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CONFIDENCE AND THE TRANSMISSION OF GOVERNMENT SPENDING SHOCKS

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ABSTRACT

There seems to be a widespread belief among economists, policy-makers, and members of the media that the "confidence" of households and businesses is a critical component in the transmission of fiscal policy shocks into economic activity. We take this proposition to the data using standard structural VARs with government spending and aggregate output augmented to include empirical measures of consumer or business confidence. We also estimate non-linear VAR specifications to allow for differential impacts of government spending in "normal" times versus recessions. In normal times confidence does not react significantly to unexpected increases in government spending and spending multipliers are in the neighborhood of one; during recessions confidence rises and spending multipliers are significantly larger. We then quantify the importance of the systematic response of confidence to spending shocks for the spending multiplier and find that, in normal times, confidence is irrelevant for the transmission of government spending shocks to output, but during periods of economic slack it is important. We argue and present evidence that it is not confidence per se – in the sense of pure sentiment – that matters for the transmission of spending shocks during downturns, but rather that the composition of spending during a downturn is different. In particular, spending shocks during downturns predict future productivity improvements through a persistent increase in government investment relative to consumption, which is in turn reflected in higher measured confidence.

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“But the hope that monetary and fiscal policies would prevent continued weakness by boosting consumer confidence was derailed by the recent report that consumer confidence in January collapsed to the lowest level since 1992.” – Martin Feldstein, Wall Street Journal, February 20, 2008

“Confidence matters independently of fundamentals!” – Roger Farmer, UCLA Today - Faculty and Staff News - 10 Questions: Economist Roger Farmer

1 Introduction

A widespread belief among economists, policy-makers, and members of the news media is that the “confidence” of households and firms is a critical component in the transmission of policy shocks into economic activity. A sampling of quotes from economists and policy-makers with wide-ranging economic and political philosophies attests to this fact (see Appendix A.1). We take this proposition to the data for the case of government spending shocks. A large literature studies the effects of these shocks on the real economy, while another literature examines the effects of confidence on aggregate fluctuations.¹ To our knowledge no study bridges these two literatures and explicitly examines the relationship between confidence and the transmission of policy shocks. Says John Cochrane (Cochrane, 2009): “Others say that we should have a fiscal stimulus to ‘give people confidence,’ even if we have neither theory nor evidence that it will work.” This paper is a first attempt at the latter.

Barsky and Sims (2011a) show that *surprise* changes in consumer confidence are associated with long-lasting movements in macroeconomic aggregates. They argue that this relationship between confidence and the economy obtains because empirical measures of confidence are reflective of changes in future economic fundamentals, in particular productivity. In contrast, they argue that *autonomous* fluctuations in confidence unrelated to fundamentals – i.e. what one might call “animal spirits” or “pure sentiment” – are unlikely to be an important source of economic fluctuations. Their analysis is, however, silent on whether the *systematic* behavior of confidence is important in the propagation of other shocks. We address this question in this paper.

Given that there is no off-the-shelf workhorse model for confidence or even a widely accepted channel by which confidence might matter in the transmission of fiscal policy shocks,

¹Examples for the first group of papers are Shapiro and Ramey (1998), Mountford and Uhlig (2009), Blanchard and Perotti (2002), Rossi and Zubairy (2010), Auerbach and Gorodnichenko (2011), Ramey (2011), Feyrer and Sacerdote (2011), Nakamura and Steinsson (2011), and Shoag (2011). Examples for the second group of papers are Carroll, Fuhrer, and Wilcox (1994), Matsusaka and Sbordone (1995), Barsky and Sims (2011a), and Barsky and Sims (2011b).

we use structural vector autoregressions (VAR), which need a minimum of theoretical restrictions, to identify government spending shocks and their effects on the macroeconomy. As David Laibson and co-authors recently wrote, “If a sample of macroeconomists were forced to write down a formal model of animal spirits, most wouldn’t know where to start and the rest would produce models that had little in common” (Fuster, Laibson, and Mendel, 2010).

We estimate VARs with a measure of government spending, an empirical measure of either consumer or business confidence, and aggregate output. The widely accepted identifying restriction to isolate government spending shocks is that spending shocks impact the economy immediately, whereas government spending only reacts to other shocks with a delay (e.g. Blanchard and Perotti, 2002; Ramey, 2011; Rossi and Zubairy, 2010). This amounts to a recursive identification with government spending ordered first. We implement this assumption throughout the paper, allowing confidence to directly and immediately respond to surprise changes in government spending.

In such a VAR, the impulse response of output to a government spending shock is the sum of two effects. First, there is a *direct* effect, because the government spending shock is allowed to have a contemporaneous effect on output. This effect captures the standard notion of a pure fiscal output multiplier. In addition, there is an *indirect* effect where fiscal policy influences confidence which in turn influences output. It is the hypothetical impulse response which features only the direct effect that we isolate and compare to the actual impulse response in order to answer the question of how important the systematic response of confidence to a spending shock is in the transmission of that spending shock into output. We do this decomposition using the methodology proposed in Bernanke, Gertler, and Watson (1998), Sims and Zha (2006), and Kilian and Lewis (2011). It amounts to constructing a hypothetical sequence of some other shock in the system so as to leave the impulse response of confidence to a spending shock zero at all horizons. As a first pass we use confidence innovations ordered second in a recursive identification for this purpose.

In conventional linear specifications of the underlying VARs we find little evidence to support the notion that confidence is an important part of the transmission of spending shocks into economic activity. The estimated spending multipliers are generally just below unity (see Hall, 2009, for an overview of the literature). Confidence typically declines slightly on impact in response to a spending shock and rises after a few quarters, though this response is economically small and statistically insignificant. The hypothetical impulse responses of macroeconomic aggregates in which we isolate the direct effect of government spending on output without the systematic movement of confidence are very similar to the actual responses. These findings are robust to a variety of different specifications, including ones in which we directly control for anticipated changes in government spending (Ramey, 2011). In

short, confidence does not appear to be a part of the transmission of government spending shocks in normal times.

Recent theoretical (Christiano, Eichenbaum, and Rebelo, 2009; and Woodford, 2010) and empirical (Auerbach and Gorodnichenko, 2011; and Shoag, 2010) work has emerged arguing that government spending multipliers might be large during periods of economic slack. To capture the idea of government spending shocks having different effects during recessions, we also estimate non-linear VAR specifications. Following Auerbach and Gorodnichenko (2011), we allow the parameters of the VAR to differ during periods in which economic growth has been weak for an extended period of time. Similar to them, we find that spending multipliers are significantly larger during recessions than in normal times. In particular, our estimated maximum spending multipliers range between 2 and 3 during recessions. Also, we find that confidence significantly rises on impact following a positive spending shock in a recession.²

These findings suggest that confidence may be an important part of the transmission of spending shocks during periods of economic distress. Indeed, in the non-linear VAR specifications the hypothetical impulse response of output to a government spending shock based only on the direct effect of government spending on output is much smaller than the actual one. The estimated hypothetical spending multipliers are much closer to those from the linear case, i.e. just below unity.

It is important to stress that the recessionary impulse responses of output to a spending shock are small on impact, and are only large after a number of quarters. Indeed, the response of output looks similar to the slowly-building response following a “news shock” about future productivity (Beaudry and Portier, 2006; Barsky and Sims, 2011b). To investigate further, we include in the VAR output per hour as a measure of labor productivity. We show that, in a recession, a positive government spending shock is also associated with a slowly-building and prolonged increase in productivity. Furthermore, when we isolate the direct effect of the government spending shock, output and productivity react similarly to the linear case. Given Barsky and Sims’ (2011a) findings about the relationship between confidence and future productivity, these results suggest that the confidence innovations we identify may be an amalgamation of “pure” confidence innovations, by which we mean fluctuations in “sentiment” that are unrelated to fundamentals, and news about fundamentals.

We therefore modify the basic approach so as to isolate structural shocks in the system. In particular, we identify what we call a “fundamentals” shock as a shock that explains productivity in the long run and that is uncorrelated with the government spending shock. We identify a “sentiment” shock as an innovation in confidence orthogonalized with respect

²Mertens and Ravn (2010) provide a theoretical example where, in contrast, aggregate demand stimulation decreases consumer confidence.

to both the government spending and “fundamentals” shocks. We then ask whether the large indirect effect of government spending on output that operates through confidence is mainly due to the fundamental content or the sentiment content in measured confidence. We thus separately create hypothetical impulse response functions where we eliminate, respectively, the indirect effect from future fundamentals and sentiment. Without the indirect sentiment effect the output and productivity responses to a spending shock are nearly the same as in the actual response. In contrast, without the indirect fundamental effect the output and productivity responses to the spending shock are much smaller at all horizons. These results suggest that it is not sentiment that is important in the transmission of government spending shocks during times of economic slack, but rather a channel that works through productivity at medium horizons.

This productivity channel is also consistent with our last finding: the composition of government spending in response to identified spending shocks is very different in recessions compared to normal times. In particular, we show that a spending shock in a recession leads to a persistent increase in the amount of government investment relative to government consumption; this is not the case in normal times. This relative increase in government investment spending causes future productivity increases. The systematic response of confidence appears to largely reflect this policy-induced change.

The remainder of the paper is organized as follows. Section 2 reviews mechanisms for why confidence might matter for the transmission of spending shocks. Section 3 describes the data and our empirical strategy. Section 4 presents our main results. Section 5 discusses why confidence matters for the transmission of spending shocks during recessions. The final section concludes.

2 Why Might Confidence Matter?

An old idea (Keynes, 1936) that has gained recent attention (Akerlof and Shiller, 2008) is that “animal spirits” in consumer and in particular business sentiment are central to understanding economic fluctuations. While intriguing, this idea lacks a widely accepted theoretical structure, and has met with limited empirical success (see Barsky and Sims, 2011a, as well as Luzzetti and Ohanian, 2010). Loosely speaking, the idea is that aggregate sentiment determines aggregate spending, which in turn determines aggregate output and employment. Fiscal or monetary shocks from the government might signal a commitment to aggregate stability, thereby raising sentiment, stimulating demand, and leading to an economic expansion. This idea is related to the “sunspot” framework popularized by Farmer (1998) and others, which holds that there are, at any time, multiple aggregate equilibria.

Stimulating sentiment could cause the economy to jump from a “bad” equilibrium to a “good” one.

Another related possibility includes a role for informational frictions and strategic complementarities in a world in which households fail to perfectly observe aggregate fundamentals and use observed variables like aggregate output to form beliefs about the true fundamentals (see Lorenzoni, 2009). Following a recession there might be induced sluggishness – the true fundamentals might have improved but beliefs about the fundamentals are slow to catch up, hence putting a brake on the recovery. By engaging in expansionary fiscal or monetary policies, the government may be able to convince agents that fundamentals have improved, thereby facilitating recovery.

Recently, Bai, Rios-Rull and Storesletten (2011) have advocated a model of consumer search where the (variable) search effort of consumers is an input of the aggregate production function. In such a context, one might interpret confidence as search effort and thus stimulative fiscal policy as having a positive impact on the willingness to search and shop.

Another possibility is that empirically measured confidence is a measure of a time-varying discount factor – periods of high confidence are periods in which households discount the future more, and thus are more willing to spend. If policies can lead to an increase in confidence, they might therefore stimulate demand over and above what would happen under normal transmission channels.

And finally there is the view in Barsky and Sims (2011a) that autonomous innovations to confidence merely reflect autonomous news about future fundamentals. This means that fiscal policy, for example through investment in infrastructure, R & D and education, might change agents’ views about these future fundamentals and thus generate important systematic movements in confidence. We provide evidence that is consistent with this view.

3 Data and Methodology

3.1 Data

Quarterly real GDP is taken from the BEA. We measure real government spending as the sum of government consumption and gross investment. We divide both aggregate quantities by the civilian non-institutionalized population aged 16 and over.

We draw on two data sources for subjective measures of confidence – one for households and one for businesses. The Michigan Survey of Consumers polls a nationally representative sample of households on a variety of questions concerning personal and aggregate economic conditions. We focus on the Index of Consumer Expectations, which is an aver-

age of the indices from three different forward-looking survey questions – one concerning expectations about *aggregate* business conditions over the next year, another concerning expectations about aggregate business conditions over the next *five* years, and the third concerning *personal* financial conditions over the next year. These data are available at a quarterly frequency beginning in the first quarter of 1960.³

For business confidence we use the Conference Board’s CEO Confidence Survey, which is available at a quarterly frequency beginning in 1976. Figures 1 and 2 plot each confidence series over time. The shaded gray areas are recessions as dated by the National Bureau of Economic Research.

3.2 Identifying Government Spending Shocks

Much of the empirical literature on the identification of government spending shocks is or can be cast in a vector autoregression framework. Let g_t be a time series measure of government spending, and x_t be a $k \times 1$ vector of other time series of interest observed at time t , (e.g. output). Let $Y_t = [g_t \ x_t]'$ be $(k + 1) \times 1$. The structural VAR can be written (abstracting from the constant term) as:

$$A_0 Y_t = \sum_{j=1}^p A_j Y_{t-j} + \varepsilon_t \quad (1)$$

p is the lag length and ε_t is a $(k + 1) \times 1$ vector of structural shocks, defined as being uncorrelated with one another. A_0 is the impact matrix. Restrictions must be imposed on A_0 to uniquely recover the structural form. Following Blanchard and Perotti (2002), most of the literature imposes that in the first row of A_0 all elements but $(1, 1)$ be zero. Economically, this assumption means that all the variables in x_t react immediately to government spending shocks, whereas government spending does not react on impact to other shocks in the system. Given the delays inherent in the legislative system, this is a natural assumption. In an econometric sense, the identifying assumption is equivalent to a Choleski factor with g_t ordered first applied to the variance-covariance matrix of reduced-form innovations, Ω_u , where $u_t = A_0^{-1} \varepsilon_t$, and where we interpret $\varepsilon_{1,t}$ as the structural government spending shock.

