DNB Working Paper
No 755/ December 2022

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DeNederlandscheBank
EUROSYSTEEM

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

Working Paper No. 755

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P.O. Box 98
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The Netherlands

December 2022

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December 2022

Abstract

We estimate the effects of monetary policy shocks across contractionary and expansionary fiscal regimes in the euro area. An expansionary monetary policy shock leads to an increase in inflation and output growth, but only when it occurs in the expansionary fiscal regime. In a contractionary fiscal regime, the responses to a monetary easing are insignificant or even negative. Similarly, a monetary tightening only reduces inflation and output in the contractionary fiscal regime. These results are robust to several alternative model specifications and underline the importance of the fiscal stance for the monetary transmission mechanism.

JEL Classification: E52, E62, E63

Keywords: regime-dependent effects of monetary policy, fiscal policy regimes, local projection methods

*We thank Guido Ascari, Peter van Els and participants of the research seminar at the Dutch Central Bank (May 2022) and the EcoMod 2022 Conference for their useful comments and suggestions. The views expressed do not necessarily reflect the official position of De Nederlandsche Bank or the Eurosystem.

1 Introduction

In response to the global financial crisis of 2008-09, the European Central Bank engaged in a prolonged spell of highly expansionary monetary policies in an attempt to stabilize inflation around the inflation target. Yet despite these efforts, economic performance in the euro area in the post-crisis period has been mediocre, with inflation often falling below target. Meanwhile, many euro area governments faced elevated public debt levels inherited from the crisis. With budgetary restrictions binding and financial market pressures rising, some fiscal authorities engaged in large-scale fiscal consolidations. Thus, in pursuing their respective objectives, monetary and fiscal policymakers occasionally worked against each other. The COVID-19 pandemic, on the other hand, prompted a strongly different policy mix, with monetary and fiscal policy being both exceptionally expansionary. At the time of writing, the recovery from the pandemic has ushered in and the economy now grapples with historically high inflation, prompting a monetary tightening. The extent to which the central bank will be successful in bringing inflation down is likely to depend on what fiscal policies will be pursued next. In this paper, we assess empirically how the effects of monetary easing and tightening shocks are affected by the prevailing fiscal stance.

According to standard (old and new) Keynesian models, inflation and output are strongly influenced by both monetary and fiscal policy. Monetary policy can, through adjustments in the interest rate, affect aggregate demand by changing the cost of borrowing and altering the cost of future consumption relative to current consumption. Fiscal policy can affect aggregate demand directly through changes in government consumption and investment (Burriel et al., 2010; Kempa and Khan, 2015; Afonso and Leal, 2019; Deleidi et al., 2020), or indirectly through, for example, changes in taxes, lump-sum transfers and public sector wages that affect the private sector's human wealth. Fiscal policy may also affect the private sector's financial wealth through its effect on interest rates (Afonso and Sousa, 2012), asset prices (Agnello and Sousa, 2011; Afonso and Sousa, 2012) and (possibly) the exchange rate (Monacelli and Perotti, 2010; Enders et al., 2011; Bouakez et al., 2014) that affect the value of government bonds held by the private sector. According to Caramp and Silva (2022), these 'wealth effects' of fiscal policy are crucial to understand the monetary transmission mechanism.

Using data for a panel of ten euro area countries and a panel smooth transition local projection model, we estimate the effects of monetary policy shocks across different fiscal regimes. Our sample covers the period 1999Q1–2019Q4, during which monetary and fiscal policy have been both in and out of sync. The monetary policy shocks are taken from Jarociński and Karadi (2020), who exploit the high-frequency co-movement of interest rates and stock prices around policy announcements to identify exogenous monetary policy shocks. The fiscal regimes are characterized by the change in the cyclically adjusted primary balance (as a % of potential GDP): positive changes indicate a contractionary fiscal regime, whereas negative changes point to an expansionary fiscal regime. Using an indicator function for the fiscal regime, we estimate the responses to a monetary policy shock conditional on being in either of the two regimes.

Our main finding is that the responses of inflation and output growth to a monetary policy shock depend strongly on whether the economy is in a contractionary or expansionary fiscal regime. An expansionary monetary policy shock increases inflation and output, *but only in the expansionary fiscal regime*. During the contractionary fiscal regime, the responses are statistically insignificant or even negative. Similarly, a contractionary monetary policy shock lowers inflation and output, but only when it occurs in the contractionary fiscal regime. Moreover, the responses of private consumption to monetary policy shocks are found to be consistent with the New Keynesian paradigm, yet only when monetary and fiscal policy are well aligned. The responses of public consumption and (private and public) investment do not differ significantly across fiscal regimes. Combined, these results suggest that the wealth effect of fiscal policy is likely to explain why the transmission channel of monetary policy depends so strongly on the fiscal stance.

In our robustness analysis, we find that our main results survive various changes to our baseline model specification, the sample of countries that we consider and the way we define the fiscal regime. The robustness exercises also offer some interesting nuances to the main results. In particular, we find that the effects of expansionary monetary policy shocks depend more strongly on the fiscal stance during economic recessions than during booms. Also, we find that changes in the spending component of the cyclically adjusted primary balance have a more pronounced effect on the monetary transmission channel than changes in the revenue component. Combined, these findings warrant enhanced coordination between monetary and fiscal policies to ensure macroeconomic stability, especially during economic downturns.

The remainder of this paper is structured as follows. Section 2 discusses the theoretical framework that will help interpret our empirical findings, and also relates our paper to the wider literature on monetary-fiscal interactions and non-linearities in the monetary transmission mechanism. Section 3 discusses the empirical strategy and the data. In Section 4, we present our main results, while the robustness analysis is presented in Section 5. Finally, Section 6 concludes.

2 Theory and related literature

The study on the role of fiscal policy in shaping the monetary transmission mechanism has a long history and can be traced back to the standard IS-LM model (Hicks, 1937). In this model, the central bank can affect aggregate demand through changes in the money supply that alter the real cost of borrowing and, thereby, the demand for private investment and output. Fiscal policy can either amplify or offset these effects through adjustments in taxes or government consumption (or both). In terms of the transmission mechanism, what is relevant in this framework is that both monetary and fiscal policy have a direct and immediate bearing on aggregate demand, which can be exploited to deliver either a short-run economic expansion or contraction, in complementing or conflicting ways.

The standard New Keynesian model retains some of the channels at work in the IS-LM model, yet adds to it a dynamic dimension that has important implications for monetary-fiscal policy interactions. In the canonical setup of the New Keynesian model, demand and supply are determined by an Euler equation, that relates consumption growth to the real interest rate, and a New Keynesian Phillips curve, that relates current inflation to economic slack and expected inflation, while the nominal interest rate is determined by a monetary policy rule. An increase in the (real) interest rate makes current consumption more costly relative to future consumption and causes households to save more and consume less. Thus, unlike in the static IS-LM model, it is through this *intertemporal substitution effect* that variations in the real interest rate indirectly affect aggregate demand. Despite the familiarity of this channel, what is often overlooked in most studies is that the intertemporal substitution effect affects the *timing* of aggregate demand, not the present value of *total* demand. In order for a monetary policy tightening to yield a contraction in the present value of aggregate demand, and concomitantly a decline in inflation, an additional channel is required.

As shown in a recent paper by Caramp and Silva (2022), this additional channel arises from the impact of policy variables on households' human and financial wealth, i.e. the *wealth effect*. At the heart of this wealth effect lies the intertemporal budget constraint of the household that equates the expected present value of consumption to the household's total wealth. The latter is the sum of the expected present value of after-tax income, the expected present value of real interest receipts on government bond holdings and the real value of initial bond holdings. The government can affect these components of wealth directly through changes in the policy rate (which equals the return on government bonds), taxes (net of transfers) and the issuance of bonds.

A monetary tightening that, through the intertemporal substitution effect, causes consumption and output to fall will lead to a decline in inflation through the New Keynesian Phillips curve. With the nominal interest rate rising and inflation falling, real interest receipts of the household increase. Furthermore, lower inflation drives up the real value of initial bond holdings. Both channels imply a positive wealth effect arising from the monetary contraction that leads to an *increase* in consumption.

Therefore, a monetary tightening reduces (total) consumption and inflation *only if* the wealth effect is sufficiently negative, which requires a sufficiently large contraction in fiscal policy. Absent this fiscal adjustment, inflation could actually rise following the monetary contraction. This is because of the forward-looking nature of the New Keynesian Phillips curve: if only the intertemporal substitution effect were operative, a decline in aggregate demand today would be followed by an expansion in aggregate demand in the future, which, due to the presence of price stickiness, induces firms to raise prices already today. Therefore, the ability of monetary policy to maintain price stability crucially depends on the fiscal policy stance.

The importance of this dependency between monetary and fiscal policy for the monetary transmission mechanism may even become more relevant in an environment characterized by greater price flexibility. This is because of the role that inflation plays in amplifying the general equilibrium effects of the wealth effect: when consumption falls, inflation declines which raises the real interest rate and further reduces consumption. This channel is stronger under more flexible prices (Caramp and Silva, 2022). As shown by Alvarez et al. (2019), prices are likely to be reset more frequently during periods when inflation is persistently high. Therefore, the currently observed high levels of inflation in the euro area, the US and many other parts of the world warrant enhanced coordination of monetary and fiscal policy in order to safeguard price stability.

In this paper, we aim to empirically assess how fiscal policy affects the responses of aggregate demand and inflation to monetary policy shocks. Our results therefore shed light on the empirical validity of the novel theoretical insights of Caramp and Silva on the role of fiscal policy in the monetary transmission mechanism. Monetary-fiscal policy interactions and their relevance for the potency of monetary policy shocks have recently gained more attention, yet empirical results for the euro area are scarce. Reichlin et al. (2021), for example, study the effects of both conventional and unconventional monetary policy shocks in the euro area using a VAR model with sign and narrative restrictions. They find that a conventional monetary easing is accompanied by an expansionary fiscal policy, but unconventional monetary easing is not. Consequently, the effect of the latter policy on inflation and output is more muted than that of the former. In contrast to their paper, we do not focus on the fiscal response to monetary policy shocks *directly*, but rather on how the effects of (conventional) monetary policy shocks change in times when fiscal policy is either expansionary or contractionary, which may be independent from monetary policy.

Also related is a paper by Luigi and Huber (2018), who study the effects of monetary policy shocks in the US across regimes of high and low government debt. Using a threshold VAR model with stochastic volatility, they find that GDP growth responds positively to an expansionary monetary policy shock in both regimes, yet the response is less pronounced in the high debt regime. Our paper is similar to theirs as we too condition the macroeconomic response to monetary policy shocks on the fiscal stance. Yet, whereas they use the difference of the lagged debt-to-GDP ratio as a measure of the fiscal stance, we use the change in the cyclically adjusted primary balance. Unlike the change in the debt ratio, changes in the CAPB are unaffected by fluctuations in the business cycle and the interest rate, factors over which the fiscal authority has limited control. Thus, changes in the CAPB offer a cleaner measure of the *discretionary* fiscal stance and are likely to impact the monetary transmission channel differently than do changes in the government debt ratio.

