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Fiscal foresight and the effects of government spending: It's all in the monetary-fiscal mix[☆]

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ABSTRACT

Announcements of future government spending have different effects on economic activity depending on the monetary-fiscal policy mix. Upon announcement, they are contractionary in the monetary regime but expansionary in the fiscal regime, in contrast with the expansionary nature of government spending at implementation in both regimes. Anticipation effects can therefore help empirically distinguish between the two regimes. Data support our theoretical insight, reconciling conflicting results in the empirical literature that disappear once conditioning on the policy regime. This evidence suggests that it could be (un)wise to anticipate future fiscal policies, depending on the regime in place.

1. Introduction

Governments frequently signal their intentions about future fiscal policies, with immediate effects on economic activity. Indeed, all changes in fiscal policy come with an implementation lag and are pre-announced.[1] The presence of lags between the announcement of a fiscal change and its implementation generates expectation effects that affect the economy at the time of both the announcement and implementation. The seminal contribution by Ramey (2011) shows that government spending innovations recovered by standard VAR identification methods la Blanchard and Perotti (2002) are predictable and are likely to have been anticipated by agents. In the post-WWII sample period, she shows that the impulse responses from

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[1] In particular, changes in fiscal policy are subject to two lags: an inside lag, due to the political discussion between the initial proposal of a new fiscal measure and its approval; and an outside lag between the legislative approval and its actual implementation.

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a VAR that takes fiscal foresight into account result in increasing output but decreasing consumption and real wages in response to a positive government spending shock. While this result is consistent with standard neoclassical DSGE models, it differs from the results from standard VARs that do not take fiscal foresight into account.[2] We replicate the analysis in Ramey (2011) but, instead of a unique sample, we consider two sub-periods: the Great Inflation (1960q1-1979q2) and the Great Moderation (1984q1-2007q2). To capture anticipated shocks, as in Ramey's 2011, we use the "defense news" variable, which reflects changes in the expected present value of government spending in response to military events. Fig. 1 shows the impulse response functions of government spending and GDP to a shock to this defense news variable in a fiscal VAR.[3] Contrary to the results from the longer sample, output responds in opposite ways in the two different samples: it increases during the Great Inflation while it decreases during the Great Moderation.

How can we reconcile these findings? We propose the following theoretical explanation. The rise in output after an anticipated increase in government spending during the Great Inflation is consistent with the behavior of agents who expect positive wealth effects if the fiscal expansion is unbacked. The decrease in output during the Great Moderation, instead, is consistent with an anticipated, fiscally-backed increase in government spending. Our two samples match two well-defined regimes that the empirical literature on monetary and fiscal policy interaction generally identifies as, respectively, a fiscally-led (regime F) and a monetary-led regime (regime M) (see Bianchi, 2012; Bianchi and Ilut, 2017; Bianchi and Melosi, 2014; 2017; Chung et al., 2007).[4] This new evidence suggests that the effects of anticipated government spending shocks depend crucially on the prevailing monetary/fiscal policy mix. In this paper we propose a way to reconcile the conflicting empirical results by considering the policy mix in place.

We contribute to both the theoretical and empirical literature. As for the theoretical part, we extend the work by Beck-Friis and Willems (2017), who analytically derive the unanticipated fiscal multipliers in both the monetary and the fiscal regime in a simple New Keynesian model, to *anticipated* changes in government expenditures. While the empirical literature convincingly shows that it is crucial to distinguish between anticipated and unanticipated government spending shocks, the vast majority of the theoretical literature looks only at the reaction to contemporaneous, unanticipated shocks to fiscal spending, and does not analyze the problem of fiscal foresight, that is, the reaction to anticipated shocks. Under standard calibration, our simple New Keynesian model shows that both an unanticipated (see Beck-Friis and Willems, 2017) and a previously anticipated government spending shock increase output in both regime M and F at implementation. However, fiscal foresight leads government spending shocks to have very different effects in the two regimes during the anticipation period. In regime M, an anticipated fiscally backed increase in government expenditure is contractionary, i.e., it decreases output and consumption. In regime F, under unbacked fiscal expansions, in contrast, the same shock is expansionary, as it increases private consumption through the expectation of positive wealth effects. As a result, while one cannot distinguish the two regimes based on output behavior after the shock implementation, one can do that by looking at output during the anticipation period. The simple model provides insights into the economic intuition, and we also show that our theoretical results remain valid in the medium-scale DSGE model of Smets and Wouters (2007), where anticipated shocks lead output to increase in regime F and to decrease in regime M, as in the empirical evidence in Fig. 1.

We thus deepen the empirical analysis and obtain findings that corroborate the theoretical implications. First, in the Smets and Wouters (2007) model the responses of consumption, investment, wages and hours to an anticipated government spending shocks are all positive in regime F during the anticipation period, while they are negative in regime M. We extend the VAR in Fig. 1 to include these variables and obtain VAR impulse responses that mimic the behavior of those in the DSGE model. Second, consistent with the theory, unanticipated shocks are always expansionary in the two sub-samples. Third, the different responses across the two regimes hold when we use other measures of anticipated shocks proposed in the literature, such as Ramey and Shapiro (1998), Forni and Gambetti (2016), and Fisher and Peters (2010). Fourth, using the standard identification by Blanchard and Perotti (2002), we find again that the effects of government spending shocks

[2] Following the contribution by Blanchard and Perotti (2002), several papers using standard VAR identification find that a government spending shock, besides increasing output, leads to an increase in consumption, hours and real wages. This contrasts with standard neoclassical DSGE models, in which the same shock leads to a decrease in consumption and an increase in the labor supply, due to Ricardian behavior. The New Keynesian literature has developed models in which consumption spending crowds in – rather than out – aggregate private consumption. In Galí et al. (2007), this crowding-in effect is accomplished via a strong response of the real wage to the fiscal shock, which boosts the consumption of hand-to-mouth nonRicardian agents. The extent of the robustness of the theoretical result in Galí et al. (2007) is discussed in Colciago (2011) and Furlanetto (2011), among others.

[3] We drop the Volcker's disinflation years (1979q3-1983q4) as it was a transition period characterized by high volatility in monetary policy. To follow Ramey (2011) closely, (i) fiscal shocks are identified through a Cholesky decomposition with the defense news variable ordered first, and (ii) the VAR also includes real government spending, real GDP, the 3-month T-bill rate, the Barro-Redlick average marginal income tax rate, and total hours worked – we omit the responses of the last three variables for brevity. Section 3 and the Online Appendix investigate the robustness of the results in Fig. 1 to different measures of anticipated government spending shocks and different VAR specifications. Throughout the paper, we estimate VARs and compute impulse responses using the OLS procedure of the BEAR toolbox version 5.0, and normalize the shock size so that the induced change in government spending is equal to one percent at the peak.

[4] In the language of Leeper (1991), the monetary regime assumes an active monetary policy, that is, the adherence to the Taylor principle, and a passive fiscal policy. In this regime fiscal expansions are always backed by future fiscal surpluses. On the contrary, the fiscal regime assumes a passive monetary policy and an active fiscal policy: here, fiscal expansions are unbacked and generate wealth effects. While there is wide consensus on considering the Great Moderation as a monetary regime, the Great Inflation regime is more debated. Papers assuming a constantly passive fiscal policy detect, in the Great Inflation period, a double passive (hence indeterminate) regime (see Lubik and Schorfheide, 2004). Once allowing for a possible switch of fiscal policy, the pre-Volcker era is found to be consistent with a fiscally led regime (see even Davig and Leeper, 2007; 2011; Sims, 2011), in which the increasing inflation is due to a lack of fiscal discipline.

are expansionary in F and contractionary in M, in line with our VARs that use measures of anticipated shocks. Surprisingly, the difference between Blanchard and Perotti (2002) and Ramey (2011) disappears when we condition the estimates on the monetary-fiscal policy mix, suggesting that the crucial feature is not the timing but, rather, the monetary-fiscal policy mix itself. This surprising result calls for a reassessment of Ramey's 2011 interpretation of the standard VAR shocks, at least when these shocks are estimated conditional on a specific regime in place.

