UNIVERSITÀ DEGLI STUDI DI PADOVA

Dipartimento di Scienze Economiche ed Aziendali "Marco Fanno"

NEWS ON STATE-DEPENDENT FISCAL MULTIPLIERS: THE ROLE OF CONFIDENCE

JUAN MANUEL FIGUERES
University of Padova

September 2015

"MARCO FANNO" WORKING PAPER N.202

News on State-Dependent Fiscal Multipliers: The role of Confidence[*]

Juan Manuel Figueres[†]

First draft: June 2014
This draft: September 2015

Abstract

This paper investigates the role of consumer confidence in determining the real effects that anticipated (news) government spending shocks have on output in recessions and in expansions as for the US economy. To account for fiscal foresight, I employ a measure of anticipated fiscal shocks defined as the sums of expectations' revisions over future fiscal spending. This variable is shown to carry relevant information about movements on government spending. Results indicate that fiscal multipliers during recession are both statistically larger than in expansions and greater than one. Importantly, consumer confidence is shown to play a decisive role in determining the real effects of an anticipated spending shock within a non-linear framework. In particular, the response of confidence is key in explaining the statistically larger fiscal multipliers during recessions. Moreover, the role of confidence is found to be relevant for the transmission of anticipated shocks only. These results qualify confidence as a key ingredient for understanding the transmission of fiscal news shocks (as opposed to unanticipated fiscal shocks).

Keywords: Consumer Confidence, Fiscal forecast, Fiscal spending multiplier, Non-linear models, Smooth Transition Vector-AutoRegressions.

JEL Classification: C32, E32, E6.

---

[*] I thank Efrem Castelnuovo for his detailed feedback. I am also grateful to Emanuele Bacchiocchi, Giovanni Caggiano, Stefano Neri, Franck Portier, Timo Teräsvirta, Tomasz Wozniak, Yukai Yang and participants to the Padova Macro Talks 2014, the 3rd Rimini Time Series Workshop and the 3rd CIdE Workshop for PhD students in Econometrics and Empirical Economics 2015 for their helpful comments. Part of this work was developed while I was visiting the Center for Research in Econometrics Analysis of Time Series at the Aarhus University whose hospitality is gratefully acknowledged. All errors are mine.

[†] University of Padova, Department of Economics and Management, via del Santo 33, 35123, Padova, Italy. E-mail address: juanmanuelfigueres@gmail.com.

1 Introduction

This paper quantifies the size of *state-dependent fiscal multipliers* to study the *role of consumer confidence* in determining the effects that an anticipated (*news*) government spending shock has on economic activity. In doing so I identify the fundamental fiscal shocks and I disentangle the effects that *anticipated* and *unanticipated* spending shocks have on confidence and output during recessions and expansions.

During the last years the debate about the role of consumers sentiment in determining the effectiveness of government policy has recovered impulse among economists and policy-makers. This idea relates to the Keynesian argument claiming that a fiscal stimulus boosts the economic activity during a recession through an improvement in confidence. In a recent paper Bachmann and Sims (2012) find empirical evidence indicating that consumers confidence is a critical factor in the transmission of spending shocks into the economic activity during a downturn. Importantly, they show that the main driver behind the relationship between a fiscal stimulus, confidence and the subsequent economic activity is the information regarding future improvements in fundamentals which follow spending shocks during recessions. Moreover, a fiscal issue that is also likely to critically affect the transmission of policy shocks is the anticipation effect, better known as fiscal foresight. This phenomenon arises from the fact that changes in fiscal policy are usually implemented with a lag so that agents might partially anticipate them and adjust their decisions before the policy changes take place. When studying consumers confidence, fiscal foresight implies that agents may anticipate a fiscal stimulus and update their expectations about the future fundamentals before the stimulus is actually implemented. Therefore, suggesting that “news” about a future fiscal stimulus may be more important in determining the role of confidence than the fiscal stimulus itself. The present paper is an attempt to shed some light on this last point by empirical studying the anticipation effect along with the role of confidence in determining the size of state-dependent fiscal multipliers.

I analyze the above mentioned relationship between confidence, fiscal multiplier and the anticipation effect in the framework of Structural Vector Autoregression (VAR) models. Given their considerable flexibility, these models have been widely used in literature on fiscal policy since the seminar contribution of Blanchard and Perotti (2002). Nevertheless, there are important issues to be considered when estimating fiscal multipliers by using VARs. First and foremost, in presence of fiscal foresight standard VAR models may not incorporate enough information to recover the fundamental fiscal shocks. This is because agents anticipate future changes (*news*) in the fiscal policy while the VAR econometrician can only observe the present and past values of fiscal variables. Forni and Gambetti (2010) and Ramey (2011) show that the government spending shocks estimated by using the standard fiscal variables are predicted by the government spending forecast, meaning that are at least partially anticipated (i.e., are non-fundamental). Importantly, Leeper, Walker, and Yang (2013) prove that when the econometric analysis fails to address fiscal foresight, the estimated tax multiplier may exhibit quantitative important biases. Secondly, estimating the effects of fiscal policy by using linear VARs omits the possibility that the fiscal multiplier may vary across the business cycle as it is mentioned by the traditional Neo-Keynesian theory[1] and New Keynesian models in presence of the zero lower bound.[2] Recent empirical studies have considered the possibility of government spending shocks having different effects depending on the state of economy. Among others, Auerbach and Gorodnichenko (2012), Bachmann and Sims (2012), Mittnik and Semmler (2012), and Baum, Poplawski-Ribeiro, and Weber (2012) find the fiscal multiplier to be significantly larger during recessions. Moreover, in a recent paper Caggiano *et al*. (2015) estimate state-dependent fiscal multipliers by explicitly addressing the fiscal foresight. To overcome the issue of non-fundamentalness they employ a measure of anticipated fiscal shocks proposed by Forni and Gambetti (2014). Their results indicate that the fiscal multiplier is statistically larger during periods of deep recession.

In the spirit of Auerbach and Gorodnichenko (2012), I compute state-dependent fiscal multipliers by employing a Smooth-Transition VAR model which allows me to consistently estimate the responses to a spending shock in recessions and in expansions. Moreover, following Forni and Gambetti (2014), I account for the fiscal foresight effect by implementing a measure of *anticipated* spending shocks that conveys relevant information about future movements (*news*) in government spending. This measure is defined as the sums of expectations' revisions about the growth rate of future government spending from the Survey of Professional Forecasters. As is shown in the present paper this News variable has a superior predictive power in comparison to others measures used in the literature. Finally, to isolate the role of confidence I compute the fiscal multipliers for the counterfactual situation where the level of confidence remains constant (i.e., it does not react to spending shocks).

My main results are the following. First, for an *anticipated* (news) spending shock the fiscal multiplier is statistically larger during recessions than over expansions. Moreover, the fiscal multiplier over recession is statistically larger than one. Second, a counterfactual exercise which holds the level of confidence constant gives as result fiscal multipliers that are not anymore statistically different across regimes. This points to the role confidence as key in determining the real effects that an anticipated spending shock has on output within non-

[1] For example in the IS-LM-AD-AS the size of the fiscal multiplier exhibits large values during periods of economic slack (the AS curve is flat and there is a lower crowing out effect affecting investment and consumption) and small values in economic booms (the AS curve is steep, implying a higher crowding out effect).

[2] Eggertsson (2009), Christiano, Eichenbaum, and Rebelo (2011) and Woodford (2011) show that when the nominal interest rate is held at the ZLB, a deficit financed increase in government spending leads to an increase in inflation expectations, which in turn leads to a decrease in real interest rates, boosting in this way investment and consumption. In such cases without crowding out effect the fiscal multiplier is around 3.

linear framework. Third, for an *unanticipated* spending shock (i.e., an innovation in the fiscal variable) the multipliers are never statistically larger than one. Interestingly, in this case confidence does not turn out to be important in explaining non-linearity. These findings suggest that the reason behind the role of confidence is the information about future government spending provided by the anticipated (news) spending shocks and not contained in the fiscal variable itself.

The closest papers to mine are Bachmann and Sims (2012), Ramey and Zubairy (2014) and Caggiano *et al*. (2015). Bachmann and Sims (2012) show that consumers confidence is a key factor in the transmission of spending shocks into the economy activity during recessions. With respect to them, I study the role of confidence in determining the anticipated and unanticipated effects of a government spending shock. In contrast they focus only on the unanticipated effect of a fiscal shock. Importantly, I show that when disentangling the anticipated and unanticipated effects of spending shocks, confidence is found to be a relevant ingredient for the transmission of anticipated (news) government spending shocks only. This indicates that the news about future increases in government spending are critical in determining the relationship between the consumers confidence and the subsequent economic activity when adopting a spending-based fiscal stimulus. Ramey and Zubairy (2014) and Caggiano *et al.* (2015) study the non-linearity of fiscal multipliers by accounting for fiscal foresight. While the former find no evidence in favour of state-dependent fiscal multipliers, Caggiano *et al.* (2015) show that the fiscal multiplier is statistically larger only during sever economic conditions. My contribution complements these two papers by adding consumer confidence to the vector of modeled variables and considering the role that confidence plays in the transmission of anticipated fiscal shocks in good and bad times.

The rest of this paper is organized as follows. Section 2 studies the anticipation effect and the estimation of anticipated (news) spending shocks. Section 3 offers statistical evidence in favour of non-linearity and presents the Smooth-Transition VAR model along with the data used for its estimation. Section 4 describes the results. The last section concludes.

2 The Fiscal Foresight

Fiscal Foresight arises because of the fact that changes in fiscal policy are usually implemented with a lag so that agents might partially anticipate them by early reacting to a change in spending and taxes (i.e., reacting before its implementation). When agents base their decisions on a larger information set than the econometrician has, the use of structural VAR models to recover the effects of changes in fiscal policy is likely to lead to non-fundamentalness problem (Beaudry and Portier, 2014). This means that the Vector Moving Average (VMA) representation of SVARs is not invertible in the past. Hence, present and past values of the fiscal variables would not convey enough information to recover the fiscal shocks. As Leeper, Walker, and Yang (2013) show, when agents' information set is larger than the one of the econometrician, then agents and econometrician employ different discounting patterns. That is, while the econometrician discounts in the usual way and assign a larger weight to recent shocks, the private agents discount by assigning a smaller weight to more recent realizations of the shock. This is because, with fiscal foresight, the recent shocks are related with news informing about movements in the more distant future.

According to different empirical studies the government spending shocks estimated by using the standard fiscal variables are Granger-caused by the government spending forecast, i.e., the estimated shocks are non-fundamental because of the fiscal foresight (Forni and Gambetti 2010, Ramey 2011). Therefore to properly assess the effects of the fiscal policy over the business cycle we have to first overcome the non-fundamentalness problem. This issue may be solved by enlarging the information set used to estimate the spending shocks. Different approaches are proposed in the literature in order to do so. Ramey and Shapiro (1998) use a narrative approach to identify government spending shocks, they use the *Business Week* magazine to construct a dummy variable reflecting the major military episodes which anticipate an increase in the defense spending. Ramey (2011) employs additional sources of information plus the *Business Week*, she proposes the use of a variable measuring the expected discounted value of government expending changes resulting from foreign political events. Leeper, Richter and Walker (2012) implement a calibrated DSGE model and government spending forecast from the Survey of Professionals Forecasters to account for the fiscal foresight. Forni and Gambetti (2010) adopt a structural, large dimensional, dynamic factor model in order to enlarge the information set used in the estimation of the government spending shocks.

In the present study I use the approach developed by Forni and Gambetti (2014). They propose the use of VAR models endowed with an supplementary variable, the "government spending *news*", containing additional information about future government spending that accounts for the fiscal foresight, hence solving a fiscal issue with the right fiscal data. This variable is defined as difference between the expectation of the agents about the growth rate of government spending for $t+j$ at time t and the expectation at time $t-1$, that is $news_t = E_t g_{t+j} - E_{t-1} g_{t+j}$. This is the expectation revision representing the new information that becomes available at time t proportional to the anticipated shock not contained in the fiscal variable. Thus when a government spending shock occurs at time t, even if the government spending measure remains unchanged due to the implementation lag, the agents know that government spending will change in the future so that they react by updating their expectations. In order for this variable to convey the information needed to recover the anticipated shock, it is necessary to consider the expectation revision of the spending growth rate over a horizon equivalent to the h periods of foresight (i.e., j equal to the h periods ahead for which the agents anticipate the fiscal movements).[3] But in general

[3] Perotti (2011) concludes that the expectation revision $E_t g_t - E_{t-1} g_t$ conveys little information on future

the periods of foresight are unknown. Nevertheless, as proposed by Forni and Gambetti (2014), this problem can be overcome by using the *sum of expectations' revisions* for a horizon long enough to ensure that the revision variable is proportional to the anticipated fiscal shock. Therefore the "government spending *news*" variable is defined as follows:

$$news_t(j,J) = \sum_{j=1}^{J}(E_t g_{t+j} - E_{t-1} g_{t+j}) \tag{1}$$

where $E_t g_{t+j}$ represents agents' expectations at time t for the growth rate of government spending from quarter $t+j-1$ to quarter $t+j$, and $E_{t-1} g_{t+j}$ represents agents' expectations for the same variable and period at time $t-1$. Consequently, $E_t g_{t+j} - E_{t-1} g_{t+j}$ represents the new information that becomes available to the agents at time t about the growth rate of government spending j quarters ahead. When J is large enough (i.e., $J \geq h$.) the variable $news_t$ is proportional to the *anticipated* government spending shock. The expectations' revisions are constructed by using the forecast for the growth rate of government spending from the Survey of Professionals Forecasters.[4] This survey contains the forecasts of the annualized growth rates of government spending up to four quarters ahead starting from 1981:Q3. Caggiano *et al*. (2015) employs the above defined measure of government spending news in order to address the fiscal foresight effect when quantifying the size of the state-dependent fiscal multipliers. They find the News variable to convey significant information about future movements in government spending.