Our paper is also related to a large body of work on price level determination across different monetary-fiscal policy regimes. As shown in Leeper (1991), monetary policy is able to uniquely pin down the path of the price level only if fiscal policy is committed to adjust the primary surplus to stabilize government debt. This regime of 'monetary dominance' is characterized by a monetary policy rule that satisfies the Taylor Principle and a fiscal policy rule that has the primary surplus respond strongly to outstanding government debt. When the policy rules are calibrated such that the Taylor Principle is violated and the fiscal authority disregards its debt stabilization objective, the regime is referred to as 'fiscal dominance'. In that case, the price level will be determined by the needs to satisfy the government's intertemporal budget constraint (e.g. Woodford, 2001; Cochrane, 2021) and the economy may respond very differently to policy shocks than is commonly assumed. For example, Bianchi and Ilut (2017) show, in a Markov-Switching DSGE model estimated for the US, that a tightening monetary policy shock causes inflation to fall under monetary dominance, yet to *rise* under fiscal dominance. In a similar vein, Banerjee et al. (2022) show that public deficits have a much stronger impact on inflation under fiscal dominance than under monetary dominance. Our paper also highlights the importance of different types of monetary-fiscal arrangements for the effects of monetary policy shocks, yet remains agnostic about the specific policy regime in place. Specifically, we focus on times when fiscal policy is either expanding or contracting, regardless of the prevailing policy regime. In that sense, our paper follows the more general approach of Caramp and Silva (2022) that centers around the role of policy *paths* rather than of policy *rules*.

Finally, our paper contributes to a large and growing literature on potential non-linearities in the monetary transmission mechanism and how the effects of monetary policy shocks may depend on, for example, the business cycle (Tenreyro and Thwaites, 2016; Alpanda et al., 2021), financial conditions (Rüth, 2017; Anzuini, 2021), the level of the interest rate (van den End et al., 2021), the level of inflation (Jordà et al., 2020), the level of private debt (Albuquerque, 2019; Alpanda and Zubairy, 2019; Kim and Lim, 2020; Alpanda et al., 2021) and the degree of economic uncertainty (Aastveit et al., 2017; Balcilar et al., 2017; Pellegrino, 2018; Hauzenberger et al., 2021). In our empirical analysis, we abstract from these (and other) potential sources of state dependence, except for the business cycle which we take into account in one of our robustness exercises since the fiscal stance may systematically vary across recessions and booms. We also distinguish between contractionary and expansionary monetary policy shocks, as we are interested in the extent to which the fiscal and monetary stance are consistent or in conflict with each other. Earlier studies on this latter type of asymmetry show that the effects of contractionary monetary policy shocks are usually more pronounced than that of expansionary shocks (Barnichon and Matthes, 2016; Angrist et al., 2018; Lin, 2021). We contribute to this literature by showing that fiscal policy affect the monetary transmission channel, regardless of whether monetary policy shocks are expansionary or contractionary.

3 Empirical strategy

3.1 A panel smooth transition local projection model

We estimate the effects of monetary policy shocks using a panel smooth transition local projection model. Specifically, let m_t denote the exogenous monetary policy shock, that is common to all countries in the panel, and $y_{i,t}$ our variable of interest for country i at time t. As suggested by Jordà (2005), we can estimate the dynamic effects of the monetary policy shock by running the following OLS regressions:

$$y_{i,t+h} = \beta_h m_t + \lambda_h x_{i,t} + \alpha_{i,h} + \epsilon_{i,t+h}. \tag{1}$$

In Equation (1), the β_h coefficients are used to construct the *unconditional* impulse response function of $y_{i,t+h}$ to a monetary policy shock occurring at time t, with $h = 0, 1, 2, ..., H$ and H the impulse response horizon. $x_{i,t}$ is a vector of control variables that includes two lags of the LHS variable and two lags and one lead of the monetary policy shock. The latter is included to account for potential persistence in the shocks (see Alloza et al., 2020).[1] Furthermore, $\alpha_{i,h}$ denotes country-fixed effects, which allows the level effect of monetary policy to be heterogeneous across the countries in our panel. Note, however, that the fixed-effects panel model imposes that the transmission mechanism of monetary policy is the

[1] Using alternative lag structures delivers results, which are available upon request, that are very similar to our main results.

same across countries.[2] Finally, $\epsilon_{i,t+h}$ is the error term, with $E\left[\epsilon_{i,t+h}\right]=0$. We use Driscoll-Kraay standard errors to account for serial correlation of the error terms and cross-sectional correlation across the countries in the panel.

The linear panel local projection model in (1) can be easily adapted to account for the potentially state- or regime-dependent effects of monetary policy shocks. Specifically, we augment the model by interacting the regressors with a regime indicator variable, which we denote by $F^{j}\left(z_{i,t}\right)\in[0,1]$, with $j=\{c,e\}$. This indicator variable determines the probability that the economy operates under a regime of either **c**ontractionary fiscal policy, labeled by c, or **e**xpansionary fiscal policy, labeled by e. We then arrive at the following panel smooth transition local projection model:

$$y_{i,t+h}=\sum_{j=\{c,e\}}F^{j}\left(z_{i,t}\right)\left(\beta_{h}^{j}m_{t}+\lambda_{h}^{j}x_{i,t}+\alpha_{i,h}^{j}\right)+\epsilon_{i,t+h}. \tag{2}$$

In (2), the coefficients β_{h}^{c} and β_{h}^{e} now capture the *regime-dependent* impulse response functions of $y_{i,t+h}$ to a monetary policy shock that occurs at t in the contractionary fiscal regime and expansionary fiscal regime, respectively. Note that, since $F^{j}\left(z_{i,t}\right)$ may, over time, take on any value between 0 and 1, the regime-dependent impulse response functions take into account the probability that the economy switches between regimes along the impulse response horizon.

We use the following logistic function to construct the regime indicator variable:

$$F^{j}\left(z_{i,t}\right)=\frac{\exp\left(-\theta\frac{z_{i,t}-c^{j}}{\sigma_{i,z}}\right)}{1+\exp\left(-\theta\frac{z_{i,t}-c^{j}}{\sigma_{i,z}}\right)}, \tag{3}$$

with $z_{i,t}$ a state variable, $\sigma_{i,z}$ its standard deviation and c^{j} a threshold value that determines which observations fall within what regime. For the state variable, we use the change in

[2] To account for potential cross-country heterogeneity in the monetary transmission mechanism, we run two panels with closely resembling countries in one of our robustness exercises. The results obtained from using these two sub-panels are similar to our baseline results.

the cyclically adjusted primary balance (CAPB) as a percentage of potential GDP.[3] Since the CAPB is purged from changes in the primary balance due to the effects of automatic stabilizers, changes in the CAPB reflect discretionary changes in fiscal policy. Therefore, periods with positive (negative) values of $z_{i,t}$ can be characterized as contractionary (expansionary) fiscal regimes. A reduction in the state variable $z_{i,t}$ causes F^c to go to 0 (i.e. the contractionary fiscal regime is less likely to prevail) and F^e to 1 (expansionary fiscal regime is more likely). Conversely, an increase in $z_{i,t}$ implies that F^c goes to 1 and F^e to 0. In the baseline specification, we set $c^c = c^e = 0$. This implies that any positive (negative) change in the CAPB is characterized as a fiscal contraction (expansion) and $F^c(z_{i,t}) + F^e(z_{i,t}) = 1$ for all t.[4] The parameter θ measures how abruptly the economy transitions between the two fiscal regimes. As $\theta \to \infty$, $F^j(z_{i,t})$ takes binary values. As a baseline, we calibrate θ to be 3, which allows for changes in the fiscal regime to occur gradually, potentially spanning multiple quarters.[5]

The extent to which a certain fiscal regime offsets or amplifies the effects of monetary policy shocks can only really be evaluated when distinguishing between expansionary and contractionary monetary policy shocks. For instance, a contractionary fiscal regime conflicts with an expansionary monetary policy shock but complements a contractionary shock. For this reason, we extend the model in (1) and (2) by replacing the shock series m_t by two new series: m_t^+, i.e. contractionary shocks, which contains only the positive values of m_t (and where all remaining observations are set to zero), and m_t^-, i.e. expansionary shocks, which contains only the negative values of m_t. The linear model then becomes:

$$y_{i,t+h} = \beta_h^+ m_t^+ + \beta_h^- m_t^- + \lambda_h x_{i,t} + \alpha_{i,h} + \epsilon_{i,t+h}, \tag{4}$$

[3]The CAPB is a structural measure of the primary balance and therefore expressed in terms of (the estimate of) potential GDP.

[4]In the robustness section, we consider different values for c^j.

[5]Choosing different values for θ does not significantly alter our baseline results. In Appendix A, we show the results corresponding to the extreme case in which θ is set to 10. Results corresponding to alternative values for θ are available upon request.

and the non-linear model becomes

$$y_{i,t+h} = \sum_{j=\{c,e\}} F^j\left(z_{i,t}\right)\left(\beta_h^{j+} m_t^+ + \beta_h^{j-} m_t^- + \lambda_h^j x_{i,t} + \alpha_{i,h}^j\right) + \epsilon_{i,t+h}. \tag{5}$$

In (4), the coefficients β_h^+ and β_h^- capture the unconditional impulse response functions of $y_{i,t+h}$ to a contractionary monetary policy shock and a expansionary monetary policy shock, respectively. The β_h coefficients in (5) are interpreted similarly.

3.2 Data

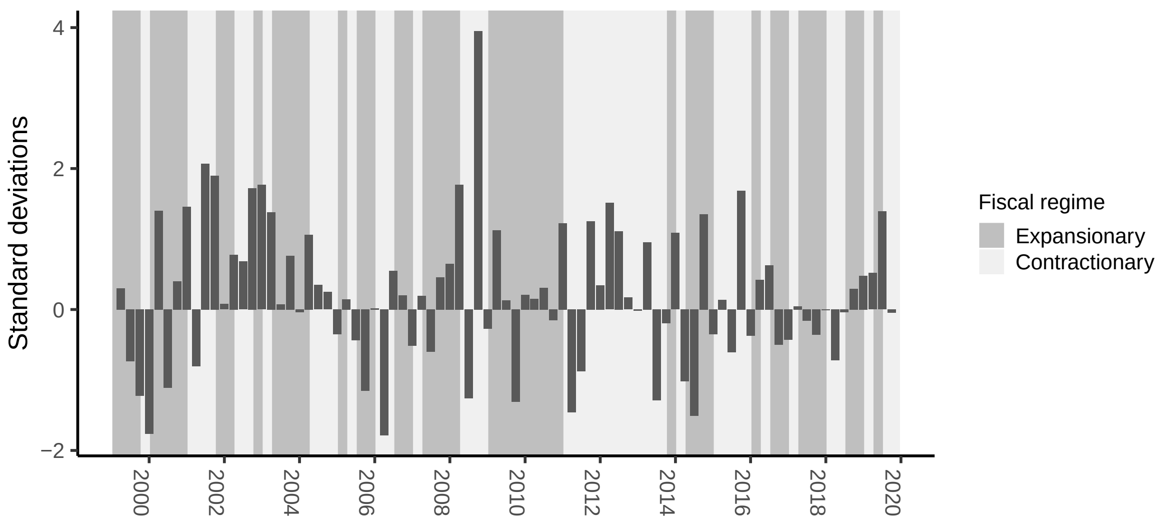
We use quarterly data, spanning the period 1999Q1–2019Q4, for 10 euro area countries: Austria, Belgium, Netherlands, Germany, France, Spain, Portugal, Luxembourg, Italy and Finland. The variable common to all countries is the monetary policy shock, m_t, which is plotted in Figure 1 against shaded areas that mark the periods in which, on average across the countries in our panel, there is a 50% or greater probability of being in the contractionary fiscal regime (light shaded) or expansionary fiscal regime (dark shaded). Our measure for m_t is taken from Jarociński and Karadi (2020), who identify exogenous monetary policy shocks for the euro area using a Bayesian VAR and sign restrictions.[6]

Table 1 shows that the monetary policy shocks are distributed roughly equally across the contractionary and expansionary fiscal regimes, and that the average size of contractionary shocks is somewhat larger than expansionary shocks (in absolute terms). However, for our purposes, what matters is that no such pattern is observed consistently *across* fiscal regimes, as is the case.

