pandemic crisis, supply chains have remained relatively stable since 1999.

Finally, we experimented with a range of alternative proxies for discretionary fiscal policies. Figure 12 shows the results when we use the change in the primary balance to capture these discretionary measures. While there still seems to be a positive contribution to inflation arising from fiscal policy in 2021 and 2022, these contributions are considerably smaller than those under our baseline specification. These results therefore suggest that a more naive approach to capture discretionary fiscal measures may result in an underestimation of the fiscal impact on inflation.

Other extensions that we consider for future work include, first, to endogenize labor market tightness in the model. This is an important feature of the economy that is likely to be affected by fiscal policy and, in turn, impacts wages and inflation.

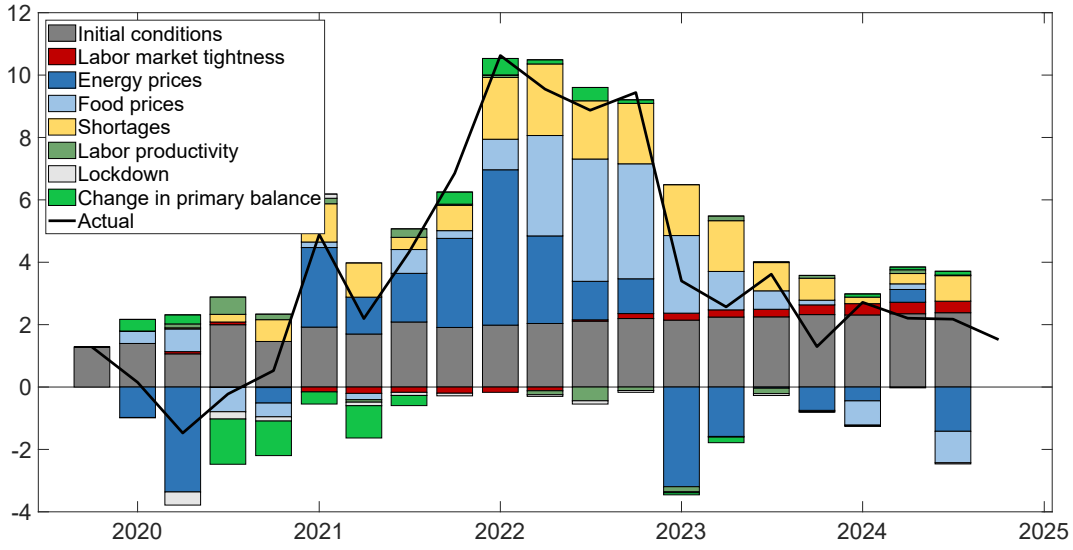
Second, to the extent possible, we aim to clean the energy and food price series for

Figure 11: Sources of inflation using pre-COVID data



Notes: See notes under Figure 7.

Figure 12: Sources of inflation using change in the primary balance as proxy for the overall fiscal policy impulse



Notes: See notes under Figure 7.

the direct fiscal impacts (taxes and subsidies), as this would allow one to better isolate the contribution of fiscal policy changes, apart from the differences already highlighted in sections 4.1 and 4.2. This exercise would be particularly important for the years 2022 and beyond, given governments' large responses to the energy crisis and the ensuing inflationary pressures. We expect the contribution of the energy price "shock" that, as in Arce et al. (2024), is proxied by the "ex-post" (final) energy prices to be less smooth, i.e., more positive as of 2022Q2 and more negative afterwards, especially in 2024 when direct energy support was considerably reduced. Third, we plan to distinguish in more detail between different types of discretionary fiscal measures, across the five large fiscal instruments mentioned in section 3.3, and potentially going into more granular detail with regards pandemic-related support (e.g., pinning down specifically the role of short-term work schemes versus other types of support).

