Does Government Spending Stimulate Private Activity?

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July 12, 2011

Preliminary

Abstract

This paper asks whether increases in government spending stimulate private activity. Using a variety of identification methods and samples, I find that in most cases private spending falls significantly in response to an increase in government spending. These results imply that the average output multiplier lies below unity. On the other hand, increases in government spending do lower unemployment. However, most specifications and samples imply that virtually all of the effect is through an increase in government employment, not private employment.

This is a preliminary version of a paper to be presented at the NBER conference "Fiscal Policy after the Financial Crisis" in Milan in December 2011. I am grateful to Jonas Fisher for sharing the Fisher-Peters defense excess returns variable.

1 Introduction

The potential stimulus effects of fiscal policy have once again become an active area of academic research. Before The Great Recession, the few researchers who estimated the effects of government spending did so in order to understand which macroeconomic models were the best approximation to the economy. Rather than analyzing differences in estimated multipliers, most of the literature debated whether the movements of key variables, such as real wages and consumption, were more consistent with Keynesian or Neoclassical views of fiscal policy (e.g. Rotemberg and Woodford (1992), Ramey and Shapiro (1998), Blanchard and Perotti (2002), Burnside et al. (2004), and Perotti (2008)). Starting with the stimulus debate, however, the focus shifted to empirical estimates of multipliers. In Ramey (2011b), I surveyed the growing recent literature that estimates government spending multipliers in aggregate national data as well as in state panel data. Reviewing that literature, I found that the range of estimates of the GDP multiplier are often as wide within studies as it is across studies. I concluded that the multiplier for a deficit-financed temporary increase in government spending probably lies somewhere between 0.8 and 1.5. This range is quite wide.

Two of the key questions for deciding whether policy-makers should use government spending for short-run stabilization policy are: (1) Can an increase in government spending stimulate the economy in a way that raises private spending? and (2) Can an increase in government spending raise employment and lower unemployment? With respect to the first question, if an increase in government spending raises GDP without raising private sector spending, then it does not necessarily raise private welfare (unless the government spending is on public goods that raise welfare). With respect to the second question, most economists and policy makers would agree that job creation is at least as important a goal as stimulating output. In theory, one can use Okun's Law to translate GDP multipliers to unemployment multipliers. However, because of variations in the parameters of this "law" over time, the advent of jobless recoveries, and the frictions involved in creating and filling jobs, the translation of output multipliers to employment or unemployment multipliers is not straightforward. Thus, it makes sense to devote as much attention to the employment effects of government spending as the output effects.

Thus, this paper empirically studies the effect of government spending on private spending, unemployment, and employment. I define private spending to be GDP less government spending. I show that whether one uses structural vector autoregressions (SVARs) or expectational vector autoregressions (EVARS), whether the sample includes WWII and Korea or excludes them, an increase in government spending never leads to a significant rise in private spending. In fact, in most cases it leads to a significant fall. These results imply that the government spending multiplier is more likely one or below rather than above one. I then investigate the effects of government spending shocks, using a variety of identification schemes from the literature, on private versus government employment. I find the the surprising result that in the great majority of time periods and specifications, all of the increase in employment after a positive shock to government spending is due to an increase in government employment, not private employment. There is only one notable exception. These results suggest that the employment effects of government spending work through the direct hiring of workers, not stimulating the private sector to hire more workers.

It is important to keep in mind that these results apply the average identified increase in government spending. Because some of the increases were financed with deficits, but others were financed with distortionary taxes, they do not necessarily tell us what the multiplier is for a pure deficit-financed increase in government spending. Doing this would require bringing in information on tax multipliers.

The next section reviews the literature on output and employment multiplier, as well as the literature that draws a distinction between the "G" devoted to purchases of goods and services from the private sector and the "G" devoted to compensation of government employees. The third section shows estimates of the effects of government spending on private output. The fourth section shows results for unemployment and the fifth section shows the results employment. The final section concludes.

2 Review of the Literature

2.1 Output Multipliers

There has been a dramatic increase in research on the output multiplier in the last few years. The aggregate studies that estimate the multiplier fit in two general categories. The first are the studies that use long spans of annual data and regress the growth rate of GDP on current and one lag of defense spending, or government spending instrumented by defense spending(e.g. Hall (2009) and Barro and Redlick (2011)).

These studies tend to find multipliers that are less than one. The second type are the vector autoregressions (VARs) estimated on quarterly data, such as those used by Ramey and Shapiro (1998), Blanchard and Perotti (2002), Mountford and Uhlig (2009), Fisher and Peters (2010), Auerbach and Gorodnichenko (2011), and Ramey (2011a). Some of these papers calculate the multipliers based on comparing the peak of the government spending response to the peak of the GDP response. Others compare the area under the two impulse response functions. As I discuss in my forthcoming forum piece for the *Journal of Economic Literature* (Ramey (2011b)), the range of multiplier estimates are often as wide within studies as across studies. An interesting, but unnoticed pattern arises from this literature. In particular, the Blanchard-Perotti-style SVARs yield smaller multipliers than the expectational VARs (EVARS), such as the ones used in my work. This result is intriguing because the SVARs tend to find rises in consumption whereas the EVARs tend to find falls in consumption in response to an increase in government spending. Overall, most output multiplier estimates from the aggregate literature tend to lie bewteen 0.5 and 1.5.

There are also a number of papers that use cross-sections or panels of states to estimate the effects of an increase in government spending in a state on that state's income (see Ramey (2011b) for a summary of these). These papers typically find multipliers of about 1.5. However, translating these state-level multipliers to aggregate multipliers is tricky, as discussed in my review.

2.2 Labor Market Effects of Government Spending

A few of the older papers and a growing number of recent papers have studied government spending effects on labor markets. Most of the studies that exploit cross-state or locality variation focus on employment as much as income. For example, Davis, Steven J. and Mahidhara (1997) and Hooker and Knetter (1997) were among the first to study the effects of defense spending shocks on employment in a panel of states. Nakamura and Steinsson (2011) study similar effects in updated data. Fishback and Kachanovskaya (2010) analyze the effects of various New Deal programs during the 1930s on states and localities. Chodorow-Reich, Gabriel and Woolston (2010) and Wilson (2010) estimated the effects of the recent American Recovery and Reinvestment Act (ARRA) on employment using cross-state variation. As summarized by Ramey (2011b), on average these and related studies produce estimates that imply that each $35,000 of government spending produces one extra job. However, some of these studies, such as by Wilson (2010), find that the jobs disappear quickly.

