Identifying the Effects of Government Spending Shocks with and without Expected Reversal: an Approach Based on Real-Time Data[*]

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January 2011

Abstract

This paper investigates how expectations about future government spending influence the transmission of fiscal policy shocks. We study the effects of two different types of government spending shocks in the United States: (i) spending shocks that are accompanied by an expected reversal of public spending growth; (ii) spending shocks that are accompanied by the expectations of further spending growth. We use a time series of military build-ups to measures exogenous spending shocks, and deviations of forecasts on public spending with respect to past trends, evaluated in real-time, to distinguish shocks into these two categories. Based on a structural VAR analysis, our results suggest that shocks associated with an expected spending reversal exert expansionary effects on the economy and accelerate the reduction of public debt. Shocks associated with a further expected increase in spending, instead, are characterized by a contraction in aggregate demand and a more persistent increase in public debt. The channels of transmission seem to run through the effects that expectations of future spending have on the slope of the yield curve and agents' perceptions about the future macroeconomic environment.

JEL: E62, E65, H20.

Keywords: Government spending shocks, Survey of Professional Forecasters, Real-time data, Spending reversal, fiscal multipliers.

[*] We are grateful to Gianni Amisano, Stephan Fahr, Michele Lenza and Philipp Rother for helpful comments and suggestions. We also would like to thank the participants to an ECB seminar for useful discussions. Sergio Sola gratefully acknowledges the Fiscal Policies Division of the ECB for its hospitality. The opinions expressed herein are those of the authors and do not necessarily reflect those of the ECB or the Eurosystem.

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1. Introduction

The global financial and economic crisis of 2008 and 2009 has induced governments in most industrialized countries to make extensive use of discretionary, in particular spending-based, fiscal policy measures to counteract the economic downturn. While these measures have probably averted an even more severe economic contraction, their effects upon the economy remain rather unclear. At the same time, the adoption of fiscal stimulus packages has certainly contributed, together with the automatic reaction of government deficits to the economic slowdown, to the strong increase in public debt-to-GDP ratios in most countries. These developments have motivated a lively debate in the academic and policy arena on the effectiveness of fiscal policies in stimulating economic activity (i.e. on the sign and the size of fiscal policy multipliers), and on the costs of expansive fiscal policies in terms of public debt accumulation and the long-term sustainability of public finances.

The theoretical literature has shown that fiscal policy multipliers (and the evolution of public debt, which largely depends on the reaction of economic activity to fiscal expansions) hinges on a wide range of factors such as the exchange rate regime, capital markets integration, credit market frictions and *agents' expectations* about the *future path of fiscal policy*. This latter element was already contemplated by early Real Business Cycle models (see e.g. Baxter and King, 1993), according to which fiscal expansions can produce a negative response in private consumption as they are accompanied by an expected increase in future taxes. However, only recently some studies, based on (calibrated) New-Keynesian DGSE models, have addressed explicitly the interplay between fiscal policy and management of expectations as a key factor to understand the transmission mechanisms of fiscal policy. In particular, Davig and Leeper (2009) show that the effects of fiscal policy shocks depend on the future path of monetary and fiscal policy and on the interaction between them. Corsetti et al. (2009, 2010) highlight that the size of multipliers depends on whether the government will offset the shock with higher future taxes or rather with lower future spending. They find that government spending multipliers are considerably larger when fiscal shocks are accompanied by a future reduction in spending. By granting a central role to the *future paths* of fiscal policy variables, these works represent a big step forward in the understanding of the size and the sign of fiscal policy multipliers. However, these studies provide limited empirical support to their predictions.

Against this background, the goal of this paper is to test empirically the predictions of this class of models, based on a new approach that explicitly takes into consideration – in an otherwise standard VAR model for fiscal policy analysis – *agents' expectations* about the future fiscal policy stance after a fiscal policy shock. In particular, we investigate whether expectations about future government spending growth are relevant in explaining the effectiveness of fiscal policy shocks and the evolution of public debt following fiscal expansions.

Focusing on the US and on a quarterly dataset spanning the period 1981Q3-2008Q3, our empirical strategy consists of three steps. First, we collect the fiscal shocks on military expenditure (i.e. the so-called "defense news" shocks) reported by Ramey (2010). These shocks, constructed following a "narrative" approach, can reasonably be considered to be truly "exogenous" and "unsystematic", therefore immune to the 'Fiscal Foresight' Critique (see Leeper, Walker and Yang, 2009). Second, we propose a new identification procedure which combines the Ramey's shocks with information on forecasts about future government spending – and on past spending trends – available "in real time" when the shock occurred. As a proxy for agents' expectations about future spending growth, we use projections on government consumption and investment spending reported in the Survey of Professional Forecasters and published by the Federal Reserve Bank of Philadelphia. Trends for past spending growth, and for the same spending aggregate, are constructed from past vintages of real-time data also from the Philadelphia Fed database. Based on these data, we are able to divide the Ramey's shocks into two categories: one includes shocks that are associated with expectations of a future reversal in government expenditures, the other includes shocks that are not associated with such reversal. More specifically: (i) *spending shocks with an expected reversal* are those shocks for which, at the time they occur, expected spending growth at the one-year-ahead horizon is below a long-run historical trend for spending growth; (ii) *spending shocks with no expected reversal* are those shocks for which spending growth expected for the next year is above past spending growth, over the same long-run period. Third, we incorporate these two classes of shocks in a structural VAR model, including also GDP and public debt, among other variables. In this way, we can investigate the differences in the responses of the economy to these two types of fiscal impulses.

To the best of our knowledge, this is the first paper that incorporates agents' expectations about future government spending, in combination with past vintages of real-time data, to identify the effects of two different types of government spending shocks. Compared to

VAR analysis proposed by Corsetti et al. (2009), our approach allows to estimate the effects of government spending shocks that are followed by a reversal in spending growth *and* of shocks that are followed by a further increase in spending growth.

Our results show that expectations do indeed matter in determining the effects of fiscal policy shocks and the evolution of public debt. We find that fiscal shocks that are followed by an expected reversal in spending have a positive effect on aggregate demand. In addition, they are associated with an increase in public debt for about one year. After that, public debt declines, following the automatic reaction of the budget balance to the economic expansion induced by the fiscal shock. At the same time, it emerges that fiscal shocks characterized by expectations of further increases of public spending have different effects, in that they are associated with a reduction in economic activity (especially in the short-run) and with a more persistent increase in public debt. The latter tends to remain above its initial level over the whole considered horizon. These effects seem to run mostly through the reaction of the yield curve and consumers' confidence about the future macroeconomic environment. All in all, this evidence shows that, in order for governments to obtain greater effectiveness of expansionary fiscal policies, it is central to anchor expectations of agents on the future path of public spending.

The rest of this paper is organized as follows. In Section 2, we summarize the related literature on fiscal policy multipliers; section 3 presents the empirical strategy and the identification of fiscal shocks; in section 4 we report and comment the results. Finally, in section 5 several robustness checks are discussed and section 6 concludes.

2. Related literature

It is by now relatively well established in the empirical literature that fiscal policy multipliers vary across countries and across time (for a review, see e.g. Spilimbergo et al., 2009), depending on a wide range of factors (see e.g. Kirchner, Cimadomo, Hauptmeier, 2010). The impact of some of these factors (notably, the exchange rate regime, the monetary policy stance, the state of the business cycle) on the effectiveness of fiscal policy has already been explored quite extensively in the empirical literature.

For example, Ilzetzki, Mendoza and Vegh (2009), show that - across a wide panel of countries - the effects of fiscal policy broadly reflect the prediction of the Mundell-

Fleming model, in that economies operating under predetermined exchange rate regimes tend to have higher fiscal multipliers than the ones operating under flexible exchange rate regimes. The relation between the stance of monetary policy and the effectiveness of fiscal policy has been inspected by Kirchner, Cimadomo, Hauptmeier (2010) for the euro area. The authors show that fiscal policy became less powerful since the end of the 1990s in the euro area, also as a consequence of a more aggressive response of monetary policy to fiscal expansions. The interlink between the state of the business cycle and fiscal policy effectiveness has been investigated by Tagkalakis (2008) and Hemming, Mahfouz and Schimmelpfenning (2002). These authors show that fiscal policy tends to be more powerful in recessions, given the prevalence of credit constrained households in this phase of the economic cycle. In fact, whenever agents are excluded from the credit markets, they cannot smooth consumption and therefore any increase in disposable income is readily transformed into an increase in current consumption (see also Gali, Lopez-Salido, Vellès (2007) and Biilbie, Meier and Muller (2008)).

The impact of other factors on the effectiveness of fiscal policy has been much less explored in the empirical literature. For example, as discussed above, agents' expectations about the future fiscal policy stance may clearly play a role in today's investment and consumption decisions by forward-looking agent (as suggested by Corsetti et al., 2009, Davig and Leeper, 2009). However, the interplay between agents' expectations and the effects of fiscal policy has received so far only limited attention in empirical works.

Early attempts to test – at least indirectly - this channel of transmission have been done in the 1990s by authors exploring the so-called non-Keynesian effects of fiscal policy. The idea was that fiscal consolidations might be accompanied by expectations of lower future interest rates and inflation, therefore they could beneficial effects on economic activity even on impact (see, in particular, Giavazzi and Pagano 1990, 1996). This mechanism has been shown to be particularly strong when the level of public debt is high, because under these circumstances consolidations are likely to induce agents to reduce their precautionary savings and increase consumption (see e.g. Giavazzi, Jappelli, Pagano (2000), Berben and Brosens (2007)).[1] These papers – mostly based on "case studies"- while clearly assigning an important role to expectations, do not explicitly incorporate measures of expectations into their empirical models. In other words, the impact of expectations about future spending on the fiscal transmission mechanism is not directly tested.

[1] On non-Keynesian effects of fiscal policy, eee also Alesina and Perotti (1997), Alesina and Ardagna (1998), Perotti (1999), Ardagna (2004), Afonso (2010).

The interaction between the effectiveness of agents' expectations and the effectiveness of fiscal policy has been addressed by Corsetti et al. (2009), based on a calibrated DSGE model for the US economy. These authors show that fiscal multipliers vary depending on whether the fiscal expansion is accompanied by a credible plan of future reduction in public spending. In their framework, expected future real interest rates decrease in presence of credible retrenchment of future spending. This directly feeds into today's long term real interest rates and this in turn boosts consumption and output. However, their empirical (VAR-based) analysis does not incorporate directly measures of expectations. In addition, the possible presence – and the related effects - of shocks not characterized by a spending reversal is not explored. In the present paper, we depart from the Corsetti et al. (2009)'s empirical model by incorporating directly agents' expectations about a possible spending reversal – based on the Survey of Professional Forecasters and on past vintages of real-time data - in a VAR model for fiscal policy analysis.[2] This allows to estimate the effects of shocks with *and* without expected reversals. In addition, some key channels through which expected future consolidations can influence the effectiveness of fiscal policy are investigated.

3. Empirical strategy

We focus on the US economy and on the period 1981:Q3 – 2008:Q3. Our empirical analysis consists of three steps. First, we collect the "defense news" shocks reported by Ramey (2010). Second, we propose a new identification procedure which combines the Ramey's shocks with information on forecasts about future government spending – and on past spending trends – available "in real time" when the shock occurred. This allows to distinguish the Ramey's shocks into two categories: shocks with and without expected spending reversal. Third, we incorporate these two classes of shocks in an otherwise standard structural VAR model. In this way, we are able to trace out the effects of these two types of fiscal shocks upon the economy.

[2] Other attempts to incorporate expectations on government spending growth in VAR models, based on projections reported in the Survey of Professional Forecasters, are Kirchner (2010), Aureback and Gorodnichenko (2010). However, these papers utilize expectations with a different purpose, namely to address the 'Fiscal Foresight' critique put forward by Leeper Walker and Yang (2009).

3.1 The Ramey's defense news shocks

As a first step in the empirical analysis, we need to select some government spending shocks which can be reasonably considered to be exogenous to business cycle fluctuations, and unpredictable on the basis of ex-ante information held by agents. In this context, natural candidates are the "defense news" shocks, constructed by Ramey (2010) on the basis of a "narrative approach".[3] In particular, Ramey (2010) refines the standard Ramey and Shapiro (1998)'s "war dates" approach by constructing a new variable of discretionary government spending shocks. As in Romer and Romer (2010), the author uses information from the press (mainly *Business Week*) to build a historical series of expected changes in government military spending, which she then expresses in present value terms. The use of this variable presents a series of advantages. First, its construction is transparent and has been thoroughly documented by the author (see Ramey, 2009)[4]. Second, data are reported at the quarterly frequency and are characterized by a relatively large number of observations. This is an advantage in particular compared to the "traditional" narrative approach, which is based on only few (four or five) dummies for war dates (see Ramey and Shapiro, 1998). Third, the use of fiscal "news" ensures that the shocks are identified before the spending actually takes place. This feature is helpful to cope with the issue of "fiscal foresight", i.e. the possibility that – given the presence of lags between the planning and the implementation stage of fiscal policy - the true reaction to a fiscal policy shock anticipates the actual increase in spending (see Leeper, Walker and Yang, 2009).[5] The decision of taking into consideration only military spending can be justified by the fact that – as pointed out by Ramey (2010) – defense spending accounts for the bulk of variability in government expenditure in the US, and it is the least likely to enter the process of production or interact with private consumption. Moreover, federal defense spending is likely to be less correlated to the business cycle compared for example to state and local government spending, whose changes are mainly driven by the cyclical fluctuations in tax revenues. The Ramey's shocks for the period under consideration are reported – both in nominal terms and in percent of previous quarter GDP - in column 2 and 3 of table 1.[6]

[3] See also Ramey (2009) for a detailed documentation on the construction of such shocks. Earlier works based on a narrative approach for fiscal policy analysis are Ramey and Shapiro (1998), Edelberg, Eichembaum and Fisher (1999).
[4] Further documentation is available on V. Ramey's webpage: http://weber.ucsd.edu/~vramey/published.html
[5] See also Forni and Gambetti (2010) for an alternative method to address the fiscal foresight critique, based on a structural factor model approach.
[6] Data in table 1 are taken from table 2 in Ramey (2010).