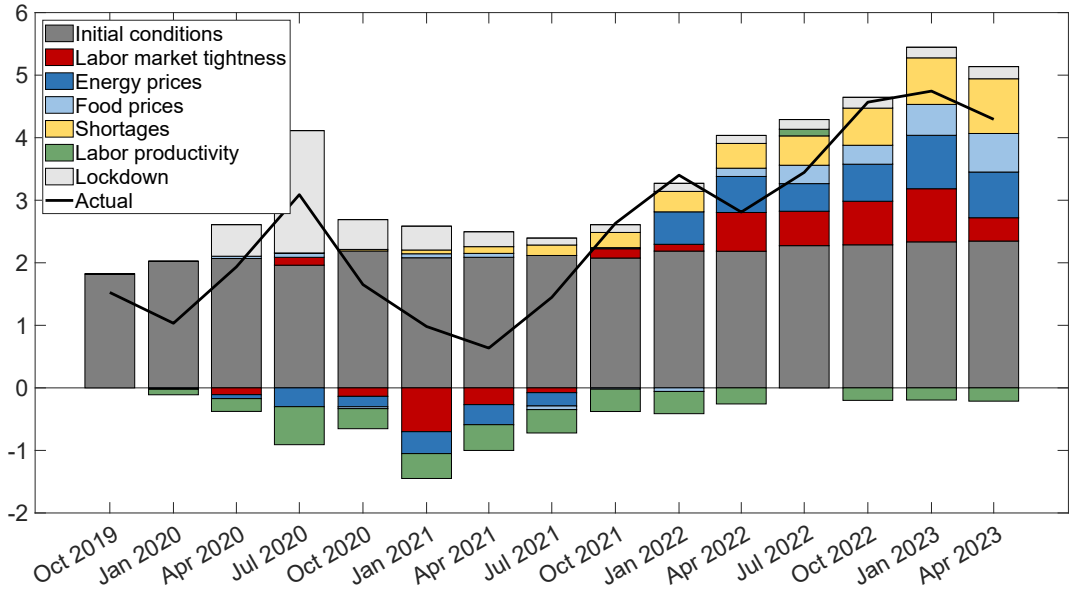
Forth, controlling for (proxies of) monetary policy shocks would allow to better identify the relative contribution of demand-side policies. Indirectly, the effects of monetary policy (credibility) are already reflected in the model through the long-term inflation expectations equation. Finally, as suggested in Bernanke and Blanchard (2024a), of more narrow interest would be the reconciliation of the estimates for the euro area aggregate with those of the individual euro area member countries. This investigation would be particularly important from a fiscal perspective, given that fiscal policies are conducted at an individual country level and initial fiscal positions, especially debt burdens, may also play a role in the transmission of fiscal and monetary policy. Our analysis is still relevant as it stands, given that, from a monetary policy perspective, we are interested in the fiscal policy impact on euro area-wide inflation.