Finally, fiscal foresight poses a challenge to VAR analysis. As shown by Leeper et al. (2013), if the VAR does not contain enough information about future shocks anticipated by agents, the variables do not have a VAR representation in the structural shocks. The identified shocks may be "non-fundamental", that is, they may not correspond to the true structural shocks and the resulting impulse responses could be misleading. Our approach allows us to draw some useful insights on non-fundamentalness issues when two well-defined regimes are considered. Following Ramey (2011), we perform Granger causality tests on the VAR shocks. When we estimate the VAR conditional on the monetary-fiscal regime in place, we find no evidence that shocks could have been predicted using external information. In other words, shocks are fundamental. As a result, it seems that fundamentalness arises not because of the intrinsic nature of the fiscal foresight problem, but because of the misspecification of a linear VAR across two different regimes, featuring two different impulse responses and hence implying two different VAR structures.

This paper is related to at least three strands of literature. First, the literature that identifies the effect on the economy of news shocks to fiscal policy in VAR models (e.g., see Ben Zeev and Pappa, 2017; Fisher and Peters, 2010; Forni and Gambetti, 2016; Mertens and Ravn, 2012; Ramey, 2011). Although the empirical evidence makes clear that fiscal foresight matters for economic conditions, surprisingly little work has been done in the theoretical literature to study the mechanisms whereby fiscal news shocks propagate to economic activity. This paper sheds light on how these mechanisms work under different monetary-fiscal mixes. Crucially, while all these papers find that, at least qualitatively, anticipated government spending shocks increase output, we show both theoretically and empirically that this result is conditional on being in regime F, while the opposite occurs in regime M. Second, this paper adds to the large literature on fiscal multipliers (e.g., see Auerbach and Gorodnichenko, 2012; Baxter and King, 1993; Cogan et al., 2010; Leeper et al., 2017; Ramey and Zubairy, 2018). Third, it deals with non-fundamentalness problems in VARs and employs some fundamentalness tests proposed in the literature (e.g., see Ellahie and Ricco, 2017; Forni and Gambetti, 2016; Leeper et al., 2013; Ramey, 2011).

The paper proceeds as follows. Section 2 contains the theoretical analysis. Section 3 provides the empirical evidence using different VAR specifications and different measures of anticipated government spending shocks. Section 4 tests for fundamentalness. Section 5 concludes.

2. Theory

This section contains the theoretical part of the paper. Section 2.1 outlines the model, Section 2.2 derives the announcement multipliers in the monetary and fiscal regimes and discusses the channels through which fiscal news shocks propagate to economic activity. Section 2.3 shows the simulations of both our simple model and of a larger model to check the validity of the theoretical results.

2.1. An analytical model

Here, we consider a small-scale New Keynesian model to provide analytical results and basic intuitions on the effects of anticipated government spending in the fiscal and monetary regimes. We extend the work in Beck-Friis and Willems (2017) to include anticipated shocks to government spending. The model is standard and features infinite-lived households, no capital, wasteful government spending and sticky prices à la Calvo, whereby each firm can reset its price in each period with probability $(1-\theta)$. The log-linearized model is:[5]

$$\hat{y}_t - \alpha_1 \tilde{g}_t = \mathbb{E}_t \hat{y}_{t+1} - \alpha_1 \mathbb{E}_t \tilde{g}_{t+1} - \alpha_2 [\hat{\imath}_t - \mathbb{E}_t \hat{\pi}_{t+1}], \tag{1}$$

$$\hat{\pi}_t = \beta \mathbb{E}_t [\hat{\pi}_{t+1}] + \kappa \alpha_3 \hat{y}_t - \kappa \alpha_4 \tilde{g}_t, \tag{2}$$

$$\hat{\imath}_t = \phi \hat{\pi}_t, \tag{3}$$

$$\tilde{\tau}_t = \psi \tilde{b}_{t-1} + \varepsilon_t^{\tau}, \tag{4}$$

$$\tilde{b}_t = \frac{1}{\beta} \tilde{b}_{t-1} - \frac{1}{\beta} (\tilde{\tau}_t - \tilde{g}_t) - \frac{1}{\beta} \frac{b}{y} \hat{\pi}_t + \frac{b}{y} \hat{\imath}_t, \tag{5}$$

[5] See the Online Appendix for the details of this standard model. Throughout the paper, variables without a time-subscript denote steady-state values, variables with a hat indicate log-deviations from this steady state (i.e. $\hat{x}_t = (x_t - x)/x$), and variables with a tilde express steady-state deviations as a fraction of steady-state output (i.e. $\tilde{x}_t = (x_t - x)/y$).

$$\tilde{g}_t = \rho \tilde{g}_{t-1} + \varepsilon^g_{t-j}. \tag{6}$$

$\hat{y}_t$ refers to output, $\tilde{g}_t$ to real government spending, $\hat{\imath}_t$ to the nominal interest rate, $\hat{\pi}_t$ to inflation, $\tilde{b}_t$ to real government debt, $\tilde{\tau}_t$ to real lump-sum taxation, and $\mathbb{E}_t$ to the (rational) expectation operator conditional on the information available at period t. Variables ε^τ_t and ε^g_t are mean zero i.i.d. shocks to taxation and government spending, respectively. Eq. (1) is the Euler equation, where parameters $\{\alpha_i\}_{i=1}^4$ are convolutions that depend on the properties of the utility function, defined over consumption and hours worked (see the Online Appendix). Eq. (2) is the New Keynesian Phillips Curve, where $\kappa \equiv (1-\theta)(1-\beta\theta)/\theta$ depends on the household's subjective discount factor, $\beta \in [0, 1)$, and the Calvo probability of not readjusting prices, θ. Both equations account for the impact of government spending. Eqs. (3) and (4) describe our simple monetary and fiscal policy rules. The central bank reacts to current-period inflation with intensity $\phi \geq 0$, while, as in Leeper (1991), the fiscal authority adjusts lump-sum taxes in response to lagged real debt with intensity $\psi \geq 0$. Eq. (5) is the government's flow budget constraint. Finally, equation (6) assumes a simple AR(1) process for the evolution of government spending, with autoregressive parameter $\rho \in [0, 1)$. Importantly, shocks to government spending are anticipated by agents j periods in advance of their actual implementation.

As is well-known from Leeper (1991), the system has a unique bounded solution under two alternative parametrizations: (i) the monetary regime, where the central bank actively adjusts the policy rate to inflation, $\phi > 1$, and fiscal policy passively adjusts taxes to deviation of lagged real debt, $\psi > (1-\beta)$; (ii) the fiscal regime, where the central bank passively adjusts the policy rate to inflation, $\phi < 1$, and fiscal policy is active, $\psi < (1-\beta)$.

2.2. Government spending multipliers

The government spending multipliers on output and inflation at horizons $j, k \geq 0$ are:

$$GSM^y(j,k) \equiv \mathbb{E}_t \frac{\partial \hat{y}_{t+k}}{\partial \varepsilon^g_{t+j}}, \qquad GSM^\pi(j,k) \equiv \mathbb{E}_t \frac{\partial \hat{\pi}_{t+k}}{\partial \varepsilon^g_{t+j}}. \tag{7}$$

The multipliers measure the expected effect on economic activity in period $t+k$ of a fiscal shock announced in period t but implemented in period $t+j$. When a fiscal shock is implemented without any anticipation ($j=0$), (7) collapses to the *unanticipated multipliers* analyzed in Beck-Friis and Willems (2017), and we can distinguish the impact multipliers (when $j=k=0$) and the tail multipliers (when $j=0$ and $k>0$). When $j>0$, instead, the expressions in (7) define the *anticipated multipliers*. When $j>0$ and $k=0$, they capture the immediate effects on output and inflation of an announcement of a future government spending change due to occur after j periods. To provide the intuition, we derive expressions for these objects under both the monetary and fiscal regime, building on the analytical insights developed by Beck-Friis and Willems (2017).