3.2 Identifying shocks with and without expected reversal

As a second step in our identification strategy, we look at the path of future spending growth expected at the time (quarter) in which each Ramey's shock occurred. Then, we compare such expected path with past trends in government spending growth, again evaluated at the time in which each defense news shock took place. For this purpose, we use vintages of real-time data on government spending released in the concerned quarter. This procedure allows us to divide the Ramey's shocks into two categories: [7]

(i) **Shocks *with* an *expected reversal* in government expenditure**: this category comprises *positive* defense news shocks, which are accompanied by projections on spending growth *above* past trends of spending growth. This category also includes *negative* defense news shocks, accompanied by projections on spending growth *below* past trends of spending growth.

(ii) **Shocks *without* an *expected reversal* in government expenditure**: this category comprises *positive* defense news shocks, which are accompanied by projections on spending growth *below* past trends of spending growth. This category also includes *negative* defense news shocks, accompanied by projections on spending growth *above* past trends of spending growth.

To proxy agents' expectations about future government spending growth, we use projections reported in Survey of Professional Forecasters (SPF), published by the Philadelphia Fed.[8] The SPF reports forecasts for an ample set of macroeconomic and financial variables on a quarterly basis, including projections on government consumption and investment. The data are compiled using questionnaires sent to a group of forecasters on the first month of each quarter. While the Ramey's shocks are based only on military expenditure, we use projections for the largest available aggregate for government spending – which includes government consumption and investment, at the federal, state and local level - to evaluate reversals. The idea is that, if expectations about future government spending are relevant in shaping today's decisions by agents, then what matters are projections on *overall* spending, rather than only on military expenses (which

[7] Note that also Corsetti et al. (2009) evaluate reversal with respect to trends. However, their empirical analysis is based on ex-post (revised) data and does not disentangle the two different types of shocks.

[8] See http://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/

might be offset by other items in the future). In addition, this choice is also justified by the fact that the SPF comprises forecasts on the aggregates of government consumption and investment, but not forecasts on sub-categories of spending (such as military spending).

In the SPF, forecasts for government consumption and investments are expressed in real terms and seasonally adjusted at annual rates. To compute the growth rate in expected future spending we take the simple *annual* growth rate implied by the forecast – expressed in the quarter in which the shock occurred - of the year ahead ($T+1$) government spending, with respect to the estimate for the current year T. The collection of SPF's forecasts start only from 1981Q3, therefore our data set starts from that date. Moreover, the SPF collects forecasts at most for the *one-year-ahead* horizon. Ideally, a longer horizon might be more useful to evaluate spending reversals. However, we rely on the fact that, because forecasts take into account all the information set available at time t, it is unlikely that forecasts for (annual) growth rates of public spending for longer horizons will be markedly different from one-year-ahead forecasts.

The past growth rate of public spending is computed using real-time data, also taken from the Philadelphia Fed's database.[9] The same spending aggregate is used, which comprises government consumption and investment, at the federal, state and local level. For a given news taking place at quarter t of year T, we select a horizon of h years and compute the average annual growth rate of public spending between T and T-h using the vintage for the real time data which refers to period t. To avoid the results being driven by cyclical factors we pass the series of real time data through a Hodrick-Prescott filter before computing the average annual growth rate.

The reason for using real-time data is that they should help to better approximate the information set of the agents at the point in time in which the defense news shock occurred. The intuition behind this approach is that agents, when evaluating whether future spending will grow more or less than in the past, will most likely draw from their experience about the "historical" path of government spending growth up to that point, which is exactly the type of information collected in real time vintages. Moreover, the use of HP filtered data allows us to capture a long term trend of spending growth.

In the baseline exercise, we focus on a period of 15 years to evaluate past spending growth. This choice is justified by the fact that we want to have a horizon long enough to meaningfully compute a "trend growth" in past government spending. However, taking a too long horizon might be unwarranted because past data for vintages at the beginning of

[9] See http://www.philadelphiafed.org/research-and-data/real-time-center/real-time-data/.

the 1980s may include the Korean war, which is characterized by a very high volatility in government spending.[10]

In sum, the distinction of the Ramey's defense shocks in the two categories "with" and "without" expected reversal follows this simple decision rule:

Positive Defense News Shocks	$\Delta g_t^e > \Delta g_{t,t-15}$	Shock *Without Reversal*
	$\Delta g_t^e < \Delta g_{t,t-15}$	Shock *With Reversal*
Negative Defense News Shocks	$\Delta g_t^e > \Delta g_{t,t-15}$	Shock *With Reversal*
	$\Delta g_t^e < \Delta g_{t,t-15}$	Shock *Without Reversal*

where Δg_t^e is the one-year-ahead expectation on spending growth, and $\Delta g_{t,t-15}$ is spending growth for the previous 15 years, evaluated in real-time on the basis of information available at the time of the Ramey's shock. This identification scheme allows us to capture the idea that agents react to news (the Ramey shocks) and the direction of their reaction tends to be driven not only by their expectations about the future state of the economy, but also by announcements regarding future fiscal consolidations (or further spending expansions).

As discussed, due to data availability issues, our sample covers the interval 1981Q3 through 2008Q3. Over this period, we have 17 Ramey's defense news shocks. Table 1 reports the series of the Ramey defense news shocks, together with their classification in "With" or "Without" reversal, stemming from the procedure presented above.

Tables 2, 3 and 4 show some descriptive statistics relative to these shocks. Table 2 shows that, out of the total of these 17 shocks, 6 are those that we identify as "With Reversal" and 11 are those identified as "Without Reversal". The split between shocks in the two categories is more even if we look at positive shocks, while among negative shocks we have only 1 with reversal and 7 without reversal. This indicates that fiscal consolidations (in this context, cuts in military spending) are generally perceived to be more persistent. Moreover the negative shocks are in general larger in size, as indicated in table 3. The average size of a fiscal consolidation is in fact 3.82% of previous quarter's GDP, compared with 1.41% of GDP for fiscal expansions. Finally, table 4 shows that shocks without reversal tend to be larger and more volatile than shocks with reversal for both positive and negative shocks.

[10] Still, the robustness section 5 shows that results based on the 15-years horizon are broadly consistent a longer time horizon, based on a 25-years window.

3.3 VAR analysis

After dividing the defense news shocks into the two different categories, we incorporate them as endogenous variables into a standard VAR model.[11] The baseline VAR includes the two series of defense news shocks (with and without reversal), public debt, GDP, private consumption, private non-residential investment, the one-year-ahead expected inflation and the federal fund rate. All the data are expressed in real per capita terms, except for the defense news shocks which are expressed in percentage of previous quarter GDP. Expected inflation and the federal fund rate are expressed in percentage points on annualized basis.

The inclusion of public debt is justified by the fact that the goal of our analysis is not only to study the size of the multipliers, but also to analyze which consequences different fiscal shocks have in terms of fiscal sustainability. In addition, some papers have shown that omitting this variable from VAR models of fiscal policy may lead to substantial bias in the estimated responses to government spending shocks (see e.g. Favero and Giavazzi, 2007),. We use expected inflation rather than actual inflation as this is consistent with the fact that our shocks are "news shocks", and hence are more likely to affect directly the expectations of future prices rather than the actual prices. Finally we add the federal fund rate to take into account the reaction of monetary policy to the fiscal shock.

The VAR also includes a constant and a quadratic trend. We incorporate four lags of the endogenous variables, given the quarterly nature of the series used. The VAR includes variables in levels, and it is estimated equation by equation by OLS.

The identification of the fiscal shocks is achieved by means of a standard Cholesky decomposition.[12] The defense news shocks are ordered first in the VAR. This recursive structure and the selected ordering are justified by the fact that - by construction - the defense news shocks should be exogenous and independent to business cycle fluctuations and other endogenous variables. Therefore, the fiscal shocks need to be ordered first as it is unlikely that they react to shocks to other variables in the same quarter. Moreover, because we only identify innovations to the first two variables in the VAR, the relative

[11] This approach follows Ramey (2010), who however did not separate the shocks into two categories.

[12] This identification approach is also adopted by Fatàs and Mihov (2001) and Biilbie Meier Muller (2008). In these papers, government spending is ordered before output, following the assumption that government spending cannot react to output movements within the same quarter. Other approaches to identification for fiscal policy shocks are proposed by Blanchard and Perotti (2002) and Perotti (2005), based on "institutional'information"; and by Mountford and Uhlig (2009), based on sign rstrictions..

ordering of the remaining variables will not alter the results (on this point, see Christiano, Eichembaum and Evans, 1999). In fact, the only ordering that might impact on the results is the relative position between shocks with reversal and shocks without reversal. However, results are not significantly affected by the relative ordering of the two shocks, as shown in the robustness section 5.

The data on GDP, consumption and investments are taken from the US Bureau of Economic Analysis's NIPA tables. The data on government debt are taken from the ECB's Statistical Data Warehouse. The series on the one-year-ahead expected inflation is taken from the SPF, and the data on the federal fund rate are taken from the New York Fed database. More details on the variables are reported in the Appendix.

4. Results

Results from the baseline specification, which includes the two (with and without reversal) defense news shocks and the other endogenous variables, are reported in Figure 1. We plot point estimates for impulse responses together with one standard deviation confidence bands, following standard practice in the VAR literature on fiscal policy (see e.g. Blanchard and Perotti, 2002). Figure 1a reports the responses to a shock with expected reversal, Figure 1b the responses to a shock without expected reversal. We normalize the two shock to be equal to 1% of GDP on impact. To better compare the effects of the two shocks, figure 1c plots together the impulse responses for the endogenous variables (excluding the defense news, for simplicity) to the two different types of impulses.

From these figures it clearly emerges that there are substantial differences in the reaction of the economy to the two types of government spending shocks. Shocks with reversal (Figure 1a) have expansionary effects on output, consumption and investments. Fiscal multipliers – expressed as the percentage response of variables to the 1% of GDP government spending shocks – peak at around 0.8 for output and consumption, and at around 0.4 for private investment. Public debt tends to increase for around one year, but declines thereafter by about 3%, compared to the no-shock scenario, after four years. The reduction in public debt is explained by the automatic reaction of the government budget balance to the output boost, which generates higher tax revenues and lower social expenditures. As regards the other variables, expected inflation falls on impact by around 0.25% but becomes insignificantly different from zero from the fourth quarter after the shock. This behaviour can be explained as the combined results by two opposing effects. On the one hand, the boost in demand that followed the shock is likely to exert upward pressures on expected future level of prices. On the other hand, the perception of a future spending reversal should bring expected inflation down right away. In addition, the reduction in the stock of public debt should translate into lower inflation expectations, given that the perceived risk of future public debt monetization is lower. Overall, while in the short-run the deflationary effects stemming from the latter two channels seem to prevail, it turns out that over the longer run the different effects offset each other.[13] Finally, the response of monetary policy to the fiscal shock – while in general not statistically different from zero - seems to be broadly consistent with a central bank following a Taylor-type of rule: the central bank is expected to tighten the policy interest rate as a response to the increase in output over the medium-run. At the same time, the fall in expected inflation makes the reaction milder in the short-run. This is reflected in the fact that the baseline response of the federal fund rate follows an "S" shape: on impact it decreases somewhat, then it starts increasing as expected inflation and output increase.

The results for fiscal shocks without reversal (Figure 1b) indicate that – in stark contrast with the previous case - a fiscal shock followed by the expectation of further increase of public spending has a contractionary effect on the economy. Output, consumption and investment decrease for the first year after the shock, then revert back to zero and increase somewhat at the end of the horizon. The short-run contraction is however not very large for GDP and consumption (around 0.2%), while it is more sizeable for private investment (around 1%). As a consequence of the fiscal stimulus and the contraction in economic activity, the stock of public debt increases over the whole horizon (by up to 0.6% one and a half year after the shock). Expected inflation falls slightly on impact (-0.04%), and remains negative (though small) over the whole horizon. In this case, deflationary expectations stemming from the contraction in real activity seem to prevail on other forces. The response of the federal fund rate seems again consistent with the Fed following a Taylor rule: the central bank cuts the policy interest rate to counteract a lower real activity and a lower expected inflation.

To formally test the statistical significance of the difference between the two scenarios, jointly plotted in Figure 1c, we construct a test based on the distribution of the bootstrapped impulse responses. We focus on the main variables of interest: public debt,

[13]Note that also other VAR studies find a negative short-run inflation response to spending shocks for the US (see e.g. Perotti, 2005).

GDP, private consumption and investment. At every replication of the bootstrap we compute the difference between the impulse responses for the two types of shocks (with and without reversal) for every horizon *t,* and then compute the 68% confidence interval for each horizon. The results from this test are plotted in Figure 1d. The areas within the dashed black lines represent the 68% confidence interval with the thick line representing its median. Hence, if the confidence interval does not contain the zero we can conclude that the differences between impulse responses are also significant at the indicated statistical level. The results broadly confirm what could be eyeballed from the previous figures: the responses of public debt are statistically different both on impact and in the longer-run (after about 8 quarters), while the responses of output and consumption are statistically different throughout the entire horizon. Investments instead result statistically different between 3 and 8 quarters after the shock.