6 Conclusion

TBA

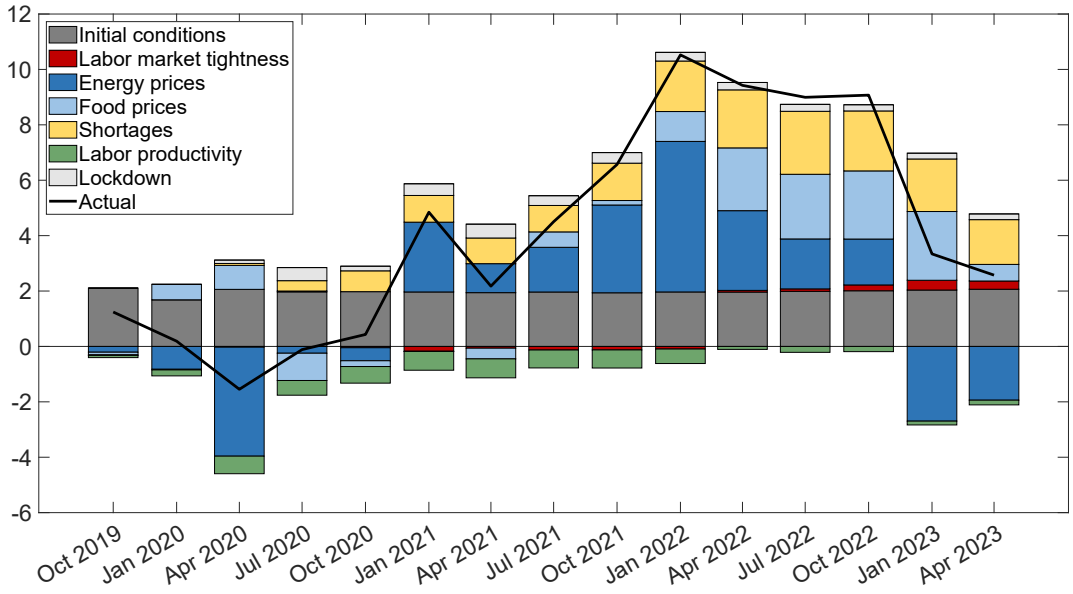
A Additional tables and figures

Figure 13: Sources of euro area wage growth without discretionary measures



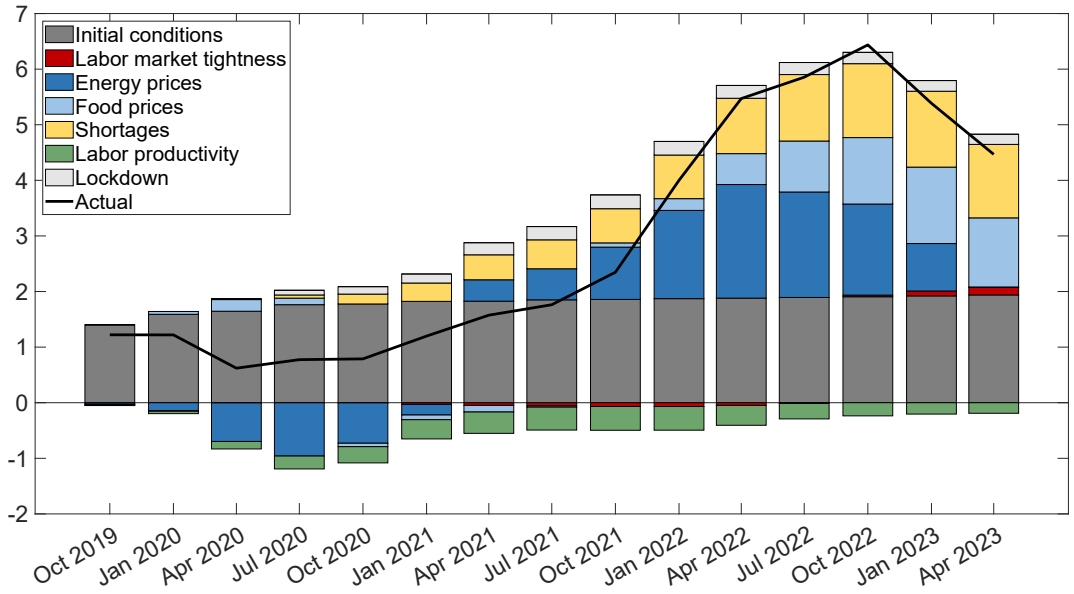
Notes: The figure shows a decomposition of the sources of wage growth, based on the solution of the extended BB model. Bars show the contributions of the various shocks in each quarter. Effects of equation residuals are omitted. The grey bars (initial conditions) show predicted values in the absence of shocks from 2020Q1 onward.

Figure 14: Sources of euro area inflation without discretionary measures



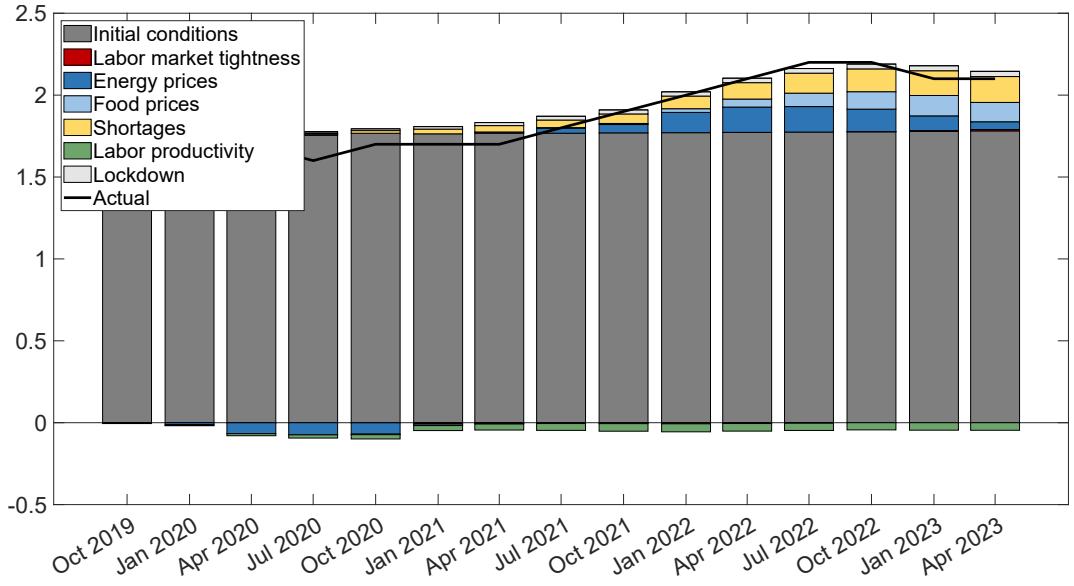
Notes: See notes under Figure 13.

