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# Made in Europe: Monetary–Fiscal policy mix with financial frictions[☆]

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ABSTRACT

We study the role of fiscal and monetary policies in a financially constrained economy. An active monetary–passive fiscal regime amplifies technology shocks, mitigates preference shocks, and neutralizes the expansionary effects of fiscal shocks through "debt deflation" and "real interest rate" channels, compared to an active fiscal–passive monetary policy regime. Several features of the data suggest that in the aftermath of the 2007 Financial crisis, the monetary policy in the United States was more dovish than in the Euro Area while fiscal policy seemed less concerned about the dynamics of sovereign debt, implying that the distinct post-crisis dynamics of the United States and the Euro area can be rationalized through different fiscal and monetary policy mixes.

## 1. Introduction

We study the interaction between monetary and fiscal policies in a financially constrained economy. Building on Leeper (1991) and Fernández-Villaverde (2010), we set up a stylized DSGE model with a non-trivial fiscal and monetary policy interaction and financial frictions, as in Bernanke et al. (1999). We use the model as a laboratory to understand how different policy arrangements affect the dynamics of key macroeconomic variables. We examine the dynamic responses of output to economic and policy shocks and find that policy arrangements are of first-order importance for the transmission of shocks and for recovery after a financial crisis.

The literature has studied the interaction between fiscal and monetary policies using the categories in Leeper (1991) of "active" and "passive" policies. In a dynamic stochastic general equilibrium model we need a coordination between fiscal and monetary policies to have a unique equilibrium. "Active monetary policy" refers to cases in which the monetary authority responds strongly to inflation. "Active fiscal policy" refers to cases in which fiscal policy does not respond to sovereign debt. Leeper (1991) shows that both monetary and fiscal dominance regimes can uniquely pin down the inflation path. In the monetary dominance regime, the Taylor principle guarantees the determinacy of a unique equilibrium, whereas the fact that taxes respond to debt guarantees

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that government debt is sustainable. Under fiscal dominance, taxes do not respond "enough" to stabilize debt by itself and, hence, it is the path of inflation that guarantees the sustainability of real government debt, partly by inflating it away, partly by implying lower real interest rates.[2]

The second building block of our model is the financial accelerator of Bernanke et al. (1999), where entrepreneurs need to borrow to purchase capital but are subject to a costly state verification that limits how much debt they can issue. The higher the internal funds of the entrepreneurs the less constrained they are by financial frictions. This gives rise to a financial accelerator where entrepreneurs constraints are weaker during the expansions, an additional channel for the impact of the interest rate to the one usually found in the New-Keynesian models. Our combination of the financial accelerator with the fiscal and monetary policy interaction highlights a new transmission channel of the fiscal policy.

Two main transmission mechanisms operate in our setup: the "debt deflation channel" and the "real interest rate channel". Through the debt deflation channel the interplay of monetary and fiscal policies is relevant in the context of financial frictions, even in the absence of nominal rigidities. The trade-off between taxes and inflation—which has no real effects in Leeper (1991)—now affects the stock of real private debt. In the case of passive monetary–active fiscal policy, higher surprise inflation reduces the stock of public debt but also reduces private debt, which increases entrepreneurs' net worth and allows them to invest more. This mechanism adds to the real interest rate channel already present in New-Keynesian models, shown, for instance, in Davig and Leeper (2011). An increase in inflation raises the real interest rate under active monetary–passive fiscal policy (monetary dominance) but lowers it under fiscal dominance, generating opposite effects on capital accumulation.

We apply our model to the context of the 2007 financial crisis in United States (US) and the Euro Area (EA) in which recovery in the Euro Area was weaker and slower than in the United States. Our estimates for each economy suggests that the US has followed a more dovish monetary policy and expansionary fiscal policy, that is more aligned with the active fiscal policy regime identified by Leeper (1991), whereas the EA was more aggressive both towards inflation and debt control and hence, more in line with an active monetary regime. According to our model, these results contributed to the divergent experiences of the US and the EA. There is suggestive evidence that the two economies followed different policy mixes. At the onset of the 2007 crisis, while the United States quickly implemented interest rate cuts and large increases in the monetary base and debt levels, the Euro Area was substantially more conservative. As a consequence, a divergence of the real interest rate – a key variable that distinguishes the two regimes – occurred between the US and the EA in the early stages of the crisis. In the next section we describe in detail the recent experiences of the US and EA as shown in Fig. 1. Beyond this suggestive evidence, several papers have found that the US followed a fiscal dominance policy regime even prior to the 2007 recession. First, Davig and Leeper (2011) estimate a New Keynesian model with a regime switching policy rules for the US and find that from early 2000s until the end of their sample in 2008, the US already had a passive monetary–active fiscal policy. Chang and Kwak (2017) estimate the two reduced-form policy rules with an endogenous switching model and find that the passive monetary–active fiscal policy was also in place during the financial crisis. Using a Markov-Switching environment (Bianchi and Melosi, 2017) estimates, in line with our findings, that after the great recession the US has followed a lax fiscal rule with monetary policy unresponsive to inflation. The Euro Area, on the other hand, is commonly treated as in a traditional monetary policy regime (Hohberger et al., 2019; Maih et al., 2021; Ratto et al., 2009; Coenen et al., 2018a; Cardani et al., 2022). To maintain simplicity, we encapsulate these policies by estimating fiscal and monetary rules within our model, using a 2007–2019 sample, and confirm the finding that the EA was more concern with inflation and debt stabilization then the US in the aftermath of the financial crisis. Hence, during this period, the EA policy is more aligned with a monetary dominance regime, while the US policy is more aligned with a fiscal dominance regime.

Our main contribution is to use an off-the-shelf model to understand how the fiscal and monetary policy interaction operates during periods of financial stress. Even though our model is stylized, it is useful to emphasize one mechanism that has not been discussed in the literature, and we think is of first-order importance. If the monetary–fiscal policy mix is essentially about whether government debt is financed by taxation, or accommodated by monetary policy with lower real interest rate and higher inflation rates, their effects should be different depending on the size of private debt or leverage in the economy. In particular, a fiscal dominance regime should help deleveraging in the private sector too. This insight is not present in recent related papers that analyse fiscal–monetary policy interactions in the presence of financial frictions such as Dimakopoulou et al. (2023), Cui (2016) or Dhital et al. (2021), and is quantitatively relevant.

We contribute to the literature on financial frictions and macroeconomic dynamics surveyed in Quadrini (2011). As pointed out by this paper, there is a long tradition in macro models of introducing financial frictions. Typically, these models are of two types: financial accelerator models where the friction comes from information asymmetries (see for instance Bernanke et al. (1999) or Christiano et al. (2008) among others) and collateral constraint models where the friction comes from limits to the amount of debt that can be hired as a function of the market value of the collateral (Kiyotaki and Moore, 1997). Financial friction models tend to amplify monetary shocks and generate more persistence.

Jermann and Quadrini (2012) document cyclical properties of US firms' financial flows and develop a model that shows the importance of financial shocks, in particular during the recent crisis. Other contributions include Christiano et al. (2008, 2010, 2014), Covas and Haan (2011), Cúrdia and Woodford (2010), Cooper and Ejarque (2003), and Leeper and Nason (2014). Most of these studies focus on the role of monetary policy and abstract from fiscal policy configurations, despite the fact that sovereign debt levels have been at the core of current policy discussions. This is an important gap in the literature that we aim to fill by considering

[2] The terms 'active monetary–passive fiscal policy' and 'monetary dominance' are used interchangeably throughout this paper, as are 'active fiscal–passive monetary policy' and 'fiscal dominance'.