2.2.1. Monetary regime

Unanticipated multipliers. In the monetary regime, the impact unanticipated multipliers of government spending are positive for both output and inflation:

$$GSM^y_M(0,0) = \frac{\alpha_1(1-\rho)(1-\beta\rho) + \kappa\alpha_2\alpha_4(\phi-\rho)}{(1-\rho)(1-\beta\rho) + \kappa\alpha_2\alpha_3(\phi-\rho)} > 0, \tag{8}$$

$$GSM^\pi_M(0,0) = \frac{(1-\rho)\kappa(\alpha_1\alpha_3 - \alpha_4)}{(1-\rho)(1-\beta\rho) + \kappa\alpha_2\alpha_3(\phi-\rho)} > 0, \tag{9}$$

and the tail multipliers decay by a factor of ρ:

$$GSM^{\{y,\pi\}}_M(0,k) = \rho^k \times GSM^{\{y,\pi\}}_M(0,0). \tag{10}$$

The multipliers on output are positive for two reasons, that Beck-Friis and Willems (2017) label as the "Keynesian effect." First, labor supply shifts out because of the Ricardian behavior of households which consume less goods and work more for any given real wage. Second, if prices are sticky, labor demand shifts out too, as firms increase production to meet the higher demand for their goods. The monetary policy coefficient ϕ decreases the multipliers because the more the central bank responds to the increase in inflation, the less the initial increase in demand, and the strength of the second effect. The first effect due to the shift in labor supply is unrelated to monetary policy.[6]

Anticipated multipliers. Before turning to the analytical expressions of the anticipated multipliers, it is helpful to note that multipliers are history-independent:

$$GSM^{\{y,\pi\}}_M(j,k) = GSM^{\{y,\pi\}}_M(j+m, k+m), \text{ for any } m \geq 0.$$

[6] To see this, note that in the flexible-price limit where $\kappa \to \infty$, the multiplier on output, (α_4/α_3), is independent of ϕ. Moreover, price stickiness affects the impact multipliers too. If the utility function is additively separable, the stickier are prices, the larger is the impact multiplier on output and the smaller is the impact multiplier on inflation.

That is, the expected effect on economic activity in period $t+k$ is independent of when the announcement of the spending shock was made. For $k<j$, only the distance $j-k$ to the actual implementation of the shock matters. In particular: $GSM_M^{\{y,\pi\}}(j,j)=GSM_M^{\{y,\pi\}}(0,0)$, that is, the effect on economic activity in the period in which the spending shock is implemented is independent of when in the past the spending shock was announced. This result is not surprising, and specific to the forward-looking nature of this simple model. The only backward-looking equations in this economy are the government's flow budget identity (5) and the taxation rule (4). However, the path of government debt is irrelevant for economic activity in the monetary regime, because all debt is backed by primary surpluses.[7]

The effects of news on government spending depend linearly on the impact multipliers:

$$GSM_M^y(j,0)=p_{1,2}(j)GSM_M^\pi(0,0)+p_{1,1}(j)[GSM_M^y(0,0)-\alpha_1], \tag{11}$$

$$GSM_M^\pi(j,0)=p_{2,2}(j)GSM_M^\pi(0,0)+p_{2,1}(j)[GSM_M^y(0,0)-\alpha_1], \tag{12}$$

where the p's are given in the Online Appendix, with $p\to 0$ as $j\to\infty$. Consider first the effect on output and inflation in the period immediately preceding the spending shock, i.e., $j=1$. Three competing effects come into play. The first two appear via the Euler equation (1). First, higher next-period inflation, see (9), lowers the ex-ante real interest rate, because, according to the Taylor rule (3), the interest rate reacts only to current inflation. This effect increases aggregate demand. Second, lower future consumption because of the Ricardian behavior depresses aggregate demand through the consumption smoothing motive.[8] With sluggish price adjustment, the net demand of these effects translates into a change in output, as firms are unable to fully adjust their prices. Sticky prices introduces a third transmission channel. Higher next-period inflation raises current inflation through the Phillips curve (2), as firms increase their prices in anticipation of a higher future demand. Higher prices, in turn, depresses output along an unchanged aggregate demand curve.

As the system is completely forward-looking, the effects in period $t+k$ depend only on the economic conditions in period $t+k+1$. We can therefore extend the above intuition by backward induction to each period preceding the spending shock.[9]

Consider CRRA-preferences for consumption and labor, i.e., $U(c_t,n_t)=\frac{c_t^{1-\sigma}}{1-\sigma}-\frac{n_t^{1+\xi}}{1+\xi}$, where σ is the coefficient of relative risk aversion and ξ is the inverse of the elasticity of labor supply. As well-documented in the literature, the impact multiplier on output is smaller than one with CRRA-preferences and government spending crowds out private consumption. The blue solid line in Fig. 2 displays the path of output before and after the implementation of an increase in government spending.[10] On impact upon announcement, the three effects described above result in a net negative demand effect that translates into lower labor demand and output. Output decreases further throughout the anticipation period. The post-implementation multipliers resemble the standard impulse response functions after an unanticipated expansion in government spending, with economic activity decaying by a factor of $\rho=0.5$ in each period, see (10).

The response of inflation during the announcement period is ambiguous. On the one hand, the negative shift in demand induces a decrease in inflation. On the other hand, forward-looking price setters will start raising their prices in the periods preceding the spending shock, in anticipation of higher future inflation after the implementation. Which of the two effects prevails depends on their relative strength and hence on the calibration. Moreover, the real value of debt is affected by two opposing forces too. Assume inflation increases in the announcement period. Then, on the one hand, higher inflation erodes the real value of outstanding nominal debt, but, on the other hand, it also calls for a higher nominal interest rate (via the Taylor rule), leading to a larger fiscal deficit and more issuance of nominal debt. If the first effect dominates then the real value of debt goes in the opposite direction of inflation. Otherwise it goes in the same direction. If $\phi\beta>1$, the second effect would tend to dominate the first, ceteris paribus.[11]

2.2.2. Fiscal regime

Unanticipated multipliers. Beck-Friis and Willems (2017) show that, when $\rho=0$, the impact and tail multipliers of government spending in the fiscal regime are:

$$GSM_F^y(0,k)=GSM_M^y(0,k)+TM_F^y(0,k)-\left(\frac{b}{y}\right)(1-\beta\phi)GSM_M^\pi(0,0)TM_F^y(0,k), \tag{13}$$

[7] It follows that this result would not survive in a more general model with endogenous state variables as, e.g., the Smets and Wouters (2007) model in Section 2.3, where the distance between announcement and implementation would affect the multipliers upon both announcement and implementation.

[8] The Online Appendix shows that the marginal utility of consumption increases in response to a government spending increase if $GSM_M^y(0,0)<\alpha_1$ (and vice versa). In the former case, thus, household consumption demand decreases. However, this effect could reverse if $GSM_M^y(0,0)>\alpha_1$, in which case government spending crowds in – rather than out – private consumption. Note that $\alpha_1=1$ for additively separable utility functions.

[9] Note that, if the impact multipliers on output and inflation are equal to α_1 and zero, respectively, these transmission mechanisms become impotent. In that specific case, as future inflation and private consumption remain unaffected by the spending shock, there is neither any incentive to change private consumption demand nor any reason for firms to smooth any price increase over time.

[10] The simulations of this simple New Keynesian model assume the following baseline calibration at the quarterly frequency: $\beta=0.99$, $\theta=0.75$, $\sigma=1$, $\xi=2$, $\rho=0.5$; the steady state fraction of government spending to output $g/y=1/3$; the steady state fraction of government debt to output $b/y=4$. In the monetary regime, we set the monetary policy parameter (ϕ) to 1.5 and fiscal policy parameter (ψ) to 0.2. In the fiscal regime, the same policy parameters are set to 0.5 and 0, respectively.

[11] To see this, substitute the Taylor rule (3) in the government's budget identity (5) and differentiate $\tilde{b}_t$ with respect to $\hat{\pi}_t$.