A possible interpretation of the different responses of output and consumption in the two scenarios hinges on the framework proposed by Galì et al. (2007). These authors suggested that – in the face of a fiscal expansion - credit constrained (i.e. “hand-to-mouth”) agents will not be able to smooth consumption and therefore will consume right away the extra disposable income generated by the fiscal stimulus. At the same time, “Ricardian” agents will consume the extra income if the shock is perceived to be temporary, therefore not accompanied by a future increase in taxes. However, they will save more and decrease consumption if the shock is perceived as permanent and higher taxes are expected in the future. In the context of our results, the effects of a shock without reversal could be associated to the ones of a permanent shock: the increase in consumption triggered by hand-to-mouth consumer will be offset by the response of Ricardian consumers, therefore the total effect will be negative (if the share of Ricardian consumer is larger than the share of non-Ricardian ones, as seems to be case from empirical estimates – see e.g. Galì et al., 2007). A shock with expected reversal, instead, is likely to be perceived as a temporary shock, and therefore the response of private consumption will be similar (and expansive) for the two class of consumers. In sum, our results seem to be consistent with the Galì et al. (2007)’s framework, where the presence of Ricardian and credit-constrained consumers brings about a response of private consumption and output that will be stronger in presence of a shock with expected reversal, rather than in the non-reversal case.

5. Robustness checks

In this section we present a battery of robustness checks. In the first sub-section we will check whether the results from the baseline estimation carry through when adding extra control variables. This will also help us to investigate possible channels underlying the differences in the response to the two types of shocks. In the second-sub-section, we will focus on alternative identification approaches. First, we will test whether results are robust to the choice of a different horizon for the evaluation of past spending growth when identifying the two types of shocks. Second, we will show results inverting the ordering of the two news shocks. All in all, these tests show that the benchmark findings of the paper, namely the ones related to the different reaction of debt, output and consumption under the two scenarios, are broadly robust.

6.1 Additional control variables

The results from the first set of robustness checks are reported in Figures from 2a through 5d. When plotting the impulse responses of the variables to the two types of shocks, we omit the responses of the first two variables in the VAR, i.e. the defense news shocks, as they do not yield any further insight from what already discussed. We add one control variable at a time to avoid problems of over-parametrization and of degrees of freedom in estimation.

The first variable we consider as a control is *real wages*. Following Mountford and Uhlig (2009), we use the real compensation per hour of the non farm business sector, and we express it in the logarithmic scale to be consistent with the other variables in the VAR. Figure 2a, 2b show that including real wages does not alter the response of the variables included in the baseline model, both in terms of shape and in terms of magnitude. Moreover results show that, after a shock with reversal, real wages increase significantly and start declining again only after around six quarters. The increase in real wages can be explained, on the one hand, by an increased labour demand following the expansive fiscal shock and, on the other hand, by a rise in labour productivity which is likely follow the upsurge of investments that takes place under this scenario. As a response to the shocks without reversals, real wages decrease somewhat in the short-run and then increase becoming statistically insignificant after one year. Again, this broadly reflects the dynamic behaviour of investments, that decrease in the short-run and pick-up after about one year following the non-reversal shock. Figure 2c and 2d focus on the difference in the responses under the two scenarios. In particular, Figure 2d shows that, for most of the variables of interest, the one standard deviation confidence interval tends not to contain the zero, therefore rejecting the null hypothesis of equal responses.

As a second robustness check, we incorporate the *unemployment rate* in the baseline VAR. We use the quarterly average of the monthly civilian unemployment rate, taken from the St. Louis Fed's FRED database. Intuitively we would expect the unemployment rate to follow the path of output, hence decreasing in the case of shocks with reversal and increasing in the other case. However, if hours worked also reacted to the fiscal expansion, this would impair the the capacity of fiscal policy to affect unemployment. Figure 3a and 3b show that unemployment does indeed react to the two types of fiscal shocks. In particular, unemployment decreases in the cases of shocks with expected reversal and increases in the other case. It is worth noticing however, that in this second case unemployment first increases and then starts decreasing 8 quarters after the shock, turning negative 10 quarters after the shock mirroring the path of output. In terms of magnitude the responses are not large: for shocks with reversal, the response of unemployment is "V" shaped with a minimum at around -0.25%, while in cases of shocks without reversal unemployment peaks at about +0.1% one year after the shock. Figure 3c and 3d highlight that the responses of the main variables of interest are not significantly modified by the inclusion of the unemployment rate. In addition, it shows that the responses of unemployment tend to be statistically different in the two cases.

We now want to focus on *government bond yields* (as represented by the slope of the yield curve) and a *consumer confidence index*. The reaction of these variables can provide interesting insight on the transmission of fiscal shocks, and that can help to explain the differences in the two scenarios.

The intuition for including government bond yields is that, if shocks without reversal increase the market's perception of unsustainable fiscal positions, a higher risk premium will be required on government bonds. In turn, higher risk premia will increase the cost of servicing the government debt, and they will be reflected in higher interest rates charged by banks and other financial institutions for private lending. Clearly, this can depress private consumption and investment decisions. To summarize information from sovereign bond yields, we use the *slope of the yield curve*. We compute this indicator as the difference between the nominal yield on the 10-years government bond and the 3 months Treasury bill, both expressed in annualized terms. The results from the VAR including this variable are reported in Figures 4a – 4d. Again, we can see that the response of the variables included in the baseline model does not change significantly. The response of the slope of the yield curve seems intuitive: in the case of shocks with reversal it seems to respond positively on impact but then starts falling as soon as public debt starts decreasing. It becomes negative and significant 4 quarters after the shock and then starts converging back to zero. When we consider fiscal shocks without reversal, instead, the slope of the yield curve responds positively to the shock and increases up to 0.1%, which is reached in the fifth quarter after the shock. After the peak it then reverts back to zero. Figures 4c and 4d focus on the differences between the two cases, with again the test statistic rejecting the null hypothesis of equal response for much of the horizon. Figure 4c highlights that the path of the slope of the yield curve seems to be connected with the behaviour of the stock of debt: in the case of shocks with reversal, in fact, the slope starts decreasing together with debt, and vice versa for shocks without reversal. This can justify the interpretation of this indicator as a proxy for risk premium: markets seem to punish fiscal indiscipline, which in the present context is reflected in the non-reversal shock, supporting the idea of a "financial" channel of transmission of fiscal policy shocks.

As regards the inclusion of a *consumer confidence index*, the intuition behind this choice is that, as conjectured by some of the earlier literature (see e.g. Caballero and Pyndick 1996), unsustainable fiscal policies may lead to a deterioration of "optimism" and "confidence" from consumers and investors. This might be driven by the expectation of higher future taxes following the non-reverted fiscal expansion, that would reduce consumption and delay productive investments. To test this possible channel of transmission, we included the quarterly consumers' confidence indicator constructed by the University of Michigan. Figure 5a and 5b show that the confidence index reacts with a steep increase to fiscal shocks with reversal, signalling that perceived fiscal restraints are considered beneficial to the overall economic conditions. As regards the response to fiscal shocks without reversals, it is negative in the short-run. The response turns slightly positive only after 8 quarters, again mirroring the behaviour of private investments. In terms of magnitude, the response of the confidence index is about five times larger in the case of shocks with reversal (Figure 5c), with the difference between the two being significantly different from zero for horizons up to two years (Figure 5d). Overall, these results suggest that, as conjectured, fiscal shocks with reversal seem to increase confidence in the future economic environment, and this can influence the decisions to consume and invest.

6.2 Alternative identification approach

As we explained in Section 3, the strategy according to which we distinguish the Ramey shocks entails the choice of a horizon over which we compute historical averages for spending growth. To have a sufficiently long time horizon, in the baseline exercise we chose an interval of 15 years. In this section, we use a longer horizon. In particular, we repeat the identification of shocks by comparing the growth rates of expectations to the average growth rate of spending computed over an interval of 25 years.[14] Again, this should be useful to capture "long-run" developments. When we use this horizon, of the classification (between "with reversal" and "without reversal") of some shocks changes. Table 5 shows the new distribution of the defense news shocks across the two categories under the alternative identification. In term of results, Figures 6a through 6d show that the choice of the benchmark does not alter significantly the basic results, both in terms of shape of the impulse responses and in terms of their magnitudes. In particular, fiscal shocks with expected reversal have a positive effect on real variables and trigger a reduction in the stock of public debt, while shocks without expected reversal tend to have opposite effects.

Finally, we check whether our identification strategy is robust to the ordering of the variables. In particular, given that we only identify innovations associated to the first two variables in the VAR, the relative ordering of the other variables will not affect the results. Hence, it is sufficient to check whether our results change if we invert the two defense news shock that we have in first and second position in our VAR. So far in fact, the analysis was conducted by ordering shocks with reversal first and shocks without reversal as second. Figures 7a to 7d show that if we invert this ordering, the results from the baseline estimation are unaffected, hence proving our results robust to use of the recursive identification.[15]

[14] The choice of the horizons to use as robustness checks was made keeping into consideration that on one hand we want a time span long enough so that we can consider the average growth rate of past spending as "trend growth"; and on the other hand we cannot choose an horizon longer than 25 - 30 years because otherwise the computation of the average growth rate of public spending would have been influenced by the large swings that public spending had during the fifties as a consequence of the Korean war.

[15] The results of the test (figure 7d) are exactly the mirror image of those for the baseline case (figure 1d). This is due to the fact that after the inversion of the defense news variables the test is now constructed as the difference between the impulse responses for shocks without reversal and that for shocks with reversal".

6. Conclusions

This paper proposes a new approach to analyze the importance of expectations about the future fiscal policy stance, for the fiscal transmission mechanism. This issue has been tackled mainly by the theoretical literature. However, little has been done on the empirical side. By combining a narrative approach à la Ramey (2010) with data on forecasts on public spending, we are able to distinguish fiscal shocks associated with an "Expected Reversal" and fiscal shocks associated with "No Expected Reversal". Our results show that there are important differences in the effects of these two types of shocks on the real economy. In particular, fiscal shocks not accompanied by expected future reduction in spending cause an increase in the burden of public debt and a decrease in confidence that depresses real activity. On the other hand, when fiscal shocks are accompanied by expectations of future reduction in spending, the fiscal stimulus effectively boosts economic activity and tends to reduce the stock of public debt in the long-run.

Overall, our results underline the importance for policymakers to anchor agents' expectations about the future sustainability of public finances, while at the same time retaining a fair degree of discretion to be able to promptly react to adverse shocks.

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8. Tables

Table 1: Ramey Defense News Shocks included in the sample

Quarter	PDV of expected changes in spending (Bil of current USD)	PDV of expected changes in spending (% of previous quarter GDP)	Type of shock (Baseline Identification)
1986q4	-89.4	-1.99	Reversal
1988q1	-242	-4.96	No Reversal
1988q4	-58.8	-1.14	No Reversal
1989q4	-507.6	-9.17	No Reversal
1990q4	112.1	1.92	Reversal
1991q4	-112.1	-1.86	No Reversal
1999q1	15	0.17	Reversal
2001q3	97.1	0.94	No Reversal
2002q1	296.3	2.86	No Reversal
2002q3	93	0.88	No Reversal
2003q1	123.8	1.15	Reversal
2003q3	41	0.37	Reversal
2003q4	78.2	0.69	No Reversal
2004q2	25	0.22	Reversal
2005q1	100	0.82	No Reversal
2006q2	227.7	1.73	No Reversal
2007q4	739.3	5.21	No Reversal

Table 2: Shocks With and Without Reversal – Sign

	With Reversal	Without Reversal	TOTAL
Positive Shocks	5	4	**9**
Negative Shocks	1	7	**8**
TOTAL	**6**	**11**	**17**

Table 3: Positive and Negative Shocks – Summary Statistics

	Bil. USD		% of Prev. quarter GDP	
	Mean	*Std Dev*	*Mean*	*Std Dev*
Positive Shocks	162.37	198.73	1.41	1.43
Negative Shocks	-201.98	184.56	-3.82	3.32

Table 4: Shocks With and Without Reversal – Summary Statistics

	With Reversal			
	Bil. USD		% Previous quarter GDP	
	Mean	*Std Dev*	*Mean*	*Std. Dev.*
Positive Shocks	63.38	50.84	0.77	0.76
Negative Shocks	-89.4	-	-1.99	-
	Without Reversal			
	Bil. USD		**% Previous quarter GDP**	
	Mean	*Std Dev*	*Mean*	*Std. Dev.*
Positive Shocks	233.08	238.08	1.87	1.66
Negative Shocks	-230.12	200.35	-4.28	3.65

Table 5: Shocks With and Without Reversal– Sign
(Identification using historical average over 25 years)

	With Reversal	Without Reversal	TOTAL
Positive Shocks	8	4	**12**
Negative Shocks	1	4	**5**
TOTAL	**9**	**8**	**17**

9. Definition of variables

(i) **Ramey Shocks:** They are the "Defense News Shocks" constructed by Ramey (2010) and reported in *Table 1*.

(ii) **Debt:** Central Government Debt (per capita), ECB, Statistical Data Warehouse.