Figure 15: Sources of euro area short-term inflation expectations without discretionary measures



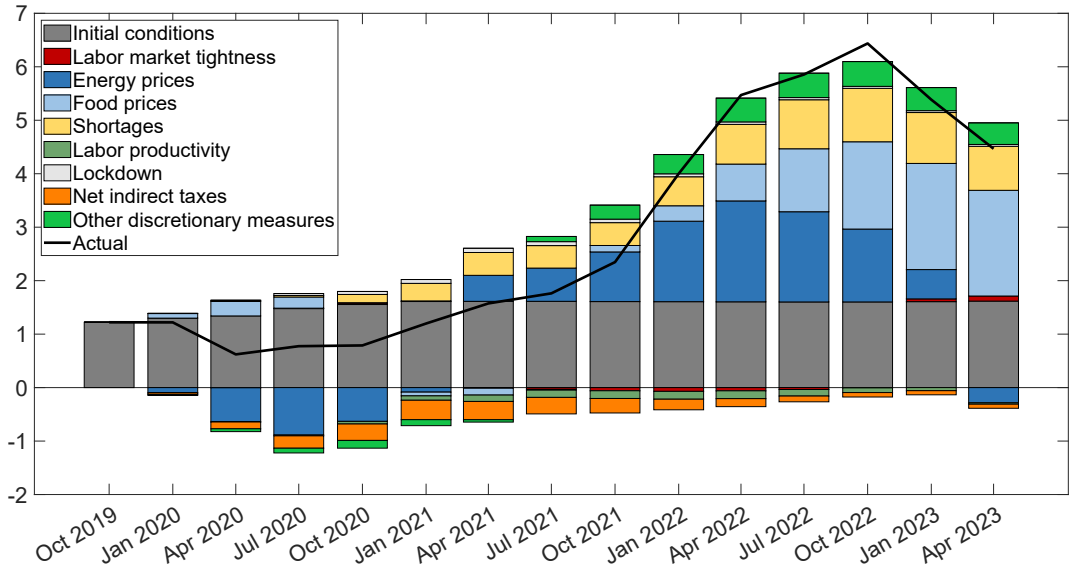
Notes: See notes under Figure 13.

Figure 16: Sources of euro area long-term inflation expectations without discretionary measures



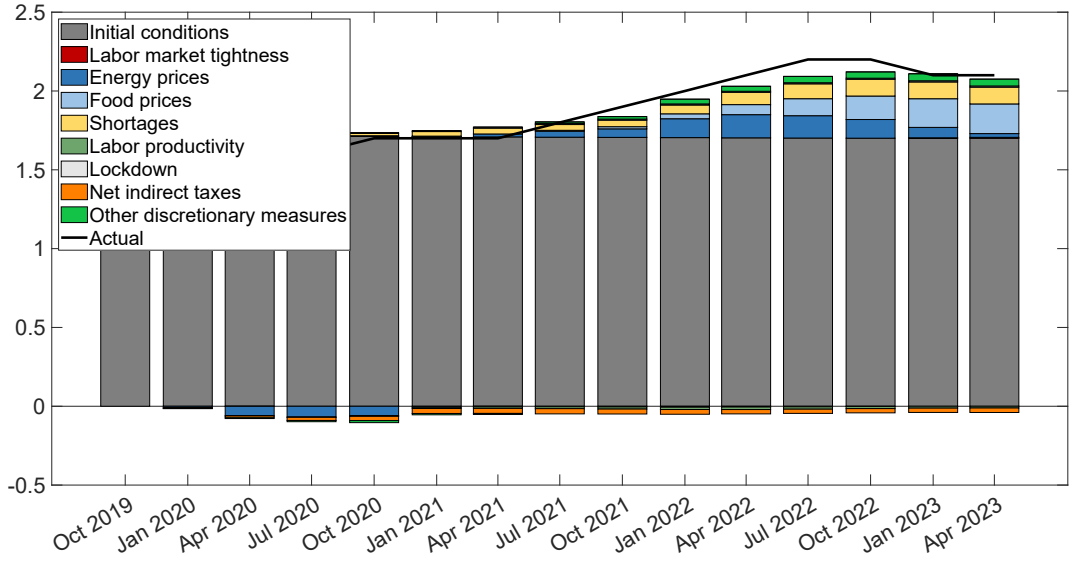
Notes: See notes under Figure 13.