Next I perform a test in order to assess the predictive power of the different specifications of the $news_t(j,J)$, and then I analyze the main advantages of using the expectations' revisions approach to identify anticipated government spending shocks.

The predictive power of the News variable. In order to statistically test the information content of the News variable I perform a Granger-causality test between the News variable computed for different specifications of j and J, and the VAR estimated government spending shocks. The aim of this test is twofold, first is to prove that the shocks estimated with standard variables can be predicted by the expectations' revisions (i.e., are non-fundamental shocks), and the second is to assess the proper specification of News variable that maximize its predictive power. Notes that when analyzing the different specifications of the News variable one should take into account all the variables included in the system under study. This is because the informational power about the movements in government spending of each specification for $news_t(j,J)$ depends upon the economic system in which the News variable is embedded. Therefore, to be consistent with the variables used in the

---

government spending. The reason is that such expectation revision does not cover a horizon long enough to capture the anticipation effect, i.e., $j < h$.

[4] As Perotti (2011) points out, constructing measures of expectations of government spending by using the forecast of the growth rate instead the forecast of the levels helps to avoid inconsistencies resulting from the frequent changes in the base years affecting the SPF forecast of the variable in levels.

main analysis of this paper, the spending shocks are drawn from a VAR(4) endowed with the log of real per capita government spending, the confidence index and the log of real per capita output. Moreover, given that the SPF collects the forecast for the growth rate of government spending up to four quarters ahead, the largest horizon for $news_t(j,J)$ is $J = 3$.

Table 1 shows the p-values for the Granger-causality test of the one period-lagged News variable. The top panel contains the expectation revisions and the bottom panel the *sum of* expectations' revisions. Observe that only $news(1,1)$ and $news(2,2)$ turn out to be informative about the government spending shocks, while the expectation revision for the shortest and the longest horizon, $news(0,0)$ and $news(3,3)$ respectively, have not predictive power since the null hypothesis is always accepted.[5] Consequently, when examining the sum of expectations' revisions the specification $news(1,2)$ (i.e., $news(1,1)$ + $news(2,2)$) results to be the most informative one.

Figure 1 plots $news(1,2)$ for the sample 1981:Q4-2013:Q1. We can observe that the series exhibits spikes related with exogenous fiscal policy episodes. For example the positive spikes coincide with episodes related to significant increase in government spending as the beginning of the War in Afghanistan (2001:Q4) and 2009 Fiscal Stimulus package (2009:Q1). While the negative spike at 1989:Q4 coincides with the government spending cut resulting from the end of the Cold War associated with the fall of the Berlin Wall.

Comparison with Ramey's narrative approach. Another widely used measure to overcome the fiscal foresight effect is the variable developed by Ramey (2011). This variable estimates the expected present value of government expending changes due to foreign political events, being constructed by using the *Business Week* magazine (mainly) and additional newspaper sources. Below I show that the News measure conveys information to predict the Ramey's variable. To do so I run a bivariate VAR with Ramey's and the News variable $news(1,2)$ regressing both variables on their first lags.[6] Table 2 reports the p-values of the t-test corresponding to the exclusion of the specified variable. I employ the longest possible sample of 1981:Q4-2013:Q1. Moreover, given that the first twenty observations of this sample are all zero for Ramey's variable, I also use a shorter sample starting from 1986:Q4. Note that only the null hypotheses for the News's variable coefficient explaining the Ramey's variable are rejected, meaning that the News variable Granger causes the Ramey's variable while the reverse direction of causality is rejected. Furthermore Figure 2 shows the News variable together with Ramey's variable. Observe that the largest spikes in $news(1,2)$ tend to anticipate the changes of the Ramey's variable, being this behavior in line with the Granger-causality test.

[5] As Forni and Gambetti (2014) point out, when the expectation revision $E_t g_{t+j} - E_{t-1} g_{t+j}$ spans over a horizon j too small the revision does not provide information about the government spending shocks.

[6] As Ramey (2011) does, the Ramey's variable at time t is divided by the nominal GDP of the previous period.

3 Methodology and Data

3.1 Non-linear Model

With the purpose of study the role of confidence in determining the effects of fiscal shocks during recessions and expansions I implement a Smooth-Transition VAR model which is similar to Smooth-Transition Autoregressive (STAR) model developed by Granger and Teräsvirta (1993). The most important advantage of this model is that it allows for responses differentiated across states of the economy (i.e., recession and expansion) having an smooth transition from one state to another. The model is described below:

$$\mathbf{X}_{\mathrm{t}} = F(z_{t-1})\mathbf{\Pi}_R(L)\boldsymbol{X}_t + [1 - F(z_{t-1})]\mathbf{\Pi}_E(L)\boldsymbol{X}_t + \boldsymbol{\varepsilon}_t, \quad (2)$$

$$\boldsymbol{\varepsilon}_t \sim N(0, \mathbf{\Omega}_t), \quad (3)$$

$$\mathbf{\Omega}_t = F(z_{t-1})\mathbf{\Omega}_R + [1 - F(z_{t-1})]\ \mathbf{\Omega}_E, \quad (4)$$

$$F(z_t) = \exp(-\gamma z_t)/[1 + \exp(-\gamma z_t)],\ \gamma > 0,\ z_t \sim N(0,1). \quad (5)$$

where $\mathbf{X}_{\mathrm{t}}$ indicate the vector of endogenous variables, $\mathbf{\Pi}_R(L)$ and $\mathbf{\Pi}_E(L)$ are the matrices of coefficients accounting for the dynamic of the variables including in $\mathbf{X}_{\mathrm{t}}$ and $\boldsymbol{\varepsilon}_t$ indicates the vector of residuals from the reduce form, with zero mean and state-depended variance-covariance matrix $\mathbf{\Omega}_t$. Moreover $\mathbf{\Omega}_R$ and $\mathbf{\Omega}_E$ are the reduced-form residuals variance-covariance matrices during recession and expansion. Notice that the above presented model accounts for nonlinearities coming from the dynamics of the system as well as from the contemporaneous relationships. Finally, one of the most important feature of this model is the transition function $F(z_t)$. This function indicates the probability of being in a recession, where z_t is the switching variable represented by an index of the business cycle and γ is the smoothness parameter regulating the transition from a regime to another.[7] In order γ to be scale invariant the index z_t is normalized to have unit variance and zero mean. Note that if $\mathbf{\Pi}_R(L)$=$\mathbf{\Pi}_E(L)$, $\mathbf{\Omega}_R$=$\mathbf{\Omega}_E$, the model falls back to the linear framework.

In addition the index z_t is dated at $t-1$ to avoid the contemporaneous feedbacks resulting from policy actions taken whenever the economy is in expansion or recession. In line with Auerbach and Gorodnichenko (2012), Bachmann and Sims (2012), Caggiano, Castelnuovo, and Groshenny (2014), and Berger and Vavra (2014) I define the switching variable z_t as the standardized seven-quarter moving average of output growth rate. The parameter γ is calibrated to 1.88 to ensure that the economy will be in recession regime about 15 percent of the times, a frequency in line with the NBER business cycle dates for the sample 1981:Q4-2013:Q1. Therefore the economy is defined to be in a recession when

[7] Lower values of parameter γ will insure smoother switches from one regime to another.

$F(z_t) > 0.85$ in such a way that with $\gamma = 1.88$ the probability to be in recession is $Pr(F(z_t) > 0.85) \approx 15\%$. This calibration implies $z_t \leq -0.92\%$ during the recessionary regime. Figure 3 contrasts the transition function $F(z_t)$ with the recessions dated by the NBER.

The variable z_t is assumed to be exogenous to the system, hence is not included in the vector of endogenous variables $\mathbf{X}_t$ so that there is no feedback from the exogenous variable to the dynamic of the system (i.e., the system can remain for a long time in deep recessions or in strong expansions, being the model linear in each fixed regime). The advantage of this last assumption is that the estimated impulse responses are linear and do not depend either on the initial conditions, the sign of the shock or the size of the shock (Koop, Pesaran and Potter 1996). Nevertheless, as it was pointed out in Owyang, Ramey and Zubairy (2013) this method of computing the impulse responses has two main drawbacks. First, in reality the economy is hardly to remain either in a deep recession or in a strong expansion for long terms of time. Secondly, even if the economy starts in one of the regimes, a shock affecting Y_{t+h} would indirectly affects z_{t+h-1} too, and, thereby the future state of the economy (i.e., the responses of output affects the future regimes which in turn affects the dynamic of the futures responses). Then even if I compute the responses for an horizon of 20 quarters, in order to overcome the issues above described I focus my attention on the responses during the first 5 quarters, being this horizon consistent with the average duration of a recession for the sample used.[8] My focus in the short run responses to a fiscal shock renders much unproblematic the use of conditionally linear impulse responses.

The baseline specification of the vector of endogenous variables is given by $\boldsymbol{X}_t = [g_t \;\; conf_t \;\; y_t \;\; news_t]'$, where g_t is the log of real per capita government spending, $conf_t$ is the confidence measure, y_t is the log of real per capita output and $news_t$ is the government spending News variable.

Model Estimation. Because of the high non-linearity of the model (2)-(5), I estimate it by using Monte Carlo Markov Chain algorithm developed by Chernozhukov and Hong (2003). Moreover, in order to construct the confidence bands I use bootstrap procedure to obtain the distribution of the generated impulse responses. See Appendix A.

Testing Non-linearity. In order to assess the presence of non-linearity at a multivariate level, I carry out two tests for the baseline vector of endogenous variables $\boldsymbol{X}_t$. First, following Teräsvirta and Yang (2014), I test the null hypothesis of linearity for the dynamics of the system in (2) against the alternative of (Logistic Vector) STVAR with a single switching variable. The result of the test points out to a clear rejection of the null hypothesis in favour of the STVAR specification. See Appendix B. Secondly, I test the constancy of the error covariance matrix in (4) against the alternative of Smooth Transition via the test proposed by

[8] During the period 1981:Q4-2013:Q1 the NBER dates 4 recessions: 1981:Q4-1982:Q4; 1990:Q3-1991:Q1; 2001:Q1-2001:Q4, and 2007:Q4-2009:Q2.

Yang (2014). For this last test, the null hypothesis of constant covariance matrix is rejected in favour of the Smooth Transition specification. See Appendix C.

3.2 Data

The sample period used in the estimation is 1981:Q4-2013:Q1, being 1981:Q4 the first observation available for the News variable.[9] Note that this sample does not include the large variation of government spending associated with the Second World War and the Korean War. Nevertheless, as it was pointed out in Blanchard and Perotti (2002) and Christiano (2013) this two war episodes had very special characteristics and effects in the economy,[10] making difficult to think of them as generated by the same stochastic process related with the rest of spending variations observed in the sample. Therefore using a shorter sample helps to avoid inconsistent estimation of the fiscal multiplier.

In line with Auerbach and Gorodnichenko (2013) government spending is the real government (federal, state and local) purchases (consumption and investments), and output is the real gross domestic product (GDP) measured in chained 2000 dollars.[11] These variables are expressed in per capita terms by dividing by the civilian non-institutionalized population age 16 and over. As it was proposed by Bachmann and Sims (2012), the measure of confidence is the Index of Consumers Expectations from the Michigan Survey of Consumers. This index represents an average of three different forward-looking survey questions related with the expectations about the business and personal financial conditions.[12] Basically, higher values of the index involves more confidence. By comparing the index series with the recessions dated by NBER it is easy to note that the Consumers Expectations has a procyclical behavior, exhibiting the lowest values in coincidence with the recession dates (see Figure 4). Moreover the government spending News variable ($news$) is constructed according to the equation (1) as proposed by Forni and Gambetti (2014). The variables g_t and y_t are taken in log levels due to possible cointegration relationships. Consequently, the variable $news_t$ is expressed in cumulative sums to preserve the same order of integration. Moreover, it has to anticipate spending levels, and recall that the news is expressed in growth rates.

---

[9] The Survey of Professional Forecasters provides forecast for the growth rate of government spending since 1981:Q3. Given that to construct the News variable a time t we need the forecast made at $t-1$, the first observation of the constructed series for News variable is at 1981:Q4.

[10] For example, main durables goods were rationed during the Second World War, something that constrained the government spending from increasing further. Moreover during the Korean War taxes were significantly raised in order to finance the increase in the military spending.

[11] The series for government purchases are drawn from the table 3.1 of the Bureau of Economic Analysis and calculated as the sum of consumption expenditures and gross investments, minus the consumption of fixed capital. The series are converted in real terms by using the GDP deflator. The series for real GDP and its implicit deflator are obtained from the Federal Reserve Bank of St. Luis website.

[12] For details about the computation of the Index of Consumers Expectations see Appendix D.