(iii) **GDP:** US Bureau of Economic Analysis's NIPA Table 1.1, row 1

(iv) **Consumption:** NIPA Table 1.1, row 2

(v) **Investments:** Private non residential investments, NIPA Tables.

(vi) **Expected Inflation:** Expected inflation rate for the following year, expressed in annualized terms; Survey of Professional Forecasters, Federal Reserve Bank of Philadelphia.

(vii) **Federal Fund Rate:** Simple quarterly average of the monthly federal fund rate, Federal Reserve Bank of New York; the rate is expressed in annualized terms.

(viii) **Real Wages:** "Non Farm Business Sector: Real Compensation per Hour", series COMPRNFB from the Bureau of Labor Statistics; expressed in logs.

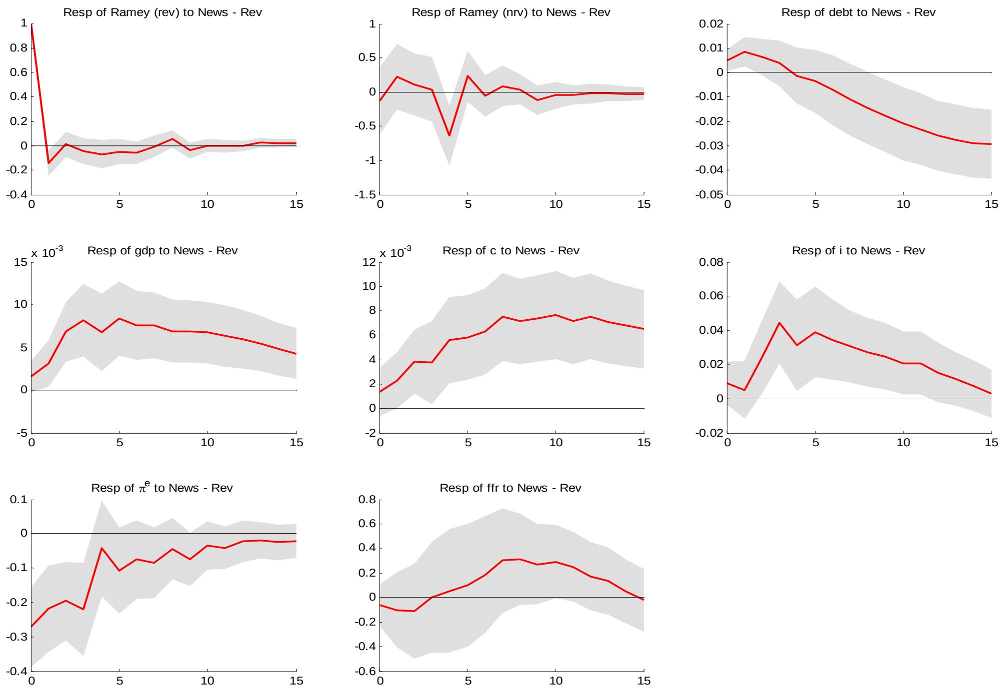
(ix) **Unemployment Rate:** Civilian unemployment rate, FRED Database, Federal Reserve Bank of St. Louis.

(x) **Slope of the Yield Curve:** Difference between the return on the 10 years US Government Bonds and the 3 months Treasury Bills; Federal Reserve Bank of New York; both rates are expressed in annualized terms.

(xi) **Confidence Index:** University of Michigan Confidence Index Indicator; expressed in logs.

10. Figures

1a) Shocks with expected reversal



1b) Shocks without expected reversal

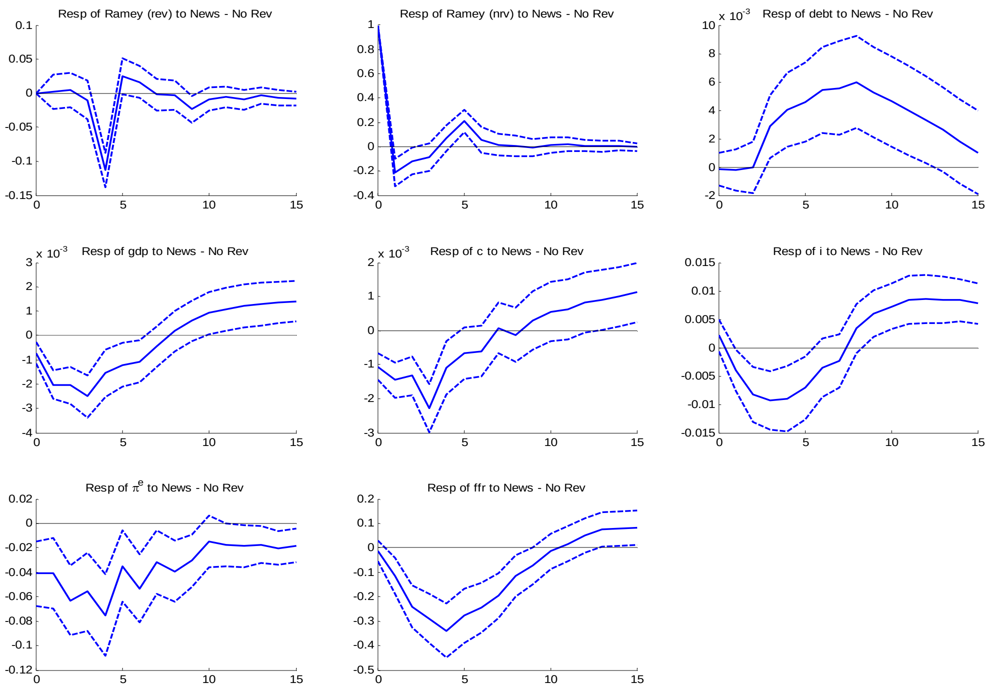
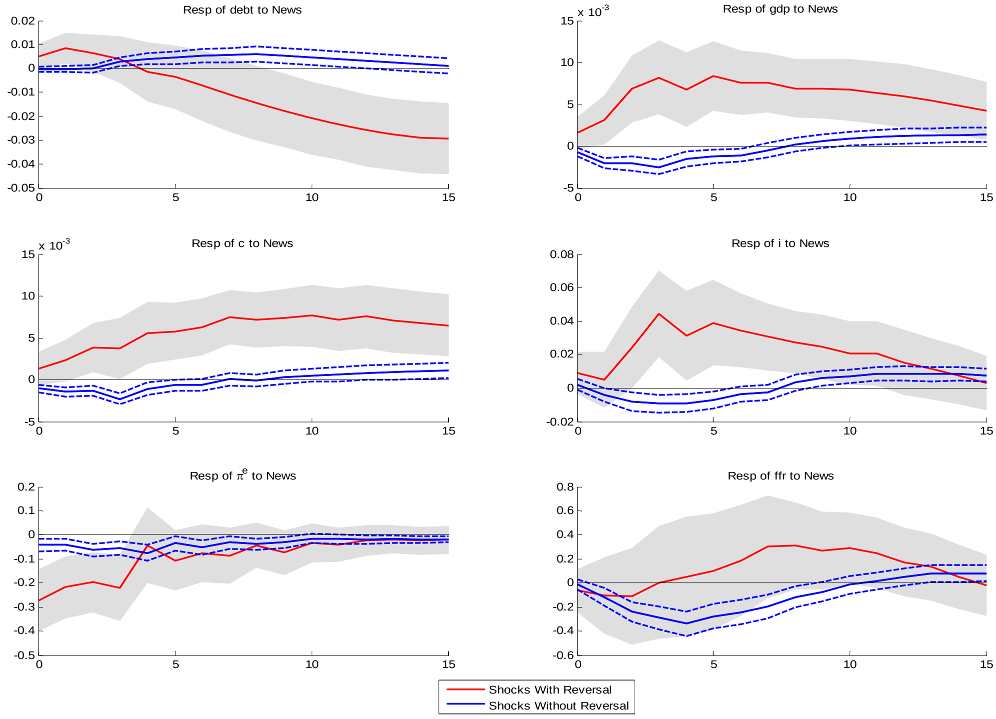


Figure 1a and 1b - BASELINE MODEL: Effects of a defense news shock equal to 1% of GDP. The effects of a shock with expected reversal in public spending are reported in figure 1a, the effects of a shock without expected reversal in figure 1b. The sample includes US data from 1981Q3 through 2008Q3.

1c) Comparison between the effects of the two shocks



1d) Testing the difference in the effects of the two shocks

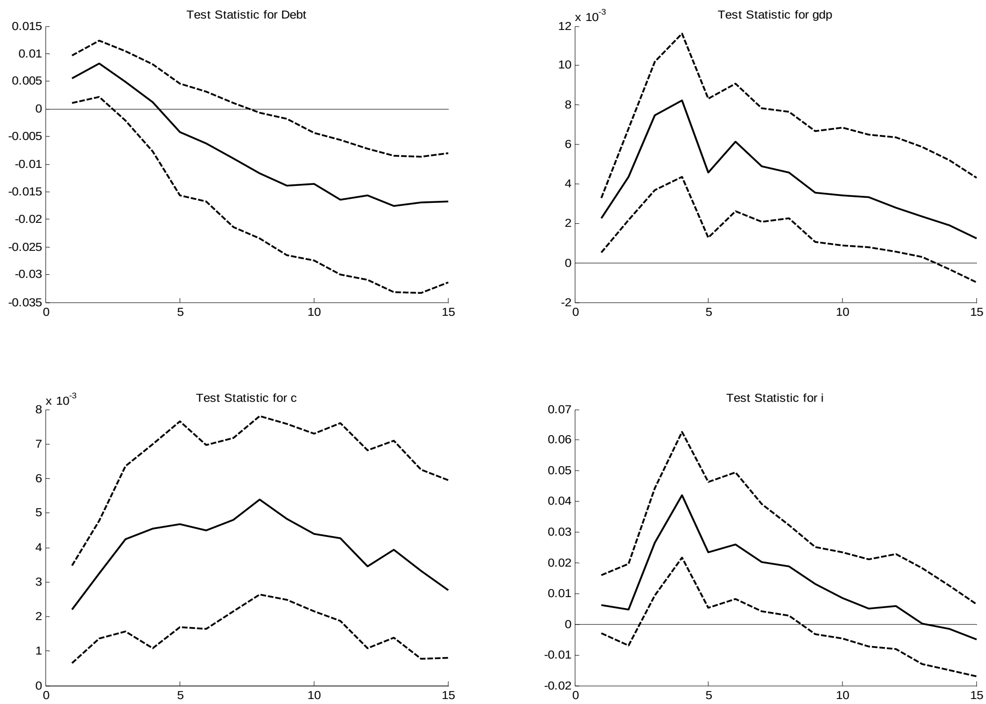
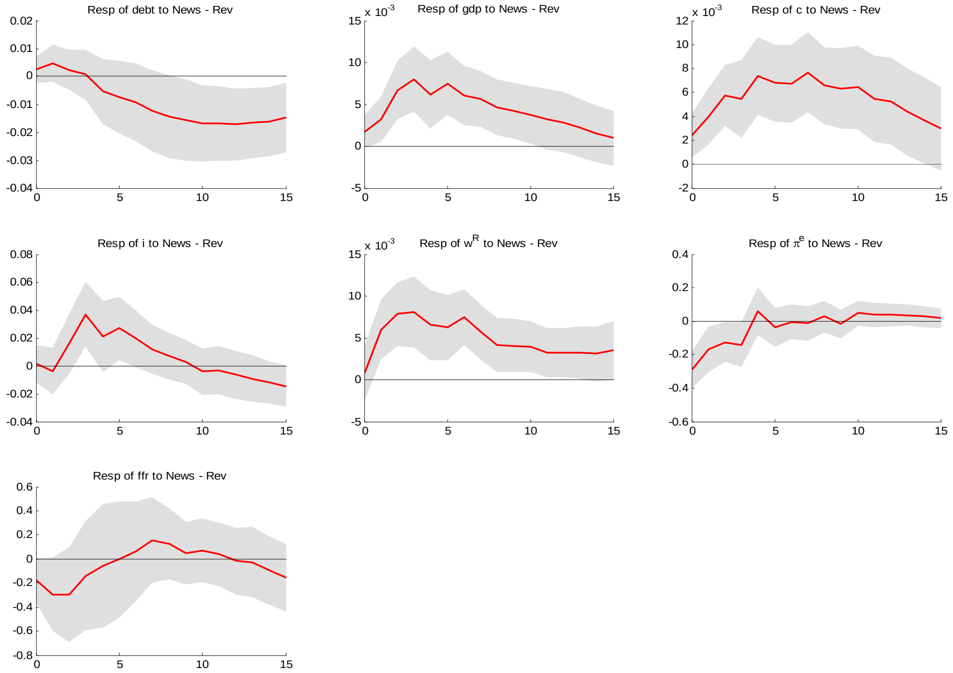


Figure 1c and 1d - BASELINE MODEL: Figure 1c reports a comparison between the effects of shocks with and without expected spending reversals. Figure 1d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon.