At the aggregate level, the recent paper by Monacelli, Tommaso and Trigari (2010) analyzes the effects of government spending shocks on a number of labor market variables. In particular, they use a standard structural VAR to investigate the effects of government spending shocks on unemployment, vacancies, job finding rates and separation rates in the post 1954 period. Their point estimates suggest that positive shocks to government spending lower the unemployment rate and the separation rate, and increase vacancies and the job finding rate. However, their estimates are imprecise, so most of their points estimates are not statistically different from zero at the five percent level. On the other hand, Bruckner and Pappa (2010) study the effects of fiscal expansions on unemployment in a sample of OECD countries using quarterly data. Whether they use a standard SVAR, sign restrictions, or the Ramey-Shapiro military dates, they find that a fiscal expansion often *increases* the unemployment rate. In most cases, these increases are statistically significant at the 5 percent confidence level.

In sum, the studies using state or local panel data find more robust positive effects of government spending on employment than the aggregate studies. As discussed above, translating state-level multipliers to the aggregate is not straightforward.

2.3 Output versus Employment Distinctions

A few papers in the literature have noted the potential importance of distinguishing two components of government purchases. In the National Income and Product Accounts, government purchases "G" include both government purchases of goods from the private sector, such as aircraft carriers, and compensation of government employees, such as payments to military and civilian personnel. Rotemberg and Woodford (1992) made this distinction in their empirical work by examining shocks to total defense spending after conditioning on lags of the number of military personnel.

Wynne (1992) was the first to point out the theoretical distinction between government spending on purchases of goods versus compensation of government employees. He used comparative statistics in a neoclassical model to demonstrate the different effects. Finn (1998) explored the issue in a fully dynamic neoclassical model. She showed that increases in G resulting from an increase in government employment and increases in G resulting from an increase in purchases of goods from the private sector have opposite effects on private sector output, employment, and investment. To see why these is a difference, consider the following key equations from an augmented neoclassical model. Consider first the production function for private value added:

$$\text{(1)} \qquad \mathrm{Y^p} = F(N^p, K^p)$$

where $\mathrm{Y^p}$ is private value added, N^p is private employment, and K^p is the private capital stock. The number of workers available for private employment is determined by the labor resource constraint:

$$\text{(2)} \qquad N^p = \bar{T} - N^g - L$$

where $\bar{T}$ is the time endowment, N^g is government employment, and L is leisure. Thus, one way that the government draws resources from the private sector is through the labor endowment. Another way that the government draws resources from the private sector is through its purchases of private goods. In this case, the affected resource constraint is the one for private output, given by:

$$\text{(3)} \qquad \mathrm{Y^p} = C + I + NX + \mathrm{P^g}$$

where P^g is government purchases from the private sector. Total "G" from national income and product accounts (NIPA) is:

$$\text{(4)} \qquad G = \mathrm{P^g} + \mathrm{Y^g}$$

where $\mathrm{Y^g}$ is government value added, created by combining government employment with government capital. Total GDP is of course given by:

$$\text{(5)} \qquad \mathrm{Y} = \mathrm{Y^p} + \mathrm{Y^g}$$

Thus, government purchases from NIPA include both purchases from private value added and government value added created by hiring government workers.

As Finn (1998) shows, in a neoclassical model purchases of goods from the private sector raise private output, employment and investment through the usual negative wealth effects that raise labor supply. In contrast, if the government hires more workers and produces output itself, it takes labor resources away from the private sector, so private output, employment, and investment fall. Using the Ramey and Shapiro (1998) military dates, Cavallo (2005) showed that during military buildups, both types of spending rise. Pappa (2009) uses sign restrictions to identify shocks to government consumption, government investment, and government employment. Using both aggregate as well as state-level data from 1969 to 2001, she finds that shocks to government consumption and investment increase real wages and employment, but that the effects of government employment shocks are mixed. Finally, Gomes (2010) studies the effects of increases in government employment in an estimated two-sector DSGE model with search and matching frictions. In addition to obtaining a number of interesting results on optimal public sector labor policy, he studies the extent to which government employment shocks crowd out private sector employment. For most shocks, he finds that private sector employment falls but private sector wages rise.

3 Why It is Useful to Analyze Periods with Big Wars

Perotti (2011) repeats the argument first made by Blanchard and Perotti (2002) that we should only study U.S. samples from 1954 and later because of unusual events during the world wars and the Korean War. In contrast, Hall (2009), Ramey (2011a), and Barro and Redlick (2011) argue that there is not enough variation in government spending after 1954 to identify the effects of government spending. Consider Figure 1, which updates the figure shown in numerous other papers, including Ramey (2011a). It is clear that the movements in government spending during WWII and the Korean War are orders of magnitude greater than any other movements. We might do well to consider Friedman's (1951) views on the use of wartime information:

> The widespread tendency in empirical studies of economic behavior to discard war years as "abnormal," while doubtless often justified, is, on the whole, unfortunate. The major defect of the data on which economists

> must rely - data generated by experience rather than deliberately contrived experiment - is the small range of variation they encompass. Experience in general proceeds smoothly and continuously. In consequence, it is difficult to disentangle systematic effects from random variation since both are of much the same order of magnitude.
>
> From this point of view, data for wartime periods are peculiarly valuable. At such times, violent changes in major economic magnitudes occur over relatively brief periods, thereby providing precisely the kind of evidence that we would like (to) get by "critical" experiments if we could conduct them. Of course, the source of the changes means that the effects in which we are interested are necessarily intertwined with others that we would eliminate from a contrived experiment. But this difficulty applies to all our data, not to data for wartime periods alone.
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> — Friedman (1951), p. 612.

The notion that there is much less information in the post-1954 period is also supported by statistical analysis. As I demonstrate in Ramey (2011a), the first-stage F-statistic for my news series is well above the Staiger and Stock (1997) safety threshold of 10 for samples that include either WWII or Korea. However, the F-statistic is very low for samples that exclude both periods. Fisher and Peters (2010) develop an alternative measure of anticipated increases in government spending based on stock returns for the later period. In particular, they use the cumulative excess returns on stocks of defense contractors relative to the rest of the stock market as an indicator of anticipated increases in defense spending. Fisher and Peters (2010) only study the R-square, which is not the best indicator of first-stage relevance. My analysis of the marginal F-statistic for their measure (from 1958 to 2008) reveals first-stage F-statistics of 5.5 for defense spending, but only 2.3 for total government spending. Although the first of these F-statistics is well above those of most instruments used in macroeconomic research, both are still below the Staiger-Stock safety threshold.