3.3 The Predictive Power of the News Variable within a Non-linear Framework

In order to statistically test the informative power of the News variable within a non-linear framework I perform a Granger-causality test involving the News variable computed for different specifications of j and J, and the fiscal shocks estimated with a STVAR not modeling News. First, I estimate the fiscal spending shocks by employing the Smooth-Transition VAR model (2)-(5) endowed only with the log of real per capita government spending, the confidence index and the log of real per capita output. Then I test whether or not these shocks can be predicted by the News variable. Table 3 contains the p-values for the Granger-causality test of the one period-lagged News variable. Observe that, alike Section 2, the specification $news(1,2)$ is the most informative about government spending shocks. Therefore from now on I define the News variable as $news(1,2)$.

3.4 Identification of the Government Spending Shock

Following Forni and Gambetti (2014), I estimate the anticipated government spending shocks by including the government spending News variable in the vector of endogenous variables $\boldsymbol{X}_t$. It is important to note that the forecasts used to construct the News variable are likely to be driven by non-fiscal shocks as well. Therefore, as Forni and Gambetti (2014) indicate, a proper identification scheme would be to order the news measure as the last variable of the Cholesky decomposition. Ordering the news last allows me to control for shocks others than the fiscal news ones which may affect the forecast revisions.[13] Hence, an *anticipated* government spending shock is defined as an innovation in the News variable. Differently, an *unanticipated* government spending shock is defined as an innovation in the fiscal variable itself. This identification strategy allows me to disentangle the effects that *anticipated* and *unanticipated* spending shocks have on confidence and output.

4 Results

This section presents the main results of the paper. For all the estimations I present the reaction of the system to a government spending shock and the respective fiscal multiplier. I compute the fiscal multiplier in two different ways. First, I compute the max multiplier as the maximum response of output divided by the maximum response of government spending.[14]

[13] This specification implies that, by construction, innovations in $news_t$ have no impact effect on the rest of the endogenous variables.

[14] A similar measure is proposed by Blanchard and Perotti (2002). Differently, they use the ratio of the maximum response of output to the *impact* response of government spending rather than to the maximum response of government spending. As it was pointed out by Ramey and Zubairy (2014), this kind of multipliers is

Second, I calculate the sum multiplier defined as the ratio of the sum of output response (to a spending shock) to the sum of government spending response (to a spending shock). This latter measure is proposed by Woodford (2011) and widely used in the literature given that it takes into account the persistence of the fiscal shock. Both types of multiplier are computed for the short run horizon of 5 quarters (length of time consistent with the NBER recessions), and the short-medium run horizons of 8 and 16 quarters.[15] Moreover given that the variables enter in the system in logs, the estimated multipliers are scaled by the sample average of $\mathrm{Y/G}$ in order to transform percent changes into dollars changes[16]. Section 4.1 shows the estimates of the system (2)-(5) for the baseline specification of $\boldsymbol{X}_t$ with an *anticipated* (news) spending shock. Additionally, for reasons of comparison I also present the estimates of the Linear model. In Section 4.2 I study the role of confidence by computing the counterfactual multipliers conditional to a fixed level of confidence. Finally, Section 4.3 I compare the previous results against the reaction of the system to an *unanticipated* government spending shock.

4.1 Anticipated (News) Spending Shocks

This section presents the estimates for the baseline $\boldsymbol{X}_t$ containing the log of real per capita government spending (g_t), the index of confidence ($conf_t$), the log of real per capita GDP (y_t) and the News variable ($news_t$) with an *anticipated* (news) government spending shock defined as the last shock of the Cholesky scheme. Figure 5 compares the impulse responses of the system for the Smooth-Transition VAR model over recessions and expansions with those for the linear model. As we can see in the linear framework output has a small positive reaction in the short-medium run which becomes negative after 14 quarters. Confidence exhibits a behavior similar to output, having a positive reaction over the first quarters which is reverted and becomes negative after 7 quarters. Moreover the reaction of government spending is smooth and positive reaching its maximum at 11 quarters before starting to decrease. This responses would indicate a modest effect of a spending shock on output, nevertheless when accounting for nonlinearities the responses of the system become markedly different depending on the state of the economy. Observe that for the non-linear model, at the short-medium run, the reaction of output during recessions

not informative for the policy makers given that it does not consider the evolution of the cost of government spending associated with the path of output.

[15] These horizon lengths are proposed by Ramey and Zubairy (2014), given that the multipliers for two-year and four-year horizons are the most relevant for the short-run stimulus policy.

[16] This *ex post* conversion factor has been criticized by Ramey and Zubairy (2014) who argue that the Y/G ratio for the U.S. data sample 1889-2013 varies from 2 to 24 with a mean of 8. Therefore the use of a constant value for Y/G may lead to inflated, or at least distorted, multiplier estimates. In the sample used in this paper the Y/G ratio varies from 5.39 to 6.76 with a mean of 5.99 and a variance of 0.13. Hence, given its the small variation, the adoption of a constant value for Y/G does not seem to be problematic in my case.

is statistically larger than over expansions. In recessions output significantly increases over the first 5 quarters and then decreases with some persistence, in contrast during the expansion regime output has a small positive reaction at the short run that is never statistically different from zero. Similar to output, confidence has a strong and positive reaction during recessions which is rapidly reverted after 4 quarters, while over expansions its reaction is slightly negative and statistically different from zero only at the long run, being the confidence responses statistically different across regimes. In addition the reaction of government spending is positive for both regimes and slightly statistically larger during recessions over the first 2 quarters. Table 3 contains the estimated fiscal multipliers for the baseline specification $\boldsymbol{X}_t$. The multiplier during recessions is much larger than over expansions across the three different horizons of 5, 8, and 16 quarters, exhibiting its maximum values of 3.41 (max) and 3.70 (sum) at the short run, and being also statistically larger than one. While in expansions the sum (max) multiplier is never larger than 0.39 (0.67).[17] The multipliers (max and sum) corresponding to the linear VAR are always lower than the ones related with recessions but larger than those corresponding to expansions, thus suggesting that the linear model captures the average effect of an increase in government spending between the two different states of the economy.

Furthermore even if at first sight the above results suggest the existence of nonlinearities, it is not clear whether or not the multiplier is statistically different across regimes. Therefore in order to address this last point I run a test by computing the distribution of the difference between the multiplier estimated during recessions and that estimated over expansions.[18] The aim of this exercise is to test if the difference in multipliers between regimes is statistically different from zero. Given that my focus is on the short run, I present the results of the test for the horizon of 5 quarters. This length of time is consistent with the average duration of a recession in the data. Moreover note from Figure 5 that either output or government spending reactions are statistically different across regimes at the medium-long run, being the proposed exercise meaningful only for the short run analysis. Nevertheless, the results here presented are robust to the different horizons of 8 and 16 quarters. The top levels of Figure 6 depicts the distribution of the difference for the max and sum multipliers with 68 % confidence intervals. Note that in both cases the zero line lies outside the confidence intervals, therefore providing evidence in favour of state-dependent multipliers from the statistical standpoint. Moreover given the importance that controlling for taxes may have in measuring the effects of a government spending shock, like when there is a fiscal consolidation or a stimulus package, I perform a further check (not shown here) by enlarging

[17] One should read the reported values as upper bounds for extremes states of the economy due to the assumption that the economy remaining in a recession/expansion forever.

[18] The empirical density of the difference between multipliers is obtained by subtracting a realization of the multiplier in expansions from a realization of the multiplier in recessions for a number of times equal to 5,000. Moreover, each realization of the multiplier is obtained via bootstrap procedure.

the estimated system with a measure of taxes.[19] I found that the baseline results are robust to this specification containing taxes.

4.2 Does Confidence Matter?

What is the role of confidence within non-linear framework? Does it matter for the real effect of anticipated (news) fiscal shocks? The role of consumers confidence on the business cycle has been widely discussed in the literature since Keynes featured the concept of animal spirits. This concept relies on the idea that changes in agents' sentiment about economic activity account for important fluctuations in aggregate consumption, which in turn account for large fluctuations in output. Observe from Figure 5 that confidence and output positively and largely reacts to an unanticipated government spending shock during recessions while during expansion the reaction of both variables is negligible, thus suggesting a possible connection between both reactions. Therefore having in mind the idea of animal spirits, the answers to the above questions are key when implementing fiscal stimulus. Then, to address this point I perform a counterfactual exercise by computing the multipliers for the system $\boldsymbol{X}_t$ conditional to a fixed level of confidence (i.e., the confidence response to an increase in government spending (news) is offset by another shock such that the level of confidence remains unchanged). Following the approach adopted by Sims and Zha (2006) I generate a hypothetical sequence of confidence shocks in order to held the response of confidence fixed to zero at each horizon, in such a way that the output response reflects the effect of an anticipated (news) government spending shock in a hypothetical situation where confidence is held constant.[20] The last rows of each panel in Table 3 shows the counterfactual fiscal multipliers (max and sum) when level of confidence remains fixed.[21] Note that, at the short

---

[19] The series for taxes are drawn from the table 3.1 of the Bureau of Economic Analysis and constructed by subtracting from the current receipts the social benefits. The nominal series are converted in real terms by using the GDP deflator. Moreover the variable is expressed in per capita terms by dividing by the civilian non-institutionalized population age 16 and over, and then taken in logs levels. Taxes is ordered second in the Cholesky decomposition, after government spending and before confidence.

[20] Sims and Zha (2006) study the effect of endogenous monetary policy in the transmission of oil price shocks. They combine the initial oil shock with a hypothetical sequence of policy innovations enough to offset the endogenous policy response at each horizon. A drawback of using this approach is that ignore the Lucas critique by assuming that the agents are repeatedly surprised by the hypothetical policy shocks without adapting their forecast process of the economy to the new policy. Nevertheless, as Sims and Zha point out, this is an acceptable assumption to entertain. This is because it would take some time for the agents to learn that policy will not respond, since it is illogical to assume that they will immediately and fully understand the policy change and take it as permanent. Therefore this kind of approach is more suitable for a short run analysis like mine, given that it is reasonable to assume that the agents will be surprised by, in my case, confidence shocks for 5 quarters, while the same would not be true for 20 quarters. A more detailed explanation about how to compute the hypothetical shocks is done by Bachmann and Sims (2012).

[21] Given that I focus my attention in nonlinearities I only present the counterfactual multipliers for the

run, during recessions the counterfactual multipliers (max and sum) are significantly lower than the baseline multipliers, while over expansions the constrained multipliers show a modest variation with respect to its unconstrained counterpart. As a consequence, the difference in multipliers between regimes shrinks. Then, as in the previous section, I test whether or not the counterfactual multipliers are statistically different across regimes. From the bottom levels of Figure 6 it is easy to observe that now the difference in multipliers between recessions and expansions is not statistically different from zero, suggesting that when confidence is held constant multipliers do not depend on the state of the economy.[22] These findings indicate that confidence plays a critical role in determining the real effects of anticipated spending shocks within non-linear framework, in such a way that the confidence response is key in explaining the statistically different fiscal multipliers. A possible explanation to this might be given by the fact that during recessions the level of confidence is lower than usual (see Figure 4), hence an anticipated (news) government spending shock generates a boost in confidence, which in turn stimulates output. While during expansions an innovation in government spending does not further increase confidence which is already at normal levels, thus having a modest effect on output. Importantly, my results are robust to the different horizons of 8 and 16 quarters (figures not shown here, but available upon request). These findings are in line with those from Bachmann and Sims (2012). In addition to them, my analysis account for the fiscal foresight effect, what allows me to properly identify the fundamental fiscal shocks differentiating the *anticipated* from the *unanticipated* fiscal effects. [23] This identification approach also permits me to detect which of the two effects is the relevant one for explaining the role of confidence in determining state-depended spending multipliers. So far, results suggest that the anticipated (news) fiscal effect would be the main driven force behind the role of confidence.

Smooth-Transition VAR model.

[22] This results are also robust to the specification controlling for taxes.

[23] Bachmann and Sims (2012) perform a robustness check to control for the fiscal foresight by estimating a Smooth-Transition VAR endowed with the Ramey's variable for the sample 1960:Q1-2011:Q1. Nevertheless there exist two important objections to their exercise. First, they estimate the fiscal multipliers for an *unanticipated* government spending shock defined as an innovation in the government spending variable. As Ramey (2011) indicates, this procedure is not valid given that her *News* variable does not fully capture all the anticipated changes in government spending, it only considers changes related with military events. Therefore if one realize an exercise as Bachmann and Sims do, the estimated spending shocks will include *anticipated* changes in government spending that are not captured by the Ramey's variable (not military related), i.e., the shocks are non-fundamental. Secondly, Ramey (2011) shows that her variable has a low predictive power about government spending in a sample that excludes the WWII and the Korean War, what worsen the non-fundamentalness problem in Bachmann and Sims exercise.