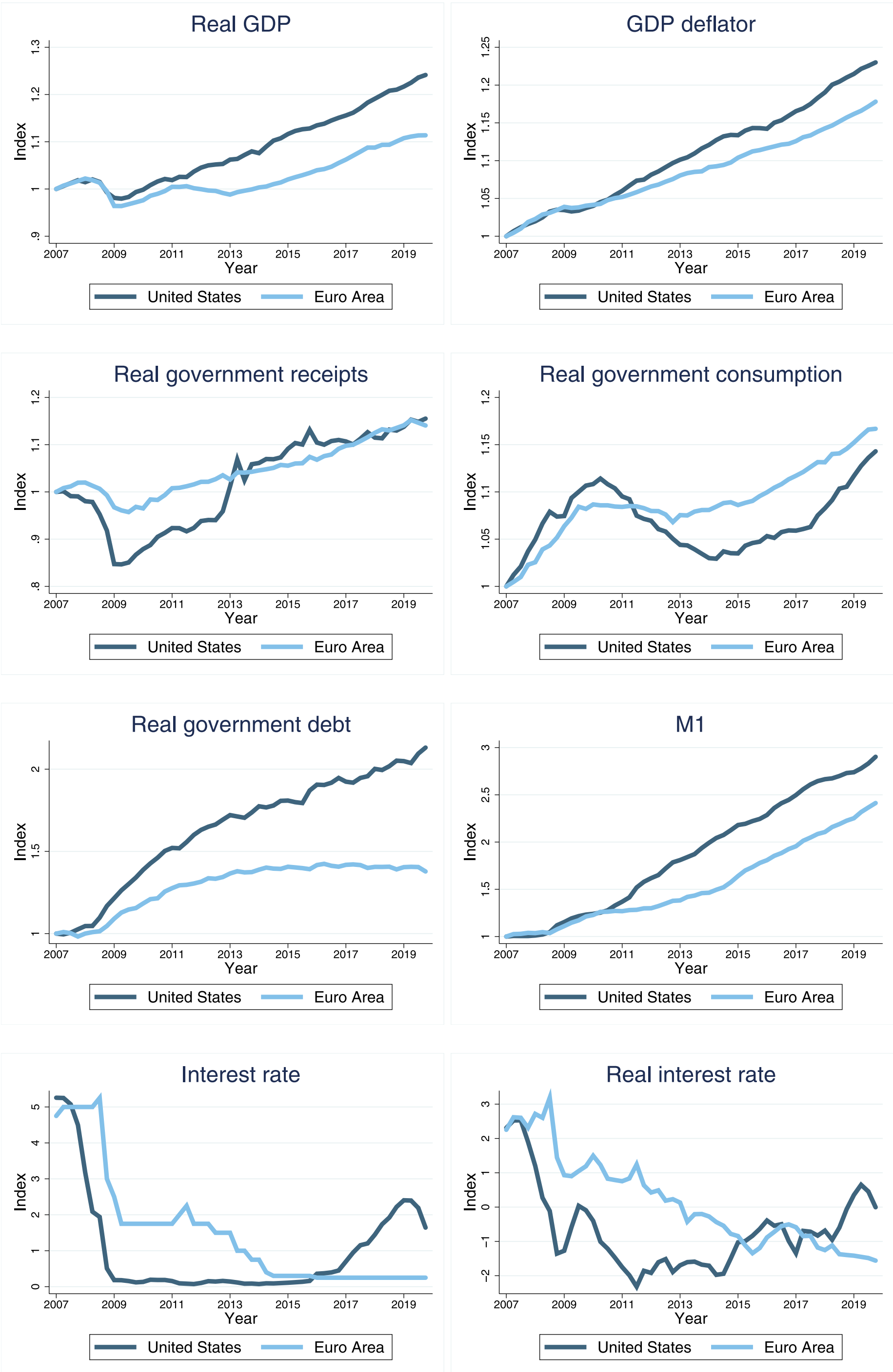



**Fig. 1.** The anatomy of the recession. *Note:* Data is from St. Louis FED FRED dataset, IMF and Eurostat. Details about sources and additional figures are in Appendix A.

fiscal and monetary policy arrangements together with financial frictions, in context of a financial crisis. In this sense, we relate this literature to that on the interaction between fiscal and monetary policies, such as Bianchi (2012), Bianchi and Ilut (2013), Leeper and Yun (2006), Leeper et al. (2017) or Davig and Leeper (2011).[3] We find that a negative technology shock induces a deeper recession under monetary dominance, than under fiscal dominance. On the other hand, a negative preference shock induces a deeper recession under fiscal dominance, than under monetary dominance.

We also contribute to the recent literature on the effects of fiscal policy with financial frictions. Fernández-Villaverde (2010) studies the effects of fiscal policy in the presence of financial frictions in the spirit of Bernanke et al. (1999), focusing on the 2008–2009 recession. His objective is different from ours, as he focuses on the impact of distortionary taxation. Carrillo and Poilly (2013), who also use a financial accelerator model interacting with the zero-lower bound, reaffirm that government spending multipliers are substantially higher under credit market imperfections. In addition to the Fisherian debt-deflation channel, they highlight a capital-accumulation channel. During the liquidity trap, an expansionary government spending shock reduces the real interest rate, allowing entrepreneurs to accumulate more capital. Eggertsson and Krugman (2012) set up a model with financial frictions in the spirit of Kiyotaki and Moore (1997), arguing that because of debt-constrained agents, the Ricardian equivalence breaks down and, as a consequence, the government spending multipliers increase. Finally, Kollmann et al. (2013) set up a New-Keynesian model with a banking sector and study the effects of the government programs that supported banks during the Euro Area crisis. They find that the program contributed to output, consumption, and investment stabilization in the Euro area. While most of these papers focus on the size of government spending multipliers, less attention has been devoted to the role of debt and its financing. We show that both tax cuts and government spending shocks are more expansionary under fiscal dominance, even in the absence of nominal rigidities. The long-run government spending present-value multiplier under monetary dominance is 0.7 while it is 3.5 under fiscal dominance. In both regimes, the multiplier depends on the steady-state level of private sector indebtedness.

The paper is structured as follows. In Section 2, we present a first analysis of the US and EA data, showing their different post-crisis dynamics that we use to illustrate the comparison between regimes. In Section 3, we describe the simple model economy that combines financial frictions with fiscal and monetary policy configurations. Section 4 describes the empirical strategy we use to take the model to the data and confirms that the fiscal policy in the US was more prone to let debt increase and the central bank more dovish than the EA during and after the crisis. Section 5 describes the quantitative implications of these findings. We examine the responses of endogenous variables to economic and policy shocks, as well as the size of fiscal multipliers under different policy configurations. In Section 6, we investigate the potential EA dynamics if it had implemented the US policy mix and find that output would have been higher. Section 7 concludes.

## 2. From crisis to recovery

Fig. 1 shows time series of key macro, fiscal, and monetary variables for the United States and the Euro Area from the beginning of the financial crisis until 2019. The figure shows that major differences exist in the evolution of prices and output, as well as in the dynamics of key variables that characterize monetary and fiscal policy responses, such as the money supply, interest rates, debt, taxation, and government spending, in particular between 2007 until 2015.

The US recovery has been more robust than the EA's. By the start of 2015, US real GDP was ten per cent above its value in 2007, while the EA real GDP matched the 2007 level. This faster recovery implied a five per cent cumulative higher price level in the United States, measured using the GDP deflator.

The US implemented expansionary monetary and fiscal policies. On the monetary side, interest rates quickly dropped to zero, and quantitative easing contributed to an increase in the money supply that more than doubled in seven years. On the fiscal side, the government followed a temporary counter-cyclical policy by both allowing for tax receipts to fall as much as 20 per cent and increasing government spending up to eight per cent. The financial counterpart of this policy is reflected in the 80 per cent increase in the real stock of government debt. In contrast, in the EA, the interest rate decline was slower and less sharp, and the monetary expansion was milder, with an increase in M1 of 50 per cent. The responses to the crisis on the fiscal side look ambiguous. On the one hand, receipts collected by the government were roughly constant. Despite the GDP drop during the crisis, governments increased tax rates, as they were concerned about the impact of sovereign spreads. On the other hand, an increase in government spending occurred that was smaller but more persistent than that in the US.

The real interest rates behaved similarly in the few first quarters of 2007 but quickly diverged. While the real interest rate became negative in the United States, it was slow to decline in Europe and reached negative values only by the end of the sample. This is in line with the hypothesis that the two economic areas implemented different policy mixes. Only after 2015, did the real interest rate converged.

The next section develops a business cycle model and studies the implications of these different policy arrangements. We introduce a simple financial accelerator model to capture the role of financial frictions, augmented by fiscal and monetary policies, to understand the diverting dynamics conditional on estimated policies. We use the model to understand one potential reason behind the recovery (or the lack thereof).

[3] We follow the specification in Leeper (1991) where the monetary authority targets the interest rate. See Coenen et al. (2018b) for a medium-scale model and Dimakopoulou et al. (2023) for a model of monetary–fiscal policy interactions, in which the central bank follows unconventional policies.

## 3. A simple model with financial frictions

We set up a financial accelerator model that combines ingredients in Leeper (1991) and Fernández-Villaverde (2010). The economy is populated by households; producers; financial intermediaries; the government; and a central bank. The supply side is divided into a chain of producers, in order to incorporate three different frictions: capital adjustment costs, financial frictions, and nominal rigidities. Capital goods producers sell their output to entrepreneurs, who face financial frictions. Entrepreneurs rent their capital to intermediate input producers, who face nominal rigidities and, in turn, sell their output to final goods producers. We consider the presence of six shocks: technology, preference, financial friction shocks, together with interest rate, taxes and government spending shocks.

The remainder of this section describes each agent. We present all the optimality conditions in Appendix B.

### 3.1. Households

Households choose consumption $c_t$, hours worked $l_t$, and nominal financial assets: $d_t$ are bonds issued by the government, and $a_t$ are deposits in financial intermediaries. Households own firms (and obtain benefits derived from this ownership, given by $F_t$) and pay lump-sum taxes, $\tau_t$. They maximize the following utility function:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{ e^{v_t} \log(c_t) - \psi \frac{l_t^{1+\varrho}}{1+\varrho} \right\}.$$

The optimal plan is subject to the following infinite sequence of budget constraints:

$$c_t + \frac{a_t}{p_t} + \frac{d_t}{p_t} = w_t l_t + R_{t-1} \frac{a_{t-1}}{p_t} + R_{t-1}^d \frac{d_{t-1}}{p_t} - \tau_t + F_t + tre_t, \ t \geq 0,$$

where $tre_t$ is a net transfer from entrepreneurs that is defined later. $p_t$ denotes the price level and $w_t$ the real wage. Two different nominal interest rates exist, one associated with sovereign debt, $R_t^d$, which is a monetary policy instrument, and the return associated with private assets, $R_t$. We follow Arias et al. (2016) in considering a preference shock that affects the marginal utility of consumption, $v_t$. We assume that this shock follows an AR(1) process given by

$$v_t = \rho_v v_{t-1} + \varepsilon_t^v.$$

### 3.2. Final-good producer

The consumption good is the unique final good of the economy produced by competitive firms that combine intermediate goods using the following technology:

$$y_t = \left( \int_0^1 y_{it}^{\frac{\epsilon-1}{\epsilon}} di \right)^{\frac{\epsilon}{\epsilon-1}},$$

where $y_{it}$ is a continuum of intermediate inputs, indexed using $i$, whose demand depends on the price of these differentiated goods:

$$y_{it} = \left( \frac{p_{it}}{p_t} \right)^{-\epsilon} y_t.$$

Here, $\epsilon$ characterizes the rate of substitution between varieties. This technology implies the following final-good price:

$$p_t = \left( \int_0^1 p_{it}^{1-\epsilon} di \right)^{\frac{1}{1-\epsilon}}.$$

### 3.3. Intermediate-good producers

Producers of intermediate goods operate in a context of monopolistic competition, they face a demand for their variety and have market power to set prices, subject to frictions in the price adjustment. They produce differentiated varieties $i$ of the inputs, mixing labour and capital in a Cobb–Douglas production function:

$$y_{it} = e^{z_t} k_{it-1}^{\alpha} l_{it}^{1-\alpha},$$

where $k_{it-1}$ is the capital that the firm rents from entrepreneurs. Productivity $z_t$ follows an AR(1) process.