In considering the WWII era, Perotti (2011) is correct that there were many other factors that make that period abnormal. Hall (2009) conjectures that the combined effects of price controls, rationing, the draft, and patriotism probably has a negative effect on the multiplier, whereas Barro and Redlick (2011) conjecture that these factors have a positive effect on the multiplier. In fact, we can measure at least some of these influences.

Consider the labor market at the start of WWII. Based on labor market data that I have compiled for that period, we can track the flows of individuals between various labor market states. I use September 1940 as the starting point, since that is when the draft was instituted and because government spending started rising in the fourth quarter of 1940. As Figure 2 shows, from September 1940 to the peak in March 1945, total employment rose by 15.6 million, a 27 percent increase in log differences. Most of the rise was due to the rise in military employment, though. Government civilian employment (including New Deal emergency workers) declined slightly during this period. As the figure shows, private employment was rising robustly from 1938 through most of 1941, but then leveled off.

Over this same time period, the population ages 14 and above rose by 5.4 million, but the labor force rose by 11.1 million. Figure 3 shows the dramatic increase in the labor force participation rate. Decennial data from before 1930 suggests a typical labor force participation rate around 56 percent. It was a little lower during the 1930s because of the Great Depression. As the graph shows, during WWII, the participation rate was six percentage points higher than it was before or in the decade after. Thus, 70 percent of the increase in employment during WWII is accounted for by the rise in the labor force, with a large part of that increase due to an increase in the participation rate. It is likely that an important part of that rise was due to the effects of the draft and patriotism. The number in the military rose by 11.5 million during WWII. The rise was only 2.2 million during Korea.

Over this same period from 1940 to 1945, the number unemployed fell by 4.5 million. Thus, the remaining 30 percent of the increase in employment was due to flows from unemployment to employment.

These numbers omit one other important flow of workers. My unemployment numbers do not include "emergency workers," who were workers employed by the various New Deal government programs. Like Darby (1976) and Weir (1992), I included those workers in the "employed" category rather than as unemployed. The number of individuals employed as emergency workers decreased from 2.5 million in September 1940 to 0 by mid-1943. Thus, these workers represented an additional 2.5 million workers available for other sectors.

While total employment rose by 27 percent, real GDP rose by 58 percent (in log points), meaning that labor productivity rose by 31 percent. Thus, during the five year period from 1940 to 1945, labor productivity rose at an average annualized rate of seven percent. This rate of growth is substantially greater than the growth of productivity in the decade before or the decade after. For example, from 1947 to 1960, labor productivity growth was about 3.3 percent.

Thus, the combination of high starting unemployment, exceptional temporary rises in the labor force participation rate, and the exceptionally high rate of productivity growth suggests that samples that include World War II should produce estimates of the GDP multiplier that are much higher than what one would expect from a temporary government stimulus package that does not involve patriotism, the draft, or exceptional productivity growth.

4 The Effects of Government Spending on Private Spending

In most studies using aggregate data, government spending multipliers are usually calculated by comparing the peak of the output response to the peak of the government spending response or by comparing the integral under the impulse response functions up to a certain horizon. Usually, no standard errors are provided, but given the wide standard error bands on the output and government spending components, the standard error bands on the multipliers are assumed to be large. Studies of the subcomponents of private spending, such as nondurable consumption or nonresidential fixed investment, often give mixed results with wide error bands.

As I will now show, a simple permutation of the variables in a standard vector autoregressions (VAR) can lead to more precise estimates for the relevant policy question: on average does an increase in government spending raise private spending? To answer this question, I will use a standard set of VAR variables employed by many in the literature with one modification: I will use private spending (Y - G) rather than total GDP. [1]

To study the effects of government spending shocks on private spending, I will estimate the following VAR system:

1. Ramey and Shapiro (1998) also studied the response of this variable using their military dates. On the other hand, Rotemberg and Woodford (1992) studied private *value added*, which is a different concept.

$$X_t = A(L)X_{t-1} + U_t, \tag{6}$$

where X_t is a vector of variables that includes the log of real per capita government spending on goods and services ("G"), the log of real per capita private spending, the Barro-Redlick average marginal tax rate, and the interest rate on 3-month Treasury bills, as well as key variables for identification that I will discuss shortly. The interest rate and tax variables are used as controls for monetary and tax policy. $A(L)$ is a polynomial in the lag operator. As is standard, I include four lags of all variables, as well as a quadratic time trend.

I consider several of the main identification schemes used in the literature. These are as follows:

1. **Ramey News**: Concerned that most changes in government spending are anticipated, Ramey and Shapiro (1998) used a dummy variable for military events that led to significant rises in defense spending as the exogenous shock. In more recent work in Ramey (2011a), I extended this idea and used sources such as *Business Week* to construct a series of changes in the expected present discounted value of government spending caused by military events. I divided this series by the previous quarter's GDP to create a "news" series. This series is added to the VAR and the shock is identified with a standard Choleski decomposition with the news series ordered first.

2. **Blanchard-Perotti SVAR**: Blanchard and Perotti (2002) identify the shock to government spending with a standard Choleski decomposition with total government spending ordered first.

3. **Perotti SVAR**: Perotti (2011) claims that the structural VAR (SVAR) equivalent to my news VAR is one that replaces the news series with defense spending or federal spending. Shocks are then identified as shocks to this variable ordered first. As my reply argues (Ramey (2011c)), there is little difference between the impulse response functions generated by this scheme and the original BP scheme. For the sake of argument, though, I will also show the results from this scheme, where I augment the system with defense spending.

4. **Fisher-Peters EVAR**: Fisher and Peters (2010) develop an alternative measure of anticipated increases in government spending based on stock returns. As discussed above, they use the cumulative excess returns on stocks of defense contractors relative to the rest of the stock market as an indicator of anticipated increases in defense spending. My analysis of this series shows that its marginal first-stage F-statistic for defense spending is 5.5 but for total government spending is only 2.3. While below the Staiger-Stock safety threshold of 10, its first stage properties are better than many implicit instruments used in macro studies. Thus, I will use this series as well. This series is available for 1958 to 2008.