4.3 Unanticipated Government Spending Shocks

Which is the effect of an *unanticipated* spending shock? Disentangling the effects of unanticipated and anticipated fiscal shocks may be key in explaining why confidence matters for the state-dependent fiscal multipliers. Aiming to do so, I compute the IRFs and multipliers for an unanticipated government spending shock defined as the first of the Cholesky decomposition for the baseline specification $\boldsymbol{X}_t$. Then I compare the results from this section with the case of anticipated (news) spending shocks. Figure 7 depicts the impulse responses of the system. Note that in contrast with the previous sections, during recessions output immediately reacts on impact and remains almost constant for a few quarters to then significantly fall. Government spending itself behaves similar to output during recessions, strongly increasing at the very short horizon to then start to fall. Observe that the above listed differences are more marked in the linear model. While the responses of output and government spending differ from the anticipated fiscal shock, the shape of the confidence reaction does not exhibit important alterations. Table 4 contains the estimated fiscal multipliers for the unanticipated government spending shock. Clearly the multipliers (sum and max) are far lower at all horizons and over both regimes than the ones corresponding to the anticipated spending shock, and even though the multipliers during recessions are still larger than over expansions the difference in multipliers markedly narrows.

The last rows of each panel in the Table 4 shows the counterfactual multipliers conditional to a fixed level of confidence. Observe that under expansions the counterfactual multipliers are so much lower than the unconstrained ones, while during recessions the difference between the counterfactual and the baseline multipliers is not that large. Hence, unlike the previous section, during recessions the size of the fiscal multiplier does not seem to be significantly reduced when confidence is held constant. Following this analysis Figure 8 shows the distribution of difference in multipliers between recessions and expansions for the unconstrained (top panel) and the counterfactual (bottom panel) multipliers. Note that now the difference in multipliers (max and sum) is always different from zero even for the counterfactual case, suggesting that for an unanticipated government spending shock the confidence reaction does not explain non-linear fiscal multipliers.

Recalling that the measure of confidence conveys consumers expectations about future economic activity, these results indicate that a news shock provides information related to future movements in government purchases which significantly influences the consumers expectations about the economy, which in turn determines an important fraction of output level, and hence the fiscal multiplier, during recessions. While an innovation in the fiscal spending variable lacks this kind of information, being the consumer expectation reaction unable to explain the difference in fiscal multipliers. Therefore the overall findings suggest that the reason behind the role of confidence is the information about future government spending contained by the news shocks.

5 Conclusions

This paper investigates the role of consumer confidence in determining the effects that an anticipated (news) government spending shock has on the economic activity within non-linear framework. To do so I quantify the size of the fiscal multiplier by implementing a Smooth-Transition VAR model endowed with government spending, confidence, output and a measure of government spending news. This exercise allows me to identify the fundamental fiscal shocks and disentangle the effects that *anticipated* and *unanticipated* spending shocks have on confidence and output during recessions and expansions. Following Forni and Gambetti (2014), I overcome the issue of non-fundamentalness by including in the estimated system a measure of government spending news defined as the sum of forecast revisions from the Survey of Professionals Forecasters. I show that such a measure of spending news is able to predict both the future movements in government spending and other measure of fiscal news used in the literature.

My results point to a positive and significant response of confidence and output to an anticipated (news) spending shock during recessions. Differently, over expansions, the responses are statistically insignificant. The fiscal multiplier during recessions is found to be statistically larger than one and different from the one estimated over expansions. Importantly, I show that when confidence is held constant the multipliers are not anymore statistically different across regimes. This result points to the role of confidence as a key driver of the response of output to anticipated fiscal stimulus during recessions.

Finally, I contrast the previous results with those conditional on an unanticipated government spending shock. I find the fiscal multiplier in general to be lower than those corresponding to the anticipated spending shock, and never statistically larger than one. Interestingly, for an unanticipated spending shock confidence does not turn out to be important in explaining non-linear fiscal multipliers. These findings indicate that an anticipated (news) spending shock provides relevant information related to future movements in government spending which significantly influences the consumers confidence, which in turn determines an important fraction of output during recessions. While an unanticipated spending shock does not convey this kind of information. Hence, the reason behind the role of confidence is the information about a future fiscal stimulus conveyed by the news shocks rather than the fiscal stimulus itself. It follows, therefore, that confidence might play an important role in the transmission of news about future fiscal policy into the economic activity.

The results of this paper highlight the importance of providing information about future public spending when taking expansionary fiscal policy in order to stimulate the economic activity during recessionary phases. Credible announcements about concrete increases in government purchases may be key in boosting aggregate confidence, and thus boosting output, during a period of economic slack.

Appendix A - Estimation procedure of the non-linear model

The STVAR model (2)-(5) is estimated by using maximum likelihood methods.[24] The log-likelihood of the model is the following:

$$\log \mathrm{L} = \mathrm{const} - \frac{1}{2}\sum_{\mathrm{t}=1}^{\mathrm{T}} \log|\boldsymbol{\Omega}_{\mathrm{t}}| - \frac{1}{2}\sum_{\mathrm{t}=1}^{\mathrm{T}} \mathbf{u}_{\mathrm{t}}' \boldsymbol{\Omega}_{\mathrm{t}}^{-1} \boldsymbol{\mu}_{\mathrm{t}} \quad \textbf{(A1)}$$

where $\boldsymbol{\mu}_t = \boldsymbol{X}_t - \big(1 - F(z_{t-1})\big)\boldsymbol{\Pi}_E(L)\boldsymbol{X}_{t-1} - F(z_{t-1})\boldsymbol{\Pi}_R(L)\boldsymbol{X}_{t-1}$ is the vector of residuals. Given the high non-linearity of the model and its many parameters $\boldsymbol{\Psi} = \{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E, \boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)\}$, the estimation by using standard optimization routines becomes problematic. Therefore I estimate the model by following the procedure used by Auerbach and Gorodnichenko (2012) which is described below.

Note that conditional on $\{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$ the model is linear in the lag polynomials $\{\boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)\}$. Thus, for a given guess on the parameters $\{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$ I can estimate the coefficients $\{\boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)\}$ by using weighted least squares where the estimates of the coefficients must minimize $\frac{1}{2}\sum_{t=1}^{T} \boldsymbol{\mu}_t' \boldsymbol{\Omega}_t^{-1} \boldsymbol{u}_t$. First we rewrite the regressors in the following way:

Let $\boldsymbol{W}_t = \big[\, F(z_{t-1})\boldsymbol{X}_{t-1} \;\; \big(1 - F(z_{t-1})\big)\boldsymbol{X}_{t-1} \;\; \ldots \;\; F(z_{t-1})\, \boldsymbol{X}_{t-p} \;\; \big(1 - F(z_{t-1})\big)\boldsymbol{X}_{t-p}\big]$ be the extended vector of regressors and $\boldsymbol{\Pi} = [\boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)]$, so we can write $\boldsymbol{\mu}_t = \boldsymbol{X}_t - \boldsymbol{\Pi}\boldsymbol{W}_t'$. Therefore the objective function is:

$$\frac{1}{2}\sum_{t=1}^{T}(\boldsymbol{X}_t - \boldsymbol{\Pi}\boldsymbol{W}_t')' \, \boldsymbol{\Omega}_t^{-1}(\boldsymbol{X}_t - \boldsymbol{\Pi}\boldsymbol{W}_t')$$

Then , it can be proved that the first order condition to obtain $\boldsymbol{\Pi}$ is:

$$vec\boldsymbol{\Pi}' = \left(\sum_{t=1}^{T}[\boldsymbol{\Omega}_t^{-1} \otimes \boldsymbol{W}_t'\boldsymbol{W}_t]\right)^{-1} vec\left(\sum_{t=1}^{T} \boldsymbol{W}_t' \boldsymbol{X}_t \boldsymbol{\Omega}_t^{-1}\right) \quad \textbf{(A2)}$$

This procedure works iterating on $\{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$, obtaining $\boldsymbol{\Pi}$ and the likelihood (A1) for each set of values for $\{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$ until the optimum is achieved. Because the model is highly non-linear in its parameters, several local optima might be founded; therefore one should try different starting values for $\{\gamma, \boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$.

To ensure that the matrices $\{\boldsymbol{\Omega}_R, \boldsymbol{\Omega}_E\}$ are positive definite I work with an alternative vectors of parameters, $\boldsymbol{\Psi} = \{\gamma, chol(\boldsymbol{\Omega}_R), chol(\boldsymbol{\Omega}_E), \boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)\}$, where $chol$ indicates the Cholesky decomposition operator. Moreover and given the non-linearity of the model I estimate the parameters by using Markov Chain Monte Carlo (MCMC) algorithm developed by Chernozhukov and Hong (2003) (henceforth CH). The advantage of this method is that not

[24] This section highly reflects the Auerbach and Gorodnichenko's (2012) "Appendix: Estimation Procedure".

only deliver a global optima but also the densities for the parameters estimates.

To implement CH we use Metropolis-Hastings algorithm. For a starting value $\boldsymbol{\Psi}^{(0)}$, the procedure to construct chains of length N is as follows :

Step 1:

Draw a candidate vector of parameters values as $\boldsymbol{\Theta}^{(n)} = \boldsymbol{\Psi}^{(n)} + \boldsymbol{\psi}^{(n)}$ for the chain's *n+1* state , where $\boldsymbol{\Psi}^{(n)}$ is the current *n* state of the vector of parameters values in the chain and $\boldsymbol{\psi}^{(n)}$ is a vector of i.i.d. shocks taken from *N*(0; $\boldsymbol{\Omega}_{\Psi}$) where $\boldsymbol{\Omega}_{\Psi}$ is a diagonal matrix.

Step 2:

Take the chain's *n+1* state as $\boldsymbol{\Psi}^{(n+1)} = \boldsymbol{\Theta}^{(n)}$ with probability $min\{\,1\,, L(\boldsymbol{\Theta}^{(n)})/L(\boldsymbol{\Psi}^{(n)}\}$, where $L(\boldsymbol{\Theta}^{(n)})$ is the value of the objective function conditional on the candidate vector of parameters values, and $L(\boldsymbol{\Psi}^{(n)})$ the value of the objective function conditional on the current state of the chain. Otherwise, take $\boldsymbol{\Psi}^{(n+1)} = \boldsymbol{\Psi}^{(n)}$.

The starting value $\boldsymbol{\Psi}^{(0)}$ is computed by approximating the model so that it can be written as regressing $\boldsymbol{X}_t$ on lags of $\boldsymbol{X}_t$, $\boldsymbol{X}_t z_t$, $\boldsymbol{X}_t z_t^2$. Then the residuals from this regression are used fit the equation for the reduced-form time-varying variance-covariance matrix of the STVAR by using maximum likelihood to estimate $\boldsymbol{\Omega}_R$ and $\boldsymbol{\Omega}_E$, these estimates are used as starting values . By using the estimates $\boldsymbol{\Omega}_R$ and $\boldsymbol{\Omega}_E$ and a calibrated γ I can obtain $\boldsymbol{\Omega}_t$. Finally, conditional on $\boldsymbol{\Omega}_t$ we compute the starting values for the lag polynomials $\{\,\boldsymbol{\Pi}_R(L), \boldsymbol{\Pi}_E(L)\}$ using the equation (A2). The initial matrix $\boldsymbol{\Omega}_{\Psi}$ is calibrated to one percent of the parameters values, then is adjusted "on the fly" for the first 20.000 draws in order to generate an acceptance rate of around 0.3, as is proposed for this kind of simulations. The number of draws is set at 100.000, and drop the first 20% draws.

Following CH, $\bar{\boldsymbol{\Psi}} = \frac{1}{N}\sum_{n=1}^{N} \boldsymbol{\Psi}^{(n)}$ is a consistent estimate of $\boldsymbol{\Psi}$ under standard regularity assumptions on maximum likelihood estimators. Furthermore the covariance matrix of the estimate of $\boldsymbol{\Psi}$ is given by $\boldsymbol{V} = \frac{1}{N}\sum_{n=1}^{N}(\boldsymbol{\Psi}^{(n)} - \bar{\boldsymbol{\Psi}})^2 = var(\,\boldsymbol{\Psi}^{(n)})$, that is the variance of the estimates in the generated chain.

In order to construct the confidence bands I use bootstrap procedure with 5000 interactions to obtain the distribution of the generated impulse responses. Then the confidence bands are computed as the selected percentiles from the bootstrapped distributions.

Appendix B- Linearity Test

In order to test for non-linear dynamics at a multivariate framework, I employ the linearity test described by Teräsvirta and Yang (2014). They propose to test of the null hypothesis of linearity against a (Logistic Vector) Smooth Transition Vector Autoregressive with a single switching variable for the whole system.

Consider the $p-$dimensional first-order Taylor approximation around $\gamma = 0$ of the logistic STVAR model (2):

$$\boldsymbol{X}_t = \boldsymbol{\Theta}_0' \boldsymbol{Y}_t + \boldsymbol{\Theta}_1' \boldsymbol{Y}_t z_t + \boldsymbol{\varepsilon}_t \tag{6}$$

where $\boldsymbol{X}_t = [g_t \; conf_t \; y_t \; news_t]'$ is the $(p \times 1)$ baseline specification of vector the of endogenous variables, $\boldsymbol{Y}_t$=$[\boldsymbol{X}_{t-1}, \dots, \boldsymbol{X}_{t-k}, \boldsymbol{\alpha}]$ is the $(k \times p + q) \times 1)$ vector of exogenous variables including endogenous variables lagged k times and a column vector of constants $\boldsymbol{\alpha}$, and z_t is the switching variable. Moreover $\boldsymbol{\Theta}_0$ and $\boldsymbol{\Theta}_1$ are matrices of parameters. Following Teräsvirta and Yang (2014), the null hypothesis of linearity is $H_0 : \boldsymbol{\Theta}_1 = 0$. In the present paper the number of endogenous variables is $p = 4$, the number of exogenous variables is $q = 4$ and the number of lags for the endogenous variables included in $\boldsymbol{Y}_t$ is $k = 2$.