2a) Shocks with expected reversal



2b) Shocks without expected reversal

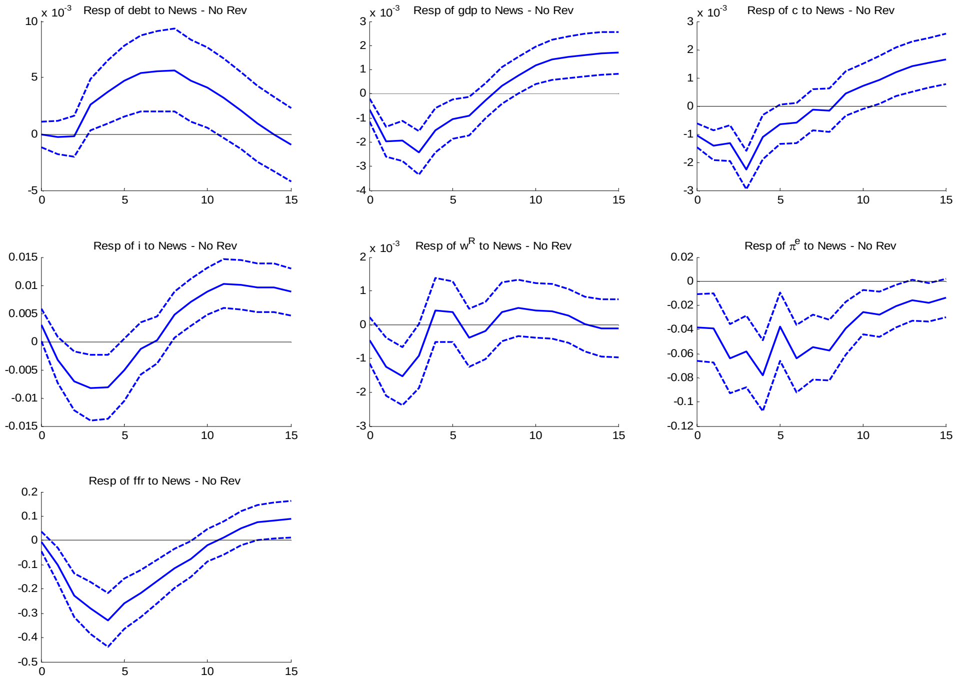
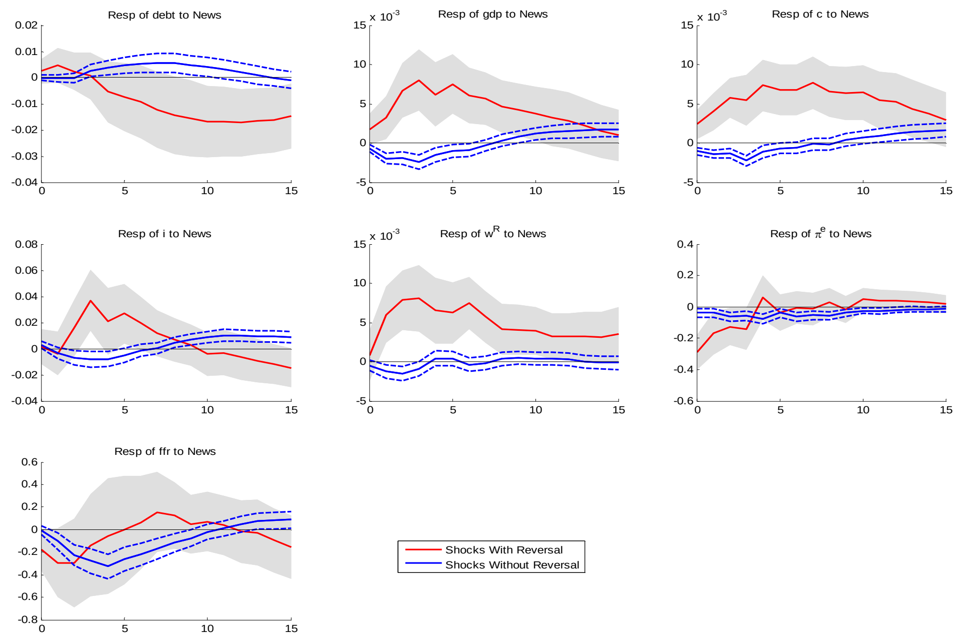


Figure 2a and 2b (real wages): Effects of a defense news shock equal to 1% of GDP, when the baseline model is extended to include also *real wages* (w^R). The effects of a shock with expected reversal in public spending are reported in figure 2a, the effects of a shock without expected reversal in figure 2b. The sample includes US data from 1981Q3 through 2008Q3.

2c) Comparison between the effects of the two shocks



2d) Testing the difference in the effects of the two shocks

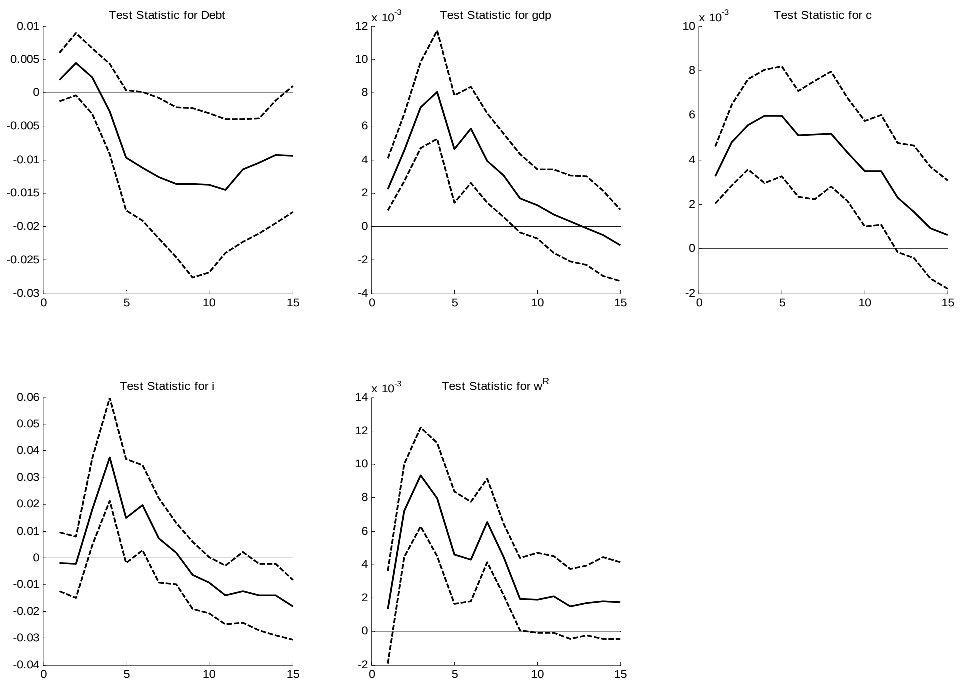
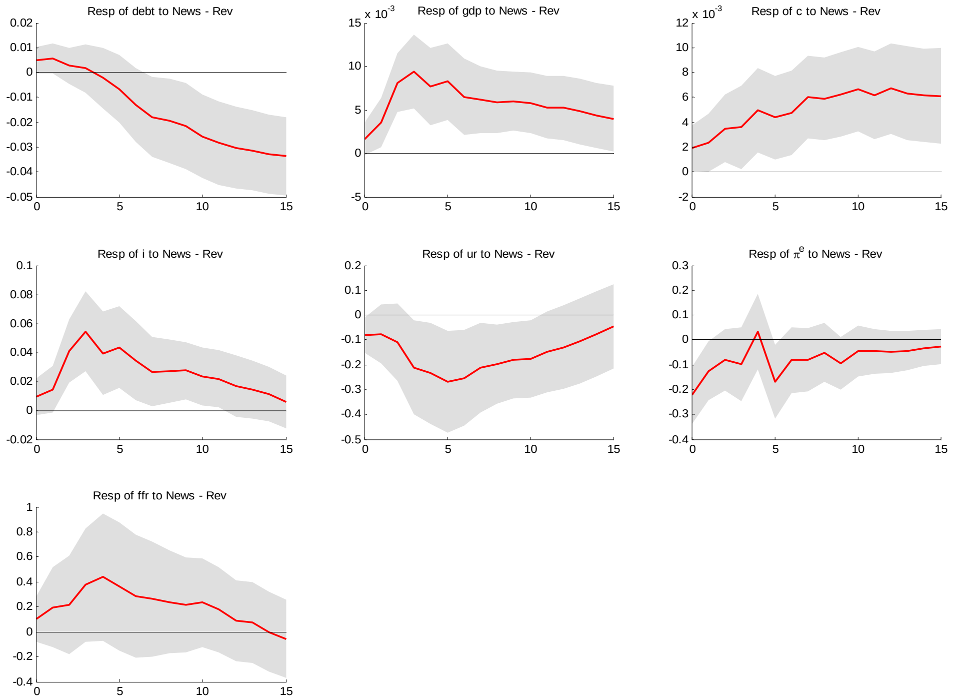


Figure 2c and 2d (real wages): Figure 2c reports a comparison between the effects of shocks with and without expected spending reversals, when the VAR model includes also *real wages* (w^R). Figure 2d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon

3a) Shocks with expected reversal



3b) Shocks without expected reversal

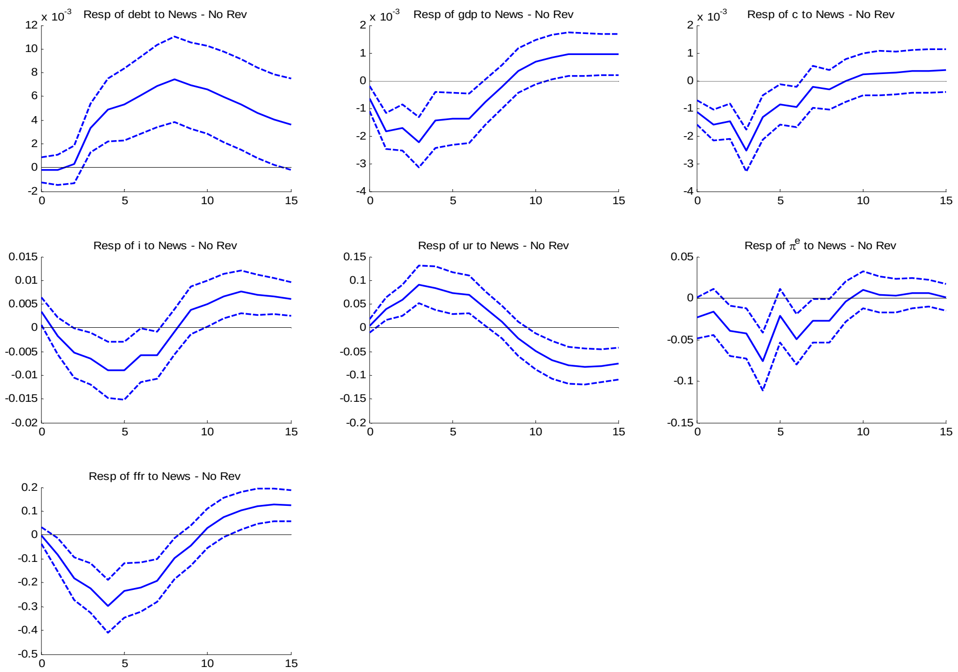
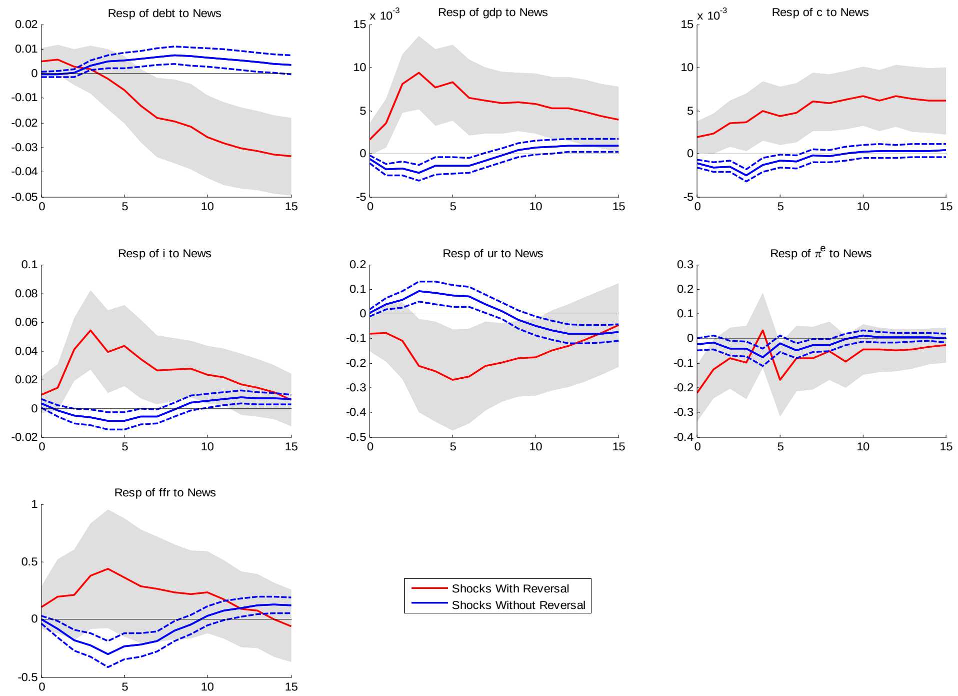


Figure 3a and 3b (unemployment rate): Effects of a defense news shock equal to 1% of GDP when the baseline model is extended to include also *the unemployment rate (ur)*. The effects of shocks with expected reversal in public spending are reported in figure 3a, the effects of a shock without expected reversal in figure 3b. The sample includes US data from 1981Q3 through 2008Q3.