Figure 17: Sources of short-term inflation expectations and disaggregated discretionary measures



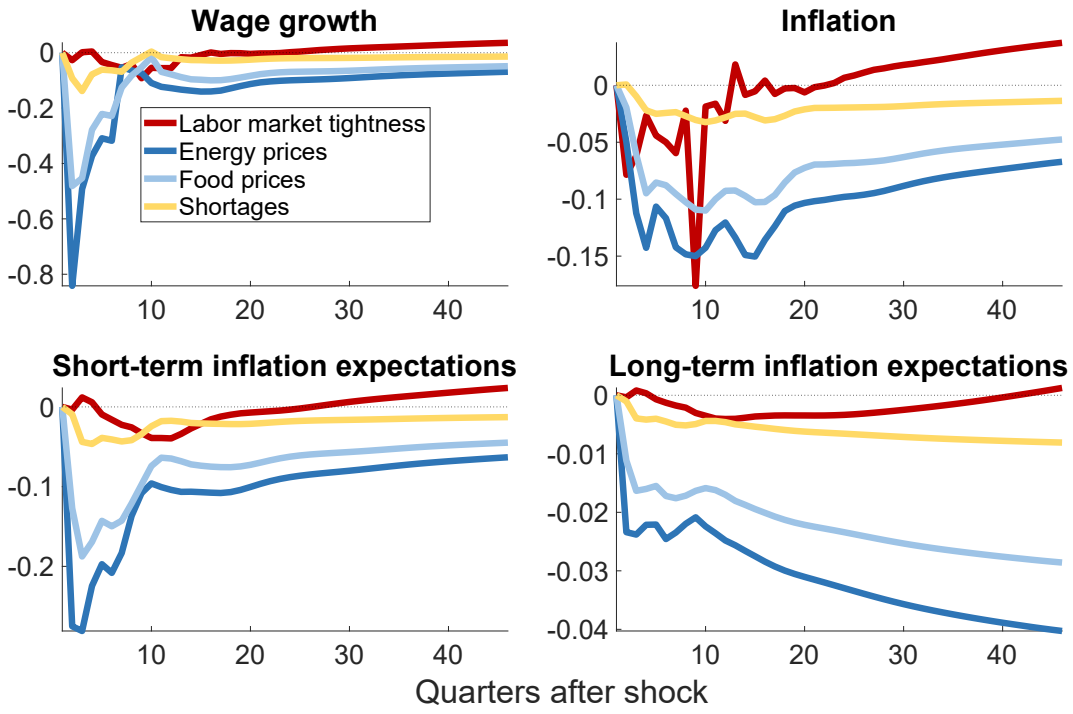
Notes: See notes under Figure 13.

Figure 18: Sources of long-term inflation expectations and disaggregated discretionary measures



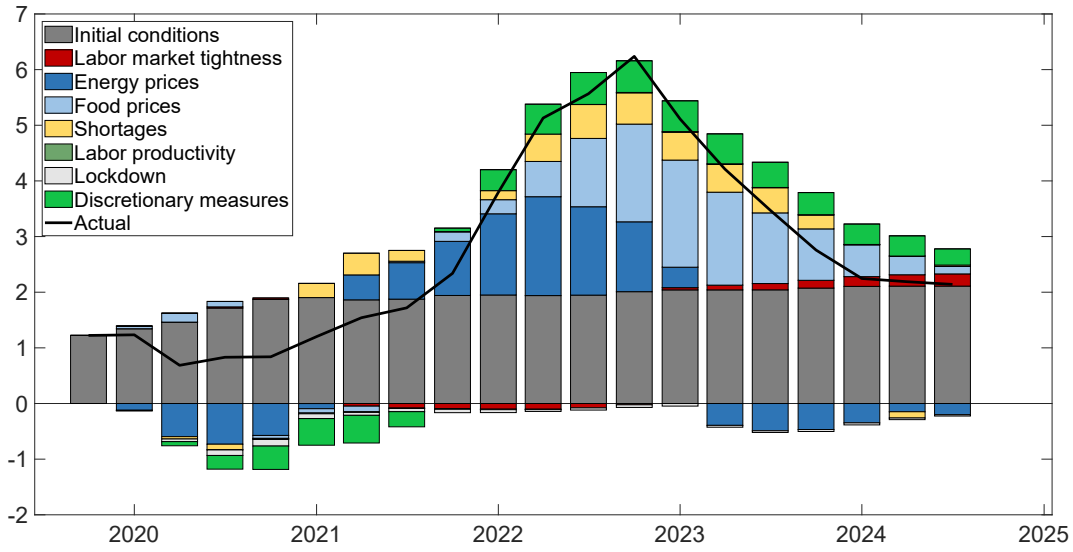
Notes: See notes under Figure 13.