I estimate the first three specifications on three samples each: 1939:1 - 2008:4, 1947:1 - 2008:4, and 1954:1 - 2008:4. Due to data limitations, the Fisher-Peters EVAR is estimated from 1958:1 to 2008:4. In all cases, the shock is normalized so that the peak of government spending is one percent of GDP. The response of private spending is converted to percentage points of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 4 shows results from the EVAR using my news variable. In the first two samples, government spending rises significantly and peaks at around six quarters. The slow response of actual government spending to the news variable is consistent with my hypothesis that government spending changes are anticipated at least several quarters before they happen. In the 1939-2008 sample, private spending rises slightly on impact, but then falls significantly below zero, troughing at around 0.5 percent of GDP. In the 1947-2008 sample, private spending rises significantly on impact, to about 0.5 percent of GDP, but then falls below zero within a few quarters. As discussed in my previous work, the Korean War is influential in the post-WWII sample. As observed in the consumer durable expenditure data and discussed in the press at that time, the start of the Korean War led to panic buying of durable goods in the U.S. because many feared WWII type of rationing was imminent. This is the most likely source of the positive impact effect. For the post-Korean War period, the low first-stage F-statistic of my news variables means that any results for that sample are questionable. Nevertheless, they are shown for completeness. The standard error bands are much larger for this sample. Private spending falls, but the estimates, though large, are not statistically different from zero.

Figure 5 shows the responses based on the Blanchard-Perotti SVAR and Figure 6 shows the results of the augmented SVAR advocated by Perotti (2011). For both specifications, private spending declines significantly in response to a rise in government spending in the first two samples. In the post-Korean War sample, private spending is either unchanged or falls slightly below zero.

Figure 7 shows the responses based the Fisher-Peters type SVAR, where government spending shocks are identified as shocks to the excess stock returns for defense contractors. In contrast to the three previous specifications in which government spending peaks around quarter 6 and returns to normal between 12 and 14 quarters, this shock leads to a more sustained increase in government spending. Government spending barely falls from its peak even after 20 quarters. Private spending oscillates around zero, but is only becomes statistically different from zero when it becomes negative at longer horizons.

Thus, the SVAR specifications give essentially the same answer to the question posed as the EVAR specifications: a rise in government spending does not appear to stimulate private spending. In fact, in many samples and specifications, it reduces private spending.

These results imply that for the types of changes in government spending identified by the various schemes, the total GDP multiplier lies below unity. As discussed earlier, though, on average these increases in government spending were financed partly by a rise in distortionary taxes. Thus, the multiplier could potentially be greater for a deficit-financed increase in government spending.

5 The Effects of Government Spending on Unemployment

As we saw in the last section, no matter which identification scheme was used and which sample period was used, an increase in government spending did not lead to an increase in private sector spending. In many cases, it led to a significant decrease. Even in the face of this result, though, policymakers might still want to use stimulus packages to reduce unemployment. There is substantial microeconomic evidence that long spells of unemployment lead to persistent losses of human capital. Thus, even if government spending cannot stimulate private spending, it might still have positive effects by raising employment.

To this end, I estimate the following modification of the VARs presented in the last section. First, I revert to using total GDP rather than just private GDP, as is common in the literature. Second, I add the log of per capita unemployment to the VARs. For the impulse response functions, I rescale unemployment so that it has the same scale as the civilian unemployment rate.

Figure 8 through Figure 11 show the impulse response functions. For the various identification schemes and samples, the point estimates suggest that an increase in government spending leads to a fall in unemployment. The fall is always statistically significant in the period from 1939-2008 and sometimes significant in the other periods for a number of the specifications. Most estimates imply that an increase in government spending that peaks at one percentage point of GDP lowers the unemployment rate by between 0.2 to 0.5 percentage points. The exception is the EVAR that uses the Fisher-Peters stock market variable. In this case, the unemployment rate falls by a full percentage point.

As noted above, though, the Fisher-Peters experiment appears to involve a much more sustained increase in government spending. However, even comparing the ratio of the integral of unemployment to the integral of government spending over the five-year period, the Fisher-Peters specification implies a much larger effect on unemployment. In contrast, the Blanchard-Perotti SVAR implies the smallest effect.

6 The Effects of Government Spending on Employment

The bulk of evidence just presented suggests that a rise in government spending tends to lower the unemployment rate. Given the earlier discussion about how much of government spending is actually compensation of government employees, it is useful to decompose the employment effects into rises in government employment versus rises in private employment.

To study this issue, I estimate the following modification of the VARs presented in the last section. In each of the VARs, I omit the unemployment variable and instead include both the log of per capita government employment and the log of per capita private employment. Government employment includes civilian government workers, armed forces employment, as well as emergency worker employment during the late 1930s and early 1940s. The four identification schemes are the same ones discussed above. In all cases, the employment numbers are converted so that they are a percent of total employment.

Figure 12 shows the results from the specification with my defense news variable. In the full sample from 1939:1 - 2008:4, a rise in government spending equal to one percent of GDP leads to a rise in government employment of close to 0.5 percent of total employment. Private employment rises by about 0.2 percent of total employment, but is never significantly different from zero at the 5 percent level. The story for the 1947:1 - 2008:4 sample is the same. For the post-Korean War sample, the estimates are even less precise (note the change in scale). It appears that private employment initially dips, then rises, but there is much uncertainty about that path.

Figure 13 shows the responses based on the Blanchard-Perotti SVAR. Private employment also falls here in the first two sample periods. In the third sample period, it rises, but the standard errors bands are very wide. Figure 14 shows similar results for the Perotti SVAR.

Figure 15 shows the responses based the Fisher-Peters type SVAR. In contrast to the previous cases, this identification and sample suggest that increases in government spending raise both government employment and private employment. Although government spending rises steeply throughout the first two years after the shock, private employment does not begin to rise until the second year. It peaks during the third year at about 1.5 percent of total employment. Since this identification scheme seems to pick up more persistent movements in government spending, it might be the case that only sustained increases in government spending raise private sector employment. More research on this is required.

To summarize, the EVAR using my defense news variable and the Blanchard-Perotti SVARs suggest that for the most part, increases in government spending raise government employment but lower private employment. In contrast, the Fisher-Peters identification scheme suggests that government spending shocks that lead to sustained rises in government spending also raise private employment significantly, even more so than government employment.