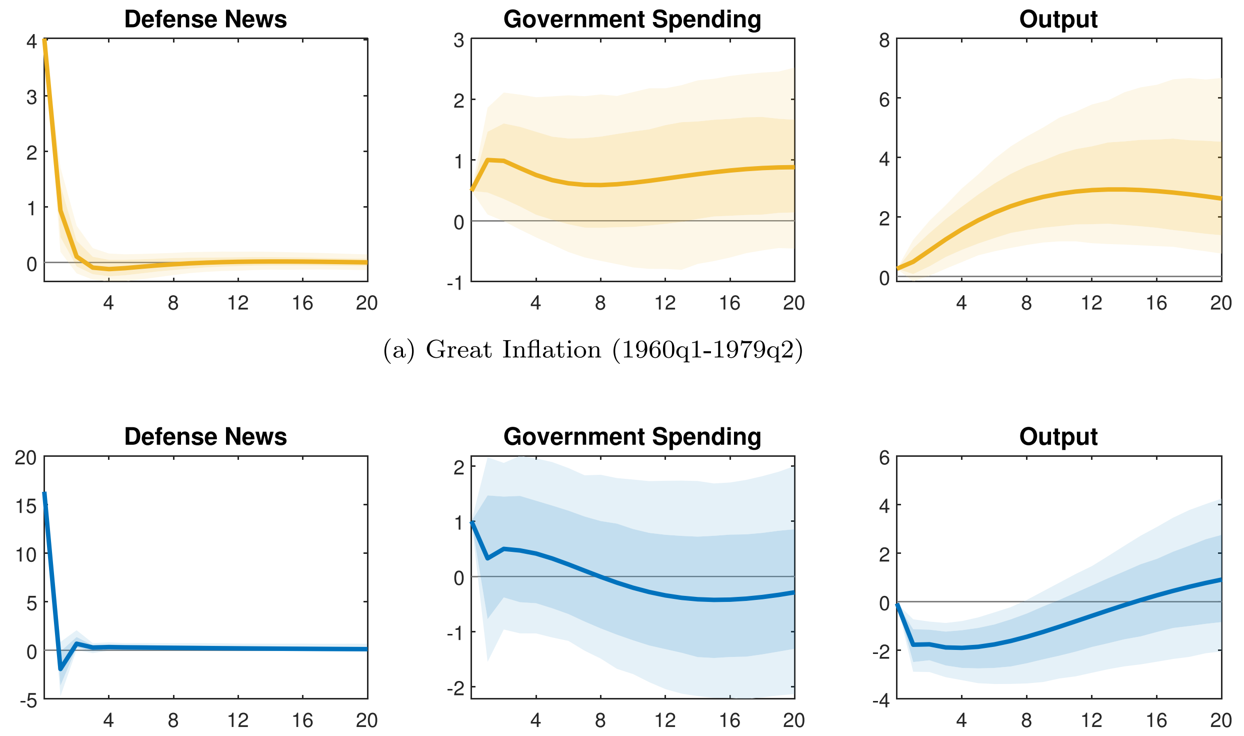


Fig. 1. Impulse responses to a defense news shock. Notes: Impulse response functions to a defense news shock in a six-variable VAR with one lag including, in this order, defense news, real government spending, real GDP, the marginal tax rate, the 3-month T-bill rate, and hours worked. Impulse responses correspond to the first shock of the Cholesky decomposition. Panel (a) reports results for the Great Inflation, panel (b) for the Great Moderation. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.

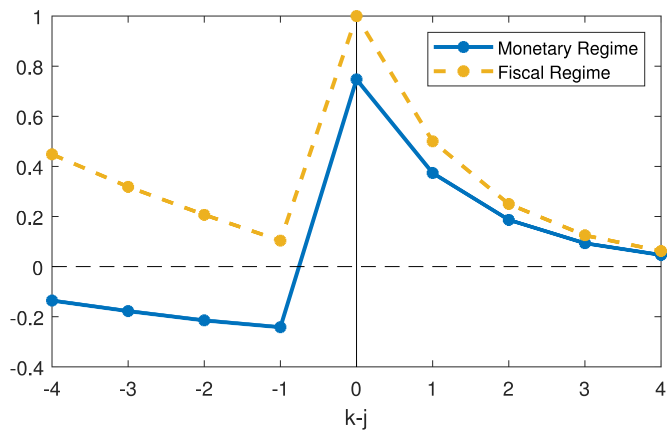


Fig. 2. Output multipliers of government spending. Notes: The graph plots the impulse response of output following an anticipated shock to government spending. The shock is announced four ($j = 4$) quarters before it is implemented. The x-axis measures the number of periods before (-) and after (+) the spending shock is implemented. The y-axis measures the size of the multipliers, with the multiplier on debt being defined analogously as in (7).

$$[1ex]GSM_F^{\pi}(0,k) = \underbrace{GSM_M^{\pi}(0,k)}_{\text{Keynesian effect}} + \underbrace{TM_F^{\pi}(0,k) - \left(\frac{b}{y}\right)(1-\beta\phi)GSM_M^{\pi}(0,0)TM_F^{\pi}(0,k)}_{\text{Nominal wealth effect}}, \tag{14}$$

where TM_F^y and TM_F^{π} are the tax multipliers on output and inflation, respectively, in the fiscal regime. The multipliers come in two parts. First, there is the standard Keynesian effect (due to labor demand and supply), just described above in the monetary regime. Second, the fiscal regime features a “nominal wealth effect” resulting from changes to the wealth of the private sector. The first term captures the direct wealth increase due to the newly-issued unbacked bonds, which is equivalent to that of a debt-financed tax cut, $TM_F^{y,\pi}$. The second term captures a “fiscal inflation tax” that results from inflation devaluing the real value of the outstanding nominal debt which is now net wealth for the households (for a detailed discussion, see Beck-Friis and Willems, 2017).

Anticipated multipliers. Contrary to the monetary regime, the fiscal regime is history-dependent, because now debt is a state variable, determining wealth. As a result, the backward-looking nature of the government's budget identity (5) plays an important role in shaping demand. The effect on economic activity in the period when the government spending shock is implemented depends on when in the past it was announced.

The analytical expressions of the announcement multipliers are complicated objects and are omitted here (see the Online Appendix for the derivation), but the intuition follows from the one above, that is, from the combination of the Keynesian effect and the nominal wealth effect. During the announcement period, the former effect is contractionary (as we explained above) while the latter effect is expansionary. Upon implementation, these two effects are both expansionary. It turns out that, during the announcement period, the nominal wealth effects dominates, as Fig. 2 shows. In regime F the impulse response functions display two bursts of activity across time, first upon announcement and then upon implementation. Fig. 2 shows that output rises after the fiscal shock implementation in both the monetary and fiscal regimes. In contrast, the dynamics of output during the anticipation period is opposite in the two regimes: output decreases in the monetary regime while it increases in the fiscal one. According to these results, output, and eventually its components, provide a viable testable implication to discriminate between the two regimes.

In the next section, we check whether the results valid for the simple New Keynesian model generalize to more operational models such as the DSGE model of Smets and Wouters (2007), and whether they apply to other components of output as well.

2.3. A quantitative illustration using the smets-Wouters model

The well-known model by Smets and Wouters (2007) includes capital together with a rich set of frictions, such as wage and price stickiness, indexation, habit formation in consumption, investment adjustment costs, variable capital utilization. This kind of medium-scale model has proved to be successful in explaining the business cycle behavior of macroeconomic data. We augment the model with a fiscal block, consisting of the policy rule for taxes (4) and the flow budget constraint (5). In addition, we replace the stochastic process for government spending to adopt the specification proposed by Ramey (2009):

$$\hat{g}_t = 1.4\hat{g}_{t-1} - 0.18\hat{g}_{t-2} - 0.25\hat{g}_{t-3} + \varepsilon^g_{t-j}, \tag{15}$$

so that government spending is fully exogenous and follows an AR(3) process that mimics the hump-shaped profile of fiscal plans.[12]

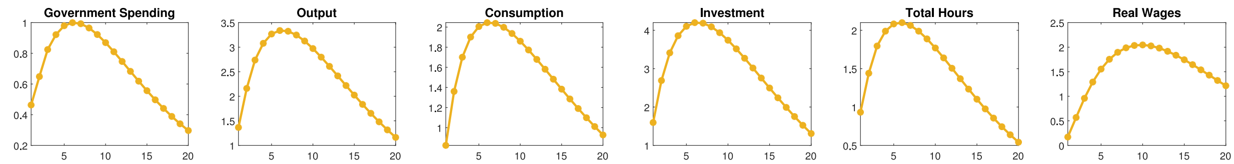
Panels (a) and (b) of Fig. 3 display the impulse responses to an expansion in government spending implemented immediately upon announcement, while panels (c) and (d) report the responses to a shock implemented with a delay of four periods. The main result from the previous section is confirmed: one cannot distinguish the monetary from the fiscal regime by looking at the response of output after an unanticipated fiscal shock, because output rises in both regimes. Conversely, an anticipated shock causes a decrease in output during the anticipation period in regime M, and an increase in regime F. This is also true for consumption, investments, wages and hours. As a result, we can identify the two regimes by looking at the impulse responses following an anticipated government spending shock: the effect is contractionary in regime M and expansionary in regime F. In our sensitivity analysis in the Online Appendix, we find that this pattern holds true for all the calibrations we consider.[13,14]

This theoretical result connects our work with two important streams of literature. The first one deals with fiscal foresight and the identification of fiscal policy shocks. This literature demonstrates the importance of carefully distinguishing between anticipated and unanticipated government spending shocks (e.g., Ramey, 2011). The second one deals with the identification of monetary-fiscal policy regimes in US data (e.g., Bianchi, 2012). Our theoretical result provides a powerful identification strategy in two directions. On the one hand, given the results in the literature that identifies the historical periods of regime M and F, we can check if the previous empirical findings on the effects of anticipated vs. unanticipated shocks are consistent with our theoretical results. On the other hand, given the shock measures proposed by the literature

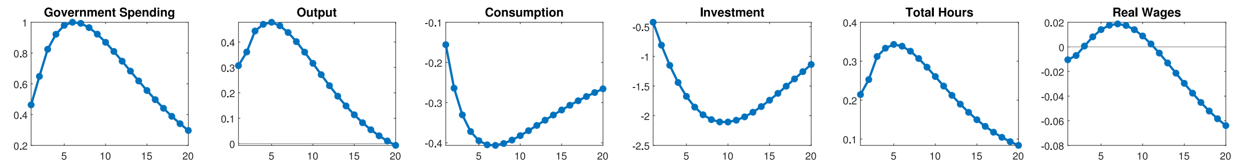
[12] We calibrate the model using the parameter values at the posterior mean (see Smets and Wouters, 2007, Tables 1A and 1B). As for the monetary policy rule, we maintain the original specification of Smets and Wouters (2007), which generalizes our simple Taylor rule (3). The inflation parameter in the monetary policy rule (r_π) is kept at the original value of 2.04 for regime M and set to 0.5 for regime F, while all the other parameters are kept unchanged. We also augment the model with a tax rule identical to equation (4), and set $\psi = 0.2$ for regime M and $\psi = 0$ for regime F.