The test for linearity against the STVAR model is performed as follows:

1- Estimate the model under the null $H_0 : \boldsymbol{\Theta}_1 = 0$ (estimate de linear model) by regressing $\boldsymbol{X}_t$ on $\boldsymbol{Y}_t$. Compute the residuals $\widetilde{\boldsymbol{E}}$ and the matrix residuals sum of squares $\boldsymbol{RSS}_0 = \widetilde{\boldsymbol{E}}'\widetilde{\boldsymbol{E}}$.

2- Regress $\widetilde{\boldsymbol{E}}$ on $\boldsymbol{Y}_t$ and $\boldsymbol{Z}_1$ where $\boldsymbol{Z}_1 = [\boldsymbol{Y}_t' z_t]$. Compute the residuals $\widetilde{\boldsymbol{\Xi}}$ and the matrix residuals sum of squares $\boldsymbol{RSS}_1 = \widetilde{\boldsymbol{\Xi}}'\widetilde{\boldsymbol{\Xi}}$.

3- Compute the test-statistic

$$\begin{aligned} LM_{\chi^2} &= T tr\{\boldsymbol{RSS}_0^{-1}(\boldsymbol{RSS}_0 - \boldsymbol{RSS}_1)\} \\ &= T(p - tr\{\boldsymbol{RSS}_0^{-1} - \boldsymbol{RSS}_1\}) \end{aligned} \tag{7}$$

where $tr\{\cdot\}$ indicates the trace of a matrix. Note that under the null hypothesis, the test statistic has an asymptotic χ^2 distribution with $p(kp + q)$ degrees of freedom (48 in my case). The value of the test for the model in (2) is $LM = 109.18$, with a corresponding p-value of 0.001. Therefore, I reject the null hypothesis of linearity in favour of a STVAR specification of the model.

Appendix C- Constancy of the Error Covariance Matrix Test

Following Yang (2014) I carry out a test of constancy of the error covariance matrix against the alternative of Smooth Transition. The proposed test assumes that an spectral decomposition of the time-varying error covariance matrix exists such that:

$$\boldsymbol{\Omega}_t = \boldsymbol{P}\boldsymbol{\Lambda}_t\boldsymbol{P}' \tag{8}$$

where the $\boldsymbol{P}$ is a time-invariant orthogonal matrix such that $\boldsymbol{P}\boldsymbol{P}' = \boldsymbol{I}_p$, $\boldsymbol{I}_p$ being an identity matrix, and $\boldsymbol{\Lambda}_t = diag(\lambda_{1t}, \dots, \lambda_{pt})$ whose elements are all positive. Notice that the above equations implies that the covariance matrix is time-varying in the way that the eigenvectors remain constant while the corresponding eigenvalues are allowed to vary over time.

Under this assumption, the log-likelihood function for observation $t = 1, \dots, T$ with Gaussian distributed errors is:

$$\begin{aligned}\log L_t &= c - \frac{1}{2}\log|\boldsymbol{\Omega}_t| - \frac{1}{2}\boldsymbol{\mu}_t'\boldsymbol{\Omega}_t^{-1}\boldsymbol{\mu}_t \\ &= c - \frac{1}{2}\log|\boldsymbol{\Lambda}_t| - \frac{1}{2}\boldsymbol{\omega}_t'\Lambda_t^{-1}\boldsymbol{\omega}_t \\ &= c - \frac{1}{2}\sum_{\boldsymbol{i=1}}^{\boldsymbol{p}}(\log\lambda_{it} + \omega_{it}^2\lambda_{it}^{-1}),\end{aligned}$$

where $\boldsymbol{\omega}_t = \boldsymbol{P}'\boldsymbol{\mu}_t = (\boldsymbol{\omega}_{1t}, \dots, \boldsymbol{\omega}_{pt})'$ contains the errors. The null hypothesis to be tested is:

$$H_0: \lambda_{it} = \lambda_i, \quad i = 1, \dots, p. \tag{9}$$

Moreover, the LM test-statistic has the following form:

$$LM_{\chi^2} = \frac{1}{2}\sum_{\boldsymbol{i=1}}^{\boldsymbol{p}}\left[\left(\sum_{t=1}^{T}\tilde{g}_{it}\,\tilde{\boldsymbol{z}}_{it}'\right)\left(\sum_{t=1}^{T}\tilde{\boldsymbol{z}}_{it}\,\tilde{\boldsymbol{z}}_{it}'\right)^{-1}\left(\sum_{t=1}^{T}\tilde{g}_{it}\,\tilde{\boldsymbol{z}}_{it}\right)\right] \tag{10}$$

where $\tilde{g}_{it} = \tilde{\omega}_{it}^2/\tilde{\lambda}_{it} - 1$ and $\tilde{\boldsymbol{z}}_{it}$ is a vector of variables determining the time-varying components λ_{it}. To test for the constancy of the covariance matrix against a Smooth Transition specification $\tilde{\boldsymbol{z}}_{it}$ is defined as the n-order Taylor approximation of the of the transition function (5) around $\gamma = 0$. In the present paper I use a second-order approximation.

As Yang (2014) shows the test can be computed in the following way:

1- Estimate the model under the null hypothesis of constant covariance matrix. Collect the estimated residuals $\tilde{\boldsymbol{\mu}}_t$, $t = 1, \dots, T$. Compute the corresponding covariance matrix $\tilde{\boldsymbol{\Omega}}$ and the eigenvalue decomposition $\tilde{\boldsymbol{\Omega}} = \tilde{\boldsymbol{P}}\tilde{\boldsymbol{\Lambda}}\tilde{\boldsymbol{P}}'$, where $\tilde{\boldsymbol{\Lambda}} = diag(\tilde{\lambda}_1, \dots, \tilde{\lambda}_p)$.

2- Compute the transformed residuals $\tilde{\boldsymbol{\omega}}_t = \tilde{\boldsymbol{P}}'\tilde{\boldsymbol{\mu}}_t$ and $\tilde{g}_{it} = \tilde{\omega}_{it}^2/\tilde{\lambda}_{it} - 1$, for $t = 1, \dots, T$, $i = 1, \dots, p$. Compute the sum of squared $\tilde{\boldsymbol{g}}_i$ as $SSG_i = \tilde{\boldsymbol{g}}_i'\tilde{\boldsymbol{g}}_i$.

3- For each equation, regress $\tilde{g}_{it}$ on $\tilde{\boldsymbol{z}}_{it}$. Collect the residuals $\tilde{\mathbf{v}}$ and compute the residuals sum of squares $RSS_i = \tilde{\boldsymbol{v}}_i'\tilde{\boldsymbol{v}}_i$.

4- Compute the LM test-statistic as follows:

$$LM_{\chi^2} = \sum_{i=1}^{p} T\frac{SSG_i - RSS_i}{SSG_i} \tag{11}$$

It can be proven that under regularity conditions the LM statistic is asymptotically χ^2 distributed with $p \times n$ degrees of freedom (8 in my case). The value of the test for the baseline vector of endogenous variables $\boldsymbol{X}_t = [g_t \; conf_t \; y_t \; news_t]'$ is $LM = 27.46$, with a corresponding p-value of 0.0589. Therefore, the null hypothesis of constant error covariance matrix is rejected in favour of a Smooth Transition alternative specification.

Appendix D- Confidence Index:

The index of Consumer Expectation is composed by following three forward-looking questions: [25]

Q1= Looking ahead, do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now? **Answer choice:** Better now, Same, Worse, Don't know.

Q2= Now turning to the business conditions in the country as a whole, do you think that during the next twelve months we'll have good times financially, or bad times, or what? **Answer choice:** Will be better off, Same, Will be worse Off; Don't know.

Q3= Looking ahead, which would you say is more likely-that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?

Answer choice: Good times, Good with qualifications, Pro-Con, Bad with qualifications, Bad times, Don't know.

The index of Consumers Expectations is computed as follows:

-First compute the relative scores for each of the three questions as the percent giving favorable replies minus the percent giving unfavorable replies, plus 100;

- Then apply the formula bellow:

$$ICE = \frac{Q_1 + Q_2 + Q_3}{4.1134} + 2 \tag{12}$$

[25] For further details see http://www.sca.isr.umich.edu/fetchdoc.php?docid=24770.

References

Auerbach, Alan J., and Yury Gorodnichenko (2012), *"Measuring the Output Responses to Fiscal Policy"*, American Economy Journal: Economic Policy, 4(2),1-27.

Auerbach, Alan J., and Yury Gorodnichenko (2013), *"Corrigendum: Measuring the Output Responses to Fiscal Policy"*, American Economy Journal: Economic Policy, 5(3),320-322.

Bachmann, R., and E. Sims (2012), *"Confidence and the transmission of government spending shocks"*, Journal of Monetary Economics,59,235-249.

Barsky, R., and E. Sims,(2012), *"Information, animal spirits, and the meaning of innovations in consumer confidence"*, American Economic Review, 102(4),1343-1377.

Baun, A., Poplawski-Ribeiro, M., and Weber, A., (2012), "*Fiscal Multipliers and the State of the Economy"*, International Monetary Fund Working Paper No. 12-190.

Baxter, M., and King, R.,(1993), *"Fiscal Policy in General Equilibrium"*, American Economic Review 83(3),315-334.

Beaudry, P., and Portier, F., (2004), *"An Exploration into Pigou's Theory of Cycles"*, Journal of Monetary Economics 51(6), 1183-1216.

Beaudry, P., and Portier, F., (2006), *"Stock Prices, News and Economic Fluctuations",* American Economic Review 96(4), 1293-1307.

Beaudry, P., and Portier, F., (2014), *"News Driven Business Cycles: Insights and Challenges"*, Journal of Economic Literature, 52(4), 993-1074.

Berger, D., and Vavra, J., (2014), *"Measuring How Fiscal Shocks Affect Durable Spending in Recessions and Expansions"*, American Economic Review: Papers and Proceedings, 104(5), 112-115.

Blanchard , O., (1993), *"Consumption and the Recession of 1990-1991"*, American Economic Review 83(2), 270-74.

Blanchard, O., and Perotti, R.,(2002), *"An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output"*, Quarterly Journal Of Economics 117(4), 1329-1368.

Caggiano, G., Castelnuovo, E., and Groshenny N., (2014), *"Uncertainty Shocks and Unemployment Dynamics: An Analysis of Post- WWII U.S. Recessions"*, Journal of Monetary Economics, 67, 78-92.

Caggiano, G., Castelnuovo, E., Colombo, V., Nodari, G., (2015), *"Estimating Fiscal Multipliers: News from Nonlinear World",* The Economic Journal, 125, 746-776.

Chernozhukov, V., and Hong, H., (2003), *"An MCMC Approach to Classical Estimation"*, Journal of Econometrics 115(2), 293-346.

Christiano, L. J., (2013), "Comment on Giavazzi and McMahon, 'The Household Effects of Government Spending'" in Alberto Alesina and Francesco Giavazzi (Eds.), "Fiscal Policy after the Financial Crisis", NBER, University of Chicago Press, 141-149.

Christiano, L. J., Eichenbaum, M., and Rebelo S., (2011), *"When is the Government Spending Multiplier Large?"*, Journal of Political Economy 119(1), 78-121.

Cochrane, John, (1994), *"Shocks"*, Carnegie-Rochester Conference Series on Public Policy 41, 295-364.

Eggertsson, G. B., (2009), "What Fiscal Policy is Effective at Zero Interest Rates?", Federal Reserve Bank of New York Staff Reports No. 402.

Fisher, J. D. M., and Peters, R., (2010), *"Using Stock Returns to Identify Government Spending Shocks"*, Economic Journal, 120, 414-436.

Forni, M., and Gambetti, L., (2010), *"Fiscal Foresight and the Effects of Government Spending"*,CEPR Discussion Paper N0. 7840.

Forni, M., and Gambetti, L., (2014), *"Government Spending Shocks in Open Economy VARs"*, Università di Modena e Reggio Emilia and Universitat Autonoma de Barcelona, mimeo.

Granger, C., and Teräsvirta , (1993), *"Modeling Nonlinear Economic Relationships"*, Oxford University Press: Oxford.

Keynes, J. M., (1936), *"The General Theory of Employment, Interest and Money"*, Palgrave Macmillan, Hampishire.

Koop, G., Pesaran, M., and Potter, S., (1996), *"Impulse Response Analysis in Nonlinear Multivariate Models"*, journal of Econometrics, 74, 119-147.

Leeper, E., Walker, T., and S-C. S. Yang, (2013), *"Fiscal Foresight and Information Flows*", Econometrica, Vol. 81(3), 1115-1145.

Mittnik, S., and Semmler, W. (2012), *"Regime Dependence of the Fiscal Multiplier"*, Journal of Economic Behavior and Organization, 83, 502-522.

Owyang, M., Ramey, V., and Zubairy, S., (2013), *"Are Government Spending Multipliers Greater During Periods of Economic Slack? Evidence from 20th Century Historical Data"*, American Economic Review Papers and Proceedings, 103(3), 129-134.