7 Conclusion

This paper presents the results of a preliminary investigation of the effects of government spending private sector activity in the U.S. For the most part, it appears that a rise in government spending does not stimulate private spending. Increases in government spending do reduce unemployment. For all but one specification, it appears that all of the employment increase is from an increase in government employment, not private employment. The only exception is in the specifications using the Fisher-Peters measure of defense news for the 1958 to 2008 period. This specification implies that a sustained increase in government spending has a robust positive effect on private employment. On balance, the entire set of results suggests that direct hiring of workers by the government may be more effective than relying on multiplier effects of government purchases.

Data Appendix

Quarterly GDP Data: The quarterly GDP data from 1939 - 1946 are the same that were constructed in my earlier work Ramey (2011a). The data from 1947 to the present are from bea.gov. The only difference from the earlier work is that I deflated total government and defense spending by the GDP deflator, rather than specific deflators, so that the multiplier is easier to interpret. Private spending is defined as nominal GDP less nominal government spending, and the result is deflated by the GDP deflator. All variables are converted to a per capita basis by dividing by total population, including the armed forces overseas. The defense news variable is discussed in Ramey (2011a). The excess returns on defense stocks was kindly provided by Jonas Fisher.

Employment and Unemployment Data: The various employment and unemployment components are from monthly data and are converted to quarterly.

Civilian Employment Data. The data from 1930 through 1940 are based on employment data from *The Conference Board*. I seasonally adjusted these data using the default X-12 features of Eviews. I then used the 12-month moving average of the ratio of the annual average of Weir's (1992) civilian employment series to the annual average of these series to make the monthly series match Weir's (1992) data. From 1941 - 1947, I used the monthly series published in the 1947 and 1949 *Supplement to the Survey of Current Business*. Again, I adjusted them so that the annual averages matched Weir's (1992). Data from 1948 to the present are from the Bureau of Labor Statistics Current Population Survey.

Civilian Government Employment The series from 1930 to 1938 are interpolated from the annual series from the BLS' establishment survey. The monthly data from 1939 to the present were from the establishment survey and were downloaded from bls.gov.

Armed Forces Employment The series from 1930 to 1937 were interpolated from annual series from the 1942 *Supplement to the Survey of Current Business*. From 1938 to 1941, the series are reported monthly in the 1942 *Supplement to the Survey of Current Business*. From 1942 to 1947, the numbers from the 1947 and 1949 *Supplement to the Survey of Current Business* were spliced (using the difference in 1948:1) to the unpublished BLS quarterly employment numbers (provided by Shawn Sprague), that are available from 1948 to the present. (The numbers from the 1947 and 1949 *Supplement* that were spliced to match the newer BLS numbers, matched the the older 1942

Supplement numbers very closely at the overlap.

Emergency Workers Monthly data was available from *The Conference Board*.

Unemployment Monthly data from 1930 to February 1940 are from *The Conference Board*, and are available from the NBER Macro History Data Base. These data were rescaled to match Weir's (1992) annual series (with emergency workers added, to be consistent). Data from March 1940 through 1946 were from the Bureau of the Census. Both the Conference Board and Census data were seasonally adjusted with Eviews. (For the case of the Conference Board unemployment data, the results using the default multiplicative seasonal factors looked odd, so I used additive factors instead.)

Population Total population was the same as used in my earlier work. The population 14 and older was interpolated from annual data.

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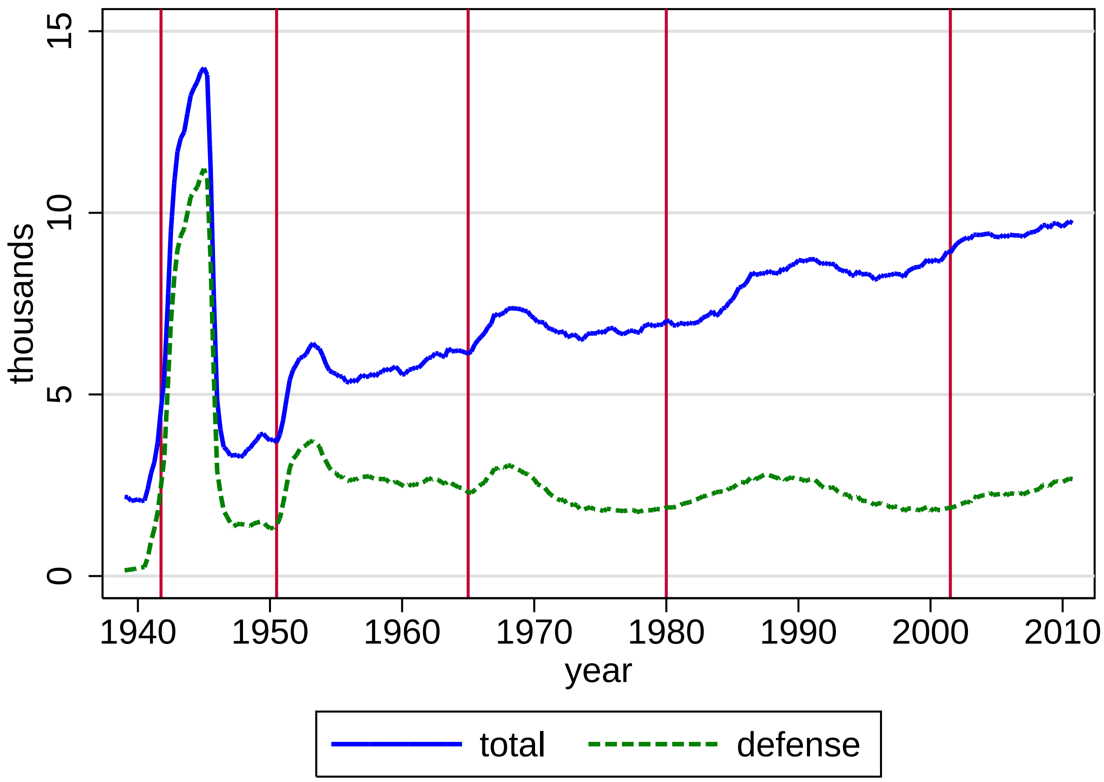
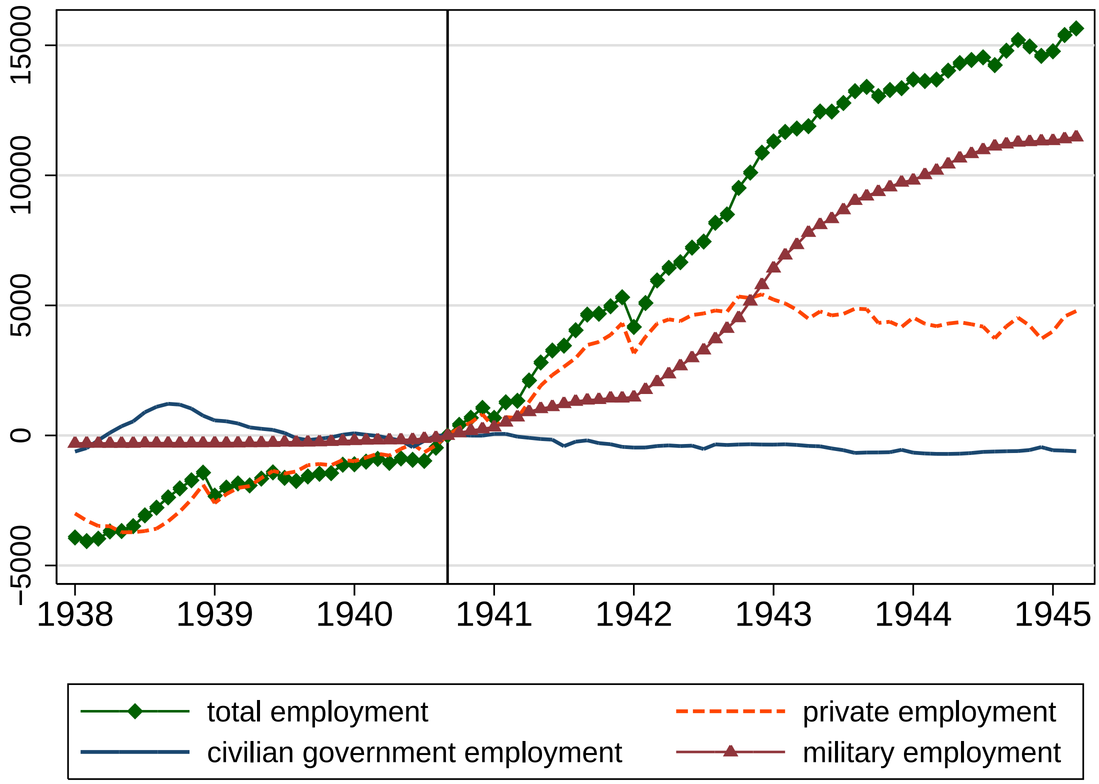
Figure 1. Real Government Spending Per Capita, 1939:1 - 2010:4