$$z_t = \rho^z z_{t-1} + \sigma^z \epsilon_t^z, \quad \epsilon_t^z \sim N(0,1).$$

The optimal input choice implies that

$$k_{t-1} = \frac{\alpha}{1-\alpha} \frac{w_t}{r_t} l_t$$

and that the marginal cost is given by

$$mc_t = \left(\frac{1}{1-\alpha}\right)^{1-\alpha} \left(\frac{1}{\alpha}\right)^{\alpha} \frac{w_t^{1-\alpha} r_t^{\alpha}}{e^{z_t}}.$$

These firms operate as competitive monopolists and are able to fix prices, which can change according to a Calvo lottery with probability $\theta$. In order to fix prices optimally, firms solve the following maximization problem:

$$\max_{p_{it}} \mathbb{E}_t \sum_{\tau=0}^{\infty} (\beta\theta)^{\tau} \frac{\lambda_{t+\tau}}{\lambda_t} \left\{ \left( \prod_{s=1}^{\tau} \frac{1}{\Pi_{t+s}} \frac{p_{it}}{p_t} - mc_{t+\tau} \right) y_{it+\tau} \right\}$$

subject to

$$y_{it+\tau} = \left( \prod_{s=1}^{\tau} \frac{1}{\Pi_{t+s}} \frac{p_{it}}{p_t} \right)^{-\epsilon} y_{t+\tau}.$$

Here, $\lambda_t$ denotes the marginal value of wealth of the households (a Lagrangian multiplier on the household's budget constraint), and $\Pi_{t+s}$ is the price ratio $\frac{p_{t+s}}{p_{t+s-1}}$.

### 3.4. Entrepreneurs

Entrepreneurs buy capital to rent it to the producers of intermediate goods. They operate in the environment of Bernanke et al. (1999) and Fernández-Villaverde (2010). Assume that entrepreneurs use their net worth, $n_t$, and issue debt to financial intermediates, $b_t$, to buy new installed capital from capital producers at price $q_t$. These assumptions imply that the balance sheet of the entrepreneur is defined through the following expression:

$$q_t k_t = n_t + \frac{b_t}{p_t}.$$

According to these assumptions, the entrepreneurs' need external funding, provided by a risk-neutral lender. Before specifying the contract offered by the lender we need to introduce a few assumptions regarding the productivity of capital.

In particular, capital becomes useable in the following period, the productivity of capital is affected by a shock $\omega_t$, drawn from a log normal distribution $F(\omega)$, that shifts the capital bought in the previous period. $F(\omega)$ is such that $E_t(\omega_t) = 1$, while the dispersion $\varsigma_{\omega,t}$ follows,

$$\varsigma_{\omega,t} = (1-\rho^{\omega})\varsigma_{\omega} + \rho^{\omega}\varsigma_{\omega,t-1} + \sigma^{\omega}\epsilon_t^{\omega}, \quad \epsilon_t^{\omega} \sim N(0,1).$$

The reason why this shock is important is that entrepreneurs that receive a low productivity shock are not able to repay their debts and, hence, will be forced to default. This assumption affects the contract offered by the lender.

Following Christiano et al. (2014), we consider the shock to the entrepreneurial-level dispersion to be the financial shock. A higher dispersion implies that there are more entrepreneurs that receive a productivity shock below the repayment threshold and will default. Hence, this implies there exist an external finance premium that increases with this dispersion shock.

The debt contract determines that the return $R_t^l$ is a return that gives zero profits to financial intermediaries in expectation,

$$\mathbb{E}_t[[1 - F(\bar{\omega}_{t+1})]R_t^l b_t + (1-\mu)\int_0^{\bar{\omega}_{t+1}} \omega dF(\omega) R_{t+1}^k P_t q_t k_t] = \bar{s} R_t b_t,$$

where $1-\mu$ is the fraction of the return that can be captured by the financial intermediate in case of default. $\bar{s}$ is an average spread charged by financial intermediates. $R_t^k$ is the average ex-post return of entrepreneurs per unit of scaled capital bought in the previous period, and is given by:

$$R_t^k = \frac{p_t}{p_{t-1}} \frac{r_t + q_t(1-\delta)}{q_t - 1}.$$

A higher $\mu$ implies stronger financial frictions. The problem of the entrepreneur is to pick a leverage ratio and a cut-off for default to maximize its expected net worth given the zero-profit condition of the intermediary.

Given such a contract, the law of motion of entrepreneurial net worth is given by

$$n_t = \gamma^e \frac{1}{\pi_t} \left[ R_t^k q_{t-1} k_{t-1} - \bar{s} R_{t-1} b_{t-1} - \mu \int_0^{\bar{\omega}_t} \omega dF(\omega) R_t^k q_{t-1} k_{t-1} \right] + w^e,$$

where $\gamma^e$ regulates the survival rate of entrepreneurs. Exiting entrepreneurs transfer their net worth to households, which fund incoming entrepreneurs by transferring $w^e$. The net of these operations is reflected in the term $tre_t$ observed in the households' budget constraint, which is given by

$$tre_t = (1 - \frac{1}{1 - e^{\bar{\gamma}^e}}) n_t - w^e.$$

Using these equations, we obtain the entrepreneurial wealth:

$$n_t = \gamma^e \left[ (r_t + q_t(1-\delta)) k_{t-1} - \frac{\bar{s} R_{t-1}}{\pi_t} b_{t-1} - \mu \int_0^{\bar{\omega}_t} \omega dF(\omega)(r_t + q_t(1-\delta)) k_{t-1} \right] + w^e,$$

We can see how surprise inflation affects the evolution of net worth - a key aspect of our mechanism. The debt in nominal terms contracted in the previous period is deflated by inflation. On the other hand, the real return of the capital stock brought in the previous period, is determined within the period, and hence not affected by inflation.

In this context, the problem of the entrepreneur is to maximize her expected net-worth by choosing its leverage, the debt-to-net-worth ratio, taking into account the zero profit condition of the lender.[4]

### 3.5. Capital producers

Finally, we assume that there is a set of competitive capital good producers that purchase installed capital ($x_t$), add new investment $i_t$ to generate installed capital for next period, and sell the refurbished capital stock to entrepreneurs. Producers operate according to the following technology:

$$x_t = x_{t-1} + \left(1 - S\left[\frac{i_t}{i_{t-1}}\right]\right) i_t.$$

Here, $S[\cdot]$ is an adjustment cost function given by $\frac{S_0}{2}\left(\frac{i_t}{i_{t-1}} - 1\right)^2$. They sell their output at a price $q_t$ to entrepreneurs. Consequently, they maximize the following profits function:

$$q_t\left(x_t + \left(1 - S\left[\frac{i_t}{i_{t-1}}\right]\right) i_t\right) - q_t x_t - i_t = q_t\left(1 - S\left[\frac{i_t}{i_{t-1}}\right]\right) i_t - i_t.$$

### 3.6. Financial intermediary

Financial intermediaries operate in a competitive environment and channel resources from households to entrepreneurs. Specifically, the financial intermediaries collect deposits from households and make loans to entrepreneurs.

$$a_t = b_t.$$

### 3.7. Government

The government is characterized by a monetary policy rule, a fiscal policy rule, a budget constraint, and a government spending shock. Monetary policy follows a simple Taylor rule:

$$R_t^d = R^d + \psi_\pi(\Pi_{t-1} - \bar{\Pi}) + \psi_y[\ln(y_t) - \ln(\bar{y})] + \varepsilon_t^r,$$

where $\bar{\Pi}$ is the inflation target, and $\varepsilon_t^r$ is an autocorrelated monetary policy shock

$$\varepsilon_t^r = \rho^r \varepsilon_{t-1}^r + \epsilon_t^r \quad \epsilon_t^r \sim N(0,1).$$

The fiscal policy rule is, instead, defined over lump-sum taxation,

$$\ln(\tau_t) = \ln(\bar{\tau}) + \psi_d[\ln(d_{t-1}) - \ln(\bar{d})] + \varepsilon_t^\tau$$

with

$$\varepsilon_t^\tau = \rho^\tau \varepsilon_{t-1}^\tau + \epsilon_t^\tau \quad \epsilon_t^\tau \sim N(0,1).$$

Here, the government spending rule has a systematic component that responds to government debt and an exogenous autocorrelated shock.

$$\ln(g_t) = \ln(\bar{g}) - \psi_g[\ln(d_{t-1}) - \ln(\bar{d})] + \varepsilon_t^g,$$

with

$$\varepsilon_t^g = \rho^g \varepsilon_{t-1}^g + \epsilon_t^g \quad \epsilon_t^g \sim N(0,1).$$

The path of taxes and government spending implies a path for government debt through the government's budget constraint:

$$d_t = g_t + \frac{R_{t-1}^d}{\Pi_t} d_{t-1} - \tau_t.$$

Depending on the coefficients of the monetary and fiscal policy rules, $(\psi_\pi, \psi_y, \psi_d, \psi_g)$, the economy would be in an active–passive regime. $\psi_\pi$ and $\psi_y$ determines whether the government is following an active monetary policy regime whereas $\psi_d$ and $\psi_g$ pins down the fiscal policy regime. The combination of coefficients matters: in order to have a determinate equilibrium that is unique we need that one policy is active and the other policy is passive. Hence, in this context of stable policies, we should note that Active (Passive) monetary policy requires a Passive (Active) fiscal policy to have a unique equilibrium.