3c) Comparison between the effects of the two shocks



3d) Testing the difference in the effects of the two shocks

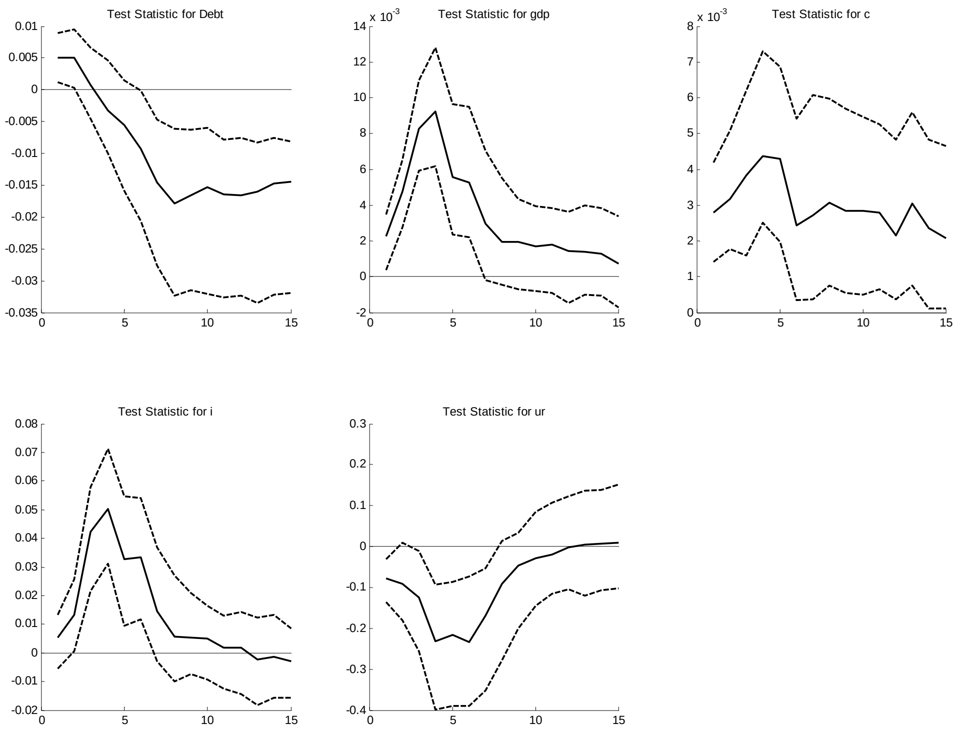
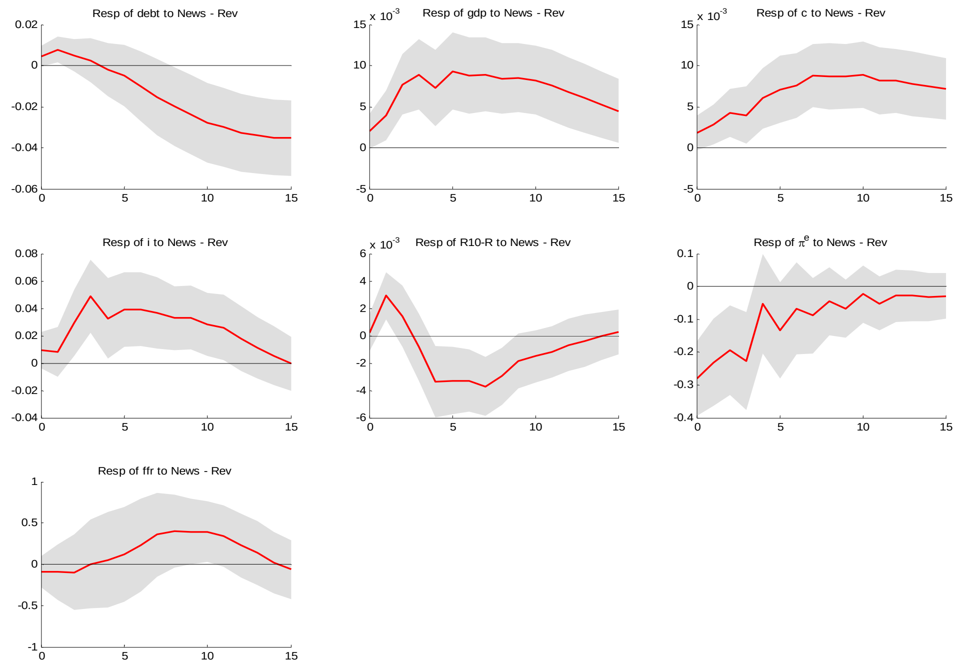


Figure 3c and 3d (unemployment rate): Figure 3c reports a comparison between shocks with and without expected spending reversals, when the VAR model includes also *the unemployment rate (ur)*. Figure 3d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon

4a) Shocks with expected reversal



4b) Shocks without expected reversal

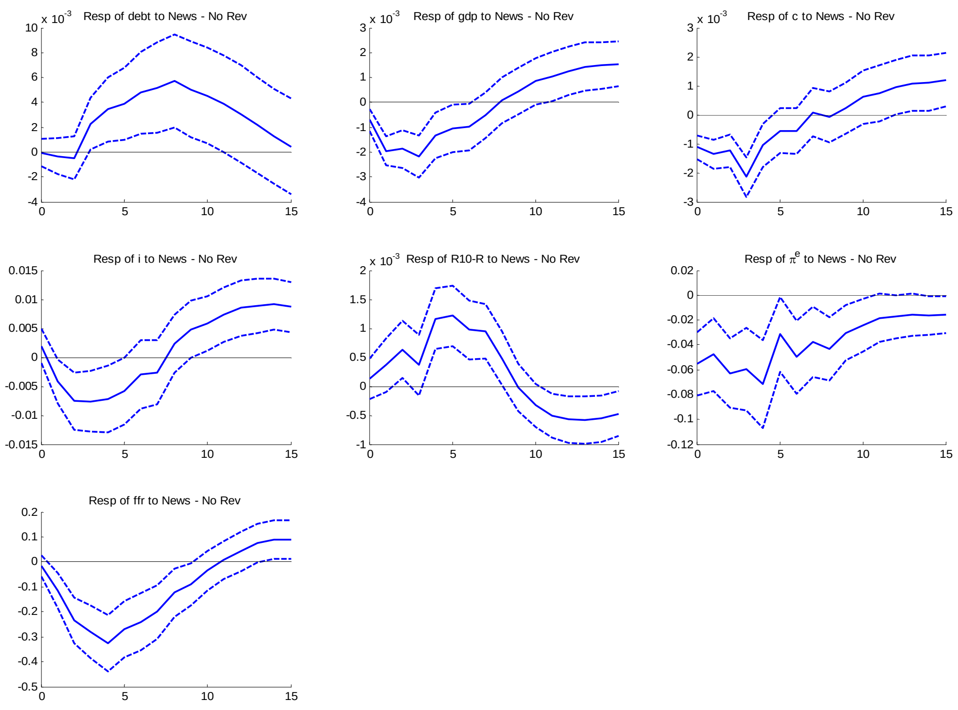
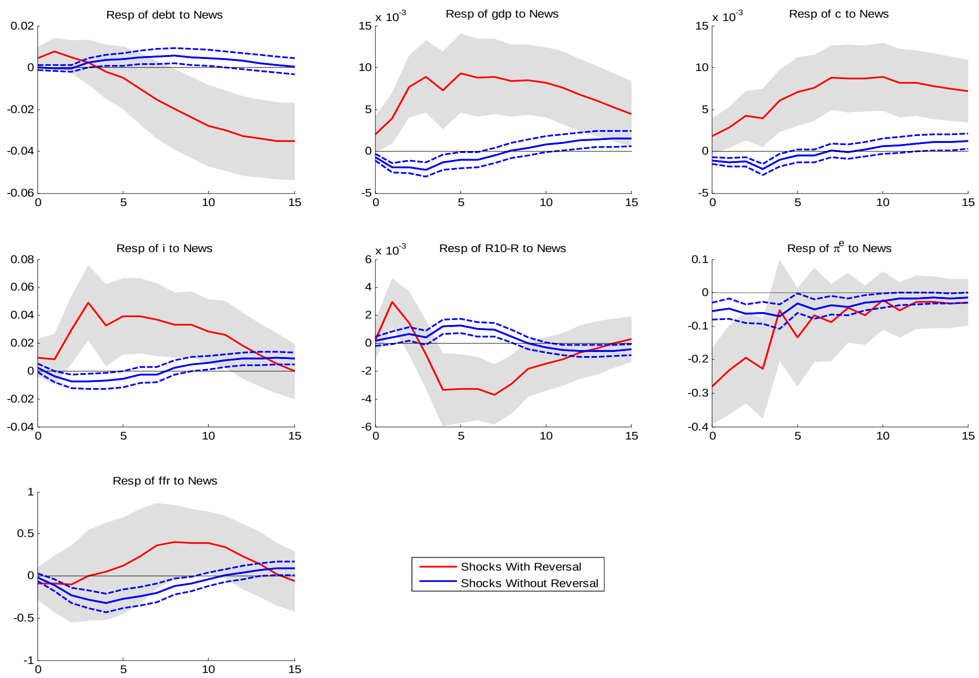


Figure 4a and 4b (slope of the yield curve): Effects of a defense news shock equal to 1% of GDP when the baseline model is extended to include also the *slope of the yield curve (R10-R)*, computed as difference between the yield on the 10-years government bond and the yield on the 3 months Treasury bill. The effects of shocks with expected reversal in public spending are reported in figure 4a, the effects of a shock without expected reversal in figure 4b. The sample includes US data from 1981Q3 through 2008Q3.

4c) Comparison between the effects of the two shocks



4d) Testing the difference in the effects of the two shocks

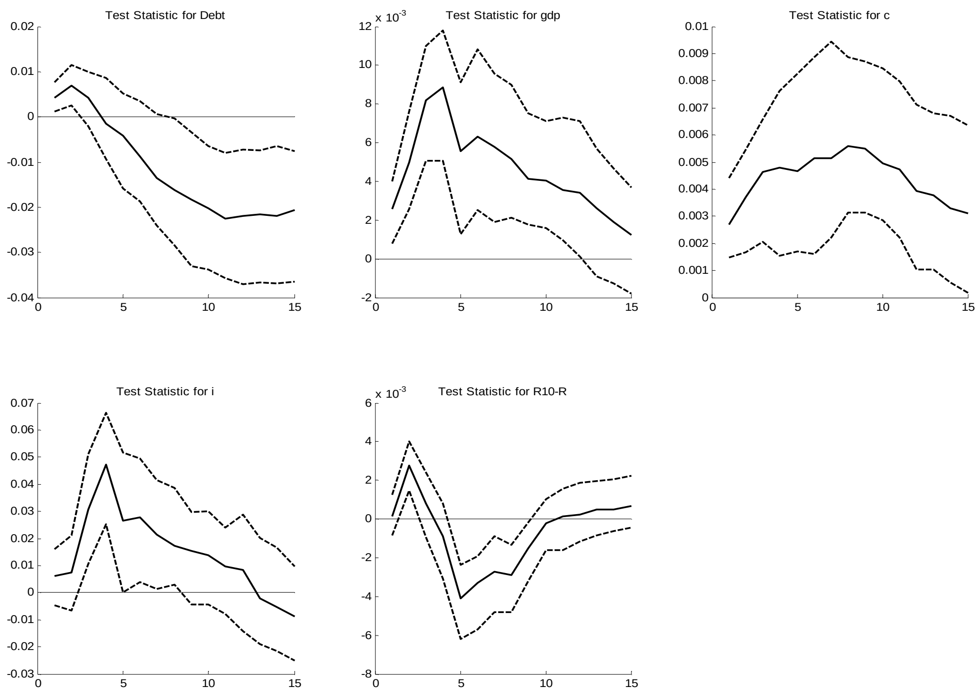
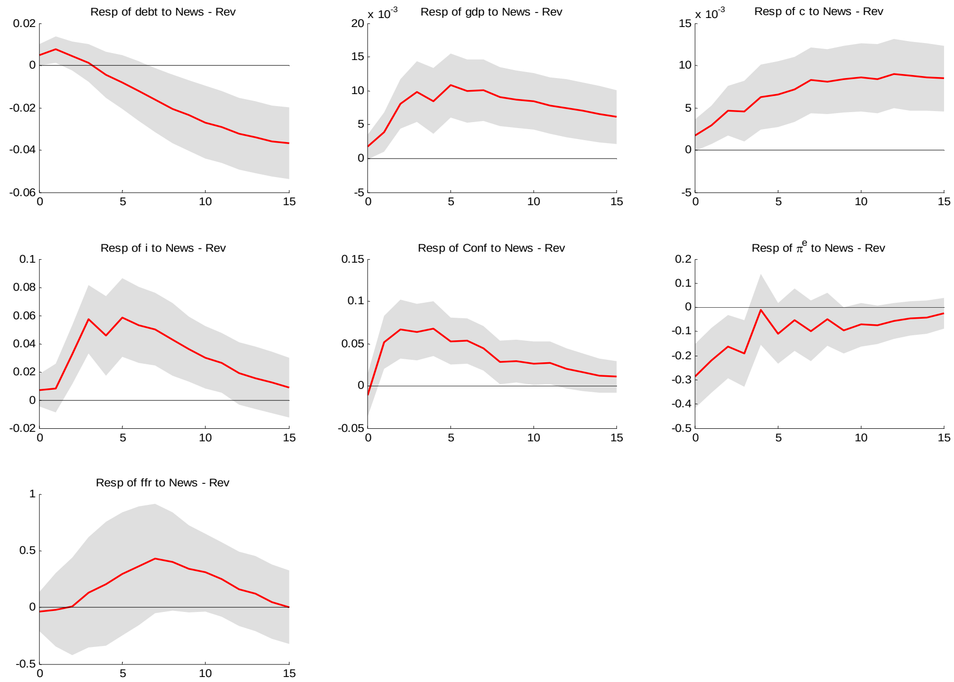


Figure 4c and 4d (slope of the yield curve): Figure 4c reports a comparison between the effects of shocks with and without expected spending reversals, when the VAR model includes also the slope of the yield curve *(R10-R)*, computed as difference between the yield on the 10-years government bond and the yield on the 3 months Treasury bill. Figure 4d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon.