Perotti, Roberto, (2008), *"In Search of the transmissions Mechanism of Fiscal Policy"*, NEBER Macroeconomics Annual (2007), Vol. 22, 1969-226, University of Chicago Press: Chicago.

Perotti, Roberto, (2011), *"Expectations and Fiscal Policy: An Empirical Investigation"*, Bocconi University.

Ramey, V., and Shapiro, M., (1998), *"Costly Capital Reallocation and the Effects of Government Spending"*, Carnegie Rochester Conference on Public Policy, 48, 145-94.

Ramey ,Valerine. (2011), *"Identifying Government Spending Shocks: It's All in the Timing"*, Quarterly Journal of Economics , 126(1), 1-50.

Ramey, V., and Zubairy, S., (2014), *"Government Spending Multipliers in Good Times and in Bad: Evidence from U.S. Historical Data"*, University of California at San Diego and Texas A&M University, mimeo.

Romer, C., and Romer, D., (2010), *"The Macroeconomics Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks"*, American Economic Review 100(3), 763-801.

Sims, D., Zha, T., (2006), *"Does Monetary Policy Generates Recessions?"*, Macroeconomics Dynamics 10(2), 231-272.

Stock, J., Watson W., (1989), *"New Indexes of Coincident and Leading Economic Indicators"*, NBER Macroeconomics Annual (1989), Vol. 4, 351-94, Cambridge, MA: MIT Press.

Teräsvirta, T, and Yang, Y., (2014), *"Linearity and Misspecification Test for Vector Smooth Transtion Regreesions Models"*, CREATES Research Paper 2014-4.

Woodford, M., (2011), *"Simple Analytics of the Government Expenditure Multiplier"*, American Economic Journal: Macroeconomics, 3(1), 1-35.

Yang, Y., (2014), *"Testing Constancy of the Error Covariance Matrix in Vector Models against Parametric Alternatives using a Spectral Decomposition"*, CREATES Research Paper 2014-11.

Independent variable	Dependent variable $g.shock_t$
Expectation revision	
$news(0,0)_{t-1}$	0.38
$news(1,1)_{t-1}$	**0.01**
$news(2,2)_{t-1}$	**0.02**
$news(3,3)_{t-1}$	0.13
Sum of expectation's revisions	
$news(1,2)_{t-1}$	**0.00**
$news(1,3)_{t-1}$	**0.05**

Table 1. Granger-causality test of government spending shocks: Linear model. P-values of Granger-causality test corresponding to the prediction of the VAR estimated government spending shocks by the different specifications of one-period lagged News variable. Values in bold indicate a predictive power found to be significant at a 10% confidence level. The structural spending shocks are draw from VAR(4) containing, in the following order, the log of real per capita government spending, the confidence index and the log of real per capita output. The sample used is 1981:Q4-2013:Q1. The test considers standard errors robust to heteroskedasticity and serial correlation.

Explained variable	$\boldsymbol{news_{t-1}}$	$\boldsymbol{Ramey_{t-1}}$
$Ramey_t$ (1981:Q4-2013:Q1)	**0.07**	
$Ramey_t$ (1986:Q4-2013:Q1)	**0.02**	
$news_t$ (1981:Q4-2013:Q1)		0.94
$news_t$ (1986:Q4-2013:Q1)		0.92

Table 2. Granger-causality test: Ramey's vs. News variable. P-values of Granger-causality test for VAR (1) including the Ramey's and News variable. Values in bold indicate a predictive power found to be significant at a 10% confidence level. The VAR is estimated for the sample 1981:Q4-2013:Q1. Moreover, given that the first twenty observations of this sample are all zero for Ramey's variable, I also use a shorter sample starting from 1986:Q4. The Ramey variable series is the one employed in Ramey and Zubairy (2014).

Independent variable	Dependent variable $g.shock.\mathrm{STVAR}_t$
Expectation revision	
$news(0,0)_{t-1}$	0.30
$news(1,1)_{t-1}$	**0.06**
$news(2,2)_{t-1}$	**0.00**
$news(3,3)_{t-1}$	0.18
Sum of expectation's revisions	
$news(1,2)_{t-1}$	**0.00**
$news(1,3)_{t-1}$	**0.08**

Table 3. Granger-causality test of government spending shocks: Non-linear model. P-values of Granger-causality test corresponding to the prediction of the STVAR estimated government spending shocks by the different specifications of one-period lagged News variable. Values in bold indicate a predictive power found to be significant at a 10% confidence level. The structural spending shocks are draw from the Smooth-Transition VAR model containing, in the following order, the log of real per capita government spending, the confidence index and the log of real per capita output. The sample used is 1981:Q4-2013:Q1. The test considers standard errors robust to heteroskedasticity and serial correlation.

Max multipliers			
	$\frac{max\{y_h\}_{h=1}^{5}}{max\{g_h\}_{h=1}^{5}}$	$\frac{max\{y_h\}_{h=1}^{8}}{max\{g_h\}_{h=1}^{8}}$	$\frac{max\{y_h\}_{h=1}^{16}}{max\{g_h\}_{h=1}^{16}}$
Linear	2.14	1.96	1.80
	[0.88 4.45]	[0.77 4.53]	[0.75 4.19]
Expansion	0.67	0.67	0.67
	[0 1.87]	[0 1.93]	[0 1.93]
Recession	3.41	3.09	3.09
	[2.62 4.41]	[2.33 4.01]	[2.33 4.04]
Expansion w/o conf.	0.98 [0.08 3.74]	0.99 [0.10 5.21]	0.86 [0.07 6.51]
Recession w/o conf.	2.71 [2.08 3.50]	2.79 [2.13 3.60]	2.88 [2.18 3.79]

Sum multipliers			
	$\frac{\sum_{h=1}^{5} Y_h}{\sum_{h=1}^{5} G_h}$	$\frac{\sum_{h=1}^{8} Y_h}{\sum_{h=1}^{8} G_h}$	$\frac{\sum_{h=1}^{16} Y_h}{\sum_{h=1}^{16} G_h}$
Linear	1.89	1.59	0.79
	[0.06 4.34]	[-0.47 4.38]	[-1.81 4.09]
Expansion	0.39	0.41	0.20
	[-0.63 1.61]	[-0.71 1.77]	[-1.29 1.89]
Recession	3.70	3.22	3.16
	[2.75 5.08]	[2.26 4.47]	[1.69 4.95]
Expansion w/o conf.	0.58 [-0.62 2.79]	0.46 [-1.14 3.34]	-0.64 [-3.40 3.19]
Recession w/o conf.	2.43 [1.78 3.24]	2.54 [1.74 3.68]	3.07 [1.79 4.93]

Table 4. Fiscal Multiplier: Anticipated (news) spending shock. Fiscal multipliers for the baseline specification containing, in that order, the log of real per capita government spending, the confidence index, the log of real per capita GDP and the News variable. The shock is the last of the Cholesky decomposition. The last rows of each panel (max and sum) shows the fiscal multipliers conditional to a fixed level of confidence. The estimated multipliers are scaled by the sample average of Y/G in order to transform elasticities into dollars changes. The numbers in brackets indicate the 68% confidence intervals from the distribution of multipliers.

Max multipliers			
	$\frac{max\{y_h\}_{h=1}^{5}}{max\{g_h\}_{h=1}^{5}}$	$\frac{max\{y_h\}_{h=1}^{8}}{max\{g_h\}_{h=1}^{8}}$	$\frac{max\{y_h\}_{h=1}^{16}}{max\{g_h\}_{h=1}^{16}}$
Linear	0.85	0.85	0.86
	[0.49 1.24]	[0.49 1.25]	[0.50 1.27]
Expansion	0.62	0.62	0.62
	[0.45 0.79]	[0.45 0.79]	[0.49 0.79]
Recession	1.24	1.24	1.24
	[0.80 1.73]	[0.81 1.73]	[0.81 1.74]
Expansion	0.40	0.37	0.31
w/o conf.	[0.21 0.60]	[0.18 0.58]	[0.09 0.55]
Recession	0.79	0.81	0.82
w/o conf.	[0.52 1.07]	[0.54 1.12]	[0.55 1.54]

Sum multipliers			
	$\frac{\sum_{h=1}^{5} Y_h}{\sum_{h=1}^{5} G_h}$	$\frac{\sum_{h=1}^{8} Y_h}{\sum_{h=1}^{8} G_h}$	$\frac{\sum_{h=1}^{16} Y_h}{\sum_{h=1}^{16} G_h}$
Linear	0.10	-0.33	-1.45
	[-0.64 0.86]	[-1.25 0.64]	[-3.31 0.23]
Expansion	0.14	-0.03	-0.49
	[-0.16 0.44]	[-0.43 0.39]	[-1.30 0.29]
Recession	1.17	1.15	1.07
	[0.74 1.60]	[0.60 1.71]	[-0.18 2.05]
Expansion	-1.02	-1.80	-3.92
w/o conf.	[-1.57 -0.51]	[-2.81 -0.97]	[-8.20 -1.84]
Recession	0.72	0.81	1.13
w/o conf.	[0.37 1.05]	[0.33 1.28]	[0.18 1.91]

Table 5. Fiscal Multipliers: Unanticipated government spending shock. Estimated fiscal multipliers for a shock on the first variable of the baseline specification. The last rows of each panel (max and sum) shows the fiscal multipliers conditional to a fixed level of confidence. The estimated multipliers are scaled by the sample average of Y/G in order to transform elasticities into dollars changes. The numbers in brackets indicate the 68% confidence intervals from the distribution of multipliers.

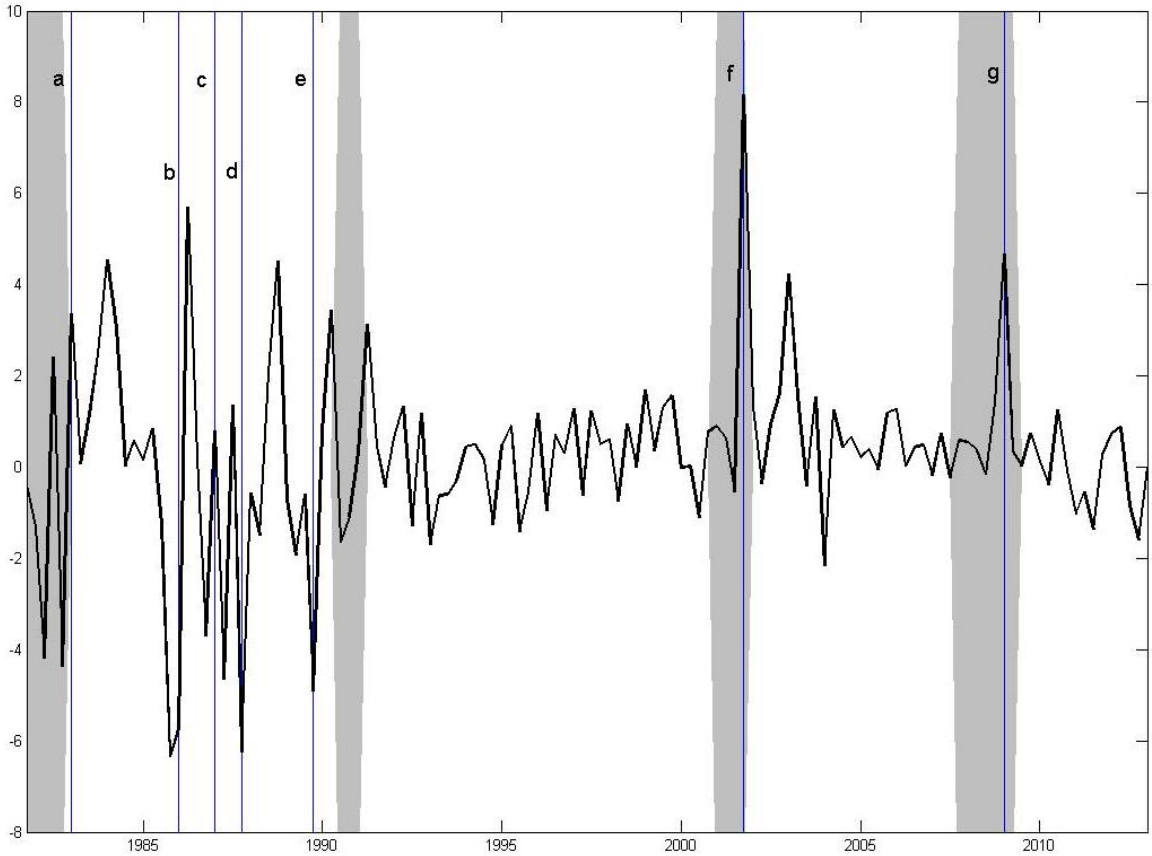

Figure 1. News variable series and exogenous fiscal policy episodes. The black solid line depicts the series for $news_t(1,2)$. The vertical blue lines correspond to the following episodes: (a) 1983Q1: Reagan's "Evil Empire" and "Star Wars" speeches; (b) 1986Q1: Perestrojka; (c) 1987Q1: Senate elections won by Democrats a quarter before; (d) 1987Q4: Spending cuts as for the Pentagon; (e) 1989Q4: The fall of the Berlin Wall; (f) 2001Q4: War in Afghanistan; (g) 2010Q4: Obama's Stimulus package. The shaded regions indicate the recessions as dated by the NBER.