[4] We refer the reader to our appendix and Fernández-Villaverde (2010) for further derivations of this problem.

An important point to highlight is that in this paper we follow the standard approach of defining the monetary policy instrument as the interest rate on sovereign debt. This is the case, explicitly, in Fernández-Villaverde (2010) and Leeper (1991), among many others; and is also implicit in most of the NK formulation where the fiscal branch of the model assumes balanced-budget. As such, our model abstracts of one important element, sovereign risk, that was particularly important characterizing the Euro Area economic dynamics in this period (Afonso et al., 2012). As analysed by Corsetti et al. (2013), in the presence of sovereign default risk, unsustainable public finances, might raise sovereign risk premium and consequently funding costs for the whole economy. In other words, in this situation, the interest rate become an endogenous variable rather than a simple policy instrument. We should have in mind when interpreting the counterfactual exercises that were are switching off this channel. If the sovereign risk premium would respond to the rise of government debt (something that did not happen in the US), than under a fiscal dominance regime, the increase in the sovereign risk could offset the decline in the real interest rate, limiting the ability to achieve a lower real interest rate, even under fiscal dominance.

### 3.8. Aggregation

Market clearing in the goods markets is

$$y_t = c_t + i_t + g_t + \mu G_{t-1}(\bar{\omega}_t)(r_t + q_t(1-\delta))k_{t-1},$$

where $G_t(\bar{\omega}_{t+1}) = \int_0^{\bar{\omega}_{t+1}} \omega dF(\omega)$. Furthermore, the aggregation of production across firms implies that

$$y_t = \frac{1}{v_t} e^{z_t} k_{t-1}^{\alpha} l_{t-1}^{1-\alpha},$$

where $v_t = \int_0^1 \left(\frac{p_{it}}{p_t}\right)^{-\epsilon} di$ is a price dispersion index. Finally, market clearing in the capital market is given by

$$x_t = k_t.$$

### 3.9. Shocks

During the presentation of the model we introduced six shocks: a productivity shock, a volatility shock, a government spending shock, a shock to the fiscal policy rule, a shock to the monetary policy rule and a preference shock.

The rationale for this menu of shocks is that we intend to capture the core macroeconomic relationships observed between 2007 and 2015 in a flexible fiscal and monetary environment. This period, in US and EA, is signed by the combination of financial shocks (volatility as, for instance, in Christiano et al. (2010)), supply shocks (TFP) and demand shocks (government spending and preference shocks). Preference shocks have been an important ingredient in the macro literature since the beginning of the Great Financial Crisis (see for instance, Eggertsson (2011) and Bianchi and Melosi (2017)). Fiscal and monetary shocks are important for the fit of the model, on top of their systematic component captured by the endogenous policy rules. Moreover, besides their use in the related literature, these shocks matter in order to evaluate the dynamics after a policy innovation along each regime.

## 4. Empirical strategy

Our empirical strategy is to use the identifying restrictions imposed by the DSGE model to estimate the parameters in the fiscal and monetary policy rules for the Euro Area and the United States. To this end, we combine calibration of the main structural parameters, together with Bayesian estimation of the policy rules and shock processes of the DSGE model. Most structural parameters are fixed to standard values in the literature and are common to both economies. These parameters, shown in Table 1, are fixed to the standard calibration in Fernández-Villaverde (2010), with only two exceptions. Bankruptcy costs $\mu$ are set as in Bernanke et al. (1999), and a discount factor $\beta$ is set to 0.99.

For the estimation of the policy rules and the shock processes, we follow a Bayesian full information approach as in An and Schorfheide (2007). The sample is from 2007Q1 to 2019Q4. Before estimation, prior information is introduced through prior distributions, as shown in the second column of Table 2. We consider the same priors for both economies, which intend to be agnostic about the policy arrangements. For this reason, we set the prior mean of $\psi_\pi = 1$ in both cases. As for the response of taxes to debt, we set it on the border of the two regimes, $\psi_d = 0.056$. The estimation strategy implies a first step with a maximization of the posterior mode, for which we use a simulated annealing algorithm and then a random walk Metropolis–Hastings, for which we target an acceptance rate of about 30% of the draws.

The observable variables for estimation are, in both the United States and the Euro Area, the following: output gap, measured as the deviations of the log of real GDP with respect to its linear trend of the period 1990–2019; inflation rate measured as the ratio of GDP deflator relative to the previous quarter; nominal interest rate; government spending to output ratio; government debt to output ratio; and private debt, measured as the log deviations with respect to its trend of the period 1990–2019 (1999–2019 for the Euro Area).

The third column of Table 2 presents the posterior mean, mode and high probability density intervals of the coefficients in the fiscal and monetary policy rules for the United States. The fourth column does the same for the Euro Area. The parameters that characterize the US and EA fiscal and monetary policies are remarkably different. Conditional on our estimates, Fig. 2 plots determinacy regions for different values of the Taylor rule coefficient, $\psi_\pi$, and the fiscal policy rule coefficient, $\psi_d$, for the two

**Table 1**
Calibration.

| Parameter | Description | Value |
|---|---|---|
| $\beta$ | Discount factor | 0.99 |
| $\bar{\Pi}$ | Target inflation | 1.005 |
| $S_0$ | Adjustment costs of capital | 4.75 |
| $\varrho$ | Frisch elasticity related parameter | 0.5 |
| $\delta$ | Capital depreciation rate | 0.01 |
| $\varsigma_\omega$ | Average volatility of entrepreneur shock | 0.5 |
| $\alpha$ | Capital share intermediate production | 0.22 |
| $\theta$ | Calvo parameter | 0.8 |
| $\epsilon$ | Input substitution | 10 |
| $\bar{s}$ | Average spread | 1.0025 |
| $\bar{\gamma}_e$ | Entrepreneurs exit coefficient | 3.67 |
| $\bar{L}$ | Labour in steady-state | 1/3 |
| $\bar{B}/\bar{K}$ | Debt-to-capital ratio | 1/3 |
| $\bar{d}/\bar{y}$ | Government debt over annual GDP | 0.6 |
| $\bar{g}/\bar{y}$ | Government consumption over GDP (US) | 0.2 |
| $\bar{g}/\bar{y}$ | Government consumption over GDP (EU) | 0.18 |
| $\mu$ | Bankruptcy costs | 0.12 |

Note: Parameters fixed for both US and EA calibration.

**Table 2**
Estimation for United States and Euro Area.

| Parameter | Prior density (mean, sd) | Posterior mean, (mode), [90% HPD interval] | |
|---|---|---|---|
| | | United States | Euro Area |
| Fiscal and monetary policy coefficients | | | |
| $\psi_y$ | Normal(0.15, 0.05) | 0.125, (0.118), [0.085, 0.163] | 0.041, (0.071), [0.021, 0.0608] |
| $\psi_\pi$ | Normal(1, 0.3) | −0.148, (−0.144), [−0.267, −0.025] | 2.446, (1.991), [2.354, 2.5333] |
| $\psi_d$ | Normal(0.056, 0.03) | 0.018, (0.010), [−0.013, 0.052] | 0.033, (0.048), [0.024, 0.0403] |
| $\psi_g$ | Normal(0, 0.03) | 0.040, (0.049), [ 0.005, 0.074] | 0.042, (0.027), [0.031, 0.0566] |
| Auto-regressive components | | | |
| $\rho_\omega$ | Beta(0.8, 0.1) | 0.571, (0.578), [0.490, 0.658] | 0.164, (0.468), [0.105, 0.24] |
| $\rho_z$ | Beta(0.8, 0.1) | 0.998, (0.998), [0.992, 0.999] | 0.830, (0.871), [0.819, 0.841] |
| $\rho_v$ | Beta(0.8, 0.1) | 0.999, (0.999), [0.997, 0.999] | 0.977, (0.967), [0.965, 0.988] |
| $\rho_r$ | Beta(0.8, 0.1) | 0.952, (0.959), [0.920, 0.987] | 0.655, (0.730), [0.589, 0.728] |
| $\rho_\tau$ | Beta(0.8, 0.1) | 0.256, (0.264), [0.181, 0.332] | 0.542, (0.639), [0.475, 0.605] |
| $\rho_{gc}$ | Beta(0.8, 0.1) | 0.970, (0.969), [0.963, 0.977] | 0.997, (0.997), [0.992, 0.999] |
| Standard deviation of innovations | | | |
| $\sigma_\omega$ | Inverse Gamma(0.01, 0.1) | 0.786, (0.725), [0.647, 0.928] | 0.780, (0.939), [0.738, 0.823] |
| $\sigma_z$ | Inverse Gamma(0.01, 0.1) | 0.019, (0.018), [0.015, 0.022] | 0.012, (0.012), [0.010, 0.014] |
| $\sigma_v$ | Inverse Gamma(0.01, 0.1) | 0.039, (0.037), [0.032, 0.045] | 0.025, (0.027), [0.022, 0.028] |
| $\sigma_r$ | Inverse Gamma(0.01, 0.1) | 0.0015, (0.0014), [0.001, 0.002] | 0.005, (0.004), [0.004, 0.005] |
| $\sigma_\tau$ | Inverse Gamma(0.01, 0.1) | 0.308, (0.300), [0.257, 0.356] | 0.190, (0.186), [0.160, 0.222] |
| $\sigma_{gc}$ | Inverse Gamma(0.01, 0.1) | 0.009, (0.009), [0.008,0.011] | 0.006, (0.006), [0.005, 0.007] |