3.3 Isolating the Role of Confidence

So as to fix ideas, let $x_t = [conf_t \ y_t]'$, where $conf_t$ is an empirical measure of confidence and y_t is log real GDP. The identifying assumption on the timing effects of government spending

³In Appendix A.2 we replace consumer confidence with a measure of consumer *uncertainty* (the cross-sectional standard deviation of the answers to the “personal finance” question in the consumer survey).

is as above. The system can be written as:

$$\begin{pmatrix} 1 & 0 & 0 \\ a_{2,1} & 1 & a_{2,3} \\ a_{3,1} & a_{3,2} & 1 \end{pmatrix} \begin{bmatrix} g_t \\ conf_t \\ y_t \end{bmatrix} = \sum_{j=1}^p A_j \begin{bmatrix} g_{t-j} \\ conf_{t-j} \\ y_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix} \quad (2)$$

Let us first look at how confidence *on impact* influences the transmission of spending shocks into the other variables of interest. If confidence reacts to government spending immediately ($a_{2,1} \neq 0$), and output reacts to confidence immediately ($a_{3,2} \neq 0$), then $a_{2,1} \times a_{3,2}$ measures the “confidence” channel of government spending on impact. This is the *indirect* impact effect. In contrast, $a_{3,1}$ is the *direct* impact effect of spending on output.

In addition, confidence can operate as a *propagation* mechanism of spending shocks, whether it has an impact effect or not. For example, if confidence reacts to spending shocks at any horizon, and if the coefficients on lagged confidence are (economically) significant in the output equation, then the dynamic response of confidence to a spending shock will have an effect on the dynamic response of output to a spending shock.

Our objective is to statistically isolate the direct effect (in a dynamic sense) of spending shocks on output from the indirect effect operating through confidence, where this indirect effect consists of both the indirect impact effect and the propagation mechanism discussed above. In particular, we construct a hypothetical impulse response of output to a government spending shock *holding confidence fixed at all forecast horizons*. A comparison of this hypothetical response with the actual impulse response allows us to quantify how important confidence is as a transmission mechanism of government spending shocks.

In order to do so, we need to first impose more structure on A_0 . While the timing assumption that government spending does not react within period to confidence or output is sufficient to identify $a_{2,1}$ and $a_{3,1}$, an additional restriction is required to identify $a_{3,2}$ and $a_{2,3}$. We begin by imposing that $a_{2,3} = 0$, which amounts to identifying the system under a Choleski decomposition with confidence ordered second and output ordered third. We then interpret $\varepsilon_{2,t}$ as a confidence shock and $\varepsilon_{3,t}$ as a residual output shock. We use confidence shocks to “zero out” the confidence response to a spending shock. Put differently, we answer the following question: while on average the output response to a government spending shock is comprised of the direct effect and the indirect effect (through confidence), and government spending and confidence shocks are uncorrelated - how would output have responded in a hypothetical situation where confidence shocks in the same structural economy completely offset the effects of the government spending shock on confidence? This eliminates the indirect effect and isolates the direct effect of government spending on output. Notice that this is a purely statistical decomposition of the actual average impulse response. We have simu-

lated data from fully-specified DSGE models (both with and without an independent role for confidence) and conducted our decomposition on simulated data. The results are remarkably good (and available upon request from the authors) and suggest that our empirical approach does in fact do a good job of isolating the role of confidence in the transmission of spending shocks. Our approach is similar to the methodology used by, for example, Bernanke, Gertler, and Watson (1998), Sims and Zha (2006), as well as Kilian and Lewis (2011).⁴

Once the restriction has been imposed on $a_{2,3}$ and A_0 has been recovered, the structural form of the system specified above can be written as:

$$Y_t = \sum_{j=1}^p A_0^{-1} A_j Y_{t-j} + A_0^{-1} \varepsilon_t \quad (3)$$

We can write this more compactly in companion matrix form as a VAR(1) by defining $Z_t = [Y_t \ Y_{t-1} \ \dots \ Y_{t-p+1}]$:

$$Z_t = \Lambda Z_{t-1} + A_0^{-1} \varepsilon_t, \quad \Lambda = \begin{pmatrix} A_0^{-1} A_1 & A_0^{-1} A_2 & \dots & \dots & A_0^{-1} A_p \\ I & 0 & 0 & \dots & 0 \\ 0 & I & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & \dots & \dots & I & 0 \end{pmatrix} \quad (4)$$

Let e_i be a selection row vector of dimension 1×3 , with a one in the i^{th} place and zeros elsewhere. Let $A_0^{-1}(q)$ be the q^{th} column of A_0^{-1} . The impulse response of variable i to structural shock q at horizon $h = 1, \dots, H$ is:⁵

$$\Phi_{i,q,h} = e_i \Lambda^{h-1} A_0^{-1}(q) \quad (5)$$

The thought experiment of holding confidence fixed in response to a change in government spending requires setting $\Phi_{2,1,h} = 0$ at each forecast horizon, where 2 is the position indicator for confidence and 1 is the index of the spending shock. We accomplish this by creating a

⁴There is an alternative interpretation of our research question whether confidence matters in the transmission of government spending shocks. While in the baseline approach we *fix the underlying economic environment* and study particular statistical shock combinations that hit this economy, one could also study the output response to a government spending shock in a *different and restricted economy*, where we restrict government spending not to move confidence at any horizon. In practice, this amounts to a restricted VAR estimation, setting $a_{2,1} = 0$ (which would impose that confidence not react to spending on impact), and then to restrict the AR coefficients of the system in such a way that confidence does not react to spending shocks at subsequent horizons either. In Appendix A.4 we show that this approach yields very similar results, compared to the baseline methodology. This gives us additional confidence in our findings.

⁵This calculation requires augmenting both $A_0^{-1}(q)$ and e_i with $3 \times p$ rows or columns of zeros for the matrix multiplication to work, given the dimension of Z_t , which is $(p+1) \times 3$.

hypothetical sequence of confidence innovations, $\varepsilon_{2,h}$, so as to force this to hold at each relevant horizon. On impact this evidently requires:

$$A_0^{-1}(2, 1) + A_0^{-1}(2, 2)\varepsilon_{2,1} = 0 \Rightarrow \varepsilon_{2,1} = -\frac{A_0^{-1}(2, 1)}{A_0^{-1}(2, 2)} \quad (6)$$

We can calculate the required values of subsequent confidence innovations recursively as:

$$\varepsilon_{2,h} = \frac{\Phi_{2,1,h} + \sum_{j=1}^{h-1} e_2 \Lambda^{h-j} A_0^{-1}(2)\varepsilon_{2,j}}{e_2 A_0^{-1}(2)} \quad h = 2, \dots, H \quad (7)$$

Given this sequence, we can compute the modified impulse responses of the variables in the system to the spending shock as:

$$\tilde{\Phi}_{i,1,h} = \Phi_{i,1,h} + \sum_{j=1}^h e_i \Lambda^{h-j} A_0^{-1}(2)\varepsilon_{2,j} \quad i = 1, \dots, 3 \quad (8)$$

We will refer to the modified impulse responses, $\tilde{\Phi}_{i,1,h}$, as the responses to a spending shock “without confidence” or as the “direct effect”. That is, these are the impulse responses to a spending shock when the response of confidence is held fixed at zero for all horizons. Comparing these hypothetical responses with the actual average responses, $\Phi_{i,1,h}$, provides a statistical measure of how important the response of confidence is in the transmission of the spending shock.

3.4 Non-Linear Specification

Traditional Keynesian thinking and some recent theoretical work (Christiano, Eichenbaum, and Rebelo, 2009, and Woodford, 2010) both suggest that fiscal policy may be more potent when the economy is experiencing significant slack. So as to allow for this possibility, we also consider a non-linear VAR specification similar to Auerbach and Gorodnichenko (2011). Following them, let z_t be a backward-looking seven quarter moving average of real GDP growth, normalized to have mean zero and re-scaled to have unit variance. Define:

$$f(z_t) = \frac{\exp(-\gamma z_t)}{1 + \exp(-\gamma z_t)}, \quad \gamma > 0. \quad (9)$$

$f(z_t)$ is thus bound between 0 and 1, and can be interpreted as the probability of being in a recession given observations on z_t . $f(z_t) \approx 1$ means that z_t is very negative, while $f(z_t) \approx 0$ means that z_t is very positive. We calibrate $\gamma = 1.5$ to match the frequency of post-War US recessions and define a “recession” as a period in which $f(z_t)$ was greater than 0.8 any time in the previous year. This lines up well with NBER-defined recessions, as shown in Figure 3, which plots $f(z_t)$ against time, with the shaded gray regions denoting NBER defined

recessions.

The non-linear system can then be written as (using the same notation as above):

$$A_0^r Y_t = \sum_{j=1}^p A_j Y_{t-j} + \sum_{j=1}^p A_{2,j} Y_{t-j} z_{t-j} + \sum_{j=1}^p A_{3,j} Y_{t-j} z_{t-j}^2 + \varepsilon_t \quad (10)$$

$$r = 1 \quad \text{if } \max\{f(z_{t-4}) : f(z_t)\} \geq 0.8$$

$$r = 0 \quad \text{if } \max\{f(z_{t-4}) : f(z_t)\} < 0.8$$

In words, Y_t follows an autoregressive process depending on its own lags, its own lags interacted with z_t , and its own lags interacted with z_t^2 . These interaction terms allow the AR coefficients to vary with the state of the economy. We assume that the impact matrix, A_0 , takes on two values – one in “normal” times (A_0^0) and one in “recessions” (A_0^1). This amounts to allowing for a conditionally heteroskedastic variance-covariance matrix of reduced form innovations and the impact effects of shocks to be different across the two regimes.

This specification nests the linear case when $A_{2,j} = A_{3,j} = 0 \forall j$ and when $A_0^0 = A_0^1$. The identifying assumptions on A_0 are identical to the linear specification, and the procedure for isolating the role of confidence is (conceptually) the same as well. To compute impulse responses for a recession we fix z_t initially at its sample average conditional on $r = 1$, and then compute the subsequent z_t consistently with the estimated impulse response of output.

4 Results

4.1 Linear VARs

As a benchmark, we estimate a system with log real government spending, a measure of confidence, and log real GDP. We estimate the system in levels with four lags. Inference is conducted via Kilian’s (1998) bias-corrected bootstrap after bootstrap.

Figure 4 shows impulse responses using *consumer* confidence data. The solid lines are the estimated responses to a one standard deviation government spending shock. The shaded gray regions are 90 percent confidence bands. Government spending follows a hump-shaped response but is nevertheless fairly persistent. Output rises by about 0.2 percent on impact before reverting back to its pre-shock value. Confidence actually falls on impact before rising slightly a few quarters later. This response, however, is never significantly (in the statistical sense) different from zero.

The dashed lines in Figure 4 show the hypothetical impulse responses holding the response

of confidence fixed at zero. The direct response of output without the endogenous response of confidence is indeed lower, suggesting a positive role of confidence in the transmission of fiscal policy. However, the differences in the impulse responses are economically small and statistically insignificant.

Keynes, for example, saw the role of animal spirits particularly with entrepreneurs and their business investment decisions. That is why in Figure 5 we use the *business* confidence index in lieu of the consumer confidence series. The responses are very similar. Government spending follows a hump-shaped response to a spending shock, confidence initially falls and then rises, and the initial impact on output is an increase of about 0.2 percent. As in the case with consumer confidence, the impulse responses to the spending shock when confidence is held fixed are very similar to the actual responses, although again the point estimate for the output response does suggest a small stimulating role for confidence.

Next, we present the corresponding spending multipliers in two different versions: the “impact” multiplier and the “max” multiplier. The impact multiplier is essentially the impact response of output divided by the impact response of government spending to a spending shock. The max multiplier is the maximum response of output taken over the first sixteen quarters divided by the impact response of government spending. As both government spending and output enter the estimated VARs in logs, these multipliers would be elasticities. To put the multipliers in dollar terms, we multiply them by the sample average ratio of output to spending.

Table 1 shows the estimated multipliers. The first column, labeled “Actual”, gives the estimated spending multipliers in both the system estimated with consumer confidence and the system estimated with CEO confidence. The numbers in brackets are the 90 percent bootstrap confidence bands. The estimated multipliers are all in the neighborhood of one, which is in line with most previous estimates (e.g. Ramey, 2011). The impact and max multipliers are both about 0.7 for the system with consumer confidence, suggesting that a one dollar increase in spending generates about 70 cents in extra output. In the system with CEO confidence, the impact multiplier is close to 1 and the max multiplier is 1.2; the difference in multipliers between the two systems results primarily from the different sample horizons used (from 1960 on for consumer confidence and from 1976 on for CEO confidence, due to data availability). The second column, labeled “Without Confidence”, gives the estimated hypothetical multipliers when confidence is held fixed following a government spending shock. These are very similar to the actual ones.