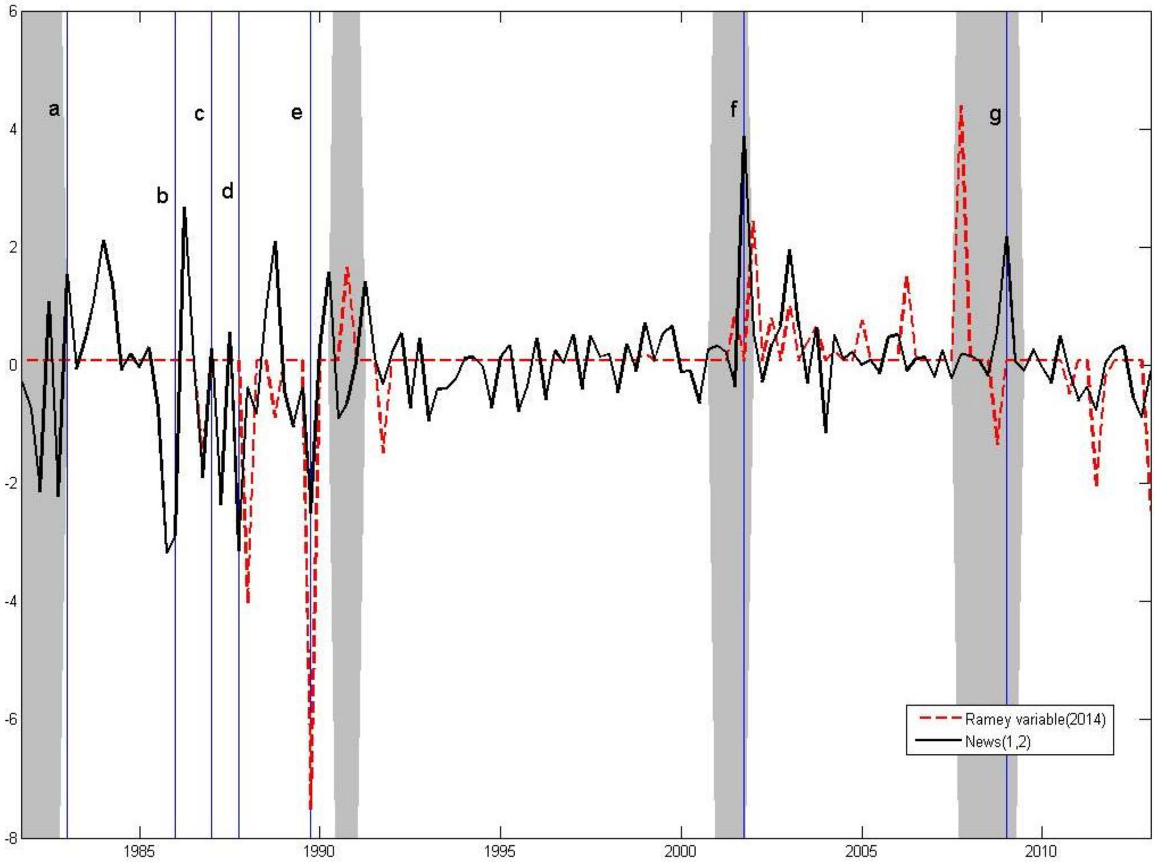

Figure 2. News variable vs. Ramey's variable. The black solid line depicts the series for $news_t(1,2)$ and the red dashed line draws the Ramey's variable. The Ramey's variable is computed as the present value of the expected government expending changes due to foreign political events (following Ramey (2011), each observation is divided by nominal GDP of the previous period). Both series shown in this Figure are standardized. The vertical blue lines correspond to the following episodes: (a) 1983Q1: Reagan's "Evil Empire" and "Star Wars" speeches; (b) 1986Q1: Perestrojka; (c) 1987Q1: Senate elections won by Democrats a quarter before; (d) 1987Q4: Spending cuts as for the Pentagon; (e) 1989Q4: The fall of the Berlin Wall; (f) 2001Q4: War in Afghanistan; (g) 2010Q4: Obama's Stimulus package. The shaded regions indicate the recessions as dated by the NBER.

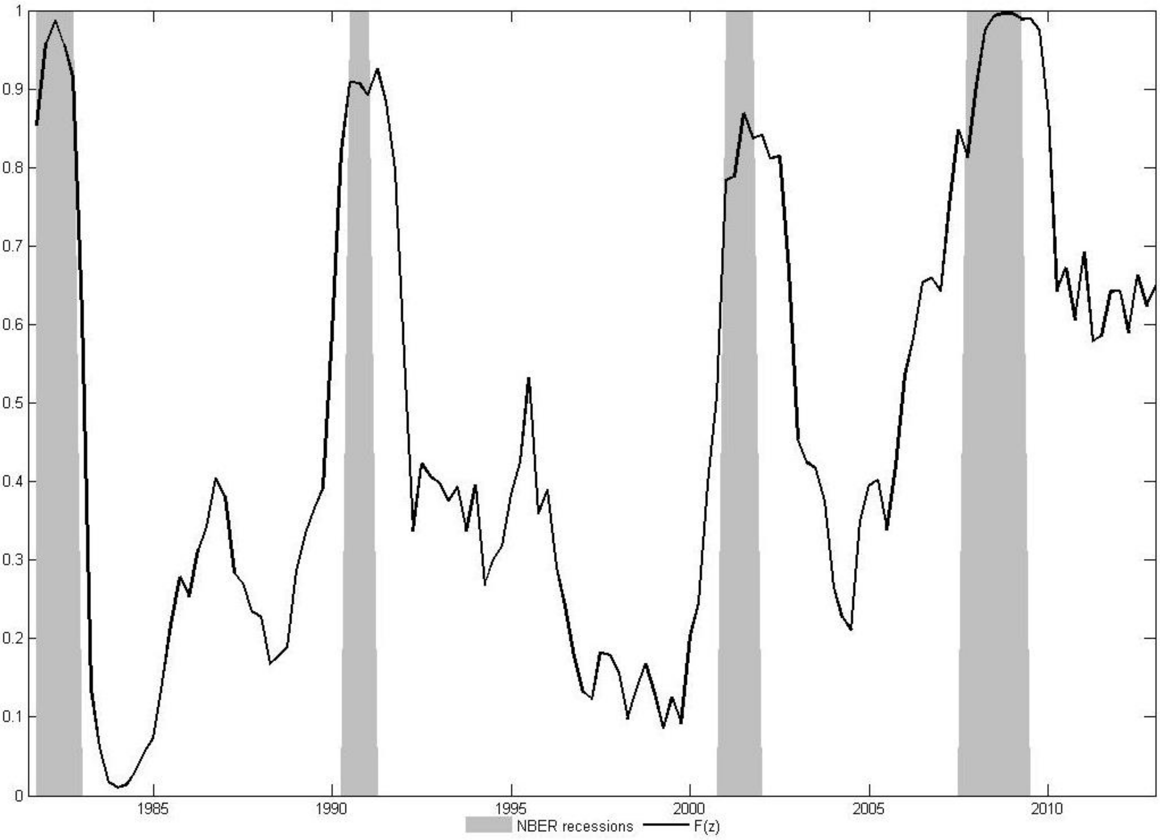

Figure 3. Transition Function. $F(z_t)$ and the NBER recession dates, we can note how the shaded regions indicating the recessions defined by the NBER coincide with the picks of the black solid line indicating the probability of being in the recessionary regime $F(z_t)$.

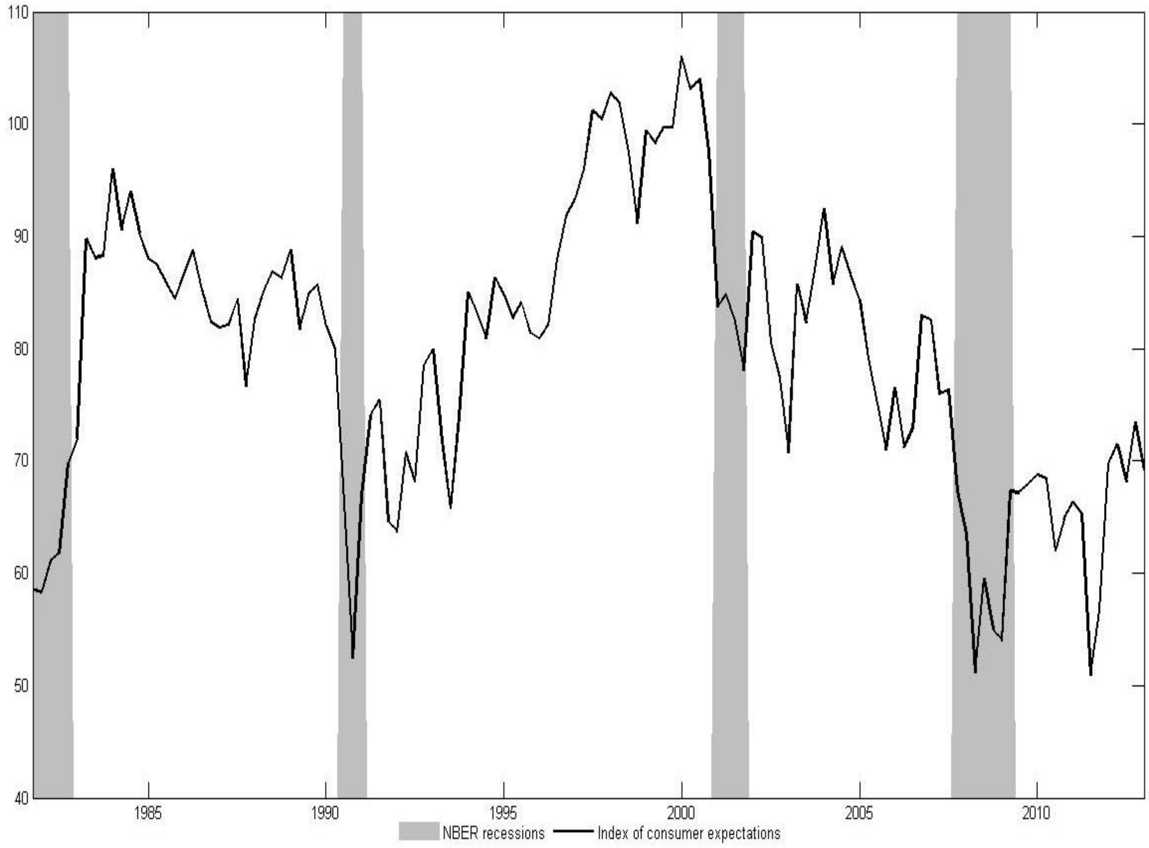

Figure 4. Consumers Confidence. The index of Consumers Expectations and NBER recession dates. Note that the negative spikes of the confidence index (black solid line) coincide with the recessions defined by the NBER (shaded region).

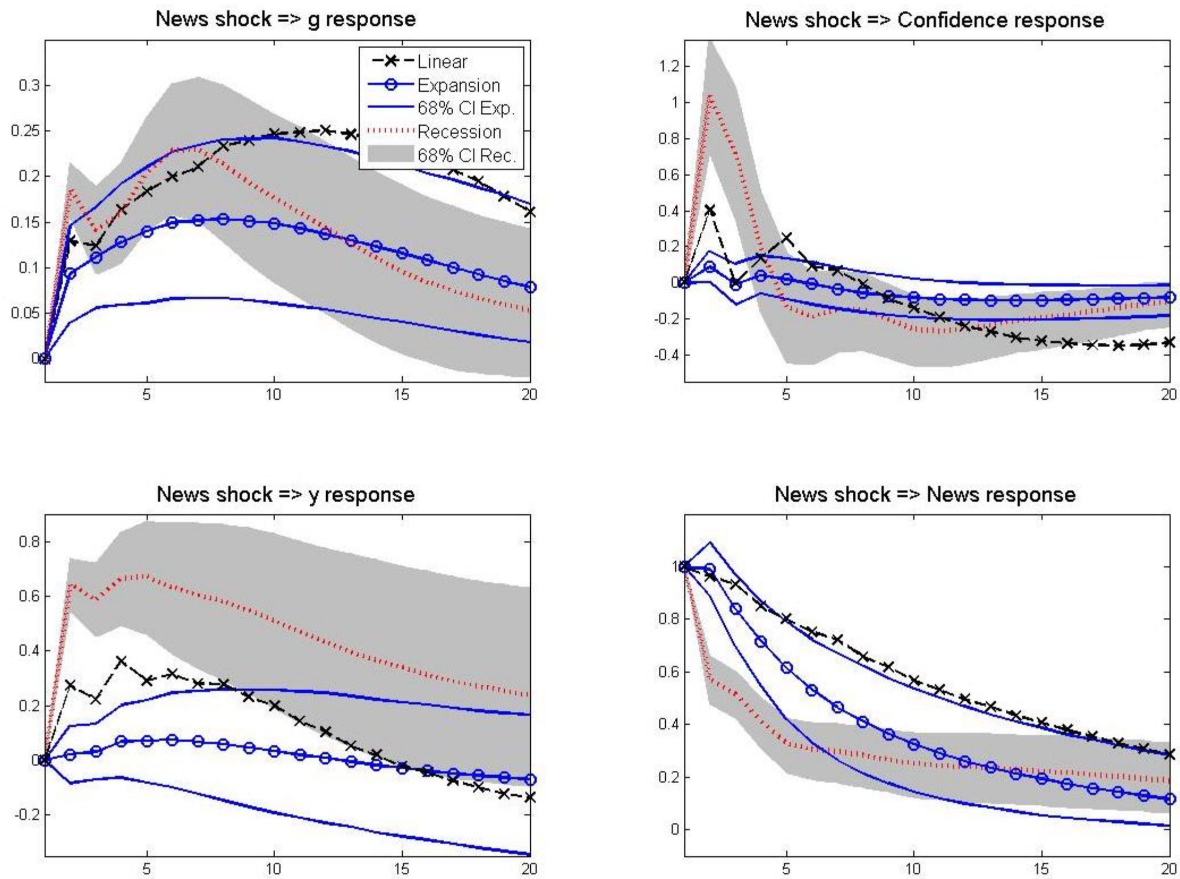

Figure 5. IRFs to an anticipated (news) government spending shock normalized to one: Recession vs. Expansion. The blue circled lines draw the median responses of the variables during expansions while the red dashed lines depict the median responses during recessions. The black dash-crossed lines indicate the median responses for the linear model. The 68% confidence bands are shown by the blue solid lines (expansions) and the shaded areas (recessions). The shock is the last of the Cholesky decomposition for the baseline specification including, in the that order, the log of real per capita government spending, the confidence index, the log of real per capita GDP and the News variable. The output responses are scaled by the sample average of Y/G in order to convert them in the same units than those of government spending, hence both responses are comparable.