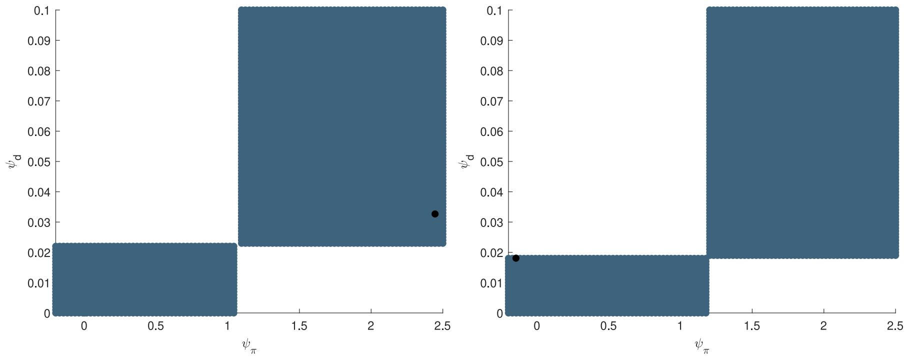
Note: In brackets is the posterior mode estimate and in square brackets is the 90% HPD interval.

economies (holding the other two policy parameters $\psi_y$ and $\psi_g$ constant at their estimated value). There are two blocks in each figure, each associated with the monetary dominance regime (upper right) or the fiscal dominance regime (lower left).[5] The black points in each figure indicate the posterior mean.

Our estimates confirm that since the crisis, the United States has followed a passive monetary policy together with an active fiscal policy. While the point estimate of $\psi_\pi$ is negative, the high posterior density interval gets very close to the zero, suggesting that monetary policy was non-responsive to inflation. Additionally, $\psi_y$ is statistically larger than 0, and hence, relatively more responsive to the output gap. Given the negative output gap experienced during the recession, this can explain the quick drop in the nominal interest rates earlier. These coefficients are consistent with the ones found in Davig and Leeper (2011) for the period after 2003, although we find that the interest rate responds less to inflation.[6] Instead, for the monetary policy of the EA we can see that the model identifies a $\psi_\pi$ of 2.44, above the typical Taylor coefficient of 1.5, as well as smaller concern with respect to the evolution

[5] As Ascari and Ropele (2009) and Arias et al. (2020) discuss, the model with trend inflation (but without financial frictions) requires a more aggressive monetary policy to induce determinacy through active monetary policy. In this model, the determinacy regions also depend on the degree of financial frictions. The regions are different for the two areas, as they have different responses of nominal interest rate to output gap and of government spending to debt.

[6] We have not explicitly considered including the zero lower bound of the interest rate in our model. It is clear that such a low coefficient for inflation is driven by the fact that in the US, the nominal interest rate was at the zero lower bound for a substantial number of periods. In fact, the model can sustain a zero lower bound for an infinite number of periods, as long as the fiscal rule is active. For a comparison of different regimes is an economy with financial




(a) Euro Area (b) United States

**Fig. 2.** Determinacy regions. *Note:* Figure (a) plots determinacy regions for the EA calibration. Figure (b) plots these regions for the US calibration. The black dots locate the estimated posterior mean of $\psi_\pi$ and $\psi_d$ of the rules for the Euro area and the United States.

of GDP. These estimates strongly in favour the hypothesis of an Active monetary policy regime in the EA, and are in line with most estimated DSGE models for the Euro Area. It is above the values of 1.8 and 2 found in Ratto et al. (2009), Cardani et al. (2022) and below the value of 2.74 estimated by Coenen et al. (2018a).

Regarding fiscal policy, the $\psi_d$ point estimate is rather small for the US, including the 0 in the high posterior density interval, suggesting that taxes did not accommodate to guarantee real debt stability. On the other hand, $\psi_g$, which captures the correction of government spending to debt accumulation, is positive, in line with, Leeper et al. (2017), with the high probability density interval excluding zero. This evidence suggests that the US may have followed a Active fiscal policy regime after the Great Financial Crisis.

For the Euro Area, although the exercise imposed the same priors as for the United States, the data contain sufficient information to conclude that the EA has been running an active monetary policy with a passive fiscal policy since 2007. Specifically, as already discussed above, the nominal interest rates strongly responds to inflation with a $\psi_\pi$ much larger than one, suggesting that the monetary policy during and since the crisis has been concerned mainly with inflation growth. The fiscal policy coefficients, on the other hand, are in line with those of an economy that, overall, responds with a passive fiscal policy in which tax schedules respond to sovereign debt accumulation, with a point estimate of 0.033, almost double of the US. As in the United States, the correction is also made through government consumption, with a coefficient of 0.042. These results are consistent with finding from Attinasi et al. (2019). They estimate the response of primary deficit to debt over GDP for the period of 1996–2017, and find coefficients ranging from 0.035 to 0.09 in downturns with high levels of debt. Although the numbers are not directly mapped to our fiscal rule, it suggests that the Euro Area follows a passive fiscal policy.

The results support our interpretation of the data in Section 2. There is ample evidence that the US followed an active fiscal policy–passive monetary policy arrangement, while the EA imposed a monetary policy relatively non-responsive to output gaps and concerned mainly with price stability.

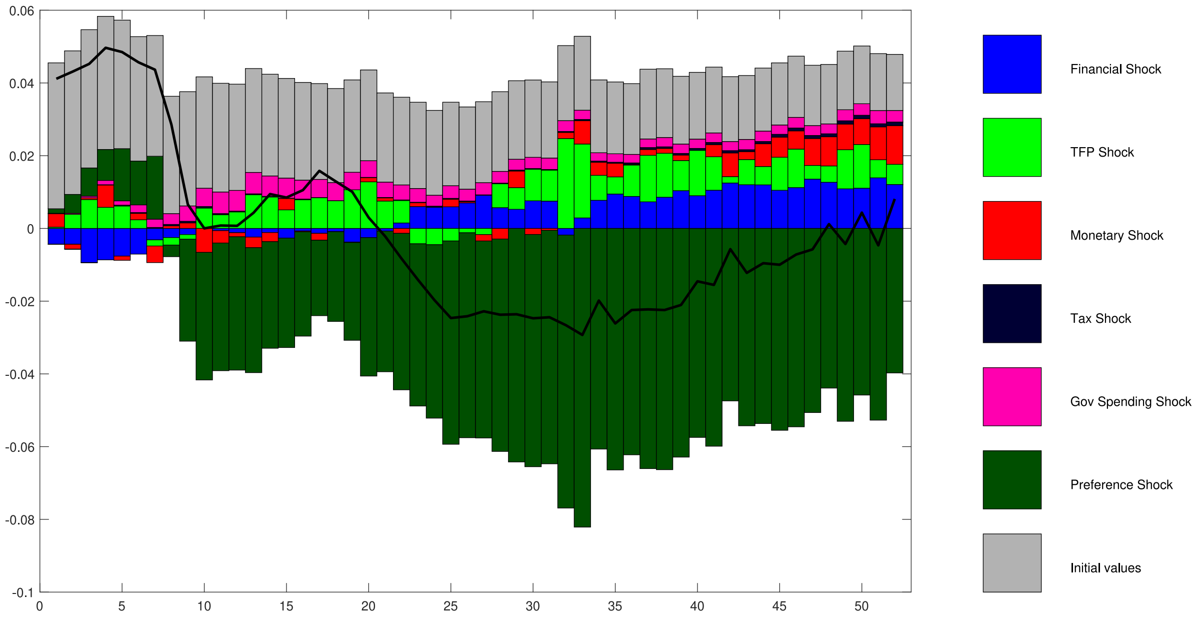
### *4.1. Historical variance decomposition*

The previous results show that the United States and the Euro Area had different policy regimes after the crisis. Different policy mixes, together with differences in the shocks received by each economy, determine the importance of each type of innovation in driving fluctuations. Fig. 3 shows the historical variance decomposition of output for the two economies, to determine which shocks affected each economy in every period, given the implemented policies. In this sense, the figures provide information on the main shocks driving the crisis and behind the recovery.