[13] As already noted for the simple model, this is not true for the behavior of inflation, which does not show such a clear-cut difference among the two regimes: while under the fiscal regime inflation always increases, its response is ambiguous under the monetary regime as parameters vary.

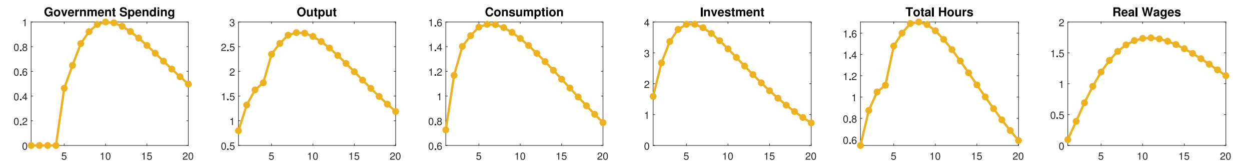
[14] Note that Cogan et al. (2010) use the Smets-Wouters model to analyze the effects of the American Recovery and Reinvestment Act of 2009. They show that the resulting fiscal multiplier is low because the larger part of the plan was announced but postponed to the second year, and that the impact fiscal multiplier could be negative in the model if a larger part of the plan was postponed to the second year.



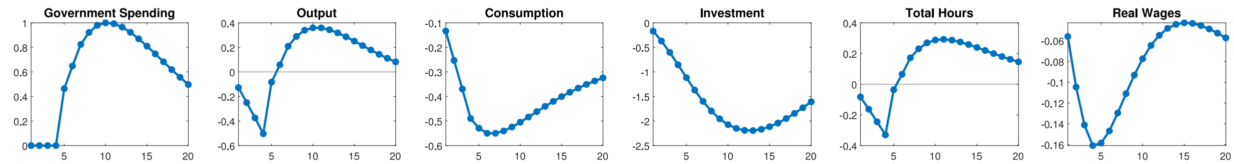
(a) Regime F: unanticipated shock



(b) Regime M: unanticipated shock



(c) Regime F: anticipated shock



(d) Regime M: anticipated shock

Fig. 3. Impulse responses to a government spending shock (anticipated vs. unanticipated) in the Smets-Wouters model. Notes: Panels (a) and (b) report the impulse responses to an unanticipated shock to government spending, while panels (c) and (d) report the impulse responses to an identical shock implemented four periods after the announcement.

on fiscal foresight, we can use our results as a tool to identify different policy regimes in the data. We proceed with these steps in the next section.

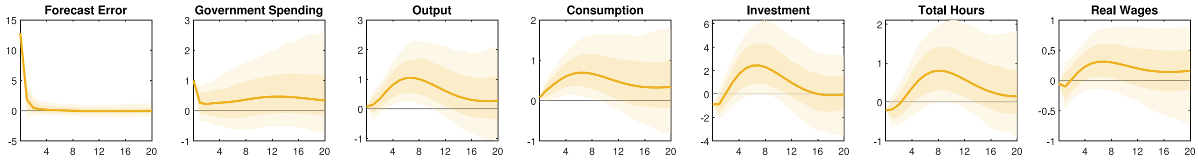
3. Empirical evidence

The above theoretical analysis shows that anticipated government spending shock are contractionary in regime M and expansionary in regime F during the anticipation period, while unanticipated shocks are expansionary in both regimes. Fig. 1 suggests that the output response in US data is consistent with this result. We now extend the VAR analysis to include other variables present in the Smets and Wouters (2007) model, namely government spending, output, consumption of non-durable goods and services, investments, and wages and hours worked in the manufacturing industry.[15] As in the introduction, we consider the Great Inflation (1960q1-1979q2) to be a regime F and the Great Moderation (1984q1-2007q2) to be a regime M. We first check whether the data confirm the similarity of the results for unanticipated government spending shocks under M and F, and then turn to anticipated shocks.

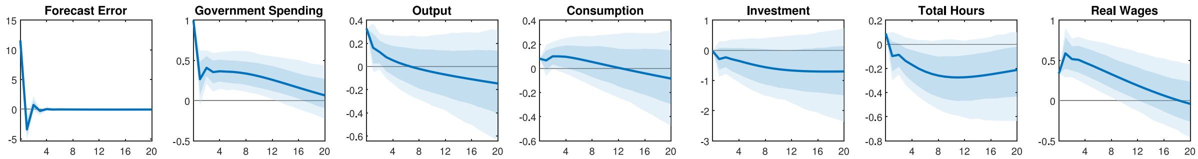
3.1. Unanticipated government spending shocks

We first consider the effects of unanticipated shocks. We follow Auerbach and Gorodnichenko (2012) who, to control for expectations not already absorbed by the VAR, draw forecasts for government spending from professional forecasters – SPF

[15] All the VARs in this section have one lag, as suggested by the Bayesian information criterion, and also include the Barro-Redlick average marginal income tax rate and the 3-month T-bill rate as endogenous variables, but we do not report their impulse responses for brevity. We use the dataset provided by Ramey (2011). Further robustness checks for the results in this section are in the Online Appendix.



(a) Regime F: 1966q4-1979q2



(b) Regime M: 1984q1-2007q2

Fig. 4. Impulse responses to a government spending forecast error shock. Notes: Impulse response functions to a forecast error shock in a nine-variable VAR with one lag, including, in this order, the forecast error for the growth rate of real government spending in the current period, real government spending, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the first shock of the Cholesky decomposition. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.

data, available since 1981 – and from the Federal Reserve staff – Greenbook data, available from 1966 to 2004. They impose a Cholesky identification scheme with the forecast error for the growth rate of government spending ordered first and government spending ordered second. They interpret an innovation in the forecast error as an unanticipated shock. Inserting their forecast error variable in our VAR specification and considering the two regimes – regime F starting from 1966 – yields Fig. 4. In accordance with the simulations of the Smets and Wouters (2007) model, the effects of an unanticipated shock in the two regimes do not show the clear-cut differences that we find in the introduction, in which we instead use Ramey's 2011 measure of anticipated government spending shocks. In Fig. 4, the effect of an unanticipated government spending shock is expansionary in both regimes – all variables increase or are not significantly different from zero. Moreover, the VAR impulse responses also mirror the quantitative difference between the two regimes implied by the theoretical model.[16]

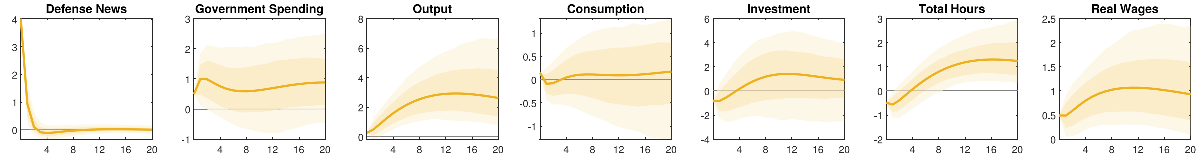
3.2. Anticipated government spending shocks

As in Fig. 1, we proceed as in Ramey's 2011, using the defense news variable as a measure for anticipated government spending shocks, the same set of variables in the VAR and a "rotating" procedure by adding the other extra variables one at a time. Fig. 5 shows the resulting impulse response functions. Anticipated government spending shocks are contractionary in regime M and expansionary in regime F. Consistent with the impulse responses from the Smets and Wouters (2007) model above, output, consumption, investment, hours and real wages show a significant reduction in the monetary regime and a significant increase in the fiscal regime - less so for consumption, significant only on impact, and investment.