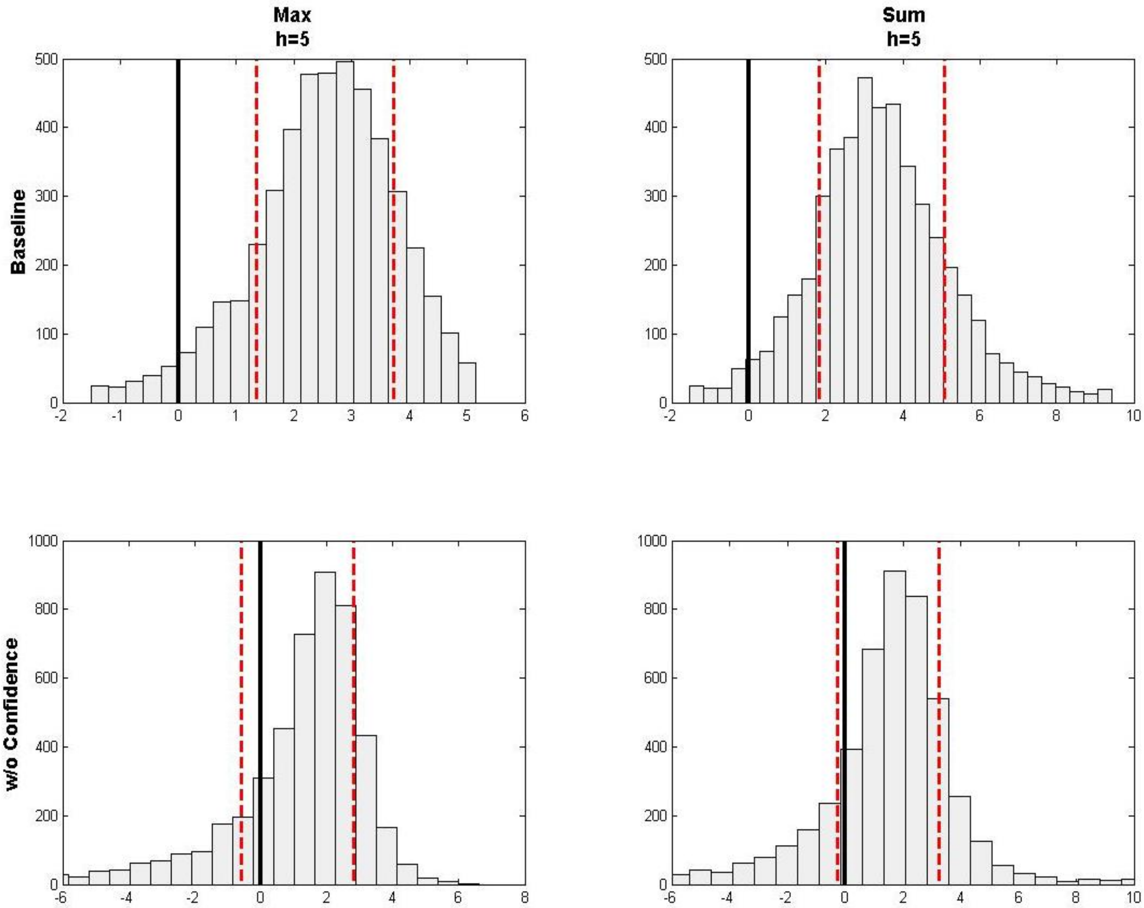

Figure 6. Difference in multipliers between expansions and recessions : Anticipated (news) spending shock. The histograms depict the distribution of the difference in multipliers (max and sum) for the short run of 5 quarters. The top panel shows the distributions for the baseline specification while the bottom panel draws the distributions for the counterfactual specification conditional to a fixed level of confidence. The red dashed lines represent 68% confidence intervals. The empirical densities of the difference in multipliers are obtained by subtracting a realization of the multiplier in expansions from a realization of the multiplier in recessions for a number of times equal to 5,000. Note that when confidence is held constant the difference in multipliers is not statistically different from zero.

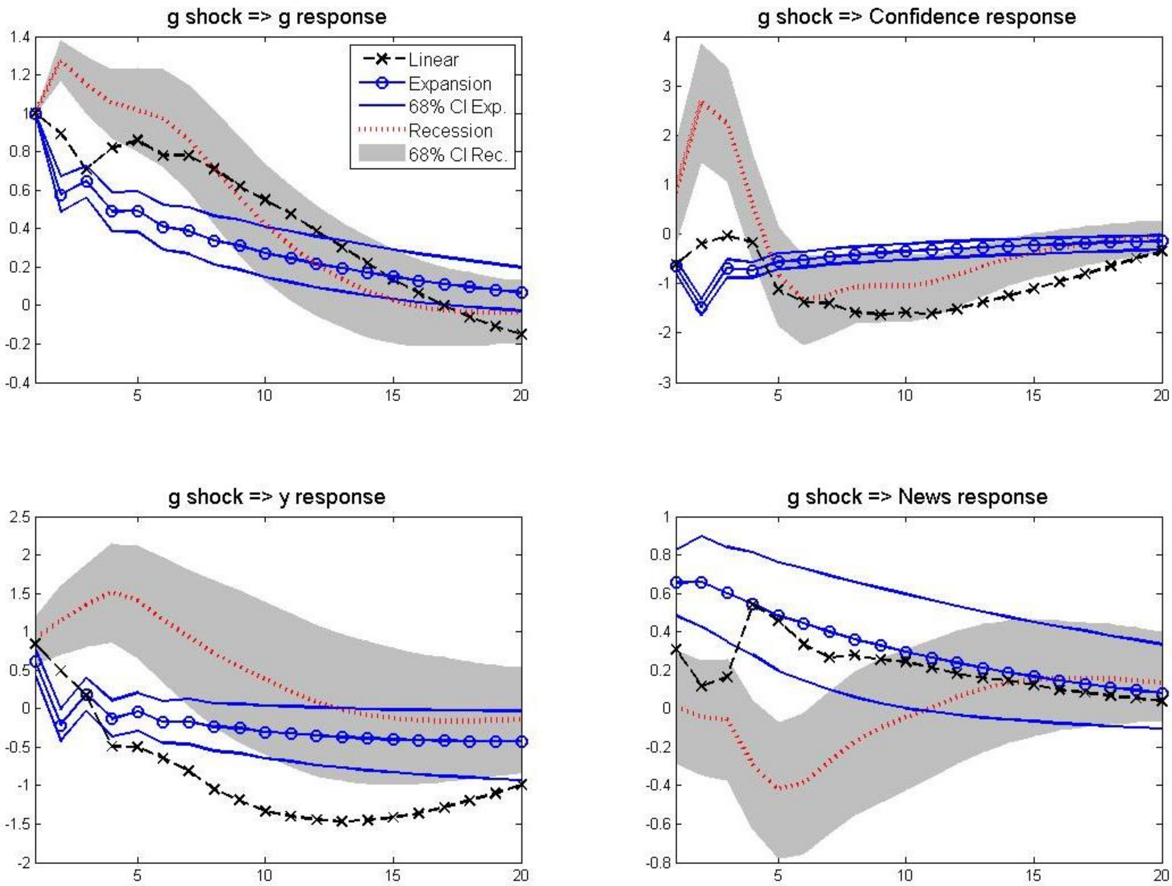

Figure 7. IRFs to an unanticipated government spending shock normalized to one: Recession vs. Expansion. The blue circled lines draw the median responses of the variables during expansions while the red dashed lines depict the median responses during recessions. The black dash-crossed lines indicate the median responses for the linear model. The 68% confidence bands are shown by the blue solid lines (expansions) and the shaded areas (recessions). The shock is the first of the Cholesky decomposition for the baseline specification including, in the that order, the log of real per capita government spending, the confidence index, the log of real per capita GDP and the News variable. The output responses are scaled by the sample average of Y/G in order to convert them in the same units than those of government spending, hence both responses are comparable.

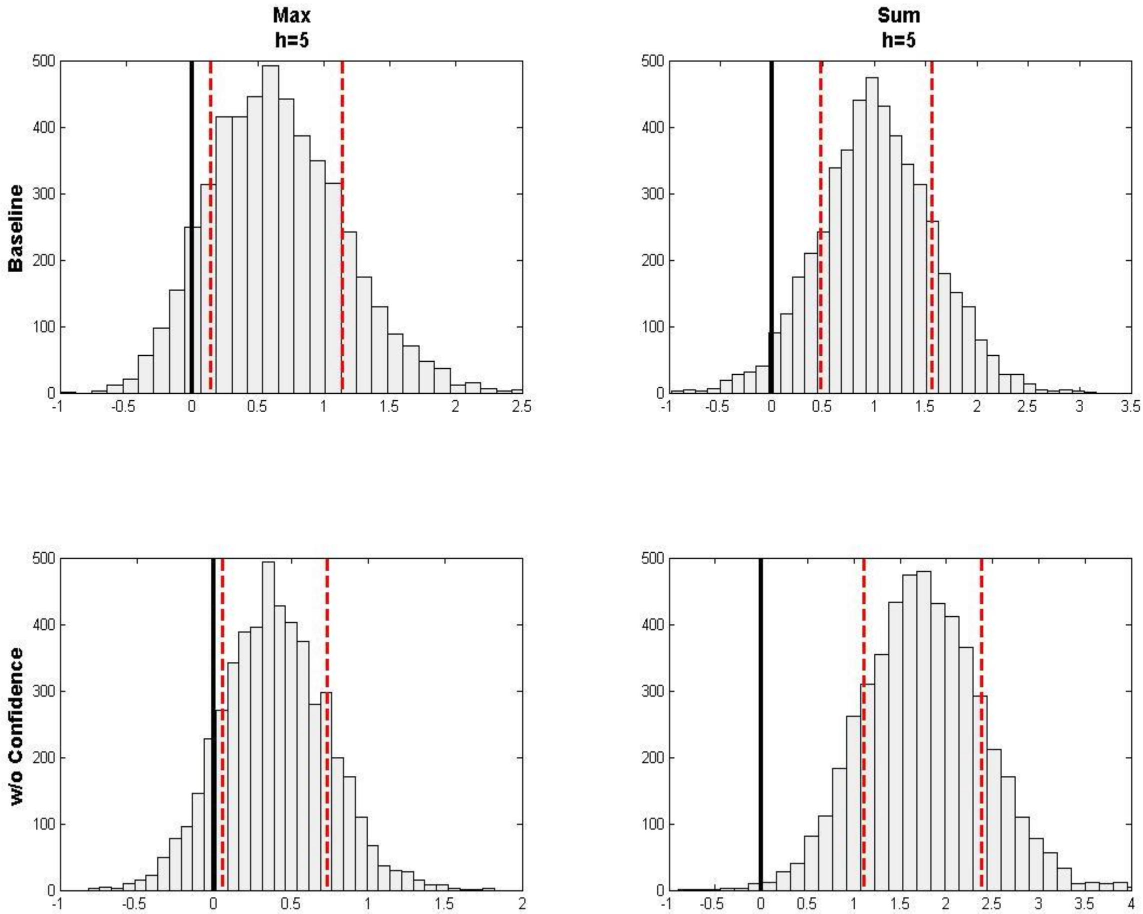

Figure 8. Difference in multipliers between expansions and recessions: Unanticipated government spending shock. The histograms depict the distribution of the difference in multipliers (max and sum) for the short run of 5 quarters. The top panel shows the distributions for the baseline specification while the bottom panel draws the distributions for the counterfactual specification conditional to a fixed level of confidence. The red dashed lines represent 68% confidence intervals. The empirical densities of the difference in multipliers are obtained by subtracting a realization of the multiplier in expansions from a realization of the multiplier in recessions for a number of times equal to 5,000. Note that now when confidence is held constant the difference in multipliers still statistically significant, indicating that for an unanticipated government spending shock the confidence reaction does not explain state-dependent fiscal multipliers.