We conduct a number of additional robustness checks on our basic result. The most important one concerns anticipation effects with respect to government spending shocks. Ramey (2011) emphasizes that VAR shocks to government spending are actually predictable,

Table 1: GOVERNMENT SPENDING MULTIPLIERS IN NORMAL TIMES

	Actual	Without Confidence
<i>Consumer Confidence</i>		
Impact Multiplier	0.684	0.765
	[0.29, 1.10]	[0.39, 1.17]
Max Multiplier	0.759	0.770
	[0.43, 2.33]	[0.43, 1.20]
<i>CEO Confidence</i>		
Impact Multiplier	0.967	0.990
	[0.47, 1.56]	[0.52, 1.53]
Max Multiplier	1.223	0.991
	[0.65, 3.64]	[0.52, 1.72]

This table shows spending multipliers from the benchmark three variable systems described in Section 3. The “Actual” column corresponds to the standard VAR specification, and the following “Without Confidence” column is the multiplier when the response of confidence is held fixed. The numbers have the interpretation as the dollar impact on output (either on impact – ‘Impact Multiplier’ – or the maximum effect – ‘Max Multiplier’ – over 16 quarters) for a one dollar increase in spending. The numbers in brackets are 90 percent bootstrap confidence intervals.

which can render impulse response functions biased. She proposes a measure of anticipated government spending, g_t^a , that is equal to the present discounted value of future spending, based on the reading of news reported in *Business Week* and other newspaper sources. In order to accommodate these anticipation effects, the VAR system to be estimated has to be modified to $Y_t = [g_t^a \ g_t \ x_t]'$. The unanticipated government spending shock is then identified as the innovation in g_t ordered second (i.e. after g_t^a). We show in Appendix A.3 that our results are robust to directly accounting for spending news a la Ramey (2011).

The inclusion of additional variables other than output, such as aggregate consumption, in the block of variables x_t also does not substantively affect our conclusions or our estimates of spending multipliers. We prefer to keep x_t small because our non-linear specifications place large burdens on the data.⁶ Our results are also largely unaffected by different lag lengths or different assumptions concerning common trends (e.g. estimating a VECM instead of a VAR in levels or including a deterministic time trend).

In summary, the evidence from the linear VAR specifications suggests that, on average, confidence is not an important part of the transmission of government spending shocks into output. The actual impulse response of output to a government spending shock is very

⁶In the benchmark system there are $p \times q$ autoregressive parameters to estimate, where p is the lag length and q is the number of variables. In the non-linear estimation there are $3 \times p \times q$ parameters to estimate, which grows quickly with q .

similar to the one that features only the direct effect of spending on output. The spending multipliers are always estimated to be in the neighborhood of one, regardless of whether confidence is allowed to react to the spending shock or not.

4.2 Non-Linear VARs

Next we examine results from the non-linear specification detailed in Section 3.4. As in Auerbach and Gorodnichenko (2011), we find that the output effects of government spending are much larger in recessions than in normal times. Figure 6 shows impulse responses to a spending shock in a recession, with the size of the shock normalized to be the same as in the linear system. The dashed lines are the impulse responses in a recession, the solid lines are the responses estimated from the linear system, and the shaded gray areas are the 90 percent confidence bands from the linear estimation. Two main features stand out. First, the output response to a spending shock is very different in a recession compared to normal times. Importantly, most of the difference is at longer horizons rather than shortly after the spending shock. Secondly, consumer confidence increases on impact and is persistently high following a spending shock. This impulse response is statistically different from the linear case. Figure 7 gives the same picture using CEO confidence: confidence rises in response to a spending shock and the output response is much larger than in the linear case, particularly at longer horizons.⁷

Having established that output and confidence respond quite differently to government spending shocks in recessions relative to normal times, we next investigate how important the confidence response is for the output response in recessions. Figures 8 and 9 show actual and hypothetical (holding confidence fixed) impulse responses in recessions, for systems estimated with consumer and CEO confidence, respectively. The shaded gray regions are the confidence bands for the impulse responses to a spending shock in recessions.⁸ Given that we effectively have few observations for recessions, these bands are significantly wider than in the linear case. For both cases we see that shutting down the response of confidence to a spending shock renders the output response significantly smaller and more similar to what obtains in the linear specification. Put differently, it appears as though the systematic response of empirical confidence measures is critical to the transmission of the spending shock to output

⁷As an additional numerical test of the non-linear specification we started the impulse response also at $z_t = 0$, i.e. $f(z_t) = 0.5$, and recuperated essentially the linear response.

⁸These confidence bands are constructed differently from the confidence bands in the linear case so as to preserve the heteroskedasticity of the innovations. In particular, instead of a parametric bootstrap where we re-sample the innovations, here we do a non-parametric block bootstrap where we resample the growth rates of the underlying series in the VAR. Then we estimate VARs on the resampled series to construct confidence regions.

in recessions.⁹

Table 2 quantifies this finding. Although the impact multipliers in recessions are about the same as their linear counterparts, the max multipliers for government spending range between 2 and 3, about two to three times as large as in the linear case. The multipliers holding confidence fixed, in contrast, are significantly smaller and close to one. While the confidence bands are indeed wide, the evidence suggests that spending multipliers are much larger in recessions than in normal times and that conventional confidence measures are related to it.

Table 2: GOVERNMENT SPENDING MULTIPLIERS IN RECESSIONS

	Recession	Without Confidence
<i>Consumer Confidence</i>		
Impact Multiplier	0.388	0.260
	[0.12, 1.91]	[-0.22, 1.97]
Max Multiplier	3.08	0.260
	[0.42, 3.21]	[0.14, 2.60]
<i>CEO Confidence</i>		
Impact Multiplier	1.019	0.835
	[0.15,1.53]	[0.29, 1.72]
Max Multiplier	2.498	0.835
	[0.92,5.57]	[0.61, 3.88]

See notes to Table 1. The “Recession” column corresponds to the recession estimates from the non-linear specification, and the following column presents multipliers in the case where the response of confidence is held fixed. The numbers have the interpretation as the dollar impact on output (either on impact – ‘Impact Multiplier’ – or the maximum effect – ‘Max Multiplier’ – over 16 quarters) for a one dollar increase in spending. The numbers in brackets are 90 percent bootstrap confidence intervals.

⁹In Appendix A.2 we show that consumer uncertainty has similar effects in the transmission of government spending shocks. It appears that government spending shocks not only help to restore confidence, but also decrease uncertainty about the future.

Also, see Appendix A.5 for a discussion of how robust this result is to an alternative specification based on seemingly unrelated regressions (SUR). One might be concerned that the difference we find in the hypothetical output responses between normal times and recessions is due to government spending being less persistent, when confidence is shut down in recessions (see Figures 10 and 11). This could render the output response to a spending shock smaller. To test whether this drives our results, we run a SUR specification, where the systematic response of government spending does not depend directly on confidence, but only on output and its own lags. Our conclusions remain the same.

5 Why and How Does Confidence Matter?

The evidence from the previous section suggests that measured confidence of households and firms may play an important role in the transmission of government spending shocks into output during times of economic slack. Prime facie, this finding might be viewed as evidence for “animal spirits” type explanations or as evidence for many of the quotations listed in the Introduction and in Appendix A.1. However, a closer inspection of Figures 8 and 9 reveals that confidence reacts strongest on impact after a government spending shock in a recession, whereas the output response is slowly-building. In a world with “animal spirits” we would likely see a similarly strong impact response of output.

Barsky and Sims (2011a) show that unexpected autonomous increases in measured consumer confidence are associated with slowly-building and persistent increases in output, consumption, and productivity. They argue that confidence innovations reflect news about future economic fundamentals. Nevertheless, they do show a large fraction of empirical confidence fluctuations is not explained by news shocks, leaving room for a potentially important pure sentiment channel. We next investigate whether it is again news about future fundamentals or pure sentiment that makes the systematic response of confidence important in the fiscal policy transmission to economic activity.

We start, in the spirit of their analysis, by including an empirical measure of productivity into the set of variables x_t in our estimated VAR. We use the BLS measure of output per hour in the non-farm business sector. Formally, the VAR to be estimated includes government spending, confidence, output, and productivity. To have a longer sample size, we focus on the results using consumer confidence. Figure 10 shows responses to the spending shock from this four variable system, both for the linear case (solid line) and in a recession from the non-linear estimation (dashed lines). As in the smaller system, confidence increases on impact in a recession and the output response is much larger, particularly at long horizons. The productivity response to a spending shock is much the same as the output response – essentially zero on impact followed by a large and protracted increase. Put differently, a government spending shock in a recession apparently leads to a very persistent and economically large increase in productivity. In contrast, the response of productivity to a spending shock in the linear specification is essentially zero at all horizons.

Figure 11 shows the estimated impulse responses to a spending shock in a recession as well as the responses when confidence is held fixed. We again use confidence innovations ordered second in a Choleski decomposition in order to construct these hypothetical responses. As in Figures 9 and 10, eliminating the endogenous confidence response renders the hypothetical output response to a spending shock significantly smaller. Also, the productivity response to a spending shock is close to zero at all horizons in this case. That

the productivity response is so different (particularly at longer horizons) indicates that the large role we attribute to confidence in the transmission mechanism may indeed be due to a “fundamentals” rather than a pure “sentiment” channel. In particular, it is possible that government spending shocks during recessions work to stimulate productivity, which in turn raises measured confidence.

To determine whether measured confidence matters for the transmission of spending shocks through a “sentiment” or a “fundamentals” channel, we identify four structural shocks from the four variable system with productivity. The first shock is the government spending shock, identified using the maintained recursive restriction that spending not react within period to any of the three other shocks. The second shock is what we call a “fundamentals” shock. It is identified as having the maximum effect on the forecast error variance of productivity at a horizon of twenty quarters.¹⁰ This can be thought of as an approximation to a long run restriction; it is proposed in Francis, Owyang, Roush, and DiCecio (2010), who show that it has superior finite sample properties over conventional long run restrictions. The third shock is what we call a “sentiment” shock. The sentiment shock is the confidence innovation orthogonalized with respect to the government spending and “fundamentals” shocks. The idea is that it reflects pure sentiment, i.e. movements in confidence unrelated to movements in productivity several years out into the future. The final shock is identified as contemporaneously affecting output but not productivity on impact; it has no direct structural interpretation.

We consider two separate cases. In the first case we create a hypothetical sequence of “sentiment” shocks to hold confidence fixed and to identify the indirect effect in response to an increase in government spending. The procedure is conceptually identical to the one laid out in Section 3.3 under the assumption that government spending influences measured confidence only through “sentiment”. In the second case we create a hypothetical sequence of “fundamentals” shocks to hold confidence fixed. This identifies the indirect effect if government spending influences measured confidence only through “fundamentals”. Figure 12 shows the responses during a recession estimated from the non-linear specification. The solid lines are the actual responses to a spending shock, the dashed lines are the responses without confidence where confidence is held fixed with “sentiment” shocks, and the dotted lines are the responses without confidence where confidence is held fixed with “fundamentals” shocks. We see that the dotted line responses with hypothetical “fundamentals” shocks show output and productivity essentially not reacting at any horizon; these responses are very similar to the responses without confidence shown in Figure 11. In contrast, the dashed lines with hypothetical “sentiment” shocks are fairly similar to the actual responses. Eliminating

¹⁰We have experimented with other horizons, like 30 quarters, without much effect on our results.

the confidence effect with “sentiment” innovations does relatively little to the responses of output and productivity to a spending shock – these are still slowly-building and large, particularly at longer horizons.

These findings suggest that pure “sentiment” is a relatively unimportant component of the transmission of spending shocks into real output in a period of economic slack. Rather than through stimulating sentiment, government spending shocks appear to have differential effects on economic activity during recessions via a channel that manifests itself through labor productivity, particularly several quarters after the shock.

It is not difficult to imagine theoretical economies in which increases in public expenditure stimulate private sector productivity. For example, spending on infrastructure and education may lead to complementarities which encourage private sector capital accumulation, thereby stimulating private sector labor productivity.¹¹ We investigate this possibility by decomposing total government spending into its two main constituent components – consumption and investment. Government consumption “consists of the goods and services that are produced by the general government, less sales to other sectors” while government investment “consists of purchases of new structures and of equipment and software both by the general government and government enterprises.”¹² We estimate a four variable system featuring the following variables: total government spending, consumer confidence, real output, and the log ratio of government investment to consumption expenditure. We are interested in whether overall spending shocks differentially affect the mix of expenditures in recessions as opposed to normal times.

Figure 13 compares the impulse responses to a spending shock from the linear system (solid line) with the recession responses from the same system, estimated in the non-linear specification (dashed line). We see that in the linear case the ratio of investment to consumption expenditure rises on impact following a spending shock, but thereafter quickly reverts back to its pre-shock level. In contrast, the response of the government investment/consumption ratio in a downturn is quite different. Rather than reverting back to its pre-shock value, the investment/consumption ratio remains permanently higher following a spending shock during a recession. This suggests that there is an important difference in the longer term consequences for the composition of government spending following a spending shock in a recession – during recessions government spending shocks are more persistently geared towards investment rather than consumption. This differential mix could explain the much larger output response during a downturn. The large output multiplier estimated here is consistent with the results in Feyre and Sacerdote (2011), who emphasize the different

¹¹See Aschauer’s (1989) seminal contribution.