Figure 19: Responses to non-fiscal shocks



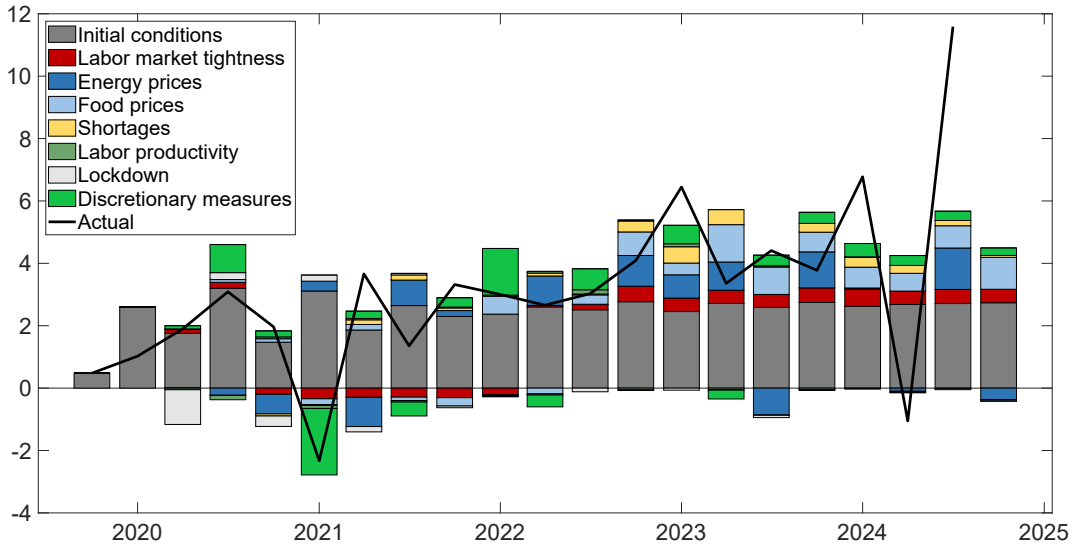
Notes: The figure shows the responses to a positive shock of 1 standard deviation to the non-fiscal policy exogenous variables in the model which includes disaggregated discretionary measures. The zero line corresponds to the steady state, at which all (endogenous and exogenous) variables are set to zero. As in Bernanke and Blanchard (2024b), we assume the labor market tightness shock is a permanent shock, while the other shocks are a one-time shock (which, for the energy and food prices, implies a permanent shock to the level).

Figure 21: Sources of short-term inflation expectations using data until 2024Q3



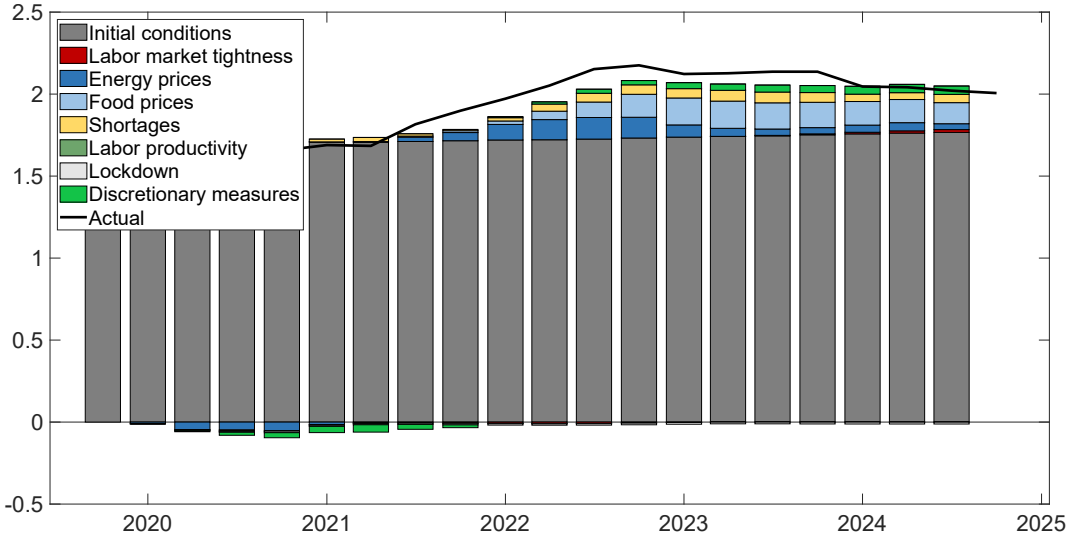
Notes: See notes under Figure 13.