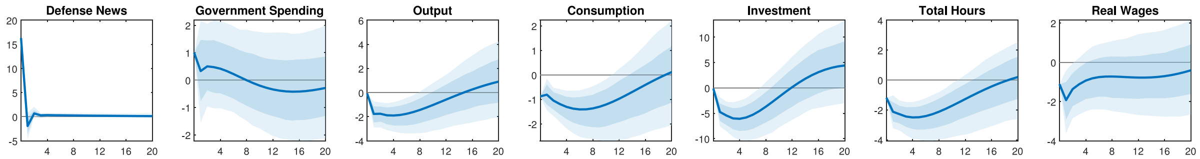
The different responses of macroeconomic variables depending on the policy regime connect our work to the literature that emphasises the importance of expectations in models of monetary-fiscal interactions. Using a different methodology that allows agents to be aware of the possibility of regime changes, Bianchi and Melosi (2014, 2017) and Bianchi and Ilut (2017) obtain results similar to ours. In particular, Bianchi and Ilut (2017) find a strong response of output in a fiscally-led regime following an increase in government spending. This happens because agents expect that the fiscal expansion will not be covered by future fiscal adjustments, while real interest rates actually fall as the central bank does not satisfy the Taylor principle. On the contrary, in a monetary-led regime, agents anticipate future fiscal consolidations while the central bank actively fights inflation by raising real interest rates, so government spending has only weak effects on output. If we include a measure of real interest rates in our VAR analysis, we do find that the real rate behaves differently under the two regimes: it decreases under F while it increases under M (see the Online Appendix).

The evidence in Sections 3.1 and 3.2 indicates that the effects of government spending shocks do depend on the timing of their implementation, as Ramey (2011) suggests, but they are also contingent on the particular monetary-fiscal policy mix. Failing to account for the monetary-fiscal mix can lead to misleading results, because anticipated government spending shocks have very different effects in the M and F regime.

[16] For example, the response of output, investment and consumption is much less pronounced in regime M than in F. Moreover, Fig. 3b shows that in the theoretical model consumption decreases in regime M, while this is not the case in the empirical responses in Fig. 4b. However, footnote [2] already discussed the literature about the crowding-in of consumption after an unanticipated government spending shock and how a New Keynesian model could be amended to replicate this fact.

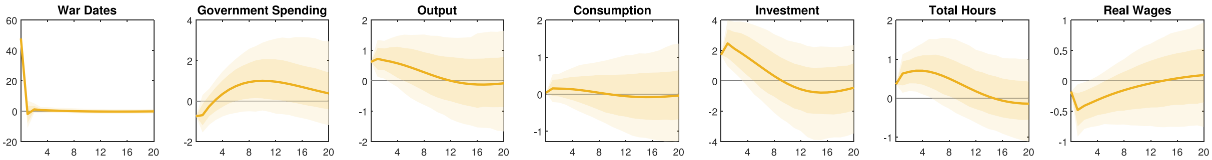


(a) Regime F: 1960q1-1979q2

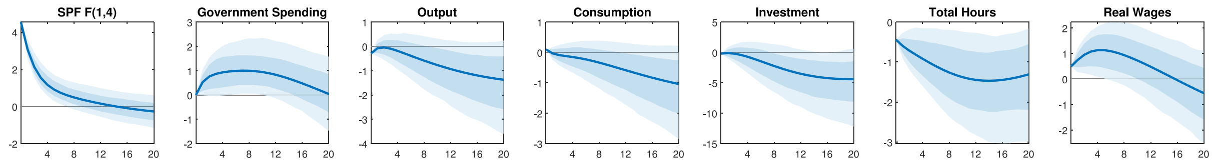


(b) Regime M: 1984q1-2007q2

Fig. 5. Impulse responses to a defense news shock, full specification. Notes: Impulse response functions to a defense news shock in a six-variable VAR with one lag including, in this order, defense news, real government spending, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), and, one at a time, real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the first shock of the Cholesky decomposition. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.



(a) Regime F: 1960q1-1979q2



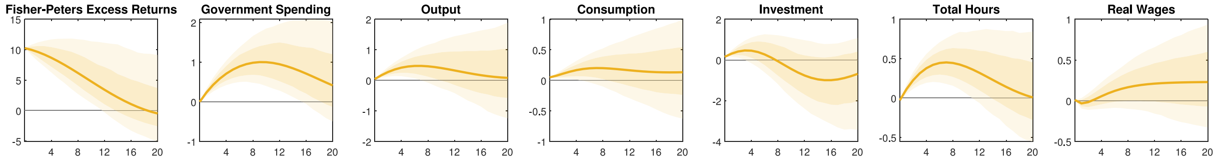
(b) Regime M: 1984q1-2007q2

Fig. 6. Impulse responses to an anticipated government spending shock under alternative specifications. Notes: Panel (a) reports impulse responses to a shock to war dates in a nine-variable VAR with one lag including, in this order, war dates, real government spending, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the first shock of the Cholesky decomposition. Panel (b) reports impulse responses to a shock to the expected growth rate in government spending in a nine-variable VAR with one lag including, in this order, real government spending, the cumulated professional forecast $F(1,4)$, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the second shock of the Cholesky decomposition. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.

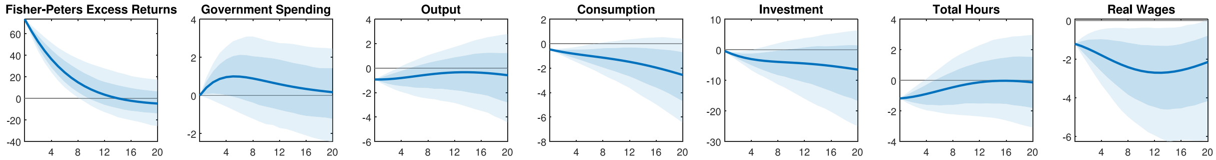
3.3. Alternative measures of anticipated shocks

As a robustness check, in Fig. 6 we first consider two different specifications, one for each regime. For regime F, we adopt the Ramey and Shapiro (1998) narrative approach to identify shocks to government spending. We augment our VAR with their war dates dummy variable, ordered first, and report the corresponding impulse responses panel (a).[17] For regime M, we follow Forni and Gambetti (2016) and use SPF data to measure anticipated movements in government spending. We consider the forecast of future spending growth over the following four quarters, i.e. the cumulated forecast $F(1,4)$. We include this variable in the VAR, ordered second after government spending, and report the corresponding impulse responses in panel (b). Note that SPF data are available starting from 1981, so we must restrict this exercise to regime M only. Fig. 6 confirms the different behavior of anticipated government spending shocks in the two regimes: output, consumption, investments

[17] Ramey and Shapiro (1998) war dates are often criticized because, if one employs a sample that excludes the Korean war, the shock variable has lower explanatory power. Our two regimes exclude that war but we still opt to employ this procedure for regime F. In fact, while the years corresponding to our regime M do not include any spike comparable to the Korean war in defense spending, those corresponding to our regime F include the Vietnam war where defense spending, although lower than the Korean war, is still noticeable.



(a) Regime F: 1960q1-1979q2



(b) Regime M: 1984q1-2007q2

Fig. 7. Impulse responses to a shock to Fisher and Peters's 2010 measure of anticipated government spending. Notes: Impulse response functions to a shock to excess returns of military contractors in a six-variable VAR with one lag including, in this order, real government spending, the excess returns variable, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), and, one at a time, real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the second shock of the Cholesky decomposition. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.

and hours all significantly decrease under M and increase under F, though the increase in consumption is not significant in this case.