¹²See *A Guide to the NIPAs* at <http://www.bea.gov/national/pdf/nipaguid.pdf>.

multipliers for different kinds of government spending. In particular, they report multipliers associated with infrastructure spending in the neighborhood of 2.

Figure 14 shows the hypothetical impulse responses in a recession. As in Figure 12, we consider two separate cases – one without “sentiment” and one without “fundamentals”. These shocks are identified as described above, though the “fundamentals” shock is identified off of the medium run behavior of output, since productivity is not in the estimated VAR.¹³ The impulse responses without sentiment are very similar to the actual response in a recession; in contrast, the responses where confidence is shut down with the “fundamentals” innovation are much closer to the baseline linear estimates. This suggests that the key channel through which government spending shocks have a differential effect on output during recessions is that spending shocks in a recession are geared more towards investment, which in turn stimulates private sector productivity, output, and confidence.¹⁴ Pure sentiment appears to play at best a minor role.

6 Conclusion

In this paper we tackle the following question: Does the transmission of fiscal spending shocks depend on systematic movements in consumer and business confidence? In doing so, we shed some new light on how expansionary fiscal policy stimulates the economy, and, to the best of our knowledge, study for the first time the role of systematic movements in consumer and business confidence for aggregate economic fluctuations. We find that the endogenous response of conventional measures of confidence explains almost all of the output stimulus in recessions, whereas its role in normal times is minor. Importantly, the positive response of output and productivity to a fiscal stimulus during times of slack is mild on impact, gradual and prolonged. This suggests that fiscal stimulus in recessions is really different from fiscal stimulus in normal times in that it boosts long-term productivity. Indeed, we find that fiscal expansions in recessions are more persistently geared towards government investment. It is this long-term productivity boost that is reflected in the important role of the systematic response of conventional confidence measures for recessionary fiscal transmission, not pure sentiment.

¹³If we replace output with productivity we get nearly identical results.

¹⁴This also means that Robert Russell got it wrong (see his quote in Appendix A.1): the government building bridges and new roads *per se* will restore confidence inasmuch this increases future productivity.

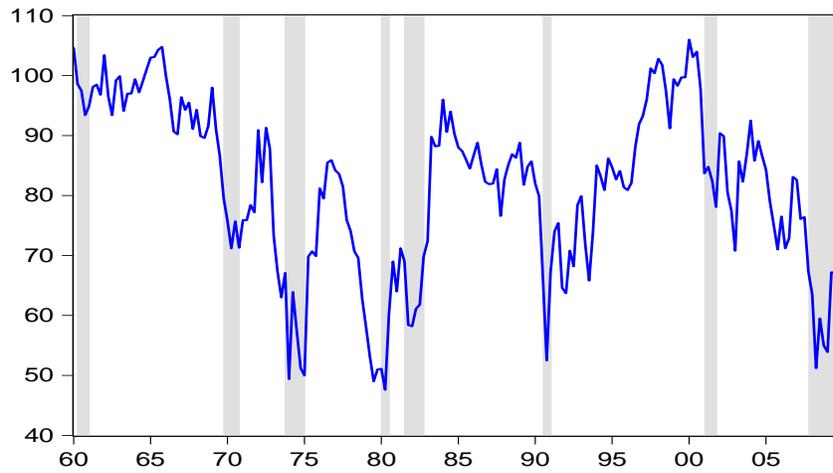
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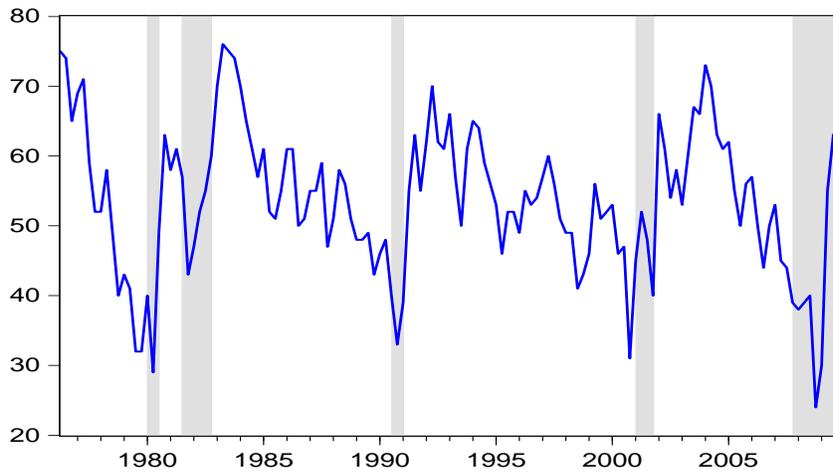
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Figure 1: Consumer Confidence



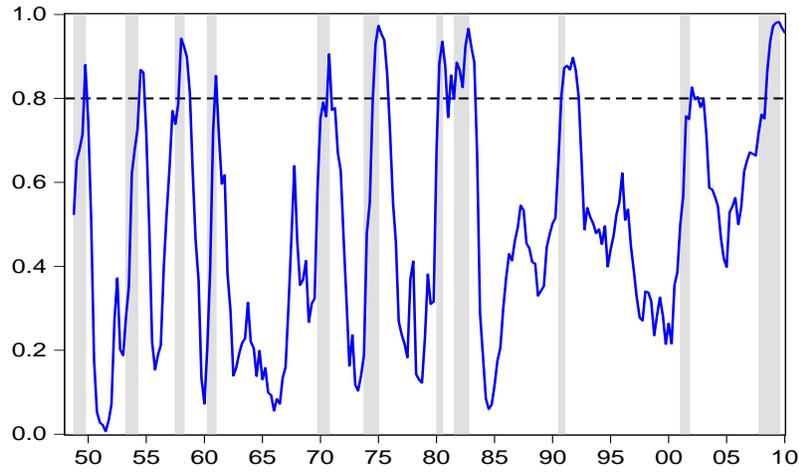
This figure plots the Index of Consumer Expectations from the Michigan Survey of Consumers. Shaded gray areas are recessions as defined by the NBER.

Figure 2: CEO Confidence



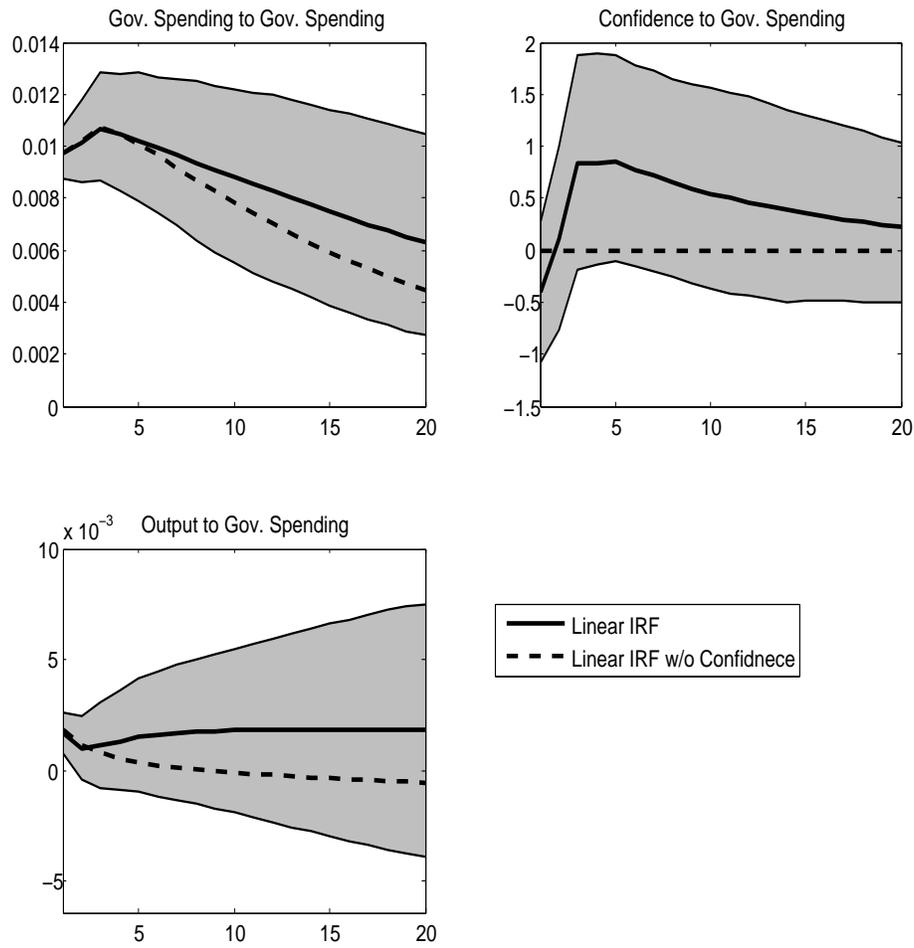
This figure plots the composite CEO confidence index from the Conference Board. Shaded gray areas are recessions as defined by the NBER.

Figure 3: $f(z_t)$ Across Time



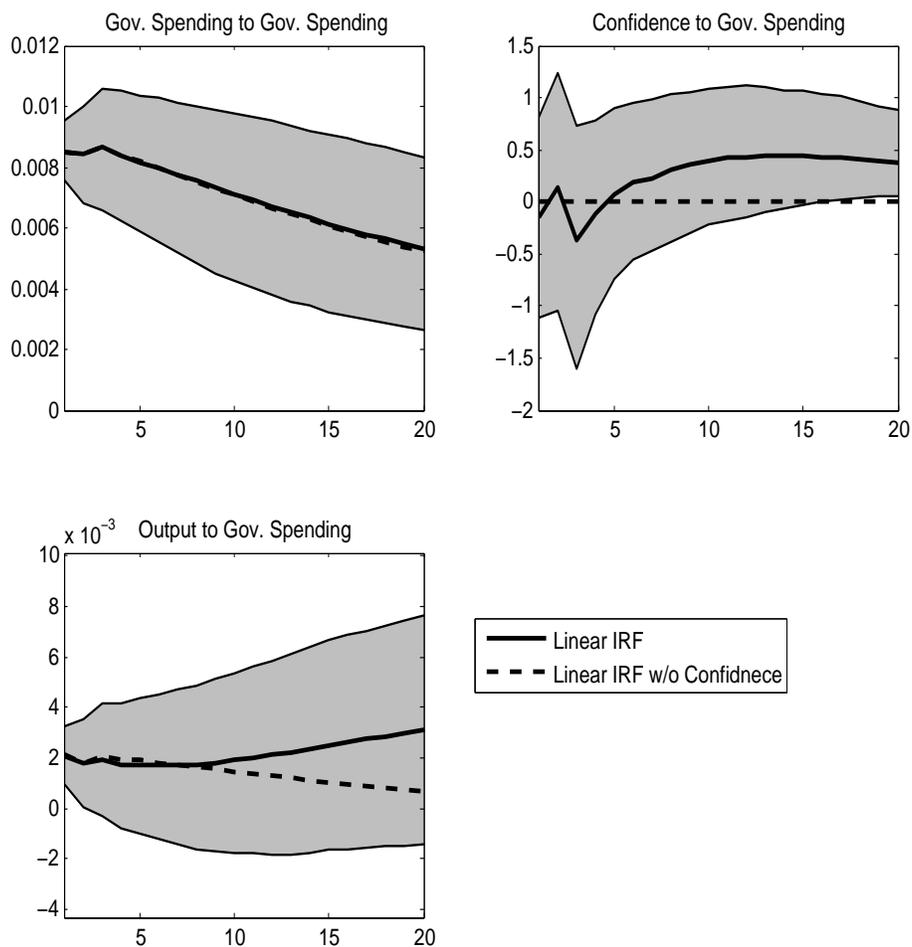
This figure plots $f(z_t) = \frac{\exp(-\gamma z_t)}{1 + \exp(-\gamma z_t)}$, $\gamma = 1.5$, where z_t is defined as the seven quarter moving average of real GDP growth. Shaded gray areas are recessions as defined by the NBER. The dashed black line is our cutoff for calling a period a “recession”: $f(z_t) = 0.8$.