Figure 20: Sources of wage growth using data until 2024Q3



Notes: The figure shows a decomposition of the sources of wage growth, based on the solution of the extended BB model. Bars show the contributions of the various shocks in each quarter. Effects of equation residuals are omitted. The grey bars (initial conditions) show predicted values in the absence of shocks from 2020Q1 onward.

Figure 22: Sources of long-term inflation expectations using data until 2024Q3



Notes: See notes under Figure 13.

Table 4: Short-term inflation expectations equation, 1999Q1-2023Q2

Dependent variable: short-term inflation expectations			
	L. Short-term inflation expectations	Long-term inflation expectations	Realized inflation
Sum of coefficients	0.719	0.079	0.202
p(sum)	0.000	0.022	0.000
p(joint)	0.000	0.285	0.000
Adjusted R^2	0.982		
Obs.	90		

Notes: p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 5: Long-term inflation expectations equation, 1999Q1-2023Q2

Dependent variable: long-term inflation expectations		
	L. Long-term inflation expectations	Realized inflation
Sum of coefficients	0.988	0.012
p(sum)	0.000	0.005
p(joint)	0.000	0.000
Adjusted R^2	0.816	
Obs.	90	

Notes: p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 6: Wage growth equation, 1999Q1-2024Q3

		Dependent variable: wage growth							
		L. Wage growth	Labor market tightness	Catch-up variable	Short-term inflation exp.	Prod. growth	DM	NIT	REST DM
Baseline without DM	Sum of coefficients	-0.812	0.436	-0.418	1.812	-0.065			
	p(sum)	0.030	0.009	0.041	0.000	0.683			
	p(joint)	0.000	0.047	0.000	0.000	0.683			
	Adjusted R^2	0.565							
With overall DM	Sum of coefficients	-0.626	0.417	-0.540	1.626	0.029	-0.148		
	p(sum)	0.081	0.014	0.010	0.000	0.860	0.367		
	p(joint)	0.000	0.076	0.000	0.000	0.860	0.012		
	Adjusted R^2	0.619							
With disaggregated DM	Sum of coefficients	-0.765	0.344	-0.554	1.765	-0.638		1.329	-0.638
	p(sum)	0.048	0.051	0.010	0.000	0.745		0.120	0.074
	p(joint)	0.000	0.175	0.000	0.000	0.745		0.172	0.002
	Adjusted R^2	0.640							
	Obs.	95							

Notes: DM = discretionary measures; NIT = net indirect taxes; RESTDM = discretionary measures minus net indirect taxes. p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 7: Inflation equation, 1999Q1-2024Q3

	Dependent variable: inflation									
		L. Inflation	Wage growth	Energy price	Food price	Shortage	Prod. growth	DM	NIT	REST DM
Baseline without DM	Sum of coefficients	0.538	0.462	0.052	0.078	0.230	0.043			
	p(sum)	0.003	0.009	0.019	0.227	0.040	0.575			
	p(joint)	0.001	0.000	0.000	0.000	0.045	0.575			
	Adjusted R^2	0.934								
With overall DM	Sum of coefficients	0.416	0.584	0.044	0.156	0.103	-0.003	-0.102		
	p(sum)	0.014	0.001	0.025	0.011	0.387	0.968	0.345		
	p(joint)	0.000	0.000	0.000	0.000	0.001	0.968	0.000		
	Adjusted R^2	0.952								
With disaggregated DM	Sum of coefficients	0.403	0.597	0.046	0.152	0.123	-0.018		0.127	-0.103
	p(sum)	0.037	0.002	0.039	0.020	0.319	0.828		0.688	0.532
	p(joint)	0.000	0.000	0.000	0.000	0.003	0.828		0.601	0.002
	Adjusted R^2	0.947								
	Obs.	98								