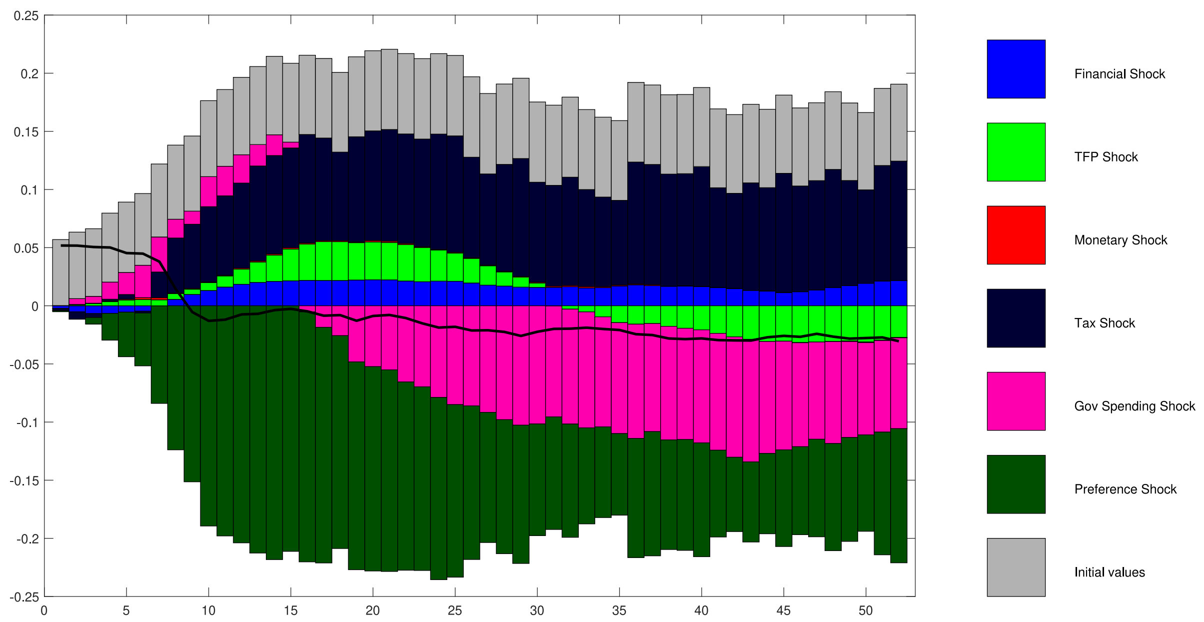
According to our estimates, both economies show a similar driver of the recession — preference shocks. The preference shock affects the desirability for current consumption, relative to future consumption an leisure. As our model is a New-Keynesian type of model, output is demand driven, so the negative preference shock contributes to a recession for almost the whole sample. At the beginning of the sample, the financial shock seems to be pushing the economy into a recession both in the US and EA. This shock was accompanied (in the case of the US) and followed by a preference shock that induced a quick drop in output (observed earlier in the US than in the EA). The importance of preference shocks in driving the dynamics after the financial crisis has been documented for the US by Merola (2015), who found preference shocks accounted for half of the variance of output growth at the peak of the crisis.

Regarding policy shocks – in particular, tax and government spending shocks – have played a mixed role in the output dynamics. In the US, tax shocks have contributed positively to output throughout the last decade. Government spending shocks made a small

frictions and where money is the monetary policy instrument, instead of the interest rate, see Dimakopoulou et al. (2023). See, as well, Coenen et al. (2023), for an analysis of unconventional policy and a fiscal stimulus in the Euro Area.




(a) Euro Area




(b) United States

**Fig. 3.** Historical variance decomposition.

positive contribution to output in the first years of the crisis, but since 2011, the spending reversals have had a strong negative impact on output. On the other hand, fiscal shocks have contributed relatively little to the variance of output in the Euro Area, with only a small positive effect of government spending shock. This finding might seem to contradict (Blanchard and Leigh, 2013) that found that this period in the Euro Area, fiscal multipliers were larger than in normal periods and let to persistent underestimation of the negative growth effect of fiscal consolidations. Although we will see the fiscal multipliers are smaller in the Euro Area when compared to the US, they are not zero. The explanation is that most of the change in the fiscal instruments was endogenous to economic conditions, captured by the policy rules.

In Appendix C, we show the historical variance decomposition for inflation and private and public debt. We also present a table with the unconditional variance decomposition. The unconditional volatility of output is lower in the Euro Area and is driven mainly by preference shocks. On the other hand, in the fiscal dominance regime in the United States, more than 80 percent of the variance of output is due to fiscal policy shocks.

In what follows, we study the importance of the policy arrangements to the transmission of the six shocks in the economy, and whether they could explain the diverging dynamics observed in United States and the Euro Area during the crisis and the recent recovery.

## 5. Dissecting the model

In order to understand the dynamics under the two regimes, we analyse the impulse response of output and inflation to the six shocks under the EA calibration. We then compare them to what their response would have been if the Euro Area had followed US policies (and, hence, a fiscal dominance regime). We show the responses of several variables to all 6 shocks in Appendix D.

As Fig. 4 shows, the fall of output after a negative technology shock at impact in the Euro Area is larger than under the US policy rules as the monetary policy in the US accommodates to ameliorate it. If technology shocks are mitigated by an active fiscal policy, preference shocks are mildly amplified (about 60 per cent). Note interestingly that the main difference in the dynamics is during the first two years after the shock, most dynamics are similar after three years. Following an dispersion of projects shock, the negative output impact is larger under monetary dominance, but the recovery is faster. Note that for the negative preference shock, in the EA, the monetary rule will accommodate monetary policy to avoid large deviations from the target. Easing monetary conditions accordingly implies a smaller output fall compared to the case where we impose the US rules.

The two main mechanisms behind the differing dynamics under fiscal and monetary dominance are related to the changes in the real value of entrepreneurial and government debt following surprise inflation and through the real interest rate channel. Inflation and taxes tend to respond differently to shocks in the two regimes and drives the differences in the degree to which the stock of private and public real debt is deflated (or inflated) after any shock. Furthermore, the paths of the ex-ante real interest rate diverge in the two regimes.

Following the technology shocks, the smaller decline in output under fiscal dominance is related to the differing responses of the real interest rate and taxes. Higher inflation decreases the real value of entrepreneurial debt, making debt repayment cheaper and ameliorating the decline in investment. In the monetary dominance case, the accumulation of government debt implies more taxes while in the fiscal dominant case, government debt does not drive larger taxes as its real value falls due to negative real interest rates. Hence, under fiscal dominance, investment and employment fall by less than under monetary dominance.

Fig. 5 also presents the dynamics after fiscal and monetary policy shocks. A positive government spending shock and a negative tax shock are expansionary under the two policy arrangements. However, the fiscal shocks are inflationary-financed under fiscal dominance (surprise inflation and lower path of the real interest rate), whereas they are covered by debt and the subsequent tax increase under monetary dominance. Under financial frictions and active fiscal policy, the impact of government spending is exacerbated, as inflation reduces the real value of private debt, which translates to higher investment and lower private debt and spreads. In addition, it lowers the real interest rate, stimulating investment. However, under monetary dominance, a higher real interest rate counteracts these dynamics.

We quantify the differences across regimes by computing the government spending present value multiplier as

$$PVM_k = \frac{E_t \sum_{j=0}^{k} \beta^j (y_{t+k} - \bar{y})}{E_t \sum_{j=0}^{k} \beta^j (g_{t+k} - \bar{g})},$$

and analogously for tax cuts. Fig. 6 shows the present value multipliers in the Euro Area and United States, for different combinations of presence or absence of financial or nominal frictions. Under the baseline scenario with both financial frictions and nominal rigidities, both spending's and tax's present value multipliers are higher in the US, with the spending multiplier converging to 3.5 in the long run. Under the EU calibration, the multiplier is 0.7. Without both nominal rigidities and financial frictions, the multipliers are between 0.55 and 0.65, and very similar in both regimes. This result is consistent with Canova and Pappa (2011) empirical evidence showing that government spending multipliers are larger for the subset of episodes that were accompanied by a fall in the real interest rate. Without the two frictions, the model is essentially an RBC model, so the government spending affects the economy only through a wealth effect. The small difference is due to the fact that government spending responds to government debt differently in the two areas, which has real effects.

We can also see that both financial frictions and nominal rigidities contribute to larger multipliers. With only nominal frictions but without financial frictions, the government spending multiplier under fiscal dominance would converge to 2. When only financial frictions are present, but without nominal rigidities, the multiplier also converges to 2. The difference is that nominal rigidities