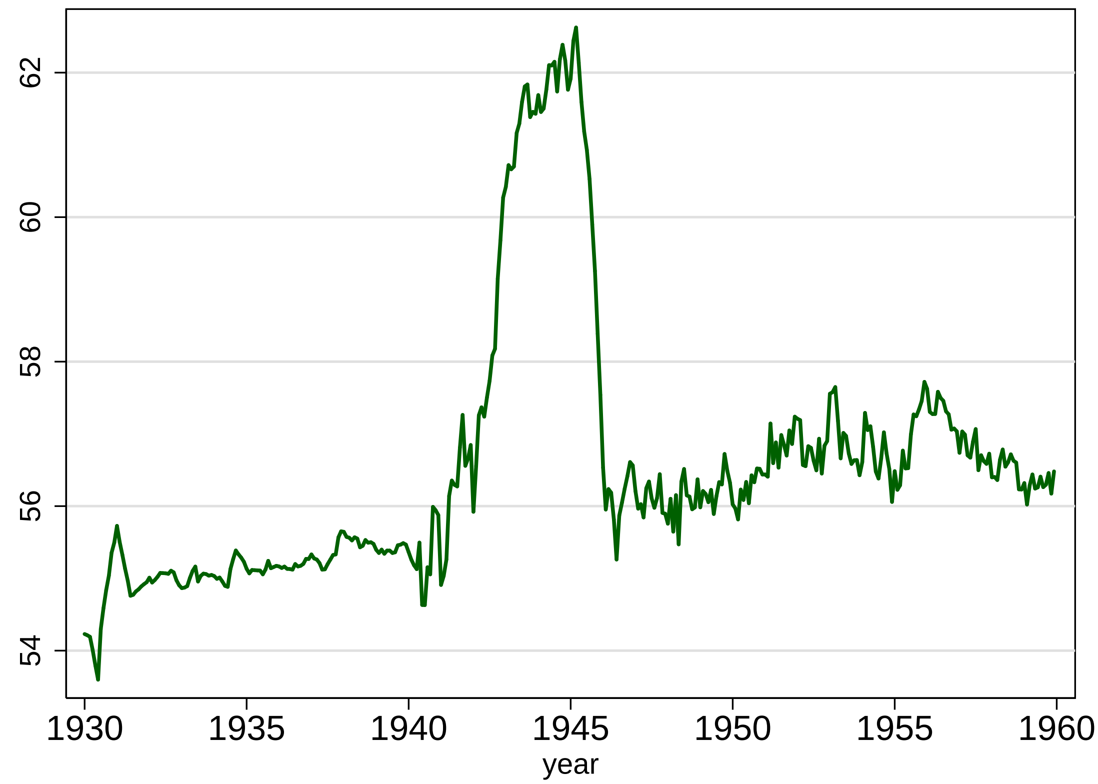
Notes: Data from the National Income and Product Accounts and the Census. Amounts are stated in 2010 dollars.