5a) Shocks with expected reversal



5b) Shocks without expected reversal

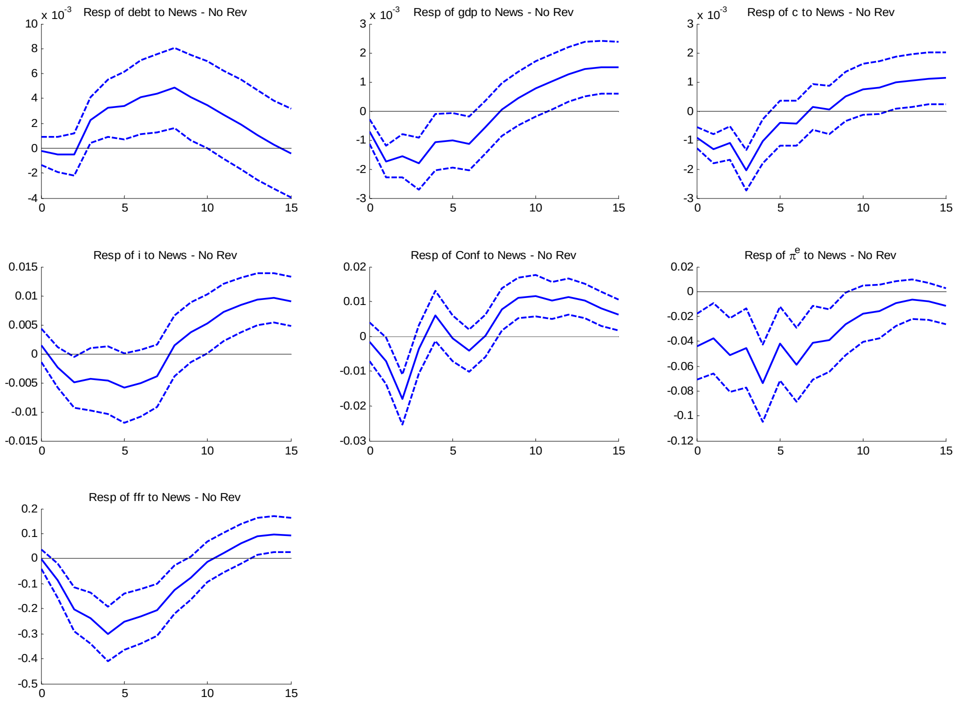
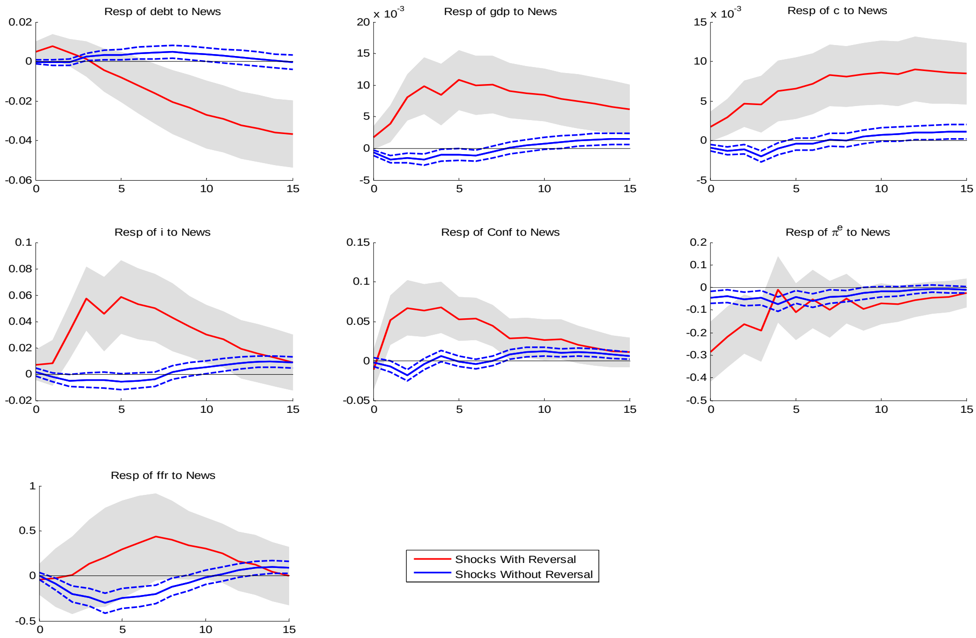


Figure 5a and 5b (Consumers' confidence index): Effects of a defense news shock equal to 1% of GDP when the baseline model is extended to include also the *Consumer's confidence index (Conf)* published by the University of Michigan. The effects of shocks with expected reversal in public spending are reported in figure 5a, the effects of a shock without expected reversal in figure 5b. The sample includes US data from 1981Q3 through 2008Q3.

5c) Comparison between the effects of the two shocks



5d) Testing the difference in the effects of the two shocks

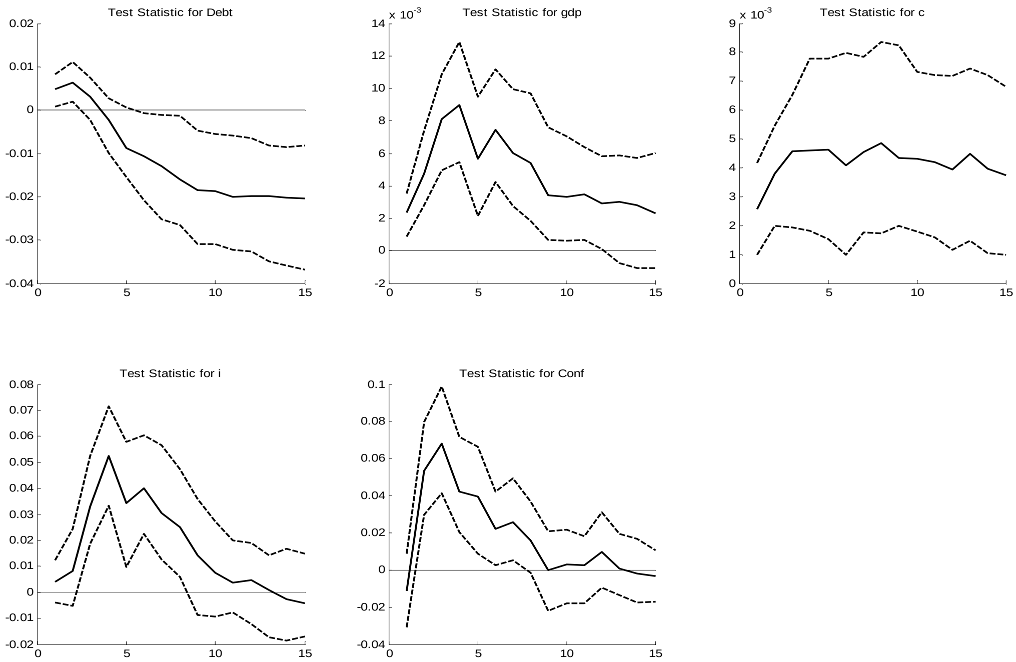
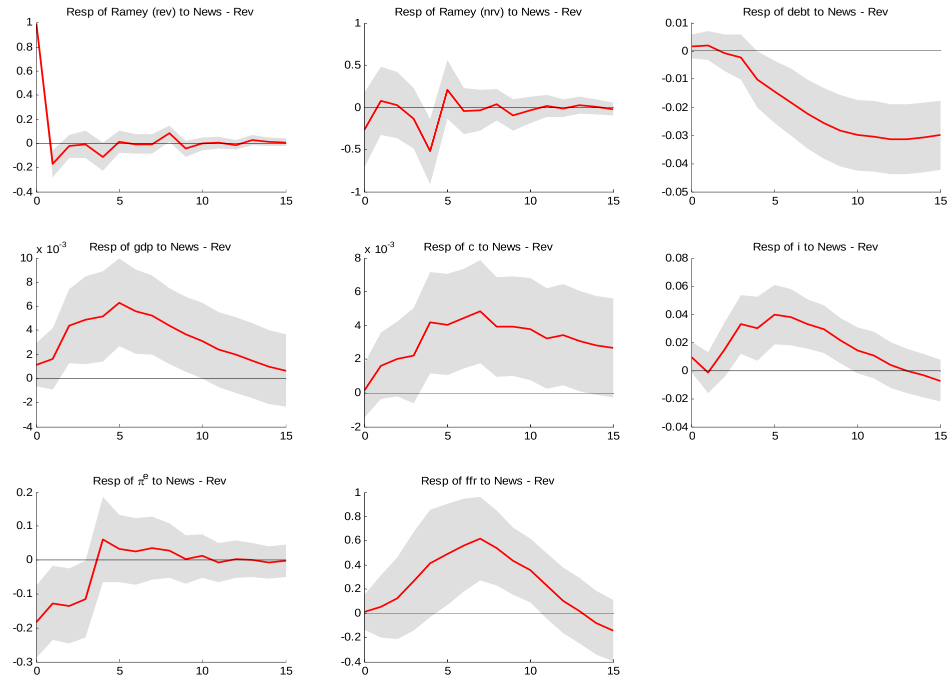


Figure 5c and 5d (Consumers' confidence index): Figure 5c reports a comparison between shocks with and without expected spending reversals, when the VAR model includes also the *Consumers confidence index (Conf)*, published by the University of Michigan. Figure 5d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon.

6a) Shocks with expected reversal



6b) Shocks without expected reversal

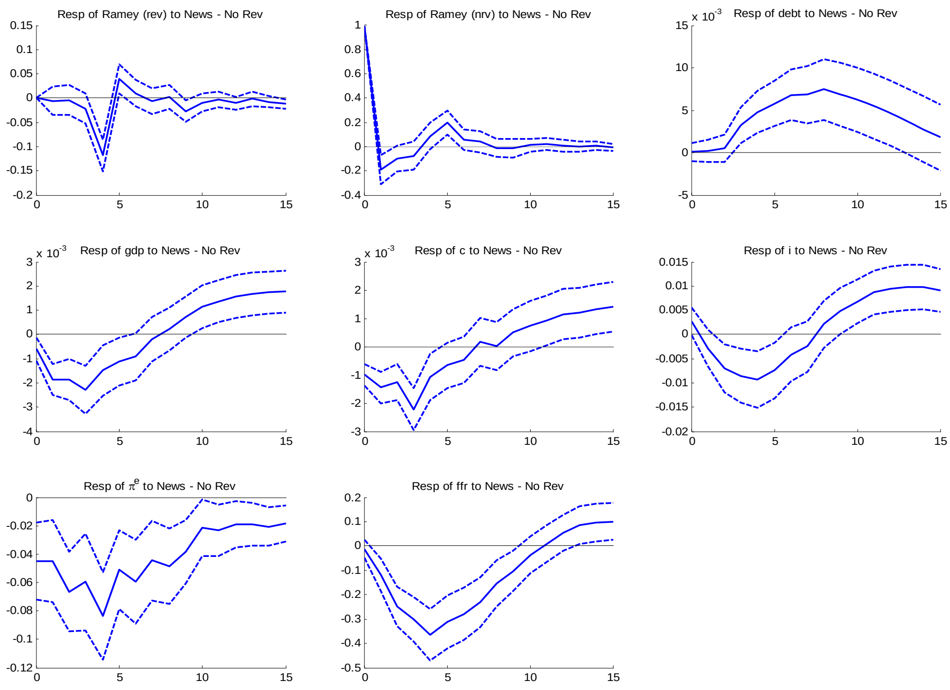
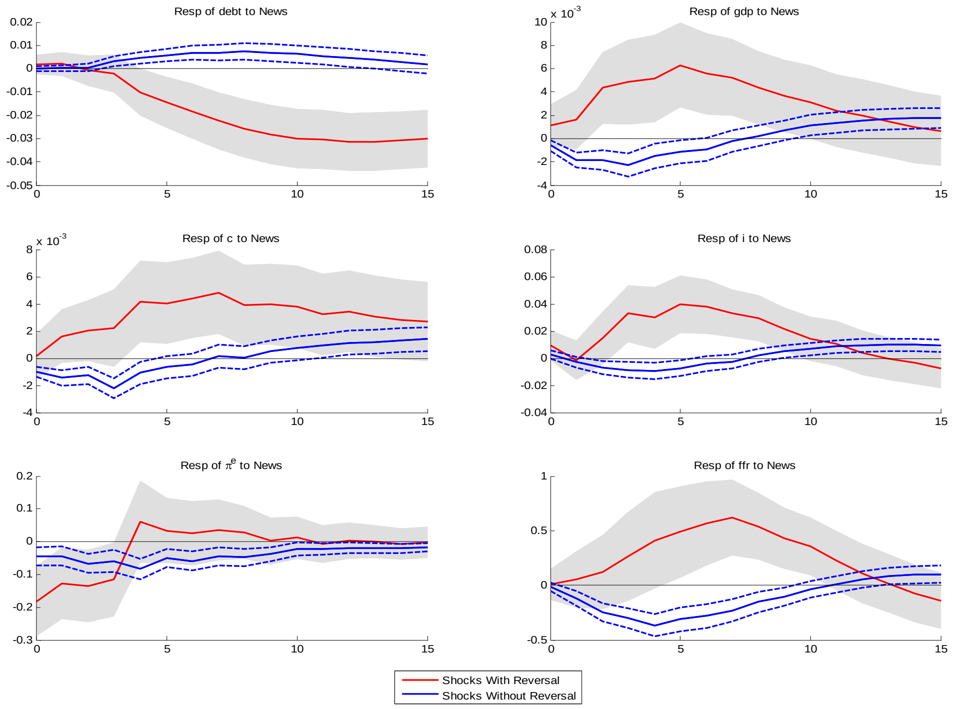


Figure 6a and 6b - 25-years interval: Effects of defense news shock equal to 1% of GDP. The effects of shocks with expected reversal in public spending are reported in figure 6a, the effects of a shock without expected reversal in figure 6b. In this model, reversals are evaluated with respect to a past trend of spending growth estimated over an *interval of 25-years*. The sample includes US data from 1981Q3 through 2008Q3.