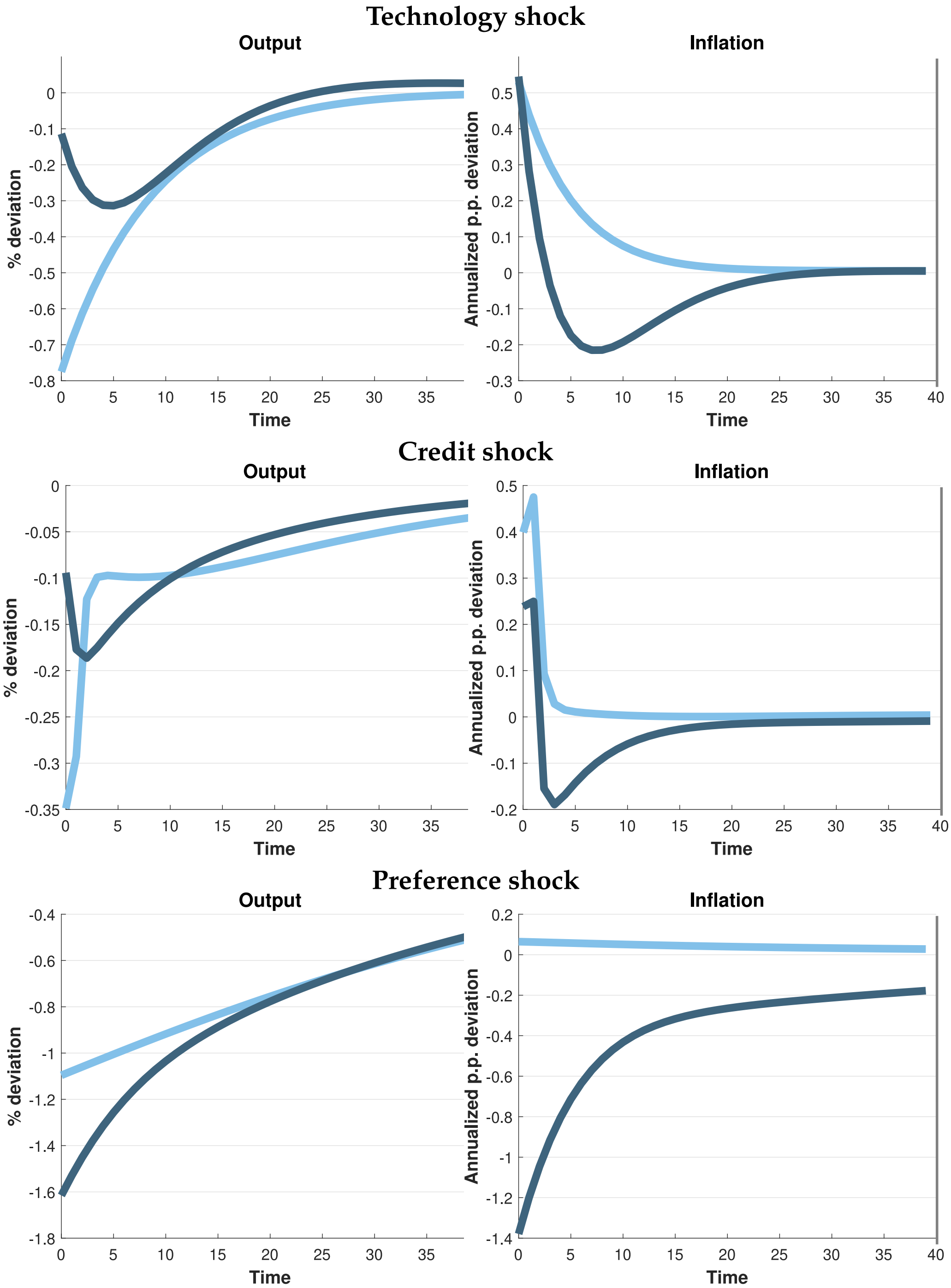



**Fig. 4.** Response of output and inflation to economic shocks. *Note:* The light blue line plots responses of the EA shocks under the EA policy parameters, and the dark line does so for the EA with the US policy parameters ($\psi_\pi, \psi_y, \psi_d, \psi_g$). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

generate larger multipliers in the short run, driven by demand effect, while financial frictions generate larger multipliers in the long-run, as the transmission mechanism works thought the accumulation of net-worth of entrepreneurs. Davig and Leeper (2011) found smaller differences in government spending multipliers: 0.8 in monetary dominance and 1.8 if fiscal dominance. These numbers are close to the multipliers when we only have price rigidities. Financial frictions amplify the differences in fiscal multipliers across regimes.

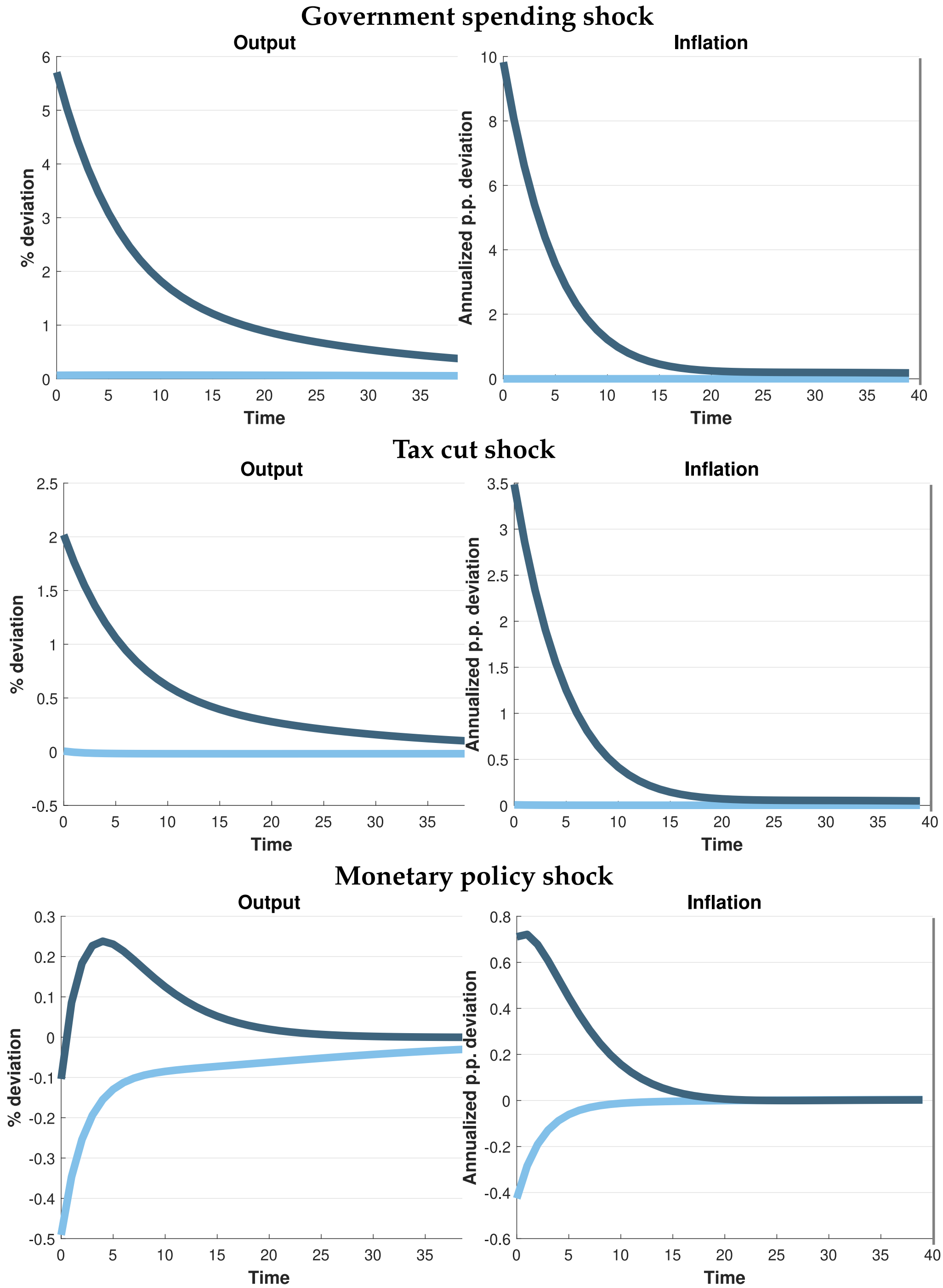



**Fig. 5.** Response of output and inflation to policy shocks. *Note:* The light blue line plots responses of the EA shocks under the EA policy parameters, and the dark line does so for the EA with the US policy parameters ($\psi_\pi, \psi_y, \psi_d, \psi_g$). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

To further illustrate the quantitative implications of our mechanism, we compute the long-run present value fiscal multipliers, in each economy, varying the steady-state levels of debt ($B/K$) from $1/8$ to $1/2$, The results are in Table 3. Independent of the regime, the government spending multiplier is larger, when the private sector is more indebted (the impact of surprise inflation, is larger if, in steady-state, entrepreneurs have a larger level of debt). Quantitatively, comparing the two extremes, the government spending multiplier goes up 10% from 0.7 to 0.77 in the Euro Area, and threefold from 2.2 to 7.51 in the United States. The tax multiplier is negative in the Euro Area because in generates a reduction of government spending.

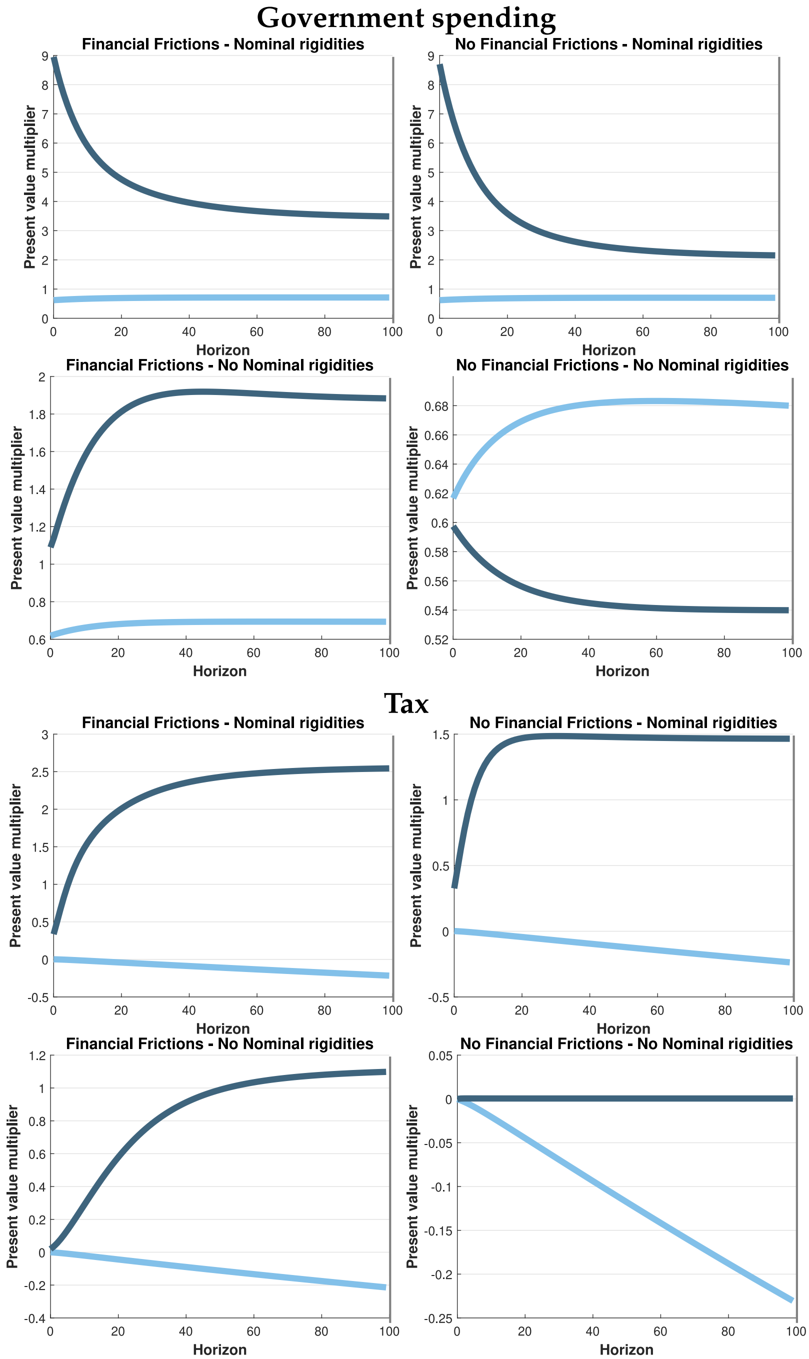



**Fig. 6.** Present value fiscal multipliers for combinations of frictions. *Note:* Each curve indicates the degree of $PVM_k$ calculated at different horizons in the horizontal axis. The light blue line plots the PVM under the EA calibration, and the dark blue line plots the PVM under US calibration. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