Figure 2. Decomposition of Employment Changes during WWII



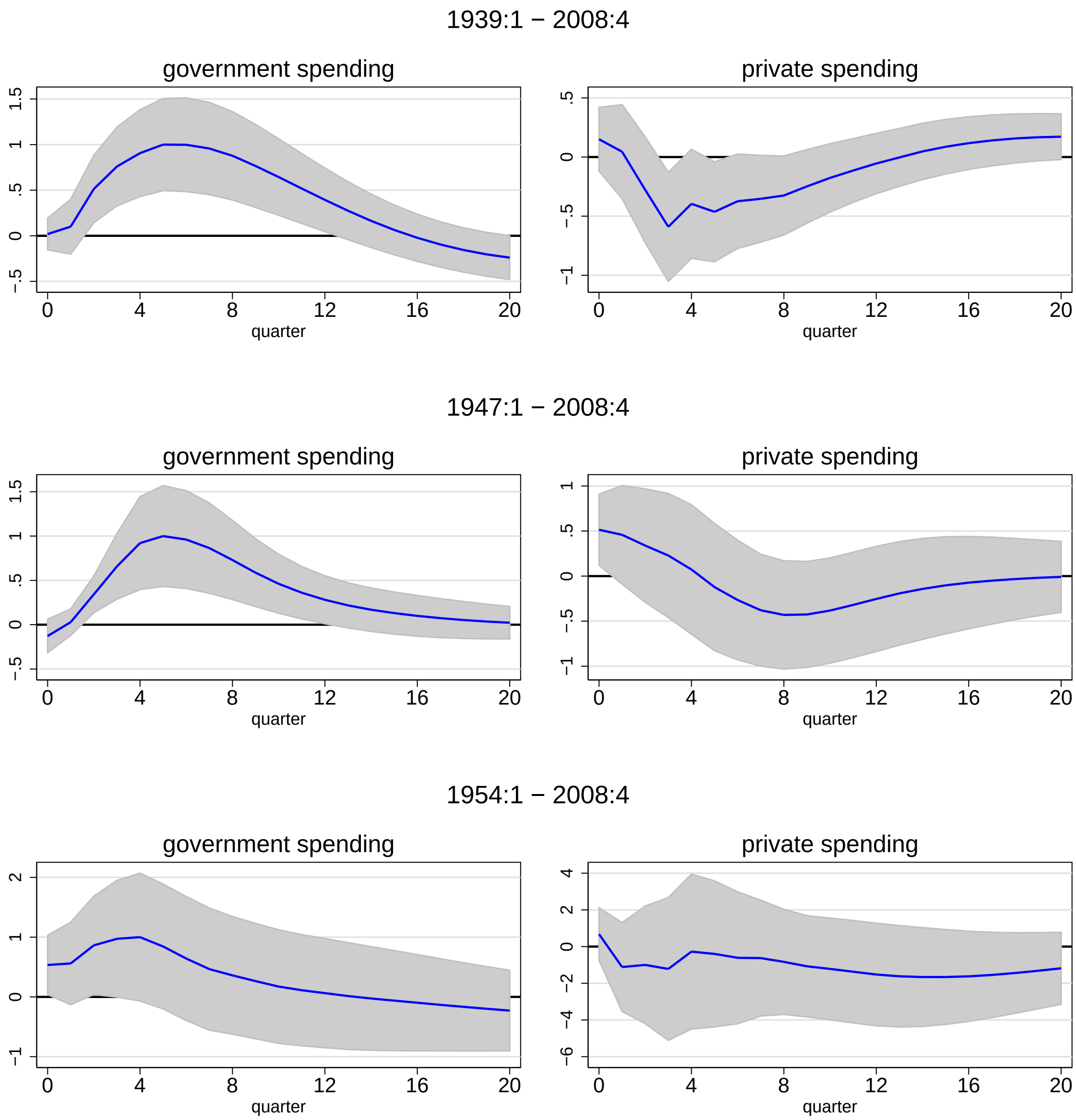
Notes: Each component has been normalized to 0 in September 1940. Numbers are in thousands. Based on data compiled by V. Ramey. See data appendix for details.

Figure 3. Labor Force Participation Rate, 1930:1 - 1959:12



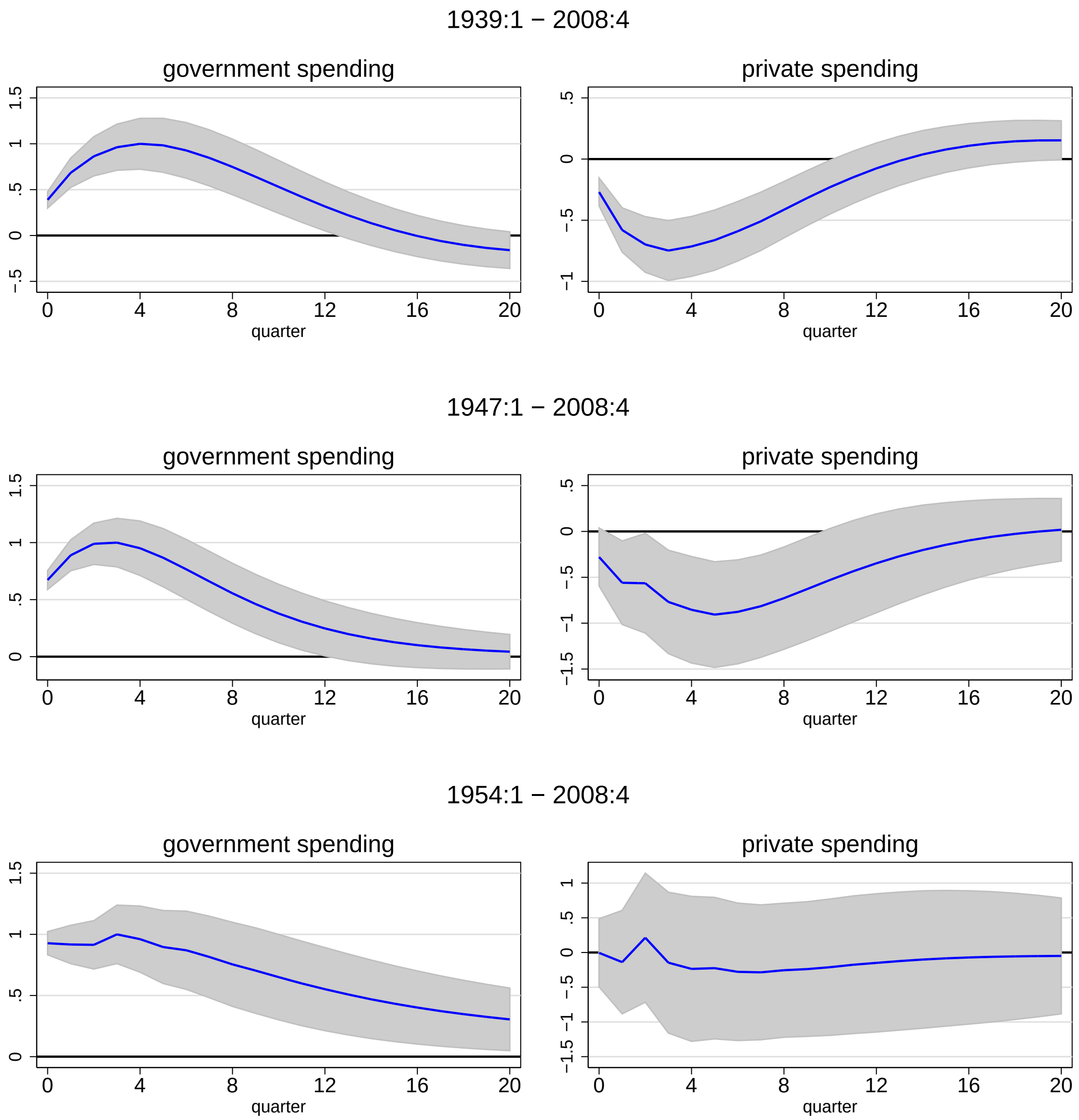
Notes: Labor force participation rate of population ages 14 and above. Based on data compiled by V. Ramey. See data appendix for details.