Fig. 7 shows that our results are confirmed if we use the alternative measure of anticipated fiscal shocks proposed by Fisher and Peters (2010), which is based on excess returns in stock prices of defense contractors. The Online Appendix presents an extensive robustness checks regarding the VAR specification.[18] The results are confirmed in all specifications, except two in which output expands in regime M, but not significantly so.[19]

3.4. Employing a standard identification: Blanchard and Perotti (2002)

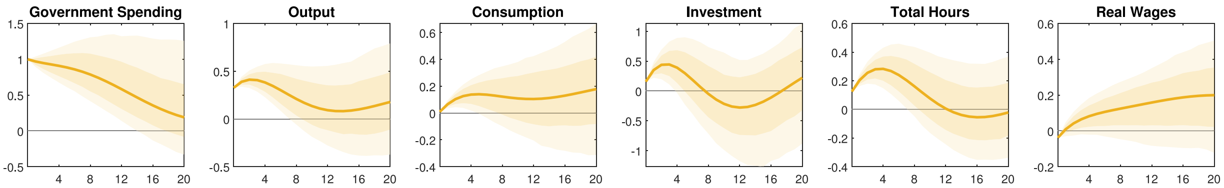
Blanchard and Perotti (2002) use a standard identification of government spending shocks, that is, a Cholesky decomposition with government spending ordered before the other variables. Fig. 8 shows that, with this standard identification in the VAR, output, non-durable and service consumption and investments decrease in regime M while they increase in regime F after a government spending shock.[20]

Though the identification by Blanchard and Perotti (2002) does not explicitly distinguish between anticipated and unanticipated shocks, the VAR produces the same type of responses that we obtained both in the theoretical models (during the anticipation period) and in the VARs that take fiscal foresight into account. In the fiscal regime, both anticipated and unanticipated shocks have the same, positive effect on output, so that disentangling the two types of shocks is not necessary to conclude that fiscal shocks are expansionary. In the monetary regime, the Blanchard and Perotti (2002) identification scheme detects a fall in output following an increase in public expenditure, supporting the idea that anticipation effects represent the main transmission mechanism of fiscal shocks in the monetary regime. This is consistent with the line of reasoning in Ramey (2011). However, our results call for a different interpretation of Ramey's 2011 critique of Blanchard and Perotti's 2002 identification scheme. While, as shown by Ramey (2011), the two identifications of government spending shocks lead to different results using the whole post-WWII sample, the surprising finding here is that this difference disappears when

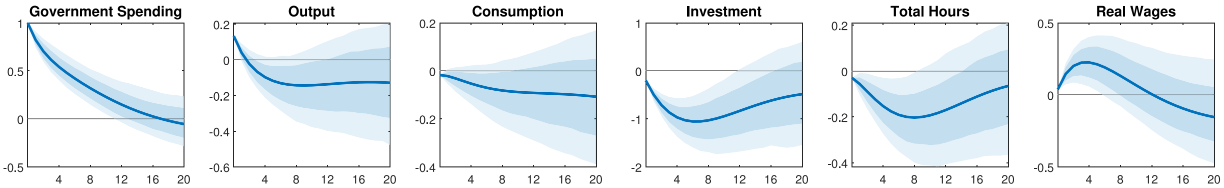
[18] Note that we follow the original procedure: non-rotating VAR for $F(1,4)$ shocks and rotating VAR for Fisher and Peters (2010), adding the T-bill rate in each case. Results are robust to the exclusion of the T-bill rate and to the use of the rotating procedure in place of the large VAR and vice versa.

[19] These two exceptions arises with $F(1,4)$ shocks when we use: (i) two lags instead of one (Figure A8) following the Akaike criterion rather than the BIC, (ii) data from Auerbach and Gorodnichenko (2012) in a small three-variable VAR (Figure A11). Moreover, employing $F(1,4)$ shocks, Forni and Gambetti (2016) and Ricco et al. (2016) find an opposite result, that is, expansionary effects of anticipated government spending in the post-80s sample. Both papers, however, employ a larger sample, which includes the Volcker disinflation and the Great Recession, that we purposely exclude. The first is a period of high volatility, while the second, with its passive monetary policy and very active fiscal policies, is akin to a regime F. Therefore, their longer sample does not coincide with a well-defined regime M. Results for robustness checks on this point are available from the authors upon request. Given the relatively short sample size for well-identified regimes, we chose the lag length according to standard information criteria, and the use of longer lag lengths - as the two papers mentioned above - are not advisable for our shorter samples. Not surprisingly, results might be sensitive to the number of lags, especially in terms of significance.

[20] Perotti (2008) and Ellahie and Ricco (2017) find instabilities of VARs estimates across sub-samples and point to the possibility that these are due to changes in the fiscal-monetary regime in place. Dividing their sample in two sub-samples very close to ours, Ellahie and Ricco (2017) find that in the Great Inflation years government spending has expansionary effects, while in the Great Moderation ones they are contractionary. However, since this sub-sample instability seems to disappear once using large VARs, they end up attributing these instabilities to misspecification in the information set. As Lutkepohl (2014) argues, these results should be taken with caution since the use of large information techniques can distort the results.



(a) Regime F: 1960q1-1979q2



(b) Regime M: 1984q1-2007q2

Fig. 8. Impulse responses to a government spending shock using the standard identification scheme by Blanchard and Perotti (2002). Notes: Impulse response functions to a government spending shock in a eight-variable VAR with one lag including, in this order, real government spending, real GDP, the marginal tax rate (not shown), the 3-month T-bill rate (not shown), real non-durable and service consumption, real investments, hours worked, and real wages. Impulse responses correspond to the first shock of the Cholesky decomposition. Each panel reports OLS estimates together with 68% (dark shade) and 90% (light shade) confidence bands.

the estimates are conditioned on the monetary-fiscal policy mix.[21] Therefore, irrespective of taking fiscal foresight explicitly into account or not, the results from the VARs within each defined regime are consistent. This suggests that the crucial feature driving the results in the two identification procedure is not the timing of the shocks – that is, whether the shocks capture fiscal foresight or not – but the monetary-fiscal policy mix, i.e. whether the estimation is conducted over a sample with a well-defined regime. Moreover, according to this interpretation, the Blanchard and Perotti (2002) identification scheme seems to indeed capture fiscal foresight, because the impulse response functions mimic what theory would predict for anticipated government spending shocks, once one controls for the monetary-fiscal regime in place. The fact that most of the changes in fiscal policy are part of multi-year fiscal plans announced in advance (see, e.g., Alesina et al., 2019) could be one possible explanation why the Blanchard and Perotti (2002) identification scheme captures fiscal foresight.

Fiscal foresight poses a challenge to VAR analysis: under a standard identification scheme, the identified fiscal shock would be a combination of anticipated and unanticipated changes in government spending. In this case, Leeper et al. (2013) shows that the underlying structural MA representation of the variables in the VAR is not invertible, or "non-fundamental", which leads to misleading results. The problem is the potential misalignment between the (richer) agents' and the (poorer) econometrician's information set, resulting from the scarce information contained in the VAR. Our analysis suggests, instead, that the problem might disappear once the estimation controls for the monetary-fiscal policy mix. In other words, the superior information the agent has with respect to the econometrician is the realization of the regime of the economy. Once one controls for the regime, shocks become fundamental. The next section investigates this possibility.

4. Testing for fundamentalness

Granger causality tests. For a VAR analysis to be well-specified, the econometrician's information set should coincide with the information set used by economic agents. If this is the case, the VAR shocks are said to be fundamental and they cannot be predicted using external information. To check if the analysis by Blanchard and Perotti (2002) incurs in a problem of non-fundamentalness, Ramey (2011) considers the government spending shocks identified according to their recursive procedure and runs a series of Granger causality tests between these shocks and two potential predictors, namely war dates dummies and the SPF forecasts of future spending growth. She finds that the shocks are indeed predictable. We extend that exercise to consider every measure of anticipated government spending employed above. Table 1 contains the results for defense news, war dates, SPF forecasts of spending growth, and Fisher and Peters (2010) shocks – panels (a) to (d), respectively. We consider both a large sample period (1947q1-2008q4) and the two sub-periods we identify as regimes M and F.[22] The evidence is clear: VAR shocks never Granger-cause any measure of anticipated shocks, while these measures Granger-cause the VAR shocks just if one considers the full sample but they do not if one considers each regime separately. As a result,

[21] The Online Appendix displays the impulse responses with these two different specifications for the full post-WWII sample, showing that output always increases while consumption increases only if fiscal foresight is disregarded.

[22] In panel (d) the large sample period starts at 1959q1 because, according to Fisher and Peters (2010), that is the first date for true reliable predictions employing their excess return variable.

Table 1
Granger causality tests .