Notes: DM = discretionary measures; NIT = net indirect taxes; RESTDM = discretionary measures minus net indirect taxes. p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 8: Short-term inflation expectations equation, 1999Q1-2023Q2

Dependent variable: short-term inflation expectations			
	L. Short-term inflation expectations	Long-term inflation expectations	Realized inflation
Sum of coefficients	0.769	0.090	0.141
p(sum)	0.000	0.008	0.000
p(joint)	0.000	0.063	0.000
Adjusted R^2	0.979		
Obs.	99		

Notes: p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

Table 9: Long-term inflation expectations equation, 1999Q1-2024Q3

Dependent variable: long-term inflation expectations		
	L. Long-term inflation expectations	Realized inflation
Sum of coefficients	0.990	0.010
p(sum)	0.000	0.001
p(joint)	0.000	0.000
Adjusted R^2	0.915	
Obs.	99	

Notes: p(sum) is the p-value for the null hypothesis that the sum of coefficients is zero, while p(joint) is the p-value for the joint hypothesis that each of the lag coefficients separately equals zero.

References

Angelini, E., Bankowski, K., Muggenthaler-Gerathewohl, P., Checherita-Westphal, C., and Zimic, S. (2025). The macroeconomic impact of euro area discretionary fiscal policy measures since the start of the pandemic. Technical Report ECB Economic Bulletin, European Central Bank.

Arce, Ó., Ciccarelli, M., Kornprobst, A., and Montes-Galdón, C. (2024). *What caused the euro area post-pandemic inflation? An application of Bernanke and Blanchard (2023).* Number 343. ECB Occasional Paper.

Ascari, G., Bonam, D., Mori, L., and Smadu, A. (2024a). Fiscal policy and inflation in the euro area. Technical report, De Nederlandsche Bank.

Ascari, G., Bonam, D., and Smadu, A. (2024b). Global supply chain pressures, inflation, and implications for monetary policy. *Journal of International Money and Finance*, 142:103029.

Bańbura, M., Bobeica, E., and Martínez Hernández, C. (2023). *What drives core inflation? The role of supply shocks.* Number 2875. ECB Working Paper.

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

Bernanke, B. and Blanchard, O. (2024a). An analysis of pandemic-era inflation in 11 economies. *Peterson Institute for International Economics Working Paper*, pages 24–11.

Bernanke, B. and Blanchard, O. (2024b). What caused the US pandemic-era inflation? *American Economic Journal: Macroeconomics, forthcoming.*

Cevik, S. and Miryugin, F. (2025). It's never different: Fiscal policy shocks and inflation. *Comparative Economic Studies*, 67(1):186–220.

Checherita-Westphal, C. (2023). The impact of discretionary fiscal policy measures on real gdp growth from 2020 to 2022. Technical Report ECB Economic Bulletin 2023 (Issue 4), European Central Bank.

Checherita-Westphal, C. and Pesso, T. (2024). Fiscal policy and inflation: accounting for non-linearities in government debt. Technical Report 2996, European Central Bank.

D'Acunto, F., Hoang, D., and Weber, M. (2018). Unconventional fiscal policy. In *AEA Papers and Proceedings*, volume 108, pages 519–523. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.

De Santis, R. A. (2024). Supply chain disruption and energy supply shocks: Impact on euro area output and prices. *International Journal of Central Banking*, 20(2):193–235.

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.

Giannone, D. and Primiceri, G. (2024). The drivers of post-pandemic inflation. Technical report, National Bureau of Economic Research.

Haroutunian, S., Osterloh, S., and Slawinska, K. (2021). The initial fiscal policy responses of euro area countries to the covid-19 crisis. Technical Report ECB Economic Bulletin 2021, European Central Bank.

Höynck, C. and Rossi, L. (2023). The drivers of market-based inflation expectations in the euro area and in the us. *Economics Letters*, 232:111323.

Pallara, K., Rossi, L., Sfregola, M., and Venditti, F. (2023). The impact of energy shocks on core inflation in the us and the euro area. *VoxEu. org*.