6c) Comparison between the effects of the two shocks



6d) Testing the difference in the effects of the two shocks

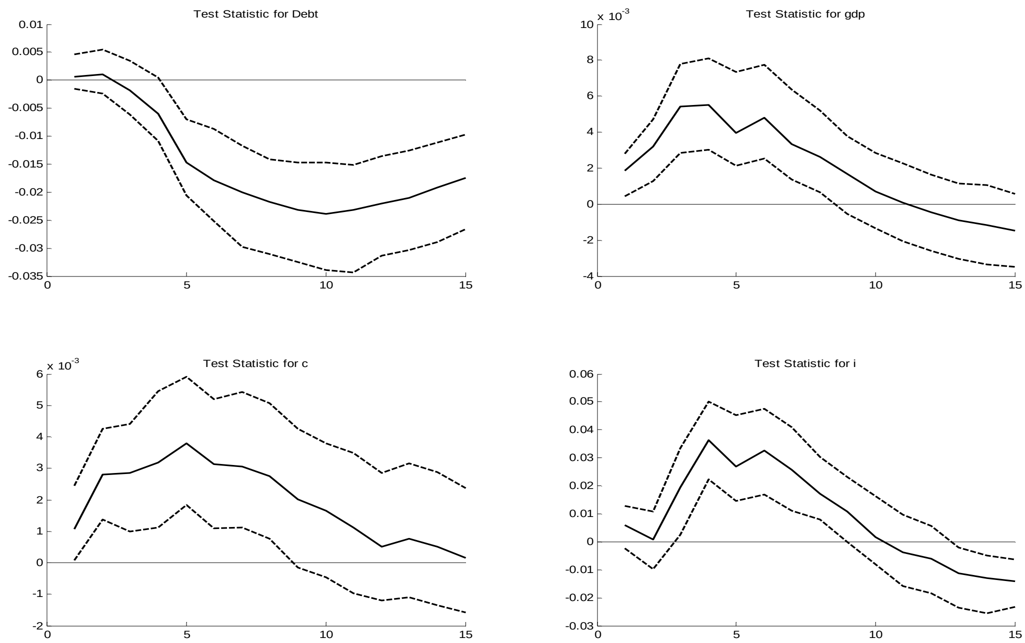
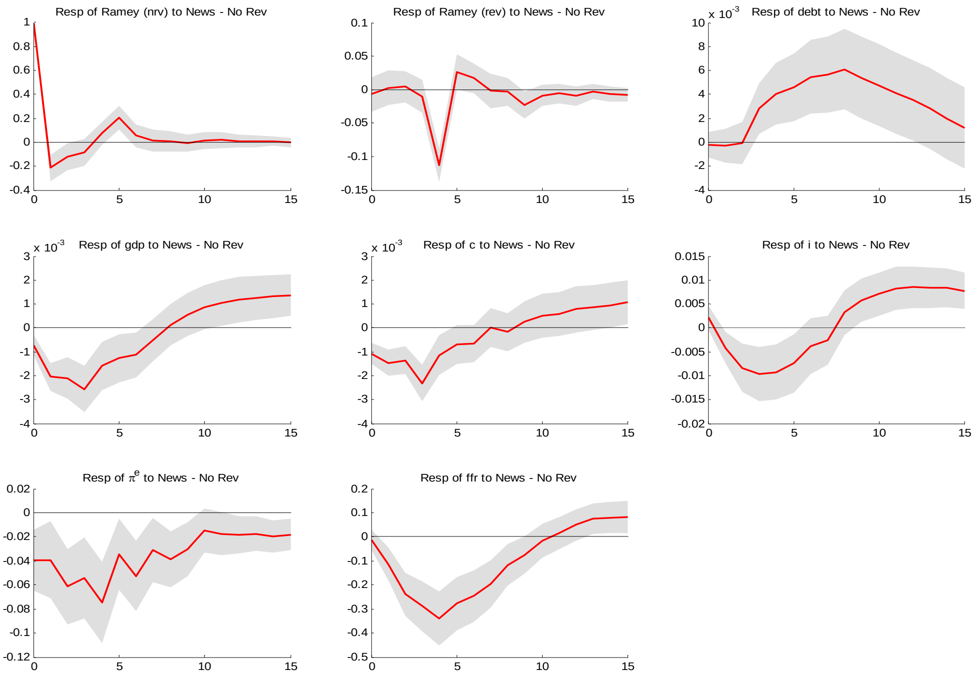


Figure 6c and 6d - 25-years interval: Figure 6c reports a comparison between shocks with and without expected spending reversals, when reversals are evaluated compared to a past *interval of 25-years*. Figure 6d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon.

7a) **Shocks without expected reversal**



7b) **Shocks with expected reversal**

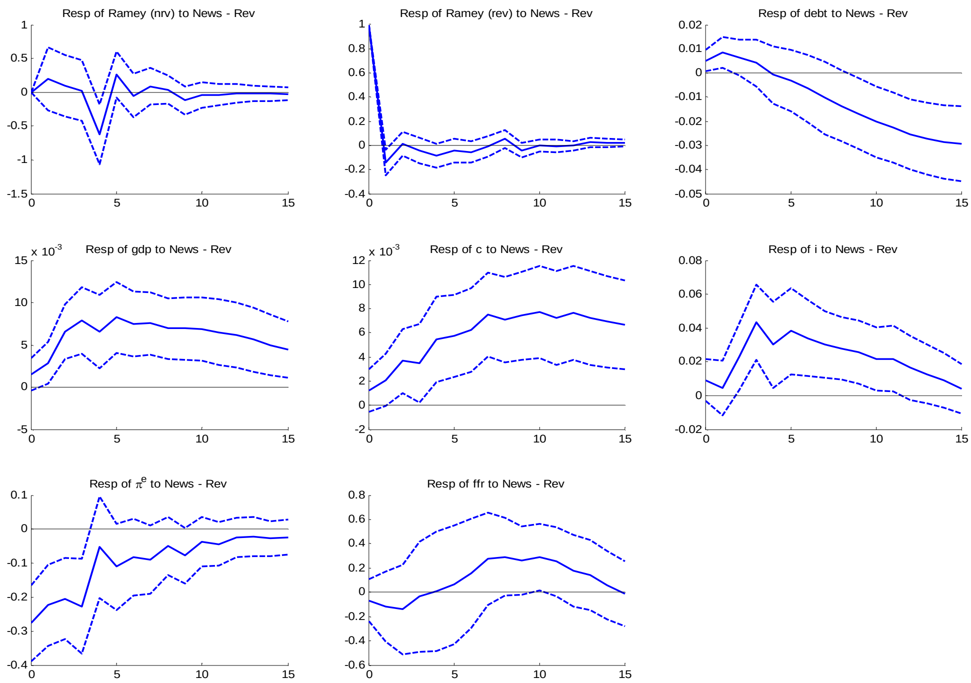
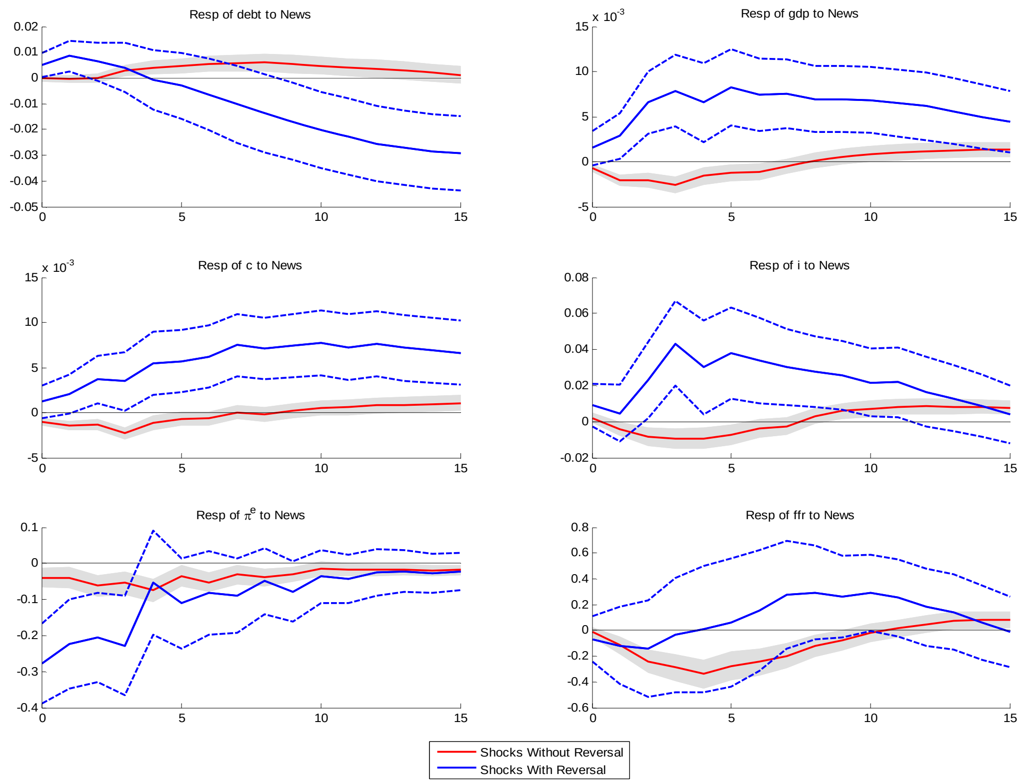


Figure 7a and 7b – inverting the order of shocks: Effects of a defense news shock equal to 1% of GDP. In this exercise, the ordering of defense news shocks is inverted: first in the ordering is the shock with no reversal, then the shock with expected reversal. The effects of shocks *without* expected reversal in public spending are reported in figure 7a, the effects of a shock *with* expected reversal in figure 7b. The sample includes US data from 1981Q3 through 2008Q3.

7c) Comparison between the effects of the two shocks



7d) Testing the difference in the effects of the two shocks

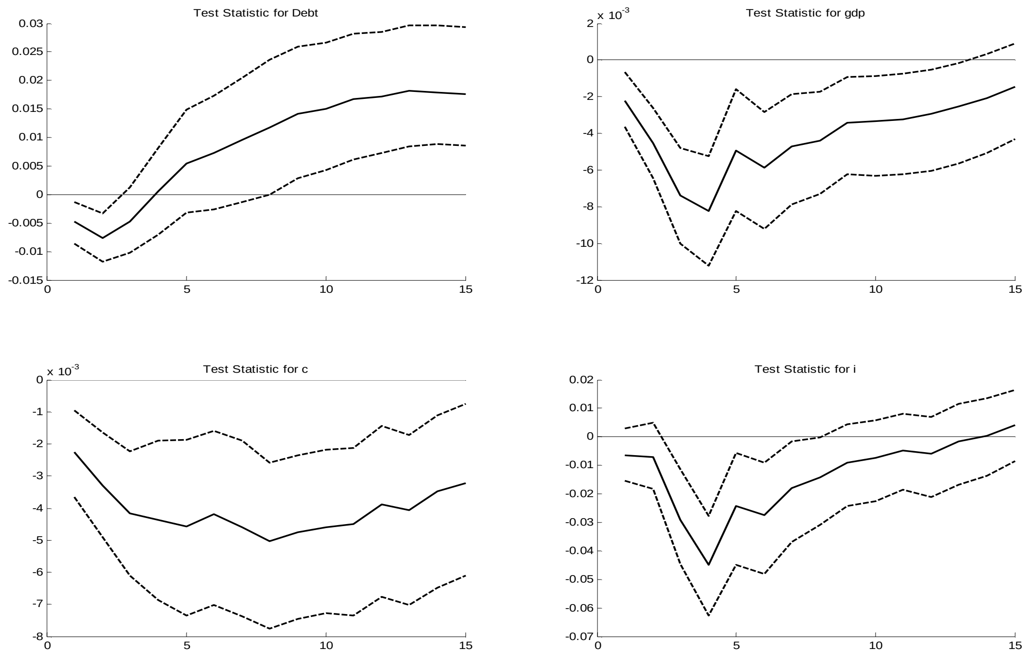


Figure 7c and 7d – inverting the ordering of shocks: In this exercise, the ordering of defense news shocks is inverted: first are shocks with no reversal, then the shocks with expected reversal. Figure 7c reports a comparison between shocks with and without expected spending reversals. Figure 7d reports the statistic constructed to test the difference between the impulse responses in the two cases. The two sets of impulse responses are statistical different at the 68% level for a certain horizon if the confidence bands do not include the zero line at that horizon.