Figure 4: Government Spending and Consumer Confidence



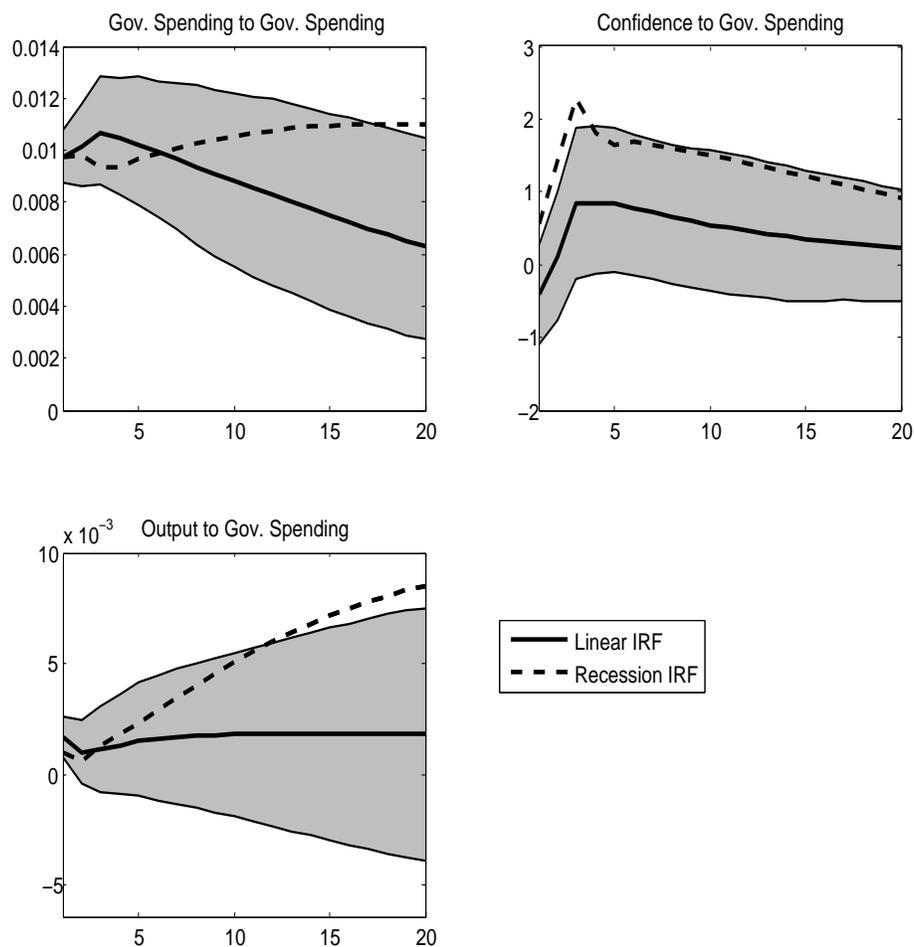
This figure shows impulse responses to a government spending shock from the benchmark system with government spending, consumer confidence, and real GDP. The solid lines are the estimated impulse responses. The shaded gray areas are 90 percent confidence bands, using the bias-corrected Bootstrap of Kilian (1998). The dashed lines are the impulse responses when confidence is held fixed.

Figure 5: Government Spending and CEO Confidence



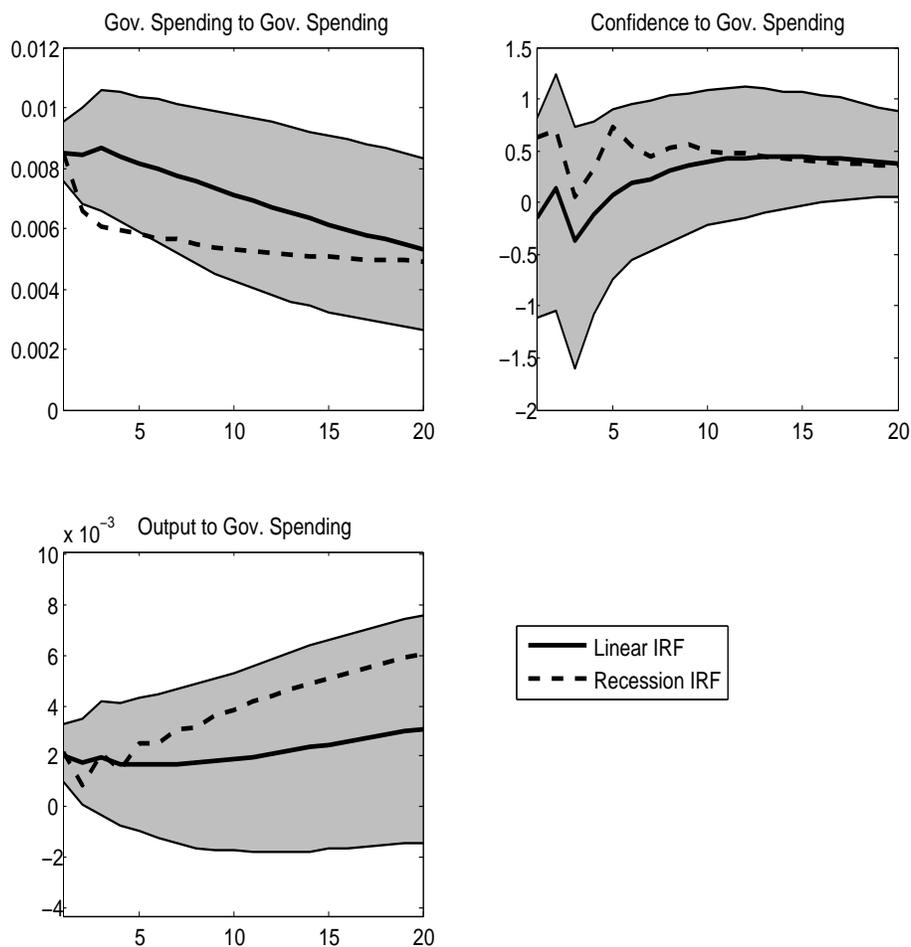
This figure shows impulse responses to a government spending shock from the benchmark system with government spending, business confidence, and real GDP. The solid lines are the estimated impulse responses. The shaded gray areas are 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed.

Figure 6: Government Spending and Consumer Confidence: Recessions



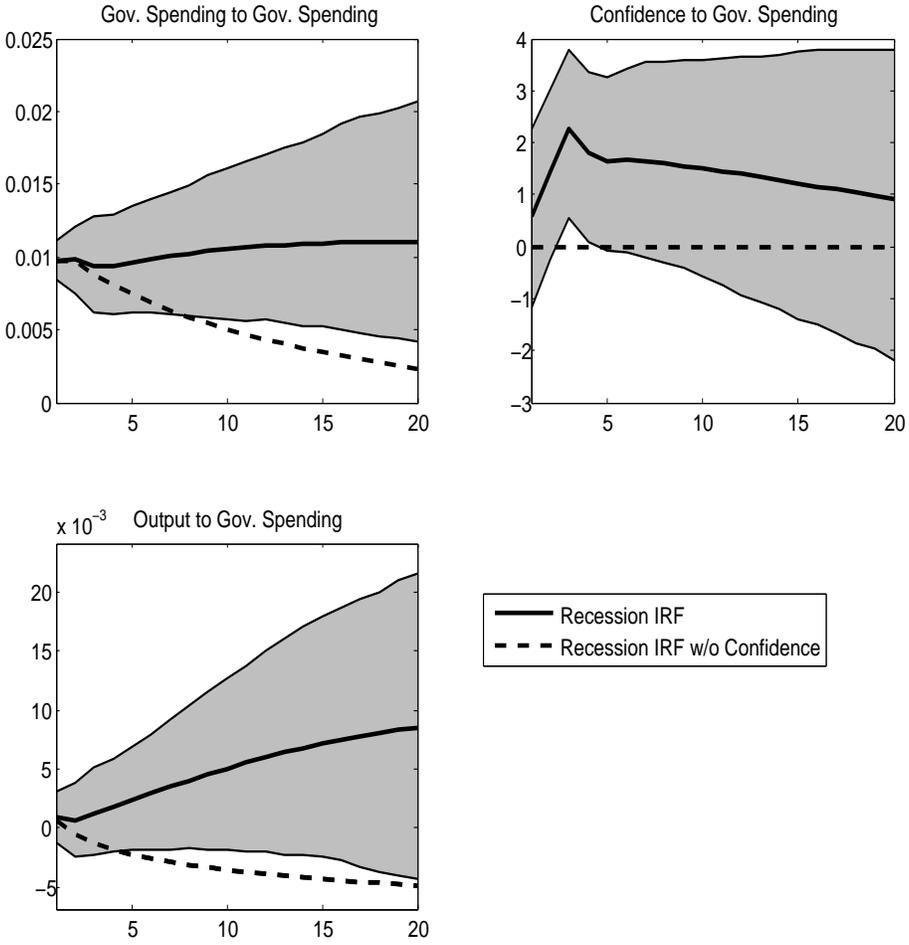
The dashed lines in this figure are impulse responses to a government spending shock in a recession estimated from a non-linear system with government spending, consumer confidence, and real GDP. The solid lines are the estimated impulse responses from the linear system, and the shaded gray areas are the 90 percent confidence bands from the linear system. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure 7: Government Spending and CEO Confidence: Recessions



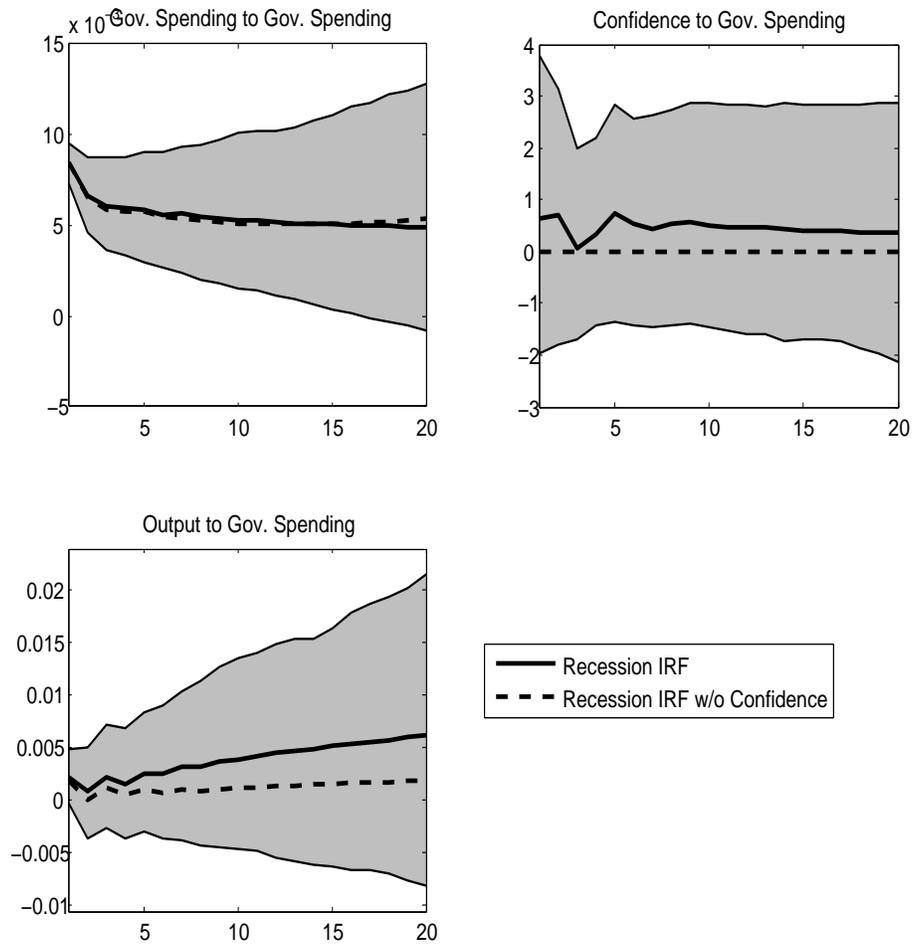
The dashed lines in this figure are impulse responses to a government spending shock in a recession estimated from a non-linear system with government spending, CEO confidence, and real GDP. The solid lines are the estimated impulse responses from the linear system, and the shaded gray areas are the 90 percent confidence bands from the linear system. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure 8: Government Spending and Consumer Confidence: Recessions with and without Confidence



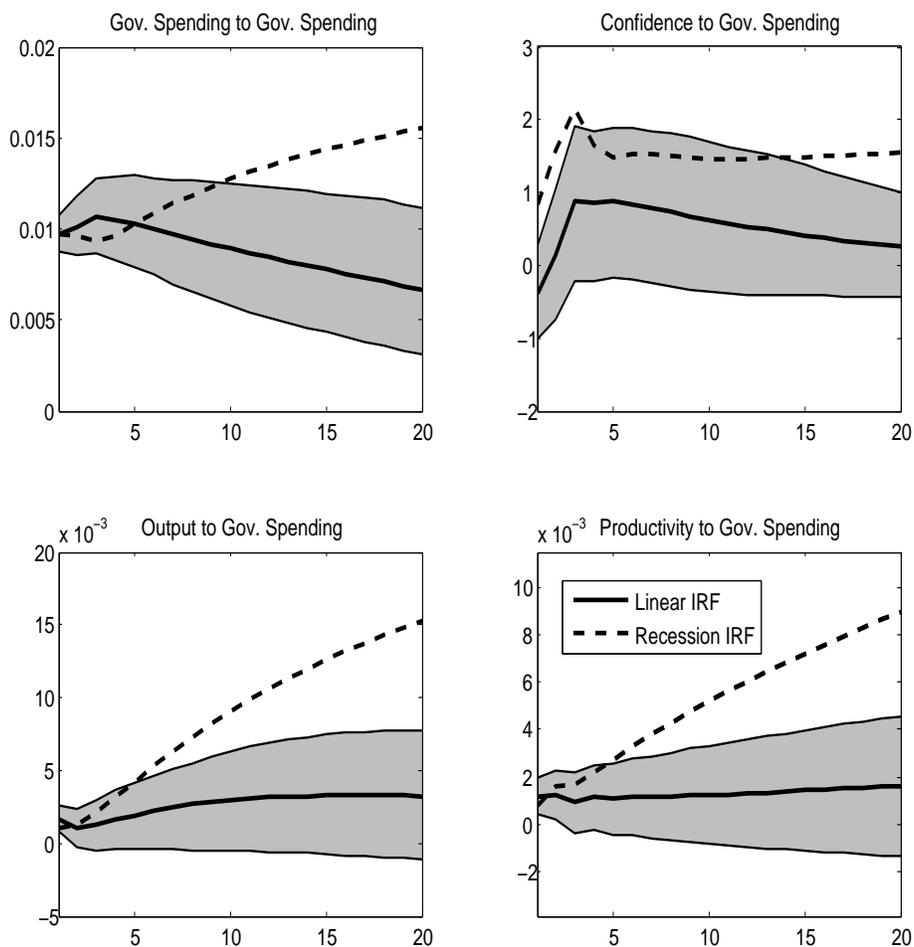
The solid lines in this figure are estimated impulse responses to a government spending shock in a recession estimated from the non-linear specification. The shaded gray regions are 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed. The underlying system features consumer confidence. The size of the shock has been normalized to be the same as in the linear system.