The fiscal regimes are defined using the change in the CAPB as a percentage of potential

[6]More specifically, Jarociński and Karadi (2020) use high frequency data on EONIA interest rate swaps and the EUROSTOXX to estimate policy surprises following a monetary event. These surprises are then included in an otherwise standard VAR model and sign restrictions are used to identify two types of monetary policy shocks. The first is an 'information shock', which is identified by imposing a positive relationship between the interest rate and stock prices. The second is a 'pure monetary policy shock', which is identified by imposing a negative relationship between the interest rate and stock prices. We use the latter as our measure for the monetary policy shock, m_t.

Figure 1: Monetary policy shocks across fiscal regimes



Notes: The graph depicts the shock series taken from Jarociński and Karadi (2020) scaled by their standard deviation. The shaded areas show the periods during which, on average across the countries that we consider, there is a 50% or greater probability of being in the contractionary or expansionary fiscal regime. The fiscal regimes are based on the change in the cyclically adjusted primary balance (as a % of potential GDP) and the logistic function shown in (3).

Table 1: Distribution (mean) of monetary policy shocks across fiscal regimes

	AT	**BE**	**FI**	**FR**	**DE**	**IT**	**LU**	**NL**	**PT**	**ES**
Contractionary shocks	**49** (0.89)	**49** (0.85)	**49** (0.83)	**49** (0.85)	**49** (0.83)	**49** (0.85)	**49** (0.84)	**49** (0.84)	**49** (0.83)	**49** (0.83)
In fiscal expansions	29 (0.61)	28 (0.73)	29 (0.84)	26 (0.67)	22 (0.73)	26 (0.63)	28 (0.83)	27 (0.81)	22 (0.79)	26 (0.88)
In fiscal contractions	20 (1.16)	21 (0.97)	20 (0.83)	23 (1.01)	27 (0.92)	23 (1.06)	21 (0.84)	22 (0.87)	27 (0.87)	23 (0.78)
Expansionary shocks	**34** (-0.66)	**34** (-0.69)	**34** (-0.69)	**34** (-0.69)	**34** (-0.72)	**34** (-0.69)	**34** (-0.69)	**34** (-0.70)	**34** (-0.68)	**34** (-0.68)
In fiscal expansions	10 (-0.57)	19 (-0.69)	11 (-0.68)	18 (-0.71)	13 (-0.82)	20 (-0.71)	15 (-0.69)	14 (-0.78)	19 (-0.79)	14 (-0.63)
In fiscal contractions	24 (-0.74)	15 (-0.69)	23 (-0.70)	16 (-0.67)	21 (-0.61)	14 (-0.67)	19 (-0.69)	20 (-0.63)	15 (-0.57)	20 (-0.73)

Notes: The numbers outside (within) brackets indicate the number of shocks (the mean value of shocks). The monetary policy shocks are taken from Jarociński and Karadi (2020) and are scaled by their standard deviation. The fiscal regimes are based on the change in the cyclically adjusted primary balance (as a % of potential GDP) and the logistic function shown in (3).

Figure 2: The cyclically adjusted primary balance (% of potential GDP)

Notes: The cyclically adjusted primary balance is constructed using country-specific output elasticities for the revenue and expenditure components of the public budget balance, taken from Price et al. (2015).

GDP. Since data on the CAPB is only publicly available at an annual frequency, we construct our own measure of the CAPB at a quarterly frequency. We do so by using an estimate of the output gap (based on an HP-filtered trend of real GDP) and country-specific output elasticities for the revenue and expenditure components of the public budget balance, taken from Price et al. (2015). We plot this measure of the CAPB in Figure 2, again against shaded areas that indicate the average occurrence of the two fiscal regimes across the countries in our sample. In one of our robustness exercises, we consider alternative ways of constructing the quarterly CAPB series and alternative measures of the fiscal stance.

Finally, our main variables of interest are inflation and output growth. We use the year-on-year growth rate of the seasonally adjusted HICP as our measure of inflation. We measure output growth by the year-on-year growth rate of the chain-linked GDP. Both series are taken from Eurostat. To help interpret our results, we also consider the effects of monetary policy shocks on other key macroeconomic aggregates, such as (private and public) consumption and investment.

4 Results

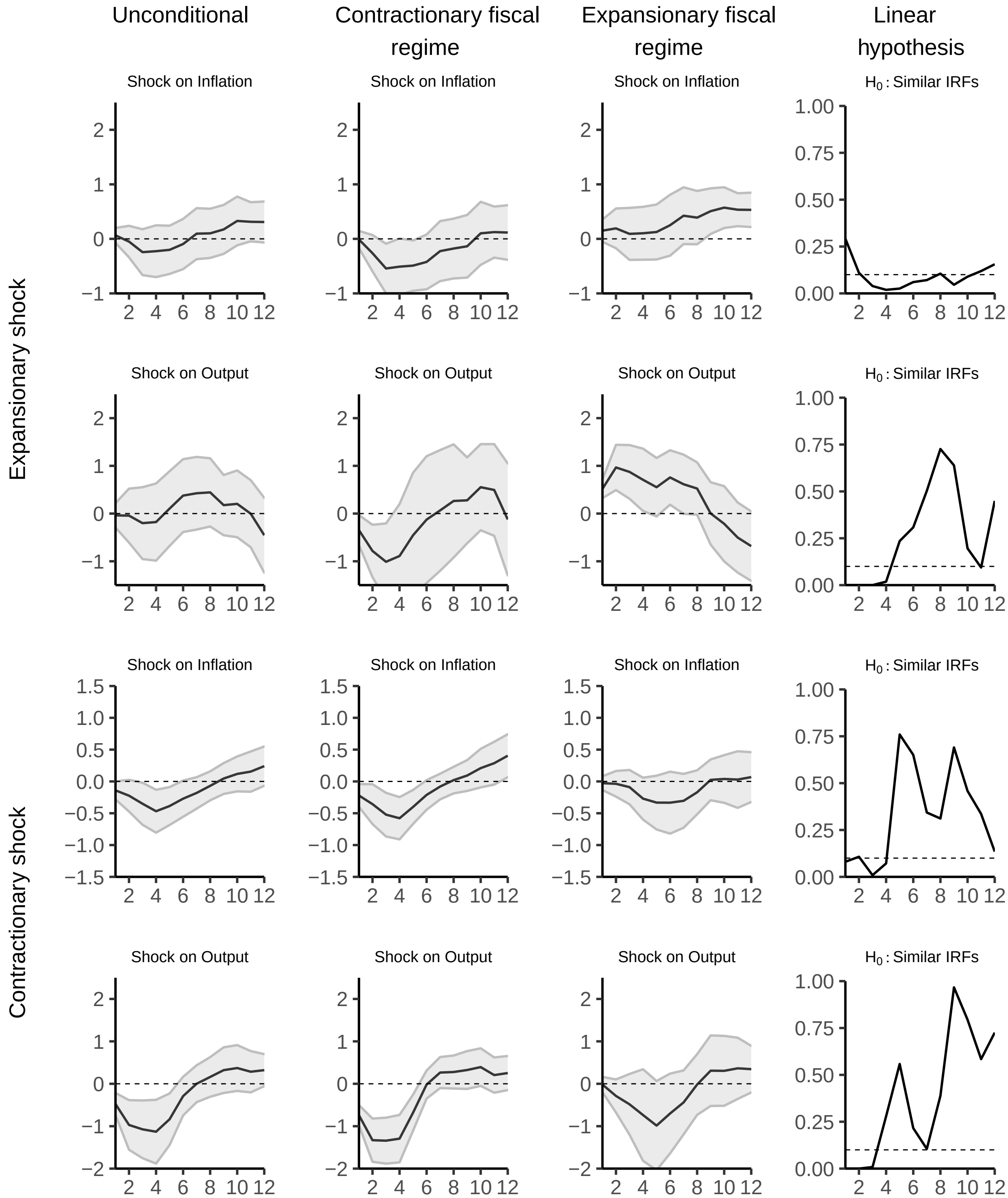
Figure 3 plots the impulse responses to a one standard deviation monetary policy shock. The first two rows show the responses to an expansionary monetary policy shock, whereas the last two rows show the responses to a contractionary monetary policy shock.

The first column shows the unconditional responses. The unconditional responses to a contractionary monetary policy shock are in line with the predictions of the standard New Keynesian model: both inflation and output decline on impact, reach their trough after around 4 quarters and then revert back to their initial levels. Expansionary monetary policy shocks, however, do not have a significant (unconditional) effect on inflation nor output. These results echo those found for the US that show that the effects of contractionary monetary policy are more pronounced than that of expansionary monetary policy (Barnichon and Matthes, 2016; Angrist et al., 2018; Lin, 2021; Stenner, 2021).

The second and third columns display the impulse responses conditional on being in the contractionary and expansionary fiscal regime, respectively. Following an expansionary monetary policy shock, we find that inflation and output growth increase, *but only when the economy is in the expansionary fiscal regime*. In contrast, the responses of output and inflation to that same expansionary monetary policy shock are *negative* in a contractionary fiscal regime. The difference between the responses across the two fiscal regimes is significant, although not across the whole impulse response horizon, as shown in the fourth column.

These results underscore the importance of the fiscal stance for the ability of monetary policy to affect macroeconomic outcomes. They also align closely with theoretical contributions that study monetary-fiscal interactions in standard New Keynesian models. As shown by Caramp and Silva (2022), the negative relationship between the policy rate and inflation occurs only when monetary and fiscal policy complement each other. However, when they are in conflict with one another, the relationship could turn positive and an interest rate cute might lead to a decline in inflation. An important factor in this regard is the wealth effect generated by monetary and fiscal policy: if the central bank lowers the interest rate, it

Figure 3: Responses to a monetary policy shock across fiscal regimes



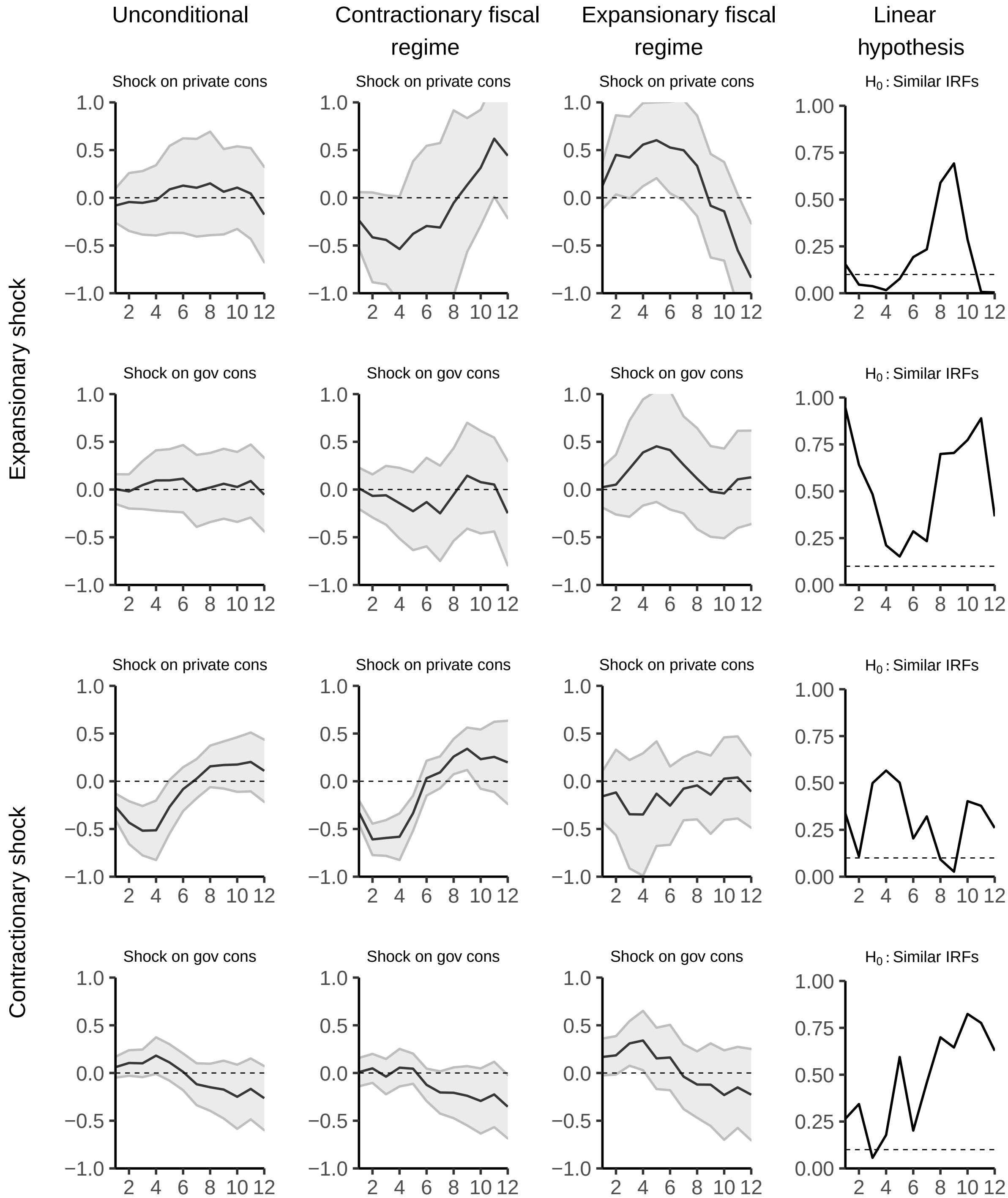
Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following an expansionary (a contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