Figure 4. Private Spending Responses: Ramey News EVAR



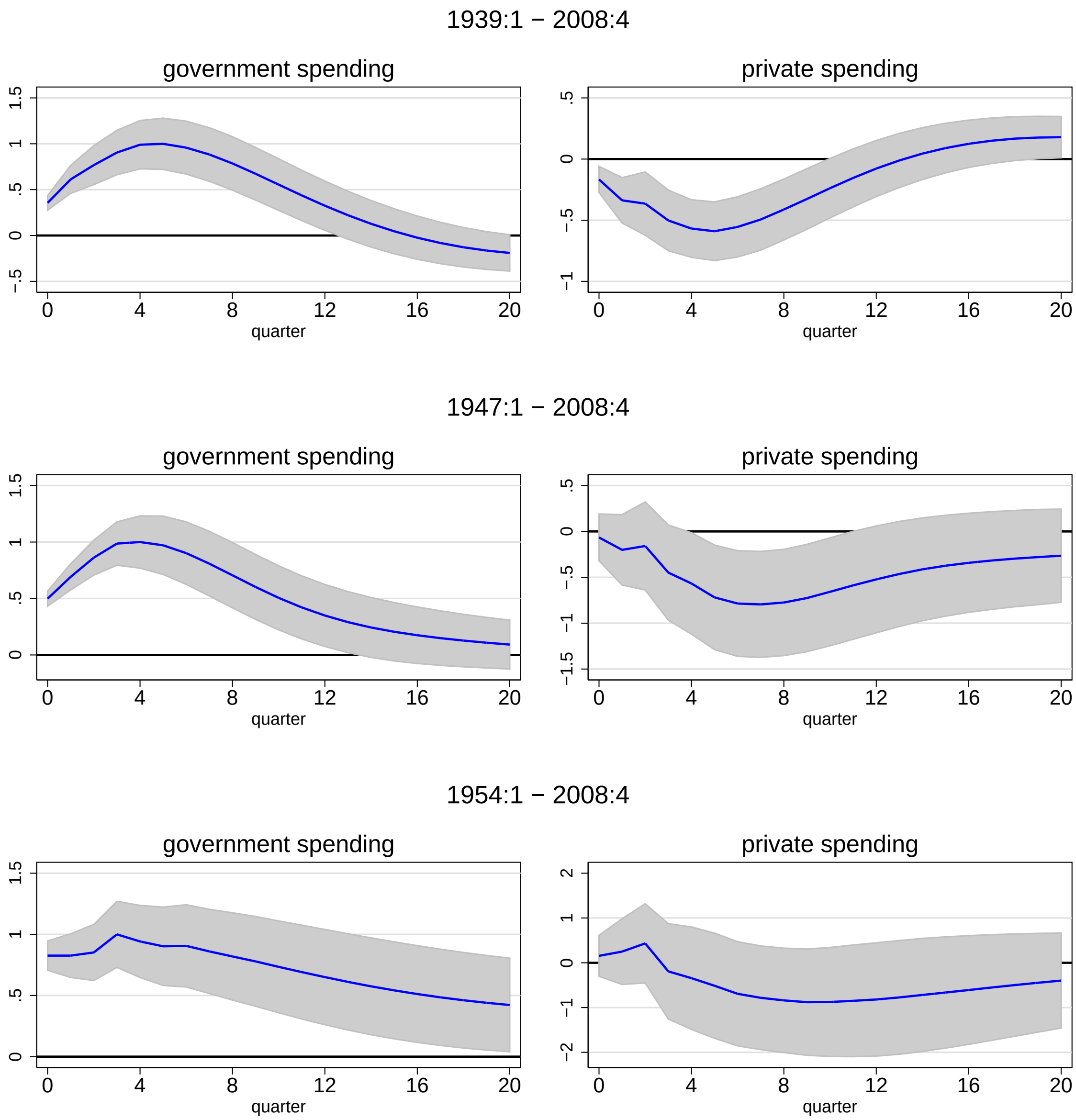
Notes: The government spending shock is identified as the shock to the news variable, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 5. Private Spending Responses: Blanchard-Perotti SVAR



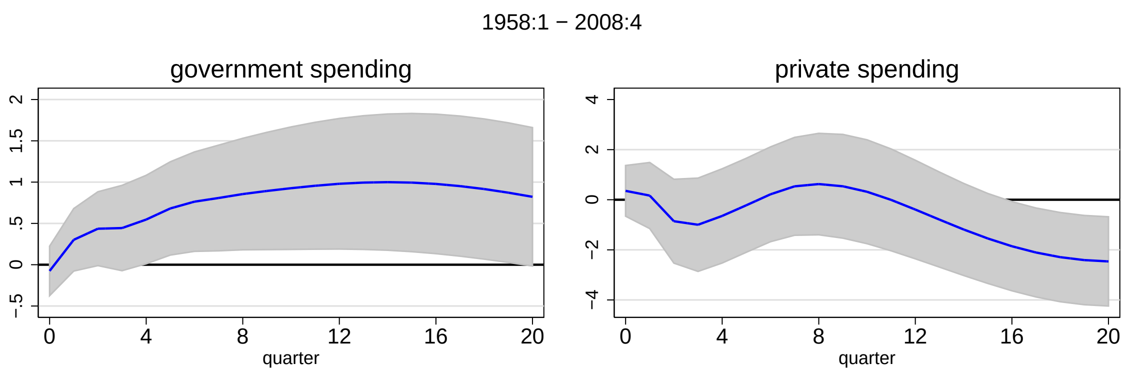
Notes: The government spending shock is identified as the shock to total government spending, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 6. Private Spending Responses: Perotti SVAR