Figure 9: Government Spending and CEO Confidence: Recessions and with and without Confidence



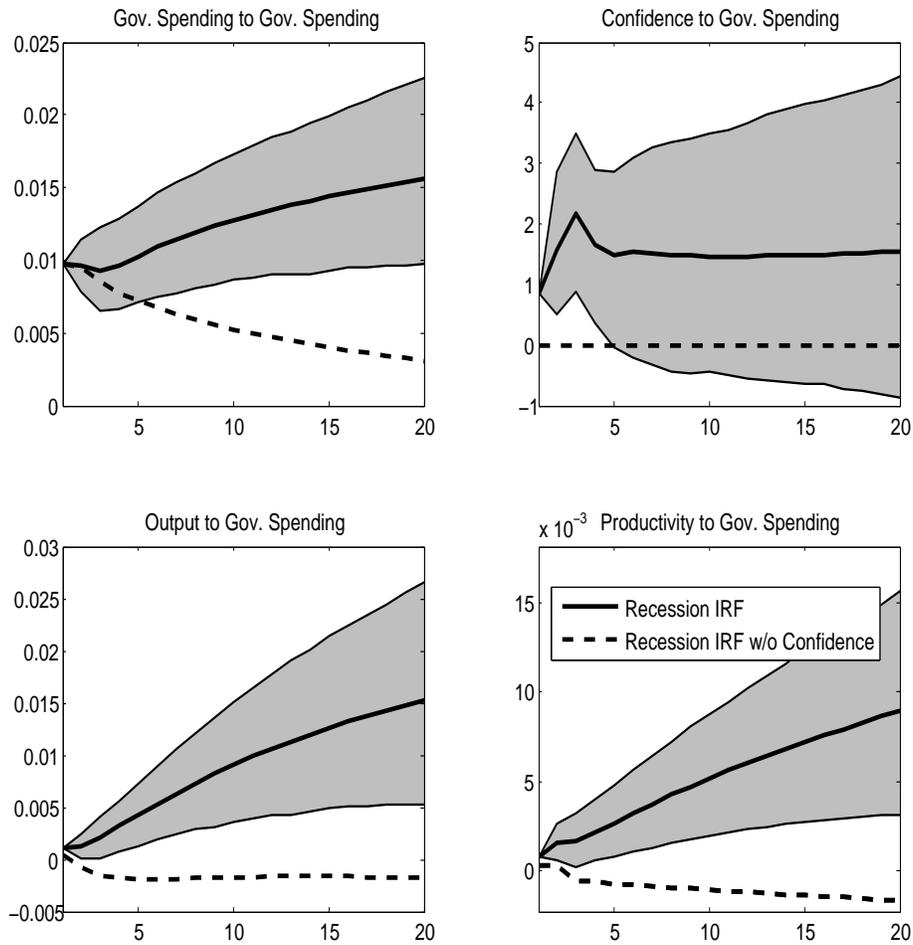
The solid lines in this figure are estimated impulse responses to a government spending shock in a recession estimated from the non-linear specification. The shaded gray regions are 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed. The underlying system features CEO confidence. The size of the shock has been normalized to be the same as in the linear system.

Figure 10: Government Spending, Confidence, and Productivity



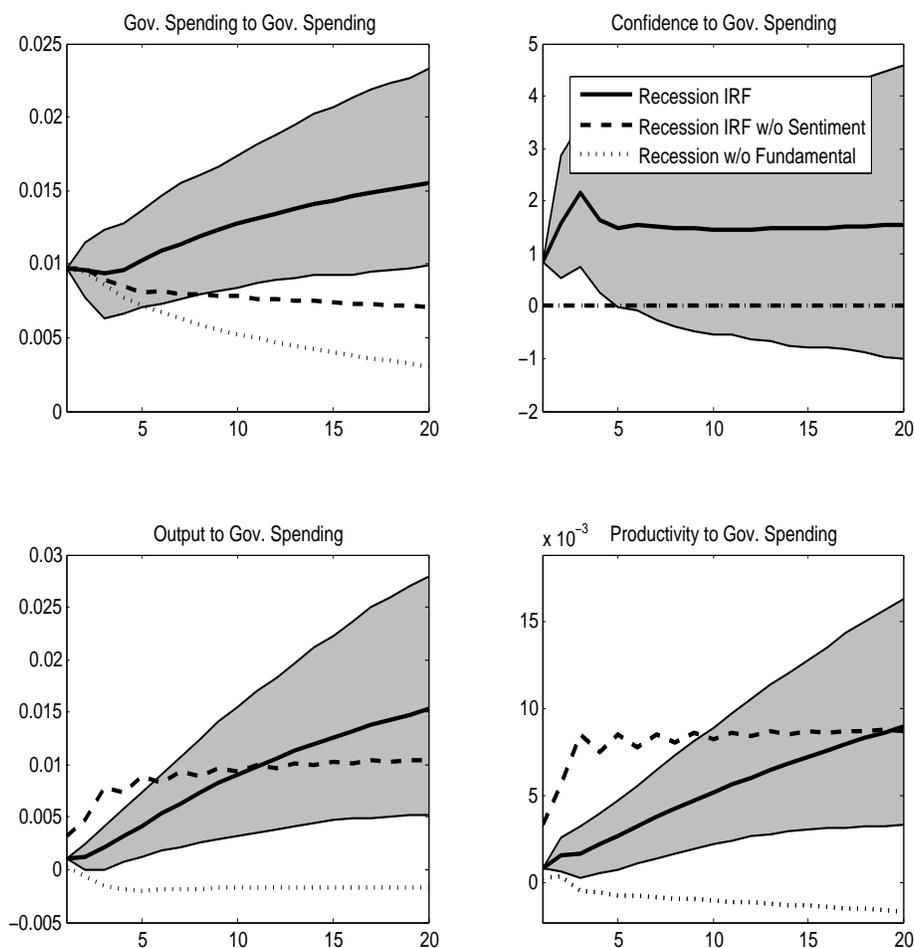
This figure shows impulse responses from a VAR featuring government spending, consumer confidence, real output, and labor productivity. The solid black lines are the impulse responses to a spending shock from the linear system; the shaded gray regions are the associated 90 percent confidence bands. The dashed lines are the impulse responses to a spending shock in a recession. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure 11: Government Spending, Confidence, and Productivity: with and without Confidence



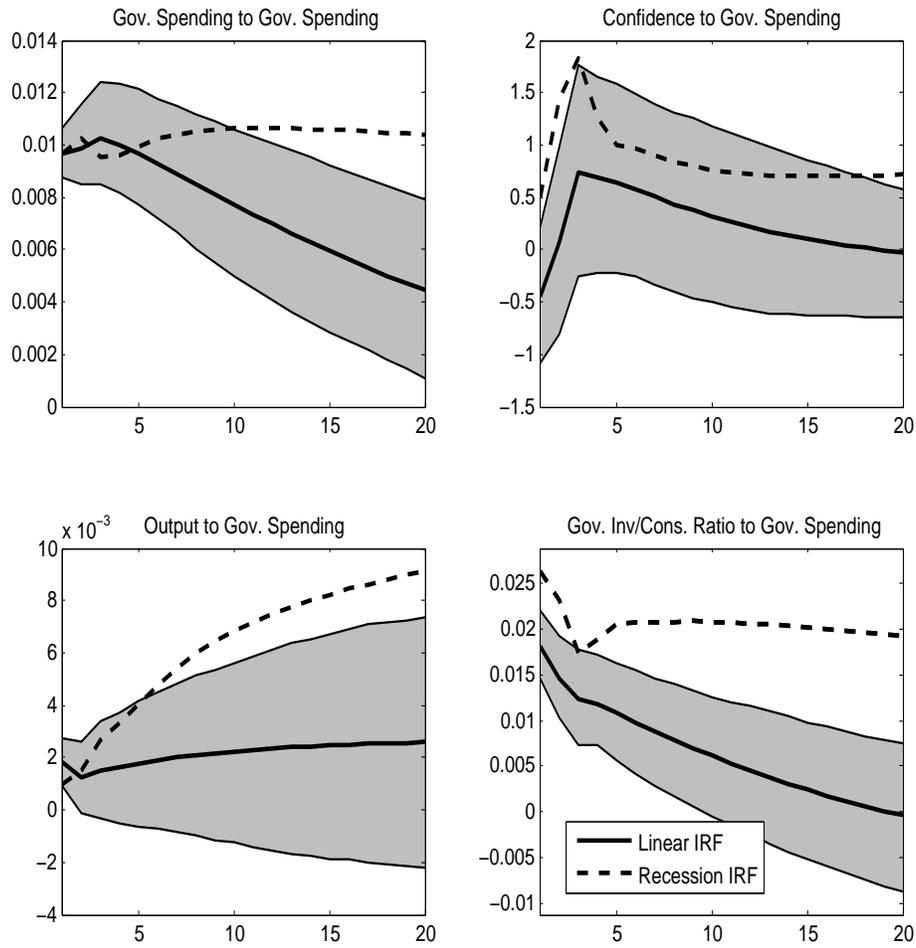
This figure shows impulse responses from a VAR featuring government spending, consumer confidence, real output, and labor productivity. The solid black lines are the estimated impulse responses in a recession and the shaded gray areas are the 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed. The size of the shock has been normalized to be the same as in the linear system.

Figure 12: Government Spending, Confidence, and Productivity: Alternative Decomposition



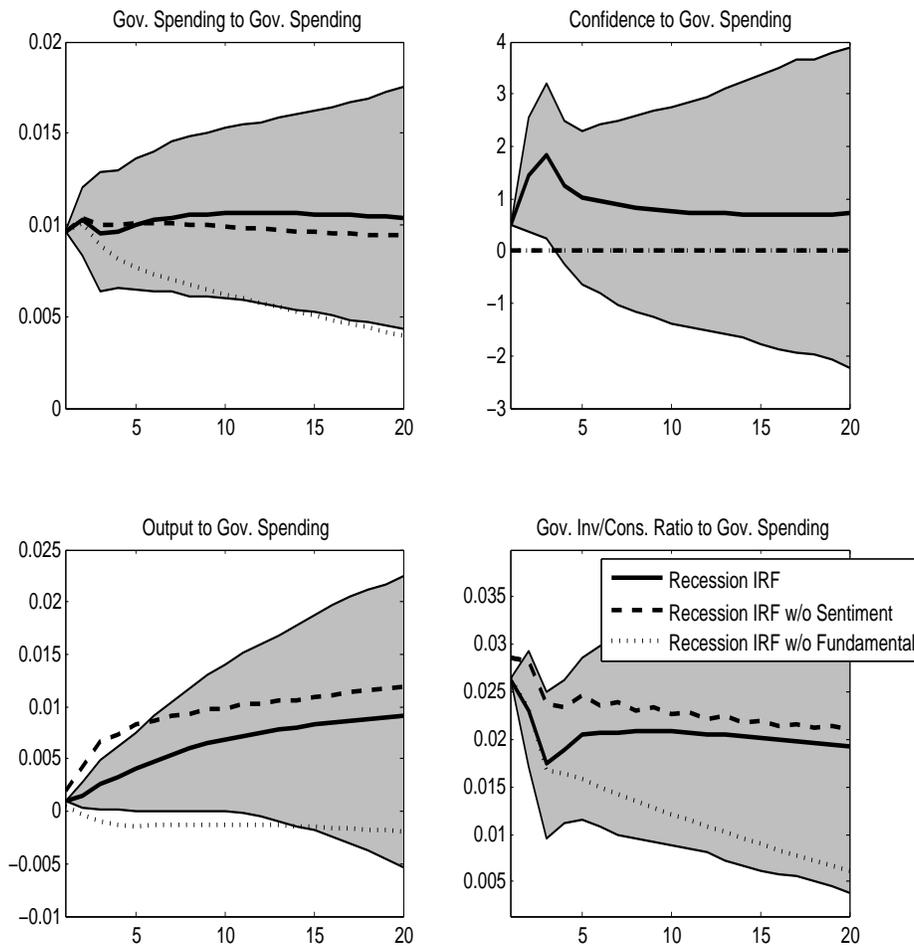
This figure shows impulse responses from a VAR featuring government spending, consumer confidence, real output, and labor productivity. The solid black lines are the estimated impulse responses in a recession and the shaded gray areas are the 90 percent confidence bands. The dashed lines are the estimated responses when confidence is held fixed using a hypothetical sequence of “sentiment” shocks. The dotted lines are the responses when confidence is held fixed using a hypothetical sequence of “fundamentals” shocks. The size of the shock has been normalized to be the same as in the linear system.