(a) Granger causality tests using defense news			
	Full sample 1947q1-2008q4	F 1960q1-1979q2	M 1984q1-2007q2
4 lags			
Do defense news Granger-cause VAR shocks?	Yes (0.0000)	No (0.5337)	No (0.9131)
Do VAR shocks Granger-cause defense news?	No (0.1346)	No (0.9997)	No (0.1398)
2 lags			
Do defense news Granger-cause VAR shocks?	Yes (0.0000)	No (0.4403)	No (0.7657)
Do VAR shocks Granger-cause defense news?	No (0.4280)	No (0.9978)	No (0.4381)
(b) Granger causality tests using war dates			
4 lags			
Do war dates Granger-cause VAR shocks?	Yes (0.0005)	No (0.6428)	
Do VAR shocks Granger-cause war dates?	No (0.4971)	No (0.5715)	
2 lags			
Do war dates Granger-cause VAR shocks?	Yes (0.0101)	No (0.3422)	
Do VAR shocks Granger-cause war dates?	No (0.4907)	No (0.2644)	
(c) Granger causality tests using the cumulated professional forecast $F(1,4)$			
4 lags			
Does $F(1,4)$ Granger-cause VAR shocks?			No (0.8194)
Do VAR shocks Granger-cause $F(1,4)$?			No (0.1805)
2 lags			
Does $F(1,4)$ Granger-cause VAR shocks?			No (0.7583)
Do VAR shocks Granger-cause $F(1,4)$?			No (0.1672)
(d) Granger causality tests using Fisher and Peters excess returns			
	1959q1-2008q4	1960q1-1979q2	1984q1-2007q2
4 lags			
Do returns Granger-cause VAR shocks?	Yes (0.0114)	No (0.1285)	No (0.7075)
Do VAR shocks Granger-cause returns?	No (0.3823)	No (0.8260)	No (0.7663)
2 lags			
Do returns Granger-cause VAR shocks?	Yes (0.0011)	No (0.1499)	No (0.5974)
Do VAR shocks Granger-cause returns?	No (0.3331)	No (0.5063)	No (0.6130)

Notes: Granger-causality tests between the government spending shocks identified with the standard scheme by Blanchard and Perotti (2002) applied on an eight-variable VAR and several measures of anticipated fiscal shocks. Panels contain: (a) defense news by Ramey (2011); (b) Ramey and Shapiro (1998) war dates; (c) cumulated four-quarter ahead SPF forecasts of future spending growth as in Forni and Gambetti (2016); (d) excess returns by Fisher and Peters (2010). The tests in the first column correspond to shocks estimated on the full sample, those in the second column correspond to shocks estimated on the sub-sample 1960q1-1979q2, and those in the third column correspond to shocks estimated on the sub-sample 1984q1-2007q2. p-values are reported in parenthesis.

non-fundamentalness seems to be present only in the long sample that includes sub-periods characterized by very different monetary-fiscal policy mixes. As such, the VAR is misspecified because the transmission mechanism of anticipated fiscal shocks differs across regimes, as our theoretical analysis shows, and thus a single linear VAR that does not distinguish among the M and F regimes can not capture this difference. On the contrary, when we consider a well-defined monetary or fiscal regime, there is no evidence that VAR shocks could be forecast, i.e. shocks become fundamental. Our analysis suggests that in this case non-fundamentalness arises from VAR misspecification rather than from fiscal foresight.[23]

Orthogonality tests. Following Forni and Gambetti (2016), one can test for fundamentalness also by regressing the VAR-based shocks on a set of potential predictors. We report these orthogonality tests in Table 2. Each row reports the p-values of the overall F-test for the regressions of the estimated government spending shocks, identified with the standard scheme by Blanchard and Perotti (2002), on the SPF forecasts of the growth rates of government spending over different horizons. Each row includes one to three lags of the predictor. We only focus on regime M, since SPF forecasts are available starting from 1981. Importantly, orthogonality tests are reported in separate columns, which correspond to two different sets of shocks. In the first three columns, we take the shocks obtained by estimating the VAR on the full sample (1947q1-2008q4), and then use data from this series for the sub-sample (1984q1-2007q2) in the regression. In the last three columns, instead, we use VAR shocks estimated on the sub-sample for regime M (1984q1-2007q2). We find that the SPF forecasts have predictive power for the VAR shocks computed on the full sample, while the VAR shocks computed on the mone-

[23] We also considered the sample just covering our two regimes (1960q1-2007q2), both including and excluding the Volcker's disinflation years (1979q3-1983q4) and we confirm results for the whole sample period. Results, as well as further robustness checks, are available in the Online Appendix.

Table 2
Orthogonality tests for the monetary regime .

	Full sample 1947q1-2008q4			M 1984q1-2007q2		
	1 lag	2 lags	3 lags	1 lag	2 lags	3 lags
$f(0)$	0.04	0.06	0.11	0.96	0.71	0.72
$f(1)$	0.00	0.00	0.00	0.26	0.25	0.37
$f(2)$	0.00	0.00	0.00	0.90	0.19	0.27
$f(3)$	0.00	0.00	0.00	0.89	0.88	0.05
$f(4)$	0.00	0.00	0.00	0.90	0.57	0.52
$f(0)$ to $f(4)$	0.00	0.00	0.00	0.65	0.16	0.18
$F(1,4)$	0.00	0.00	0.00	0.73	0.94	0.81

Notes: The table reports the p-values of the overall F-test for the regressions of government spending shocks on the lagged SPF forecasts of the growth rates of government spending over different horizons. We estimate the same eight-variable VAR on two different samples and identify fiscal shocks using the standard scheme by Blanchard and Perotti (2002). The regressions in the first three columns have, as dependent variable, the VAR shocks estimated on the full sample 1947q1-2008q4, while the regressions in the last three columns include the VAR shocks estimated on the sub-sample 1984q1-2007q2. As for the predictors, $f(h)$ indicates the forecast made in t for the growth rate between $t+h-1$ and $t+h$, with $h=0,\dots,4$. The regressions in the first five rows include forecasts for one horizon at a time, the regressions in the sixth row include forecasts for all horizons, and the regressions in the seventh row include the cumulated forecast $F(1,4)=\sum_{h=1}^{4} f(h)$. Note that all regressions are estimated on the sub-sample 1984q1-2007q2, so that the regressions in the first three columns have the same number of observations as the regressions in the last three columns.

tary sub-sample appear to be fundamental - with only one exception.[24] Therefore, the problem of non-fundamentalness of government spending shocks is absent if one estimates the VAR on a well-defined policy regime, irrespective of the issue of fiscal foresight. Instead, non-fundamentalness arises when one disregards monetary-fiscal interactions and considers a sample that potentially nests sub-periods characterized by heterogeneous policy mixes.

5. Conclusions

Government spending shocks affect the economy activity not just when they are implemented but also when they are announced. In a simple analytical model, we show that the reaction of output to anticipated government spending shocks crucially depends on the predominant monetary-fiscal regime. In the monetary regime the anticipation of a government spending shock generates an immediate decrease in aggregate demand ahead of its implementation, as agents expect higher future taxes given the Ricardian nature of fiscal policy. Conversely, in a fiscal regime, the same anticipated shock is expansionary, as the increase in nominal debt generates a wealth effect that stimulates consumption. The effect of anticipated shocks contrasts with the effect of unanticipated shocks, which are expansionary in both regimes. The opposite movement of output after an anticipated shock could be exploited to identify different monetary and fiscal regimes in the data. We show that the evidence on US data support this theoretical predictions.

Moreover, we show that conflicting results in the literature due to the two different identification procedures in Blanchard and Perotti (2002) and Ramey (2011) disappear once the estimates are conditional on the existing monetary-fiscal policy mix. This happens irrespective of explicitly accounting for fiscal foresight or not: using both identification procedures, consumption, wages, and even output increase in the fiscal regime, while all variables decrease in the monetary regime.

Even the non-fundamentalness problem due to a misalignment between the information sets of economic agents, who take into account anticipation effects, and of the econometrician, who does not, disappears once the estimation controls for the monetary-fiscal policy mix. The superior information held by the agents, with respect to the econometrician, seems to be the realization of the regime of the economy: once one controls for the regime, shocks become fundamental.

The different behavior of output in the two regimes in the anticipation period points to the key role that forward guidance of fiscal policy could exert. In general, fiscal forward guidance produces different effects depending on the monetary-fiscal mix in place: while it could lead to immediate wealth effects on aggregate demand under fiscal dominance, it could discourage spending in a monetary regime. This evidence suggests that it could be (un)wise to anticipate future fiscal policies, depending on the regime in place.

Credit Author Statment

All authors contributed to each of the different aspects of the project.

[24] Note that, however, even in the case where orthogonality is rejected, the consequences of non-fundamentalness do not seem so severe. Looking at the R^2 associated to the relative regression (i.e., the empirical diagnostic for the non-fundamentalness severity proposed by Beaudry et al., 2019) we find it is lower than 0.08, i.e., it explains less than the 8% of the variance of government shocks.

Data Availability

Data will be made available on request.

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Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2022.11.008.

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