creates a negative wealth effect by lowering real interest receipts of households and reducing the real value of initial bond holdings. To yield a positive output response to the interest rate cut, fiscal policy needs to be expansionary and, thereby, generate an overall positive wealth effect. If, on the other hand, fiscal policy is contractionary, it amplifies the negative wealth, thereby making it more likely that the output and inflation responses to the monetary easing are negative. Our empirical findings shown in Figure 3 are consistent with these theoretical predictions. Not only do we find that expansionary monetary policy is successful in raising inflation and output *only if* accompanied by expansionary fiscal policy, but also that contractionary fiscal policy can cause inflation and output to *fall* following an interest rate cut.

Considering only contractionary monetary policy shocks, we find a similar result. Particularly, the responses of inflation and output to a monetary tightening are significantly negative, but only when the economy is in the contractionary fiscal regime. The responses are found to be insignificant when the contraction in monetary policy occurs in the expansionary fiscal regime. The difference in the responses across the two regimes is significant up to almost 1 year after the shock. These results mirror those for the monetary easing shocks: the effects of a monetary tightening are amplified when fiscal policy is contractionary, whereas they are muted when fiscal policy is stimulative.

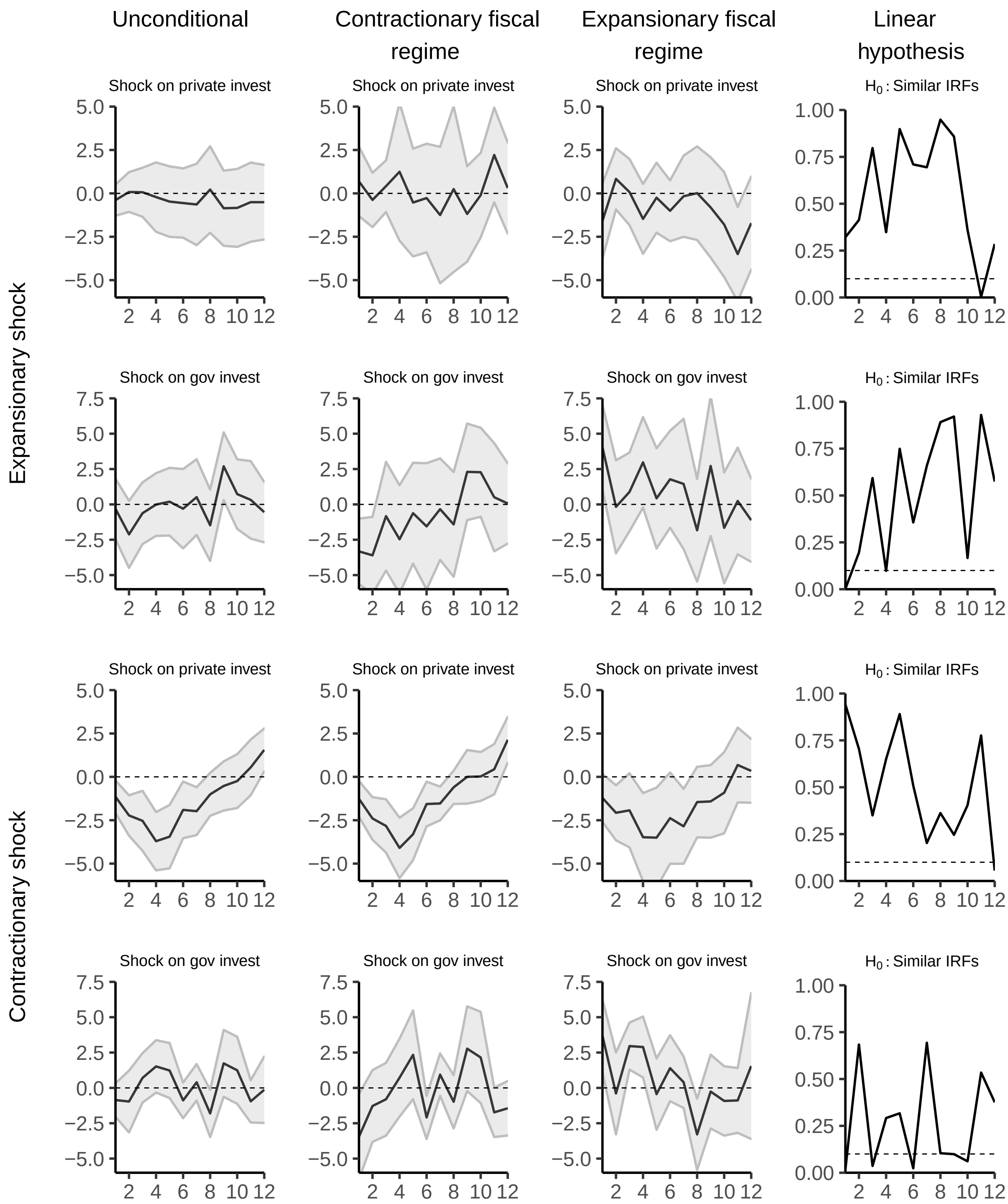
Although our findings can be explained by the wealth effect of monetary and fiscal policy, other channels could potentially be at play. In order to assess the importance of the wealth channel, we now focus on the responses of consumption and investment to the monetary policy shocks across the two fiscal regimes. Figure 4 shows that, following an interest rate cut, private consumption rises in the short run and then falls below its initial level in the medium- to long run, but only when fiscal policy is expansionary. This pattern is consistent with the type of intertemporal consumption smoothing featured in many New Keynesian models characterized by monetary dominance. A lower interest rate reduces the cost of current consumption relative to future consumption, making households want to save less

Figure 4: Response of private and government consumption growth to a monetary policy shock across fiscal regimes



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) rows displays the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

Figure 5: Response of private and government investment to a monetary policy shock across fiscal regimes



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) rows displays the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

and consume more. However, for the consumption response to actually be positive, fiscal policy needs to be expansionary and generate a positive wealth effect. If the interest rate cut were accompanied by a contractionary fiscal policy, the wealth effect may be sufficiently negative to cause a *decline* in consumption. Indeed, Figure 4 shows that private consumption *falls* following a monetary easing shock if, at the same time, fiscal policy is contractionary, although the response is statistically insignificant. The responses of private consumption to the interest rate cut across the fiscal regimes are significantly different, at least in the short run.

Considering only contractionary monetary policy shocks, we again find a similar result: an interest rate hike accompanied by a contractionary fiscal policy yields the 'conventional' response of private consumption, i.e. being negative during the first few quarters and positive in the medium- to long run, which is in line with the optimizing behavior and intertemporal consumption smoothing of households in standard NK models. However, if the interest rate hike were to occur in a regime of expansionary fiscal policy, the consumption response is insignificant. The difference in the response of consumption to the monetary tightening across regimes is significant after two years.

The responses of inflation and aggregate demand, as shown in Figure 3, are unlikely to be driven by adjustments in government consumption or the responses of (public and private) investment. As shown in Figure 4, the responses of government consumption to both an expansionary and a contractionary monetary policy shock are (generally) insignificant and do not differ significantly across the two fiscal regimes. The responses of government investment are significant, but only on impact (see Figure 5). Moreover, regardless of whether the monetary policy shock is contractionary or expansionary, the government adjusts by reducing investments when the overall fiscal stance is contractionary and by raising investments when the fiscal stance is expansionary, which makes it an unlikely candidate for explaining the different responses of aggregate demand across fiscal regimes. Finally, the responses of private investment also do not seem to be an important driver of our main results: in response to a contractionary monetary policy shock, private investment responds significantly and negatively, yet the response is statistically no different across the two fiscal regimes. Following a monetary easing shock, both the unconditional and regime-dependent responses of private investment are insignificant.

In sum: this section provides a novel empirical result on the impact of the fiscal stance on the monetary transmission mechanism. Expansionary (contractionary) monetary policy shocks lead to a significant rise (fall) in inflation and output, but only when fiscal policy is expansionary (contractionary) as well. When monetary and fiscal policy conflict with each other, the effect of an interest rate cut or hike on inflation and output are substantially muted or even reversed. These responses to monetary policy shocks across fiscal regimes are statistically different from each other, especially for inflation. Zooming in on the response of private consumption to the monetary policy shocks suggests that the wealth effect of monetary and fiscal policy is likely to drive these results: again, only when monetary and fiscal policy complement each other, do we find that a monetary easing (tightening) has a positive (negative) effect on private consumption.

5 Robustness analysis

5.1 Controlling for the business cycle

Although the change in the CAPB represents discretionary changes in fiscal policy, i.e. purged from automatic changes due to fluctuations in the business cycle, it may still be that discretionary fiscal expansions or contractions are systematically correlated with the business cycle. If this is the case, it could be that our main results (shown in Figure 3) are primarily driven by shifts in the business cycle, rather than by changes in the fiscal regime. To rule out this possibility, we augment the model in (5) to account for the impact of the business cycle.