Figure 13: Government Spending, Confidence, and Spending Components: Recessions



This figure shows impulse responses from a VAR featuring government spending, consumer confidence, real output, and the log-ratio of government investment to consumption expenditure. The solid black lines are the estimated impulse responses in the linear system and the shaded gray areas are the 90 percent confidence bands. The dashed lines are the estimated responses in a recession from our non-linear specification. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure 14: Government Spending, Confidence, and Spending Components: with and without Confidence



This figure shows impulse responses from a VAR featuring government spending, consumer confidence, real output, and the log-ratio of government investment to consumption expenditure. The solid black lines are the estimated impulse responses in a recession and the shaded gray areas are the 90 percent confidence bands. The dashed lines are the estimated responses when confidence is held fixed using a hypothetical sequence of “sentiment” shocks. The dotted lines are the responses when confidence is held fixed using a hypothetical sequence of “fundamentals” shocks. The size of the shock has been normalized to be the same as in the linear system.

A Appendix

A.1 Quotes

“We must be certain that programs to solve the current financial and economic crisis are large enough, and targeted broadly enough, to impact public confidence.” – Robert Shiller, Wall Street Journal, January 27, 2009

“Yale’s Bob Shiller argues that confidence is the key to getting the economy back on track. I think a lot of economists would agree with that. [...]. The sad truth is that we economists don’t know very much about what drives the animal spirits of economic participants. Until we figure it out, it is best to be suspicious of any policy whose benefits are supposed to work through the amorphous channel of ‘confidence.’” – N. Gregory Mankiw, Blog, January 27, 2009

“Enacting such a conditional stimulus would have two desirable effects. First, it would immediately boost the confidence of households and businesses since they would know that a significant slowdown would be met immediately by a substantial fiscal stimulus.” – Martin Feldstein, Testimony to the Committee on the Budget, U.S. House of Representatives, December 5, 2007

“But the economy is not stagnant because of a lack of spending. The economy is stagnant because of a lack of confidence in the future. Government spending on bridges, roads and new schools will stimulate the construction industry. But without confidence, the benefits will not spread to the rest of the economy.” – Russell Roberts, Forbes.com, January 23, 2009

“The stimulus was too small, and it will fade out next year, while high unemployment is undermining both consumer and business confidence.” – Paul Krugman, New York Times, November 23, 2009

“Economic activity in the United States turned up in the second half of 2009, supported by an improvement in financial conditions, stimulus from monetary and fiscal policies, and a recovery in foreign economies. These factors, along with increased business and household confidence, appear likely to boost spending and sustain the economic expansion.” – Ben Bernanke, Monetary Policy Report to the Congress, February 24, 2010

“Confidence today will be enhanced if we put measures in place that assure that the coming expansion will be more sustainable and fair in the distribution of benefits than its predecessor.” – Larry Summers, Responding to an Historic Economic Crisis: The Obama Program Brookings Institution, March 13, 2009

“President Obama’s top priority has been to stop the vicious cycle of economic and financial collapse, stem the historic rate of job loss, restore confidence and put the economy on a path to recover.” – Larry Summers, memo to Members of Congress Re: Status Report on Rescuing and Rebuilding the American Economy, August 4, 2009

“The subsequent global sell-off in equity markets suggested that governments would need to take action with more immediate impact to restore confidence in the markets.” – James Bullard, The U.S. Economy and Financial Market Turmoil, October 14, 2008

A.2 Government Spending and Consumer Uncertainty

In the benchmark approach we investigate the role of consumer confidence in the transmission of government spending shocks. Consumer confidence is essentially a cross-sectional *average* of the qualitative survey responses to questions like “Now 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?”. The answers are quantified as +1 if the answer is “better off”, as -1 if “worse off” and as 0 otherwise.¹⁵

Researchers have used the cross-sectional *standard deviation* of these qualitative survey responses to measure consumer uncertainty or the dispersion of beliefs in the population (see Bachmann, Elstner and Sims, 2010, as an example). In this Appendix we test whether the transmission of government spending shocks into aggregate economic activity might work through an impact on consumer uncertainty (as measured through the dispersion of the “personal finance” question above), rather than consumer confidence.¹⁶

Figures A-1 to A-3 repeat the same three steps as with confidence: the linear actual and hypothetical impulse responses (see Figure 4), the linear and recession actual impulse responses (see Figure 6) and the recession actual and hypothetical impulse responses (see Figure 8). Three findings are noteworthy: 1) a surprise increase in government spending leads to a decrease in consumer uncertainty, and when the indirect effect through uncertainty is taken out the output stimulus is weaker, albeit only slightly so; 2) the uncertainty-decreasing effect of government spending is (if not stronger on impact) much more prolonged in a recession compared to normal times; 3) taking out the indirect effect of government spending through uncertainty renders the positive output response weaker, more so than in normal times, but not significantly so. We conclude that fiscal stimulus has a similar effect through a reduction in consumer uncertainty as it has through a boost in measured consumer confidence.

¹⁵The Michigan Index of Consumer Expectations that we are using is an average of these cross-sectional averages across several forward-looking questions, such as the “personal finance” question above.

¹⁶We experimented with the one-year-ahead and five-year-ahead business expectation questions, which make up the other two questions from the Index of Consumer Expectations with similar results.

Figure A-1: Government Spending and Consumer Uncertainty

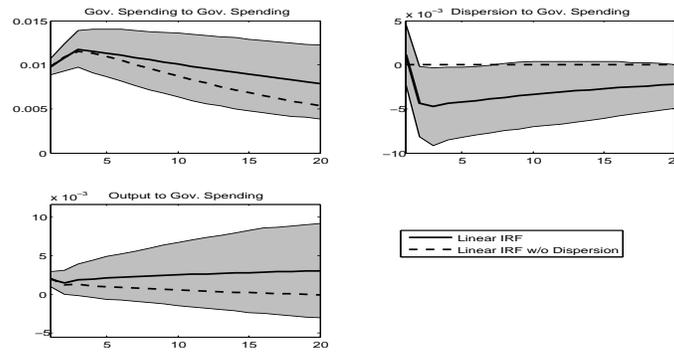
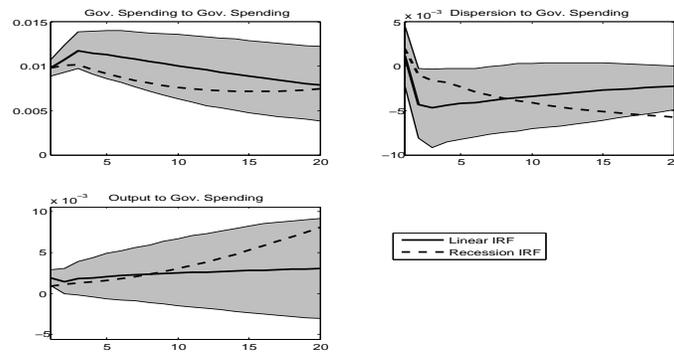


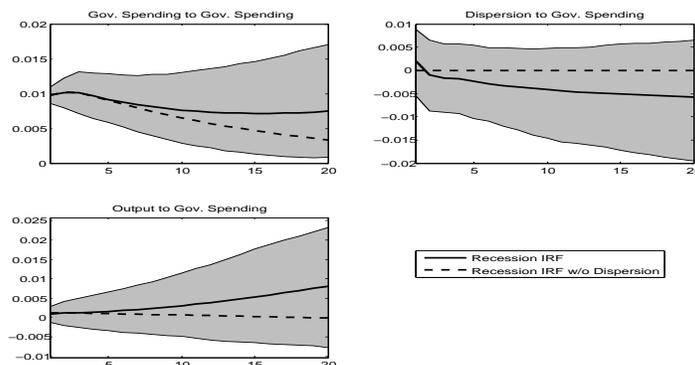
Figure A-1 shows impulse responses to a government spending shock from the benchmark system with government spending, consumer uncertainty, and real GDP. The solid lines are the estimated actual impulse responses. The shaded gray areas are 90 percent confidence bands. The dashed lines are the hypothetical impulse responses when uncertainty is held fixed.

Figure A-2: Government Spending and Consumer Uncertainty: Recessions



The dashed lines in Figure A-2 are impulse responses to a government spending shock in a recession estimated from a non-linear system with government spending, consumer uncertainty, and real GDP. The solid lines are the estimated impulse responses from the linear system, and the shaded gray areas are the 90 percent confidence bands from the linear system. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure A-3: Government Spending and Consumer Uncertainty: Recessions with and without Uncertainty



The solid lines in Figure A-3 are estimated impulse responses to a government spending shock in a recession estimated from the non-linear specification. The shaded gray regions are 90 percent confidence bands. The dashed lines are the hypothetical impulse responses when uncertainty is held fixed. The size of the shock has been normalized to be the same as in the linear system.

A.3 Accounting for Fiscal News

Ramey (2011) stresses that conventional VAR-identified government spending shocks are often predictable. As a remedy, she produces a time series of “news” about the present discounted value of expected changes in future defense spending, based on a narrative reading of the historical record (readings of *Business Week* and other periodicals). This can be incorporated into the VAR, with the system of variables to be estimated $Y_t = [g_t^a \ g_t \ \text{conf}_t \ x_t]$, where g_t^a is the defense news variable. We can then identify impulse responses to two different spending shocks: defense news (the innovation in the defense news series ordered first), and the conventional unanticipated government spending shock (the innovation in actual government spending ordered after the news variable). We can construct the hypothetical impulse responses in which the response of confidence is held fixed just as in the usual case. Figure A-4 shows the actual and hypothetical responses of actual spending, confidence, and real GDP to the defense news shock. Figure A-5 does the same for a surprise spending shock.

Figure A-4: Impulse Responses to Defense News

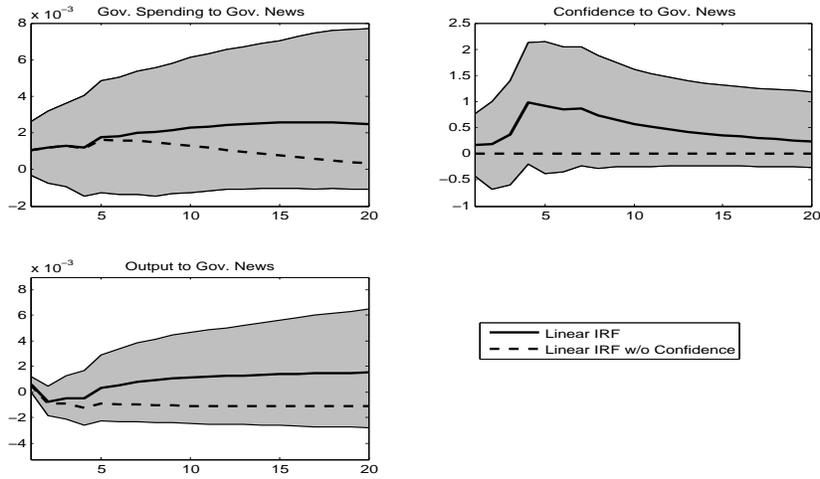


Figure A-5: Impulse Responses to Unanticipated Spending

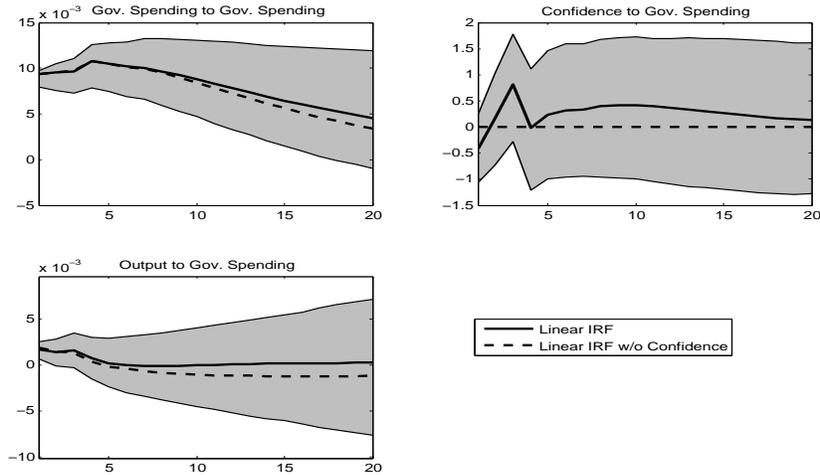
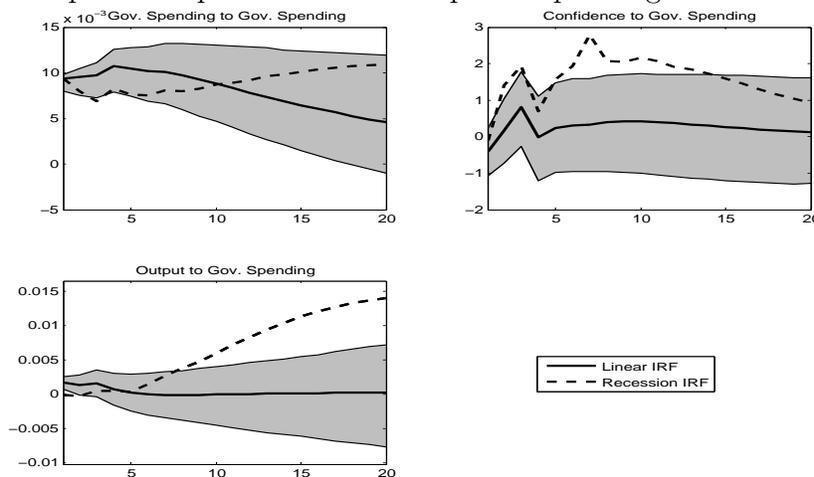


Figure A-4 shows the impulse responses to a defense news shock as defined in Ramey (2011). Figure A-5 shows impulse responses to an unanticipated government spending shock. The system features defense news, total government spending, consumer confidence, and real GDP. The solid lines are the estimated impulse responses. The shaded gray areas are 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed.