## 6. Counterfactual policies during the crisis

How important is the policy regime in generating the post-crisis recoveries observed in the Euro Area? This section presents the observed dynamics in the EA and the counterfactual dynamics implied by the model that would have been observed if the EA had implemented the US policy rules and share the same persistence of policy related shocks.

The exercise is designed as follows: as a by-product of the estimation strategy, we recover the smoothed estimates of unobserved states and shocks for the Euro Area. Then, we assume that the fiscal and monetary policy rules used are those of the United States,

**Table 3**
Long-run present-value fiscal multipliers.

| Debt-to-capital ratio | Euro Area | | United States | |
|---|---|---|---|---|
| | Government spending | Tax cuts | Government spending | Tax cuts |
| $B/K = 1/8$ | 0.702 | −0.236 | 2.162 | 1.4709 |
| $B/K = 1/5$ | 0.705 | −0.223 | 2.651 | 1.8467 |
| $B/K = 1/3$ | 0.712 | −0.216 | 3.490 | 2.5465 |
| $B/K = 1/2$ | 0.774 | −0.228 | 7.513 | 5.9389 |

Note: Shows the Present-Value Multiplier at an horizon of 100 quarters, for different steady-state levels of $B/K$, for the calibrated economies of the Euro Area and United States.

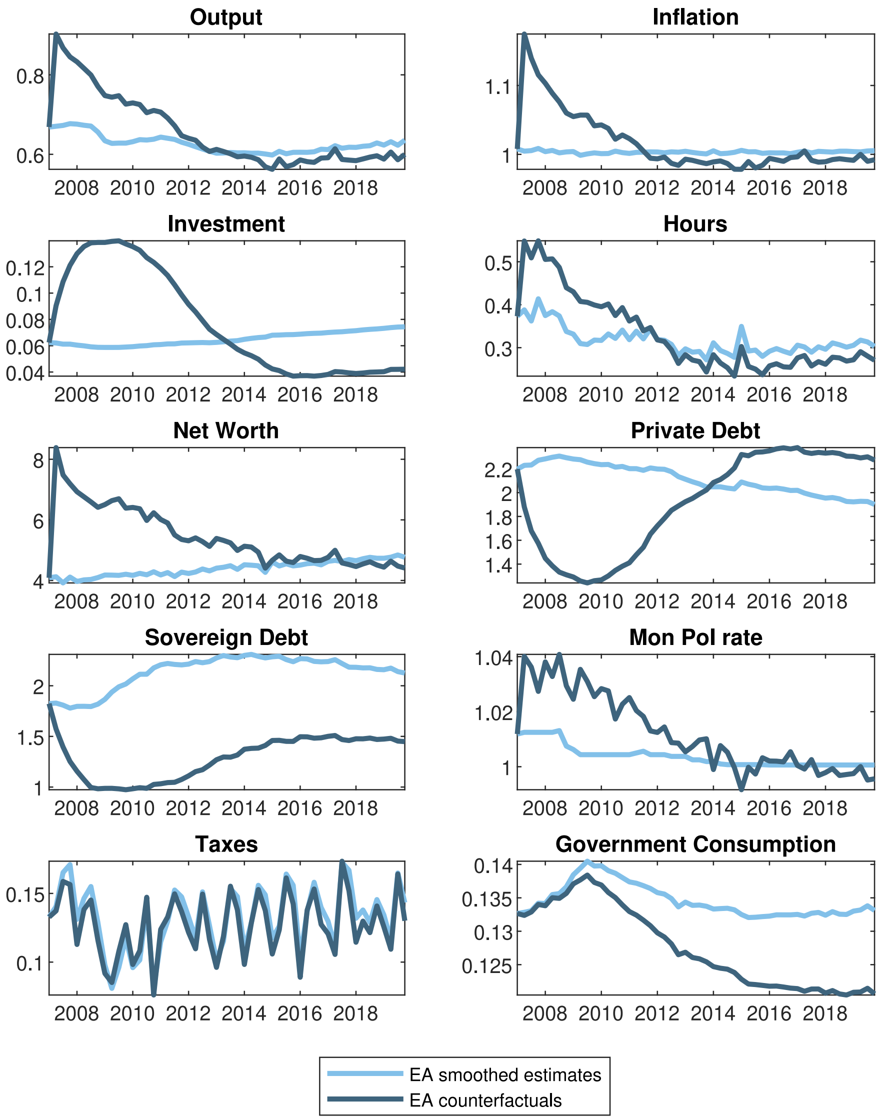



**Fig. 7.** A counterfactual crisis and recovery. *Note:* The light line represents actual EA data. The dark line shows the counterfactual economy simulated by imposing US fiscal and monetary policies.

and we feed the smoothed shocks to simulate a new set of counterfactual variables. The fiscal and monetary policy rules coefficients that we modify for the counterfactual exercises are those of the interest rate, tax and government spending policies. Fig. 7 presents the observed and counterfactual dynamics.

The figure shows that approaching the crisis using the active fiscal policy arrangement would have generated substantially different dynamics. In particular, it would have reversed the fall in output, especially during 2008. Additionally, fiscal policy variables – taxes and government spending – would not have changed much in the EA case if the economy had implemented an active fiscal policy arrangement. This positive difference in output, would have been accompanied by higher inflation and a lower real interest rate would have implied a lower real value of both sovereign and private-sector debt. The counterfactual interest rate is higher due to the response of monetary policy to the output gap. The divergence of inflation and output during the period 2008–2012 would have disappeared after 2012.

The dynamics of inflation and the effect on eroding the real value of debt of different agents would have contributed to a less dramatic output fall and more room for manoeuvre for the monetary policy, as it would have reduced the risk of hitting the zero lower bound until 2014. However, it is important to highlight that the model predicts a substantially larger inflation.

Note that the most salient difference between the observed and counterfactual economies are the evolution of sovereign and private debt, and the recovery is, to a large extent, driven by investment. Financial frictions exacerbate the impact of a fiscally dominant regime in this variant of New-Keynesian economy.

## 7. Conclusion

This paper shows that the post-crisis recoveries in the United States and the Euro Area can be rationalized by a different combination of fiscal and monetary policies. After 2007, the United States seemed to be more dovish than the Euro Area. We use a stylized model to understand whether the differences in dynamics after the financial crisis can be accounted for by the monetary and fiscal policy mix and to isolate the main transmission channels.

We find that dynamics and transmission channels following technology and financial shocks are substantially different, depending on whether fiscal policy or monetary policy induces determinacy. Moreover, our model produces a stylized framework to understand why a more solid recovery could have occurred in the United States rather than in Europe, due to different policy mix.

Whether our hypothesis is true depends on how do economic agents perceive the regimes and their duration. We have focused on the crisis and post-crisis periods to tackle our question using a parsimonious model that is easily comparable with the existing literature, with the caveat that we assume that economies will be forever in the same regime. Another approach would be to consider a Markov switching model in the policy rules, as in Bianchi (2012), Bianchi and Ilut (2013), Bianchi and Melosi (2022) or Davig and Leeper (2011), in which agents anticipate the switches between regimes. However, the complexity of such a setup would divert attention from the key dynamics implied by financial frictions and policy mix interaction, so we leave it for future work.

While we considered only lump-sum taxes, the presence of distortionary taxes would amplify the divergencies across regimes. The relative stability of tax revenue in the Euro Area in the last decade was achieved by increasing tax rates that have distorted the economy, further amplifying the recession. This effect would have been mitigated under fiscal dominance, in which higher inflation and a lower real interest rate would have contributed to financing government debt, and at the same time deleverage the private sector. On the other hand, the fact that we abstracted from sovereign risk might have mitigated divergences across regimes. In particular, it might have limited the ability of a fiscal dominance regime to achieve lower real interest rate, if the sovereign risk premium responded sufficiently to changes in government debt. This was not the case in the United States, but could have happened in the Euro Area if the monetary policy had accommodated the rise if government debt. Considering the Euro Area as a whole masks much heterogeneity. While this mechanism was certainly present in Southern European countries that faced a sovereign debt crisis, it was less relevant for the core countries. Still, the presence of this channel might have been one of the reasons for the choice of a particular policy mix (monetary dominance) in the Euro Area.

## Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.euroecorev.2024.104727.

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