We use the seven-quarter lagging moving average of the growth rate of output as our measure of the business cycle, $s_{i,t}$ (following Tenreyro and Thwaites, 2016). We then construct an additional indicator, $G^k(s_{i,t})$ with $k = \{rec, exp\}$, to determine the possibility that the economy is in either a **rec**ession or an **exp**ansion using a logistic function similar to the one shown in Equation (3). We calibrate the logistic function such that the economy experiences a recession 20% of the time on average (the same assumption is made in Tenreyro and Thwaites, 2016). Finally, we estimate the following model:

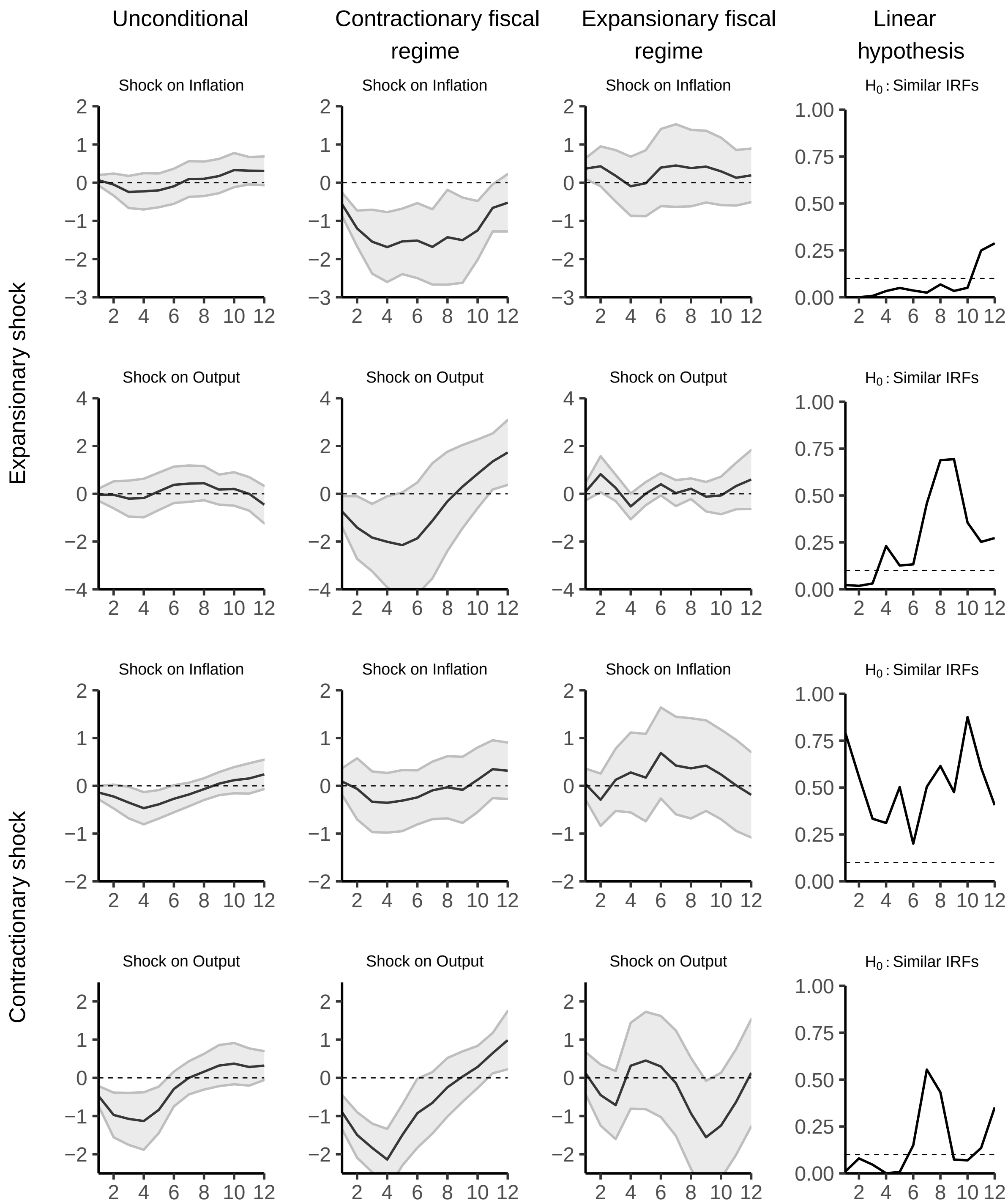
$$y_{i,t+h} = \sum_{k=\{rec,exp\}} G^k(s_{i,t}) \left[\sum_{j=\{c,e\}} F^j(z_{i,t}) \left(\beta_h^{k|j+} m_t^+ + \beta_h^{k|j-} m_t^- + \lambda_h^{k|j} x_{i,t} + \alpha_{i,h}^{k|j} \right) \right] + \epsilon_{i,t+h}. \tag{6}$$

To enhance readability, we plot the estimated impulse responses conditional on being in an expansion and recession in two separate graphs.

The impulse responses of inflation and output growth when conditioning on being in an economic recession are depicted in Figure 6. Consistent with our baseline results, we find that, following an expansionary monetary policy shock, inflation and output both rise, albeit temporarily, if the shock occurs in the expansionary fiscal regime. If, on the other hand, the fiscal stance is contractionary, both inflation and output *fall* following the interest rate cut. The difference in the responses of inflation across the two fiscal regimes is highly significant for almost the entire projection horizon, whilst for output this only holds for the first year. The impact of contractionary monetary policy shocks on inflation is insignificant, regardless of whether fiscal policy is also contractionary or not. The output response to a monetary tightening is negative in the expansionary fiscal regime and insignificant in the contractionary fiscal regime. While not only confirming our baseline results, these findings also point to an important implication for policymakers: when the economy faces a recession, a monetary easing can only generate higher inflation and output when tied to a sufficiently expansionary fiscal policy.

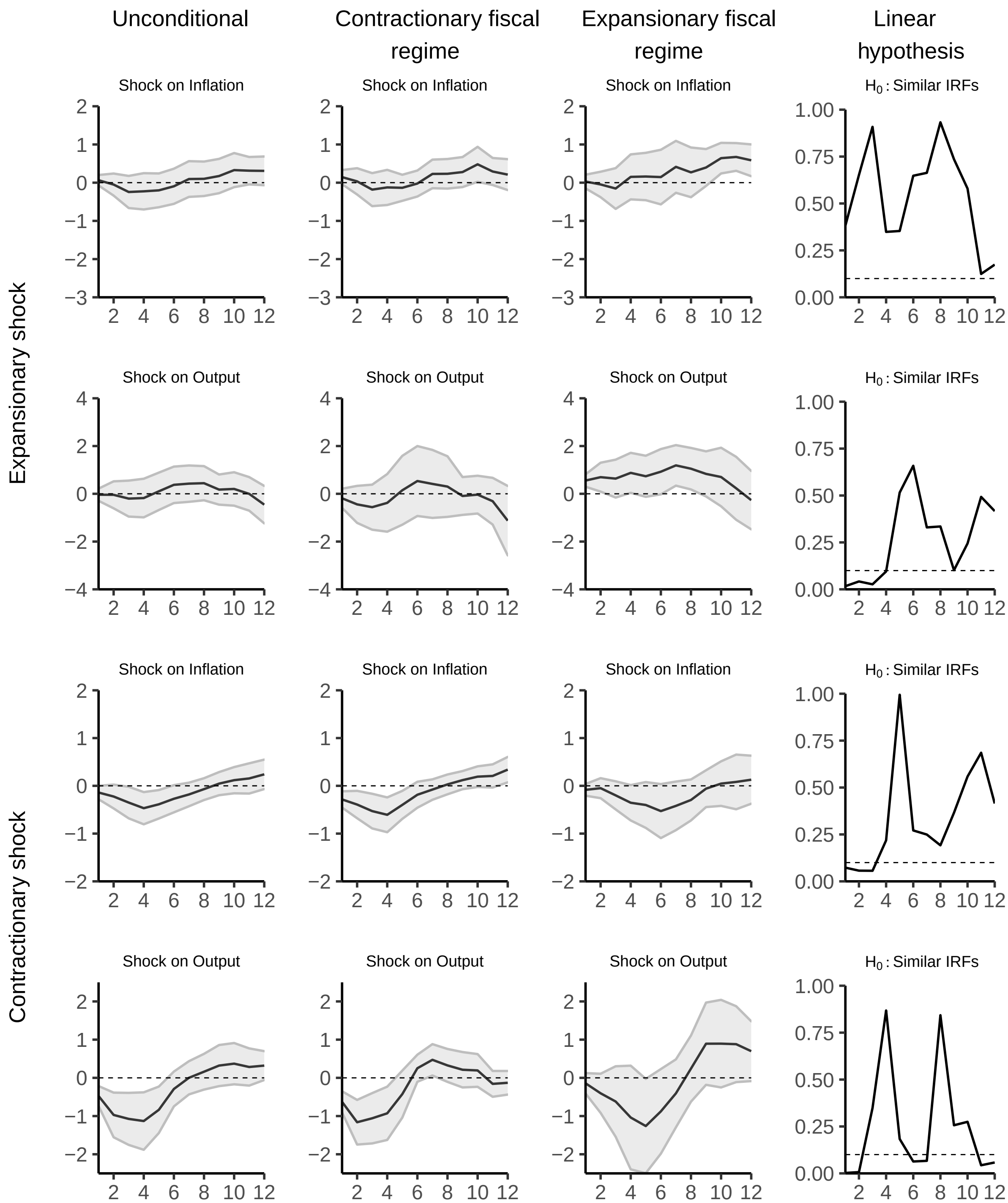
The impulse responses to a monetary policy shock conditional on being in an economic

Figure 6: Responses to a monetary policy shock in an economic recession



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. In both fiscal regimes, the responses are also conditional on being in an economic recession. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^{rec|e} = \beta_h^{rec|c}$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

Figure 7: Responses to a monetary policy shock in an economic expansion



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. In both fiscal regimes, the responses are also conditional on being in an economic expansion. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^{exp|e} = \beta_h^{exp|c}$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

expansion are shown in Figure 7. Again in line with our baseline results, we find that expansionary monetary policy shocks lead to higher inflation and output, but only in the expansionary fiscal regime—in the contractionary fiscal regime, the responses are insignificant. The role of the fiscal stance, however, is only significant in shaping the response of output and ceases to be of importance for the response of inflation. Following a monetary tightening, the fiscal regime is important for both the inflation and output response: only when fiscal policy is contractionary do we find a significant decline in inflation and output in response to an interest rate hike.

Figures 6 and 7 introduce important nuances to our baseline results. First, even when controlling for the business cycle, we find that the fiscal stance remains an important conduit for monetary policy shocks. Second, the role of fiscal policy is particularly relevant for the impact of expansionary monetary policy shocks on inflation during a recession.

5.2 Using alternative measures for the fiscal stance

As shown in Section 3, a key element of our empirical strategy is the choice for the state variable that is used to define the fiscal regime. In our baseline model, we used the change in the CAPB to capture changes in the fiscal stance and characterize the fiscal regime. Because the CAPB is only publicly available at an annual frequency, we constructed a quarterly measure using country-specific estimates of the output gap and output elasticities of the revenue and spending components of the observed primary budget balance. In this section, we consider two alternative measures for the fiscal stance.

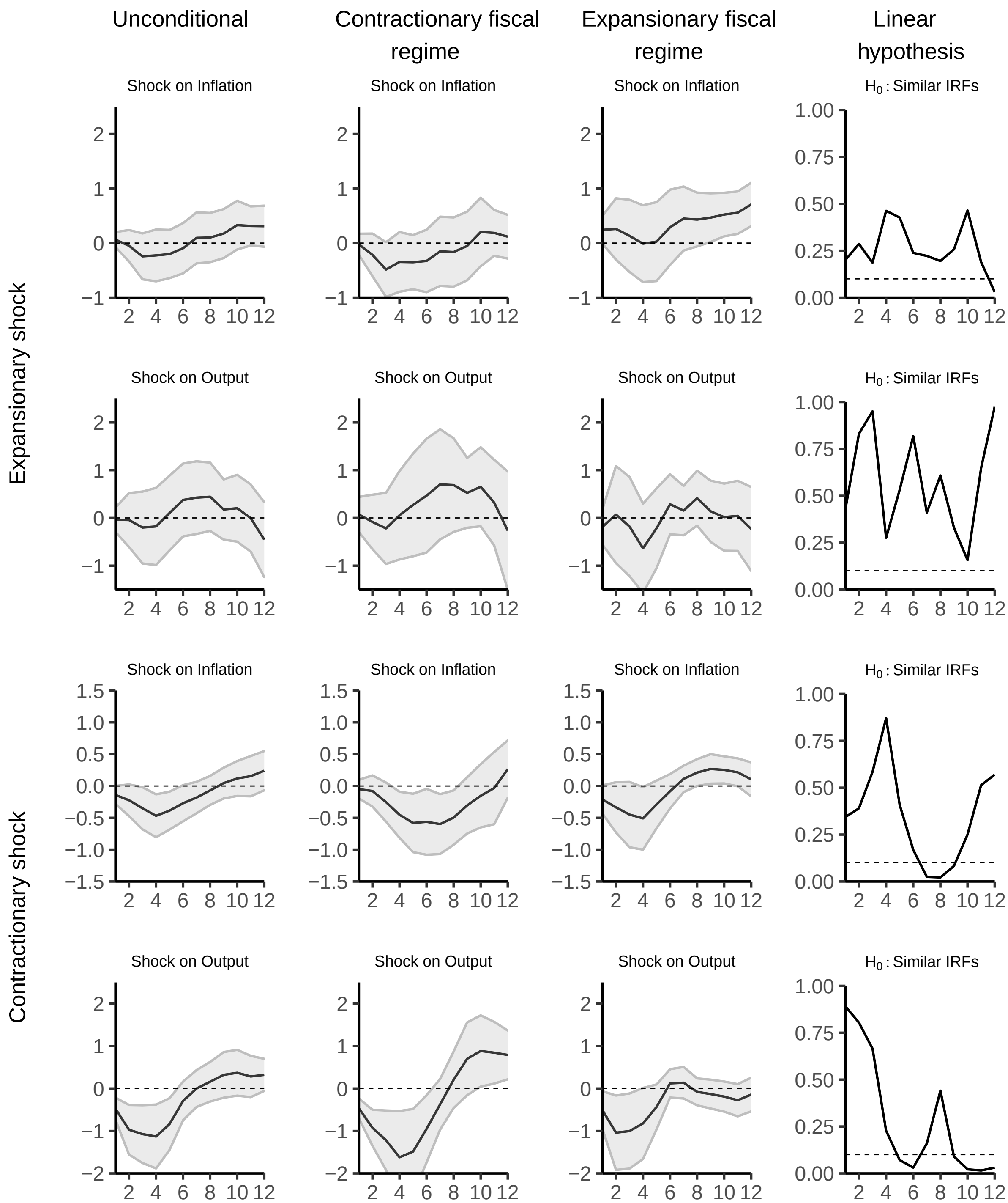
For the first alternative measure, we again focus on the change in the CAPB, but now derive the CAPB differently. In particular, we proxy the CAPB by extracting the trend component of the primary surplus using a Kalman filter. An advantage of this approach is that it does not rely on fixed (i.e. time-invariant) estimates of the output elasticity of the budget balance. Therefore, when filtering out the cyclical component of the primary balance, the degree with which the primary balance varies automatically with the business cycle is allowed to change over time (e.g. due to changes in the tax system). A disadvantage is that discretionary changes in fiscal policy in response to the business cycle might also be filtered out. Consequently, this measure may potentially miss out on important adjustments in fiscal policy that are relevant for the transmission of monetary policy.

For the second alternative measure, we distinguish between the expenditure and revenue side of the budget balance, and focus on the change in cyclically adjusted primary government expenditures (CAGE) and cyclically adjusted government revenues (CAGR). As in our baseline model, we perform the cyclical adjustment by using the country-specific output elasticities of government expenditures and revenues. This distinction helps us identify what type of fiscal adjustment is most relevant for the monetary transmission mechanism. The distinction is also relevant given that government spending multipliers and tax multipliers may differ substantially in terms of their size.

Figure 8 shows the impulse responses to a monetary policy shock when we proxy the CAPB using the Kalman-filtered trend of the primary balance. Although, at least qualitatively, the responses are similar to those from our baseline model, the role of the fiscal regime seems to be less apparent. We again find that expansionary monetary policy shocks only induce higher inflation when fiscal policy is also expansionary, yet the difference in the inflation response across the two fiscal regimes is only slightly significant near the end of the horizon. Similarly, the inflation response to a contractionary monetary policy shock is significantly negative only when fiscal policy is also contractionary, yet the response only differs significantly across regimes after two years following the shock. As mentioned earlier, this measure of the CAPB may omit important variations in the fiscal regime that could be relevant for the effects of monetary policy. Nevertheless, the results are in favor of our baseline results and also justify the use of our baseline measure for the CAPB.

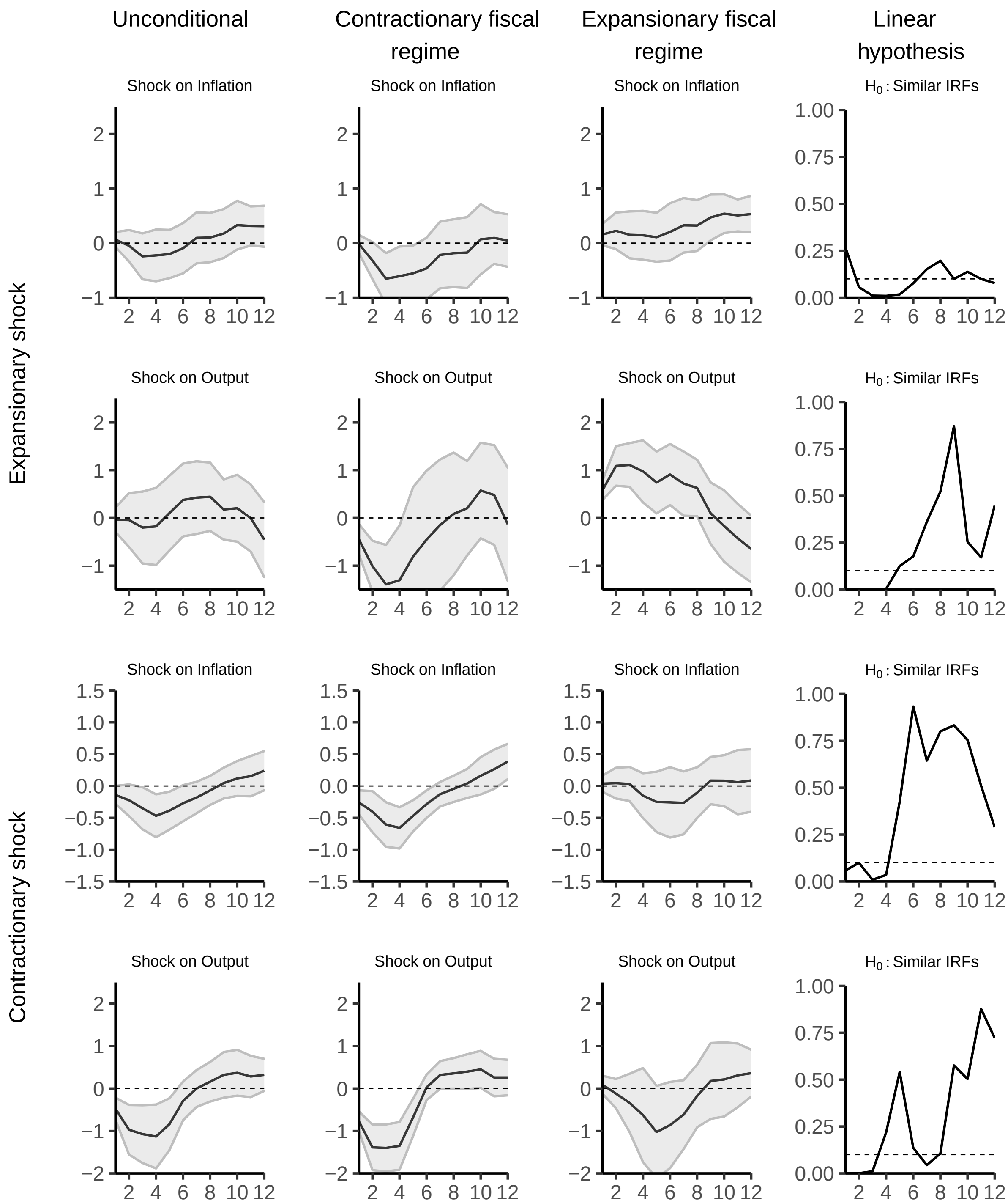
Figures 9 and 10 show the responses to a monetary policy shock across fiscal regimes when the latter are determined by the change in the cyclically adjusted government expenditures and revenues, respectively. These figures suggest that discretionary (expansionary

Figure 8: Responses to a monetary policy shock across fiscal regimes, using the Kalman-filtered trend of the primary balance as a proxy for the CAPB



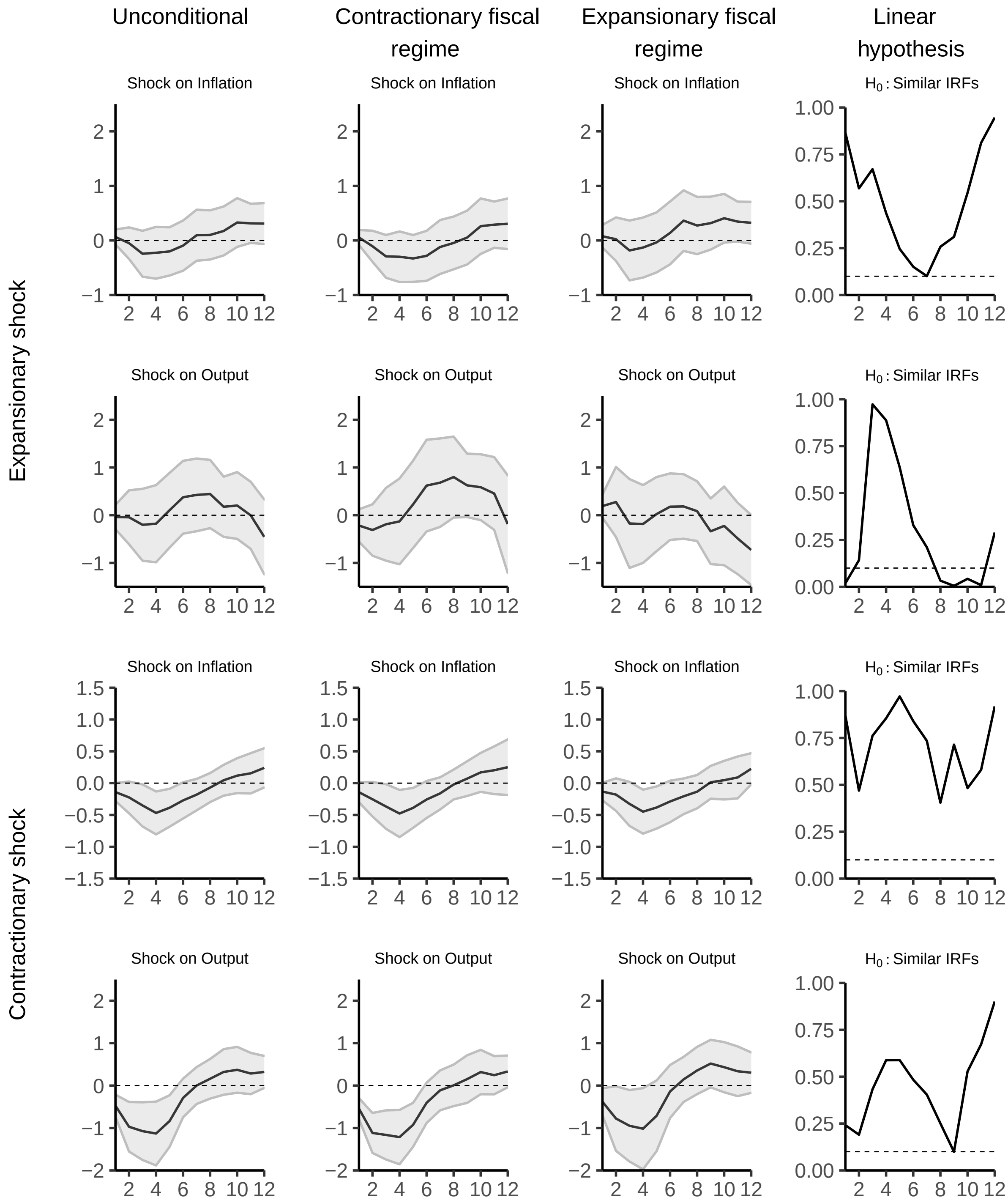
Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

Figure 9: Responses to a monetary policy shock across fiscal regimes using CAGE as state variable



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. A contractionary (expansionary) fiscal regime corresponds to a decline (increase) in cyclically adjusted primary government expenditures (CAGE) expressed in percentages of GDP. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

Figure 10: Responses to a monetary policy shock across fiscal regimes using CAGR as state variable



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. An increase (decrease) in cyclically adjusted government revenues (CAGR) corresponds to a fiscal contractionary (expansionary) regime.The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

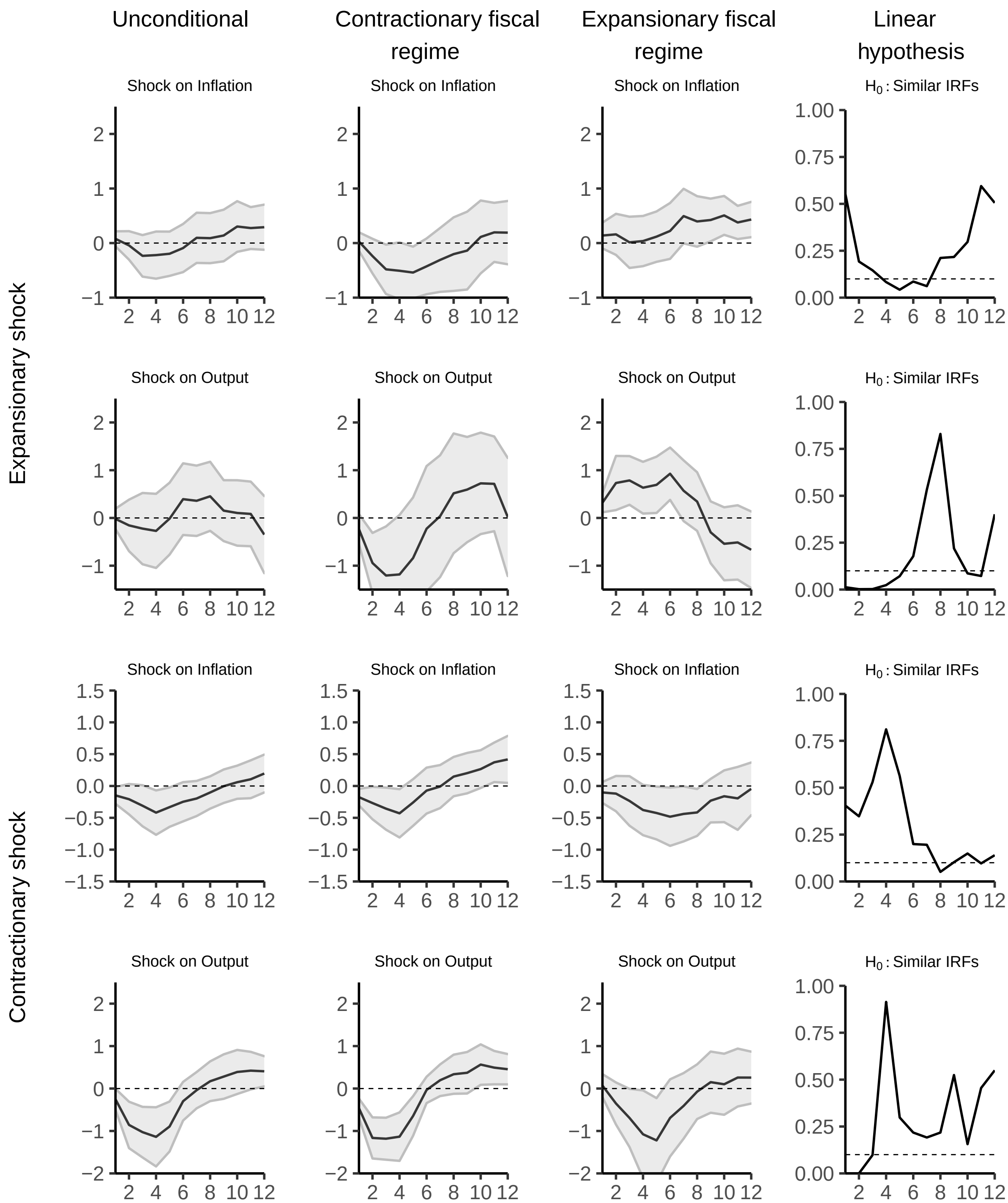
and contractionary) changes in government expenditures, rather than in revenues, are mostly responsible for the impact of the fiscal stance on the monetary transmission mechanism. In particular, we find that characterizing the fiscal regime using the change in the CAGE produces very similar results as our baseline results. In contrast, when using the change in the CAGR to define the fiscal regime, we find that the latter seems to become irrelevant for the monetary transmission mechanism. One implication of this finding is that, in the context of the wealth channel of monetary and fiscal policy, changes in government expenditures (e.g. transfer payments, subsidies, social benefits, pensions and salaries) are most relevant in affecting household wealth and, thereby, the output and inflation response to monetary policy shocks.

5.3 Different country samples

In our baseline model, we impose that the monetary transmission mechanism, and the role played by the fiscal stance, is the same across the countries in our sample, which may be a strong assumption. To allow for cross-country heterogeneity, one could perform a country-by-country analysis. However, such an approach is likely to suffer from a limited number of observations across the fiscal regimes that we study. One way to circumvent this issue is to focus on a subset of countries that share similar characteristics. We follow this approach in two ways. First, we consider a subset consisting of the five largest euro area countries. Second, we focus on a subset of countries that share a relatively low degree of sovereign stress, which is the original panel excluding Spain, Portugal and Italy. We do so, since sovereign risk may change the wealth effect of fiscal policy through a revaluation of government bonds.

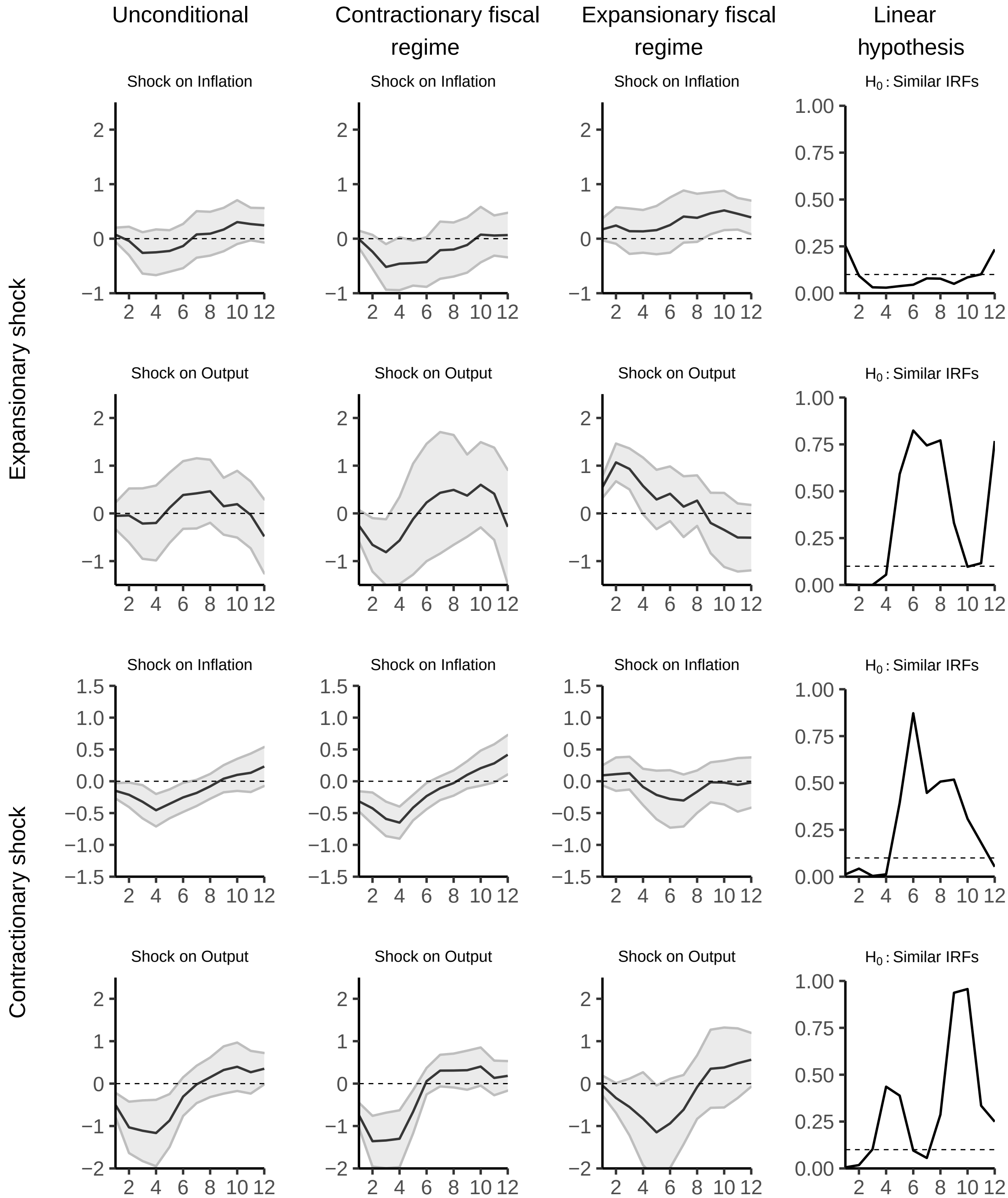
Figure 11 shows that, when focusing only on the five largest euro area countries, the implications of the prevailing fiscal regime for the effectiveness of monetary policy are still present: expansionary monetary policy shocks are able to lift inflation and output growth only when accompanied by expansionary fiscal policy. The difference in the effects of a

Figure 11: Responses to a monetary policy shock across fiscal regimes for only the five largest EA countries



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

Figure 12: Responses to a monetary policy shock across fiscal regimes for countries with low sovereign stress



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

monetary easing across the two fiscal regimes remains significant. The responses following a monetary tightening are also dependent on the fiscal regime, but only quantitatively: inflation and output respond negatively in both fiscal regimes, yet more so when fiscal policy is contractionary. Figure 12, in which we only focus on the low-sovereign-stress countries, paints a similar picture: the fiscal regime is crucial in the transmission of both expansionary and contractionary monetary policy shocks.

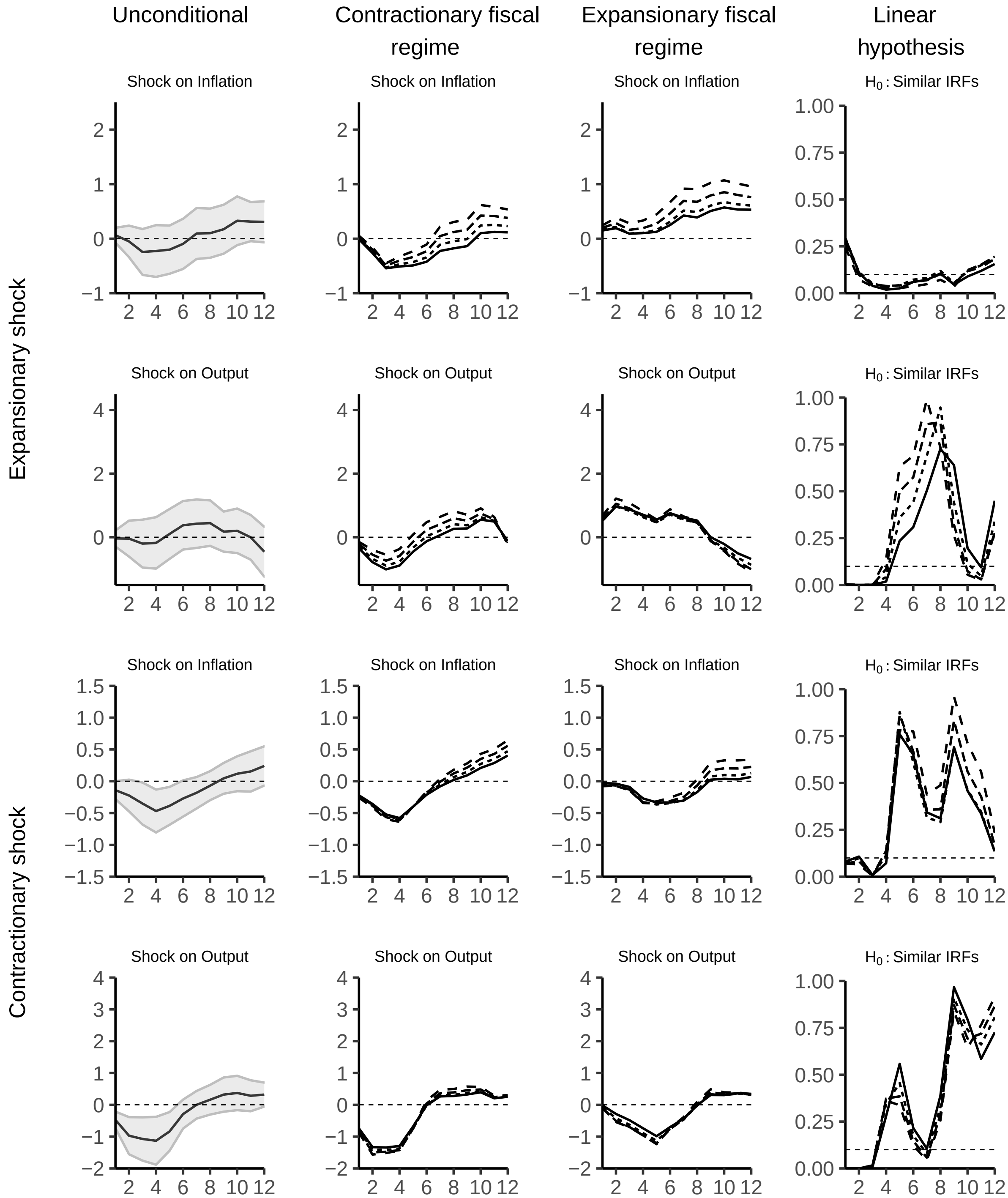
5.4 Defining the fiscal regimes

As a final robustness check, we re-calibrate the threshold that determines when an expansionary or contractionary fiscal regime is in place. Recall that this threshold, denoted by c^j in Equation (3), is set to zero in our baseline model, which implicitly assumes that all positive (negative) changes in the CAPB are discretionary fiscal contractions (expansions). One objection to this assumption is that, in reality, small changes in the CAPB may not necessarily reflect discretionary changes in fiscal policy, but could reflect other things like measurement errors or automatic changes in taxes due to certain country-specific characteristics in the tax code.

To circumvent this issue, we now focus on changes in the CAPB that are sufficiently greater than zero (in absolute terms) and vary c^j over a range of values. In particular, we consider $c^e = \{0, -0.1, -0.2, -0.3\}$ and $c^c = \{0, 0.1, 0.2, 0.3\}$. So, for instance, when $c^c = 0.3$, the change in the CAPB needs to be at least 0.3% of potential GDP in order for the fiscal regime to be characterized as contractionary. One can interpret the case when $c^j \neq 0$ as one where we focus only on the more prominent contractionary and expansionary fiscal regimes. In that case, there will be episodes that do not fall into either regime and $F^e(z_{i,t}) + F^c(z_{i,t}) < 1$ in Equation (2).

Figure 13 shows that, as the threshold c^j increases, the results become more pronounced compared to our main results: following an expansionary monetary policy shock, the inflation and output responses are more positive when fiscal policy is expansionary than if fiscal

Figure 13: Responses to a monetary policy shock when using different threshold values to define the fiscal regimes



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors.

policy is contractionary, and more so the higher is the threshold value. In the context of the wealth channel of fiscal policy, this result confirms that a more expansionary fiscal policy helps generate a larger positive wealth effect and, consequently, a greater positive effect of monetary easing shocks.

However, when fiscal policy is more contractionary, these positive effects also seem to be larger. One way to reconcile this finding with our baseline results is that contractionary fiscal policies could result in a *positive* wealth effect if they result in lower debt sustainability concerns that reduce the risk of the government defaulting on bonds held by the private sector. Such expectations could also lead to lower risk premia and higher growth expectations. Such effects, if sufficiently large, could render the net effect of fiscal contractions on household wealth to be positive. These types of 'non-Keynesian' effects of fiscal policy have been documented, among others, by Giavazzi and Pagano (1990) for Ireland and Denmark. Considering the responses to the contractionary monetary policy shock, we find that the inflation and output responses also differ significantly across fiscal regimes, yet the magnitude of the change in discretionary fiscal policy seems to be of little relevance. This finding is consistent with the results from previous robustness exercises that the fiscal stance matters more for the transmission of expansionary monetary policy shocks than for contractionary shocks.

6 Conclusion

In the past decade, we have witnessed various configurations of monetary and fiscal policies in the euro area, each with potentially different implications for macroeconomic stability. Whereas monetary policy has been expansionary throughout most of the period following the global financial crisis, the fiscal stance has varied between expansionary and contractionary in most euro area countries. In this paper, we showed that the fiscal stance is crucial for the effectiveness of monetary policy. In particular, an expansionary monetary policy shocks leads to an increase in inflation and output growth, yet only when the shock is accompanied by expansionary fiscal policy. The dependency of the transmission channel of monetary easing shocks on fiscal policy is most apparent during an economic recession. The effectiveness of contractionary monetary policy shocks also relies on the prevailing fiscal regime, with the inflation and output responses being more negative when fiscal policy is also contractionary. The responses to a monetary policy shock of consumption and investment suggest that the wealth effect of fiscal policy is an important factor in shaping the monetary transmission mechanism. Combined, these results underline the importance of monetary and fiscal policy coordination for macroeconomic stability.

Our results line up well with the euro area's experience with monetary-fiscal interactions of the past decade. While economic performance has been somewhat disappointing following the global financial crisis, during which monetary and fiscal policy were often out of sync, the recovery from the pandemic crisis, when monetary and fiscal actions have been more harmonious, seems to be more robust. With inflation currently reaching historically high levels, monetary policy switched to a more contractionary stance. Our results suggest that the European Central Bank's ability to bring down inflation will depend strongly on the type of fiscal policies pursued by the euro area's member states. One important caveat, however, is that our results are based on data covering a period during which inflation has often been below target and the ELB became binding. The effects of a monetary tightening, and how these depend on the fiscal stance, may be different in the current regime of high inflation and away from the ELB. At the same time, many member states currently face elevated public debt levels, which in recent years have surged well above the Stability and Growth Pact's limit of 60% of GDP. The recent rise in the policy rate, and expectations of future rate hikes, have led to the emergence of sovereign debt sustainability concerns and a widening of sovereign bond spreads across the euro area. The extent to which these (and other) indicators of sovereign risk impact the monetary transmission mechanism is a topic we leave for future research.

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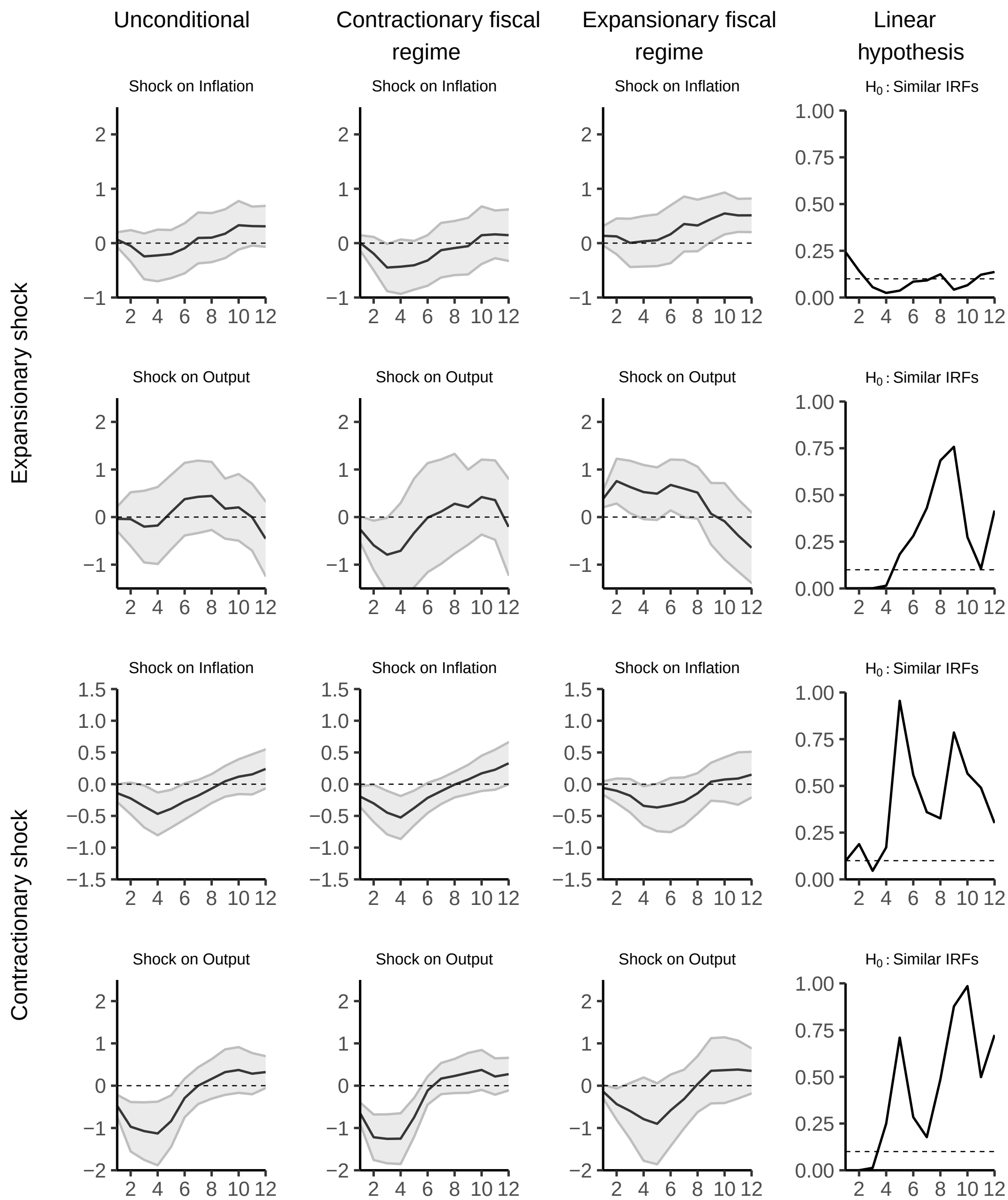
A Additional graphs

Figure 14: Responses to a monetary policy shock when using an alternative calibration for the logistic function ($\theta = 10$)



Notes: The first column shows the impulse responses to an unconditional, i.e. regime-invariant, one standard deviation monetary policy shock. The second and third columns show the impulse responses to a monetary policy shock conditional on being in the contractionary and expansionary fiscal regime, respectively. The fourth column is the p-value for each horizon of the Wald hypothesis test that $\beta_h^e = \beta_h^c$. The top (bottom) two rows display the impulse responses following a expansionary (contractionary) monetary policy shock. Shaded areas reflect the 90% confidence interval based on Driscoll-Kraay standard errors. θ measures how abruptly the economy is assumed to switch between the two fiscal regimes, see (3).

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