Eliminating the indirect effect of confidence leaves the output response to the defense news shock smaller than in the actual impulse response, as we might expect, though the difference is statistically insignificant. Comparison of Figure A-5 with the corresponding figure in the case where we do not include the defense news variable (Figure 4) reveals that the responses to a surprise spending shock are very similar. Figure A-6 below shows the recession and linear impulse responses to an unanticipated government spending shock; these are also very similar to the benchmark case (see Figure 6).

Figure A-6: Impulse Responses to Unanticipated Spending - Linear and Recession



This figure shows impulse responses to an unanticipated government spending shock, both in the linear case (solid lines) and in a recession (dashed lines). The system features defense news, total government spending, consumer confidence, and real GDP. The solid lines are the estimated impulse responses. The shaded gray areas are 90 percent confidence bands. The dashed lines are the impulse responses when confidence is held fixed. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

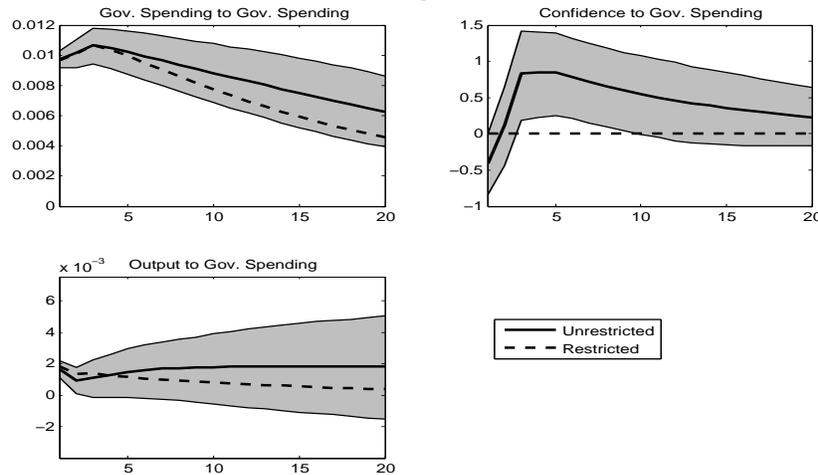
A.4 An Alternative Approach to Isolating the Role of Confidence

In the main part of the paper, we fix the underlying economic environment and isolate the role of confidence in the transmission of policy shocks by decomposing the observed average effect of government spending on output into its direct effect and its indirect effect through confidence. An alternative interpretation of the question “Does Confidence Matter in the Transmission of Government Spending Shocks?” would be to restrict the coefficients of the underlying VAR in such a way as to force the response of confidence to a spending shock to be zero, and then compare the restricted impulse responses with the unrestricted ones. There is a subtle difference to the baseline approach: there we fix the underlying economic environment and study particular hypothetical shock combinations that hit this economy, here we postulate a different (restricted) economic structure, i.e. confidence is *structurally* not allowed to respond to government spending and output shocks, and reestimate. Then we compare how different the unrestricted and the restricted economy behave after a surprise increase in government spending.

A necessary condition for confidence to not react to a spending shock at any horizon is $a_{2,1} = 0$, so that it not react on impact. This plus restricting the AR coefficients on lagged output and spending in the confidence equation to zero will be *sufficient* for imposing that confidence not react to a spending shock at any horizon. We implement these restrictions

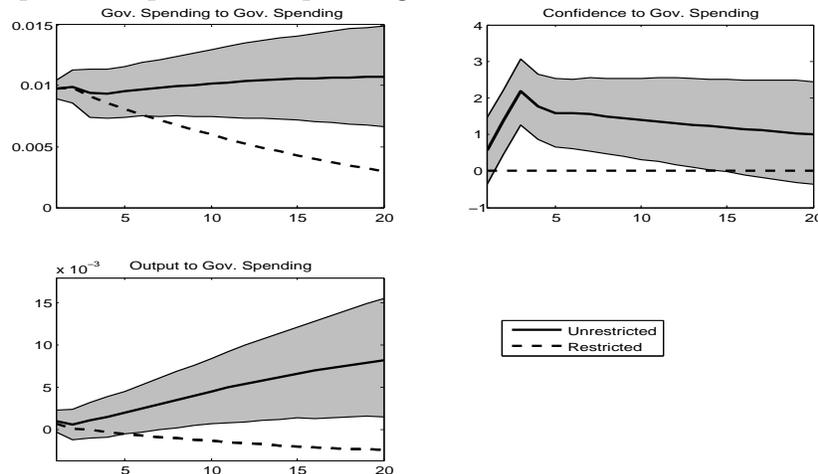
by estimating the benchmark three variable system using seemingly unrelated regressions, with the additional restriction that confidence not react to a spending shock on impact. The impulse responses for the benchmark system with consumer confidence are shown below, for the linear case (Figure A-7) and recessions (Figure A-8).

Figure A-7: Impulse Responses to Spending Shock: Restriction on Confidence - Linear



The solid line in Figure A-7 shows the unrestricted impulse responses to a spending shock from the three variable linear system with government spending, confidence, and output. The dashed lines show responses to a spending shock from a SUR system in which the coefficients on lagged output and government spending in the confidence equation are restricted to be zero. The shaded gray areas are 90 percent confidence bands.

Figure A-8: Impulse Responses to Spending Shock: Restriction on Confidence - Recession



The solid line in Figure A-8 shows the unrestricted impulse responses to a spending shock from the three variable non-linear system in a recession. The dashed lines show responses to a spending shock from a SUR system in which the coefficients on lagged output and government spending in the confidence equation are restricted to be zero. The shaded gray areas are 90 percent confidence bands. The size of the shock has been normalized to be the same as in the linear system.

Both figures, which show the linear and the recession response to a government spending shock, respectively, are almost identical to what obtains in our benchmark approach (see Figures 4 and 8).

A.5 Seemingly Unrelated Regressions

In the main text, we find that government spending multipliers are much larger in recessions compared to normal times. In addition, we find that the hypothetical output response without confidence is much smaller. One potential concern is that the response of government spending to its own shock is not the same in the hypothetical case. For example, see the impulse responses in Figure 8 (in the upper left panel). There we observe that a spending shock in a recession leads to a much less persistent response of spending when confidence is held fixed.

In principle, the output response to a spending shock could be much smaller simply because the government spending response to its own shock is less persistent. This is consistent with two different views of the world. On the one hand, the government spending response could be smaller because the output response is weaker when confidence is held fixed. If government spending responds positively to output fluctuations with a delay (see Bachmann and Bai, 2011), a weaker and less persistent response of government spending to its own shock should be expected. On the other hand, it could also be the case that government spending is responding directly to lagged confidence. While this is possible, one might be concerned that imprecisely estimated coefficients on lagged confidence could cause the government spending response to be less persistent and thus artificially cause the smaller output response.

To address this possibility, we re-estimate the system using seemingly unrelated regressions (SUR), in which we impose a restriction that the coefficients on lagged confidence in the government spending equation be zero. The identification of the spending shock and the construction of the hypothetical impulse response where the indirect output effect is eliminated are otherwise the same. Figure A-9 shows the linear actual and hypothetical responses; Figure A-10 shows the linear vs. recession impulse responses, and Figure A-11 shows the actual and hypothetical recession responses from the non-linear estimation. Although there are some minor differences with the benchmark estimates, the qualitative responses are the same, as are the conclusions about the role of confidence in the transmission of spending shocks during a recession.

Figure A-9: Impulse Responses to Spending Shock: SUR

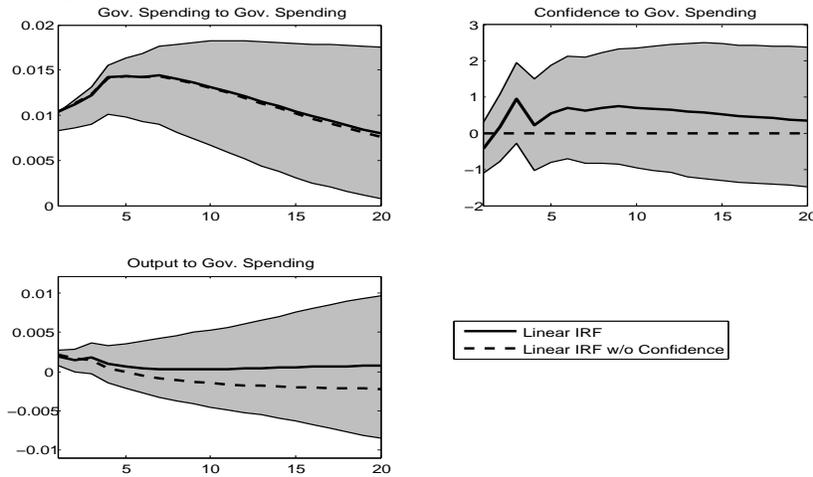
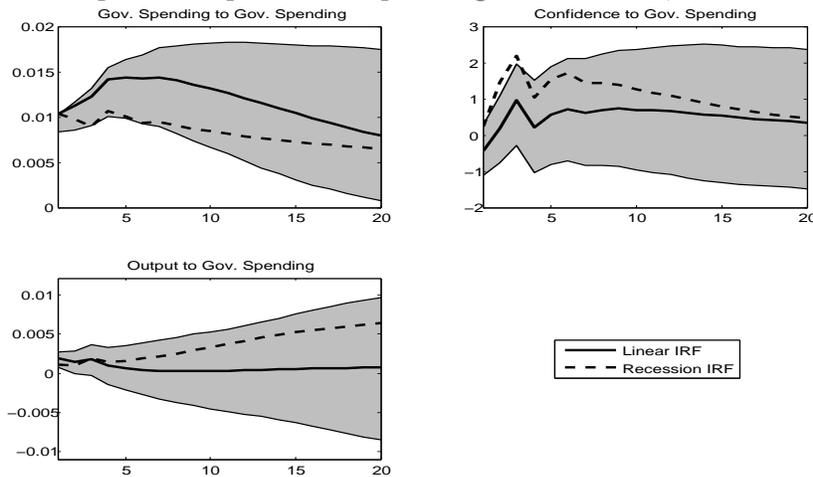


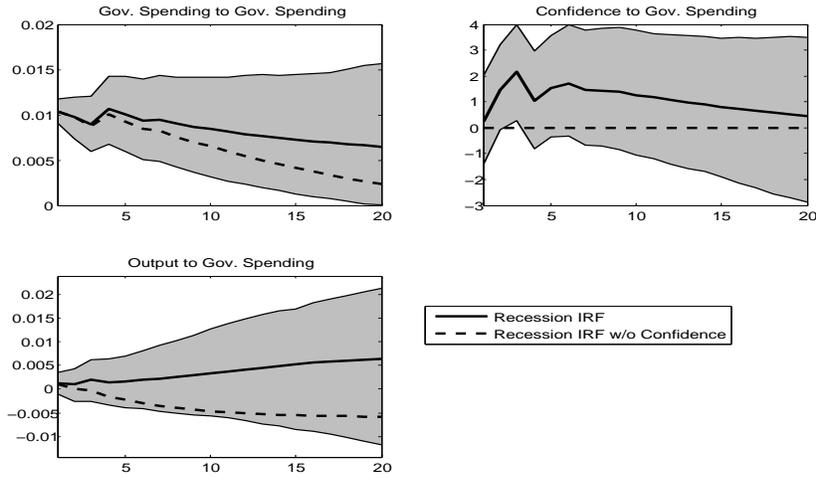
Figure A-9 shows impulse responses to a government spending shock from the benchmark system with government spending, consumer confidence, and real GDP, but estimated via seemingly unrelated regressions (SUR) imposing that lagged confidence does not appear in the government spending equation. The solid lines are the estimated impulse responses. The shaded gray areas are 90 percent confidence bands. The dashed lines are the impulse responses when uncertainty is held fixed.

Figure A-10: Impulse Responses to Spending Shock: SUR, Recession vs. Linear



The dashed lines in Figure A-10 are impulse responses to a government spending shock in a recession estimated from a non-linear system with government spending, consumer confidence and real GDP via seemingly unrelated regressions (SUR) imposing that lagged confidence does not appear in the government spending equation. The solid lines are the estimated impulse responses from the linear system, and the shaded gray areas are the 90 percent confidence bands from the linear system. The size of the shock in the non-linear system has been normalized to be the same as in the linear system.

Figure A-11: Impulse Responses to Spending Shock: SUR, Recession with and without Confidence



The solid lines in Figure A-11 are estimated impulse responses to a government spending shock in a recession estimated from the non-linear specification via seemingly unrelated regressions (SUR) imposing that lagged confidence does not appear in the government spending equation. The shaded gray regions are 90 percent confidence bands. The dashed lines are the impulse responses when uncertainty is held fixed. The size of the shock has been normalized to be the same as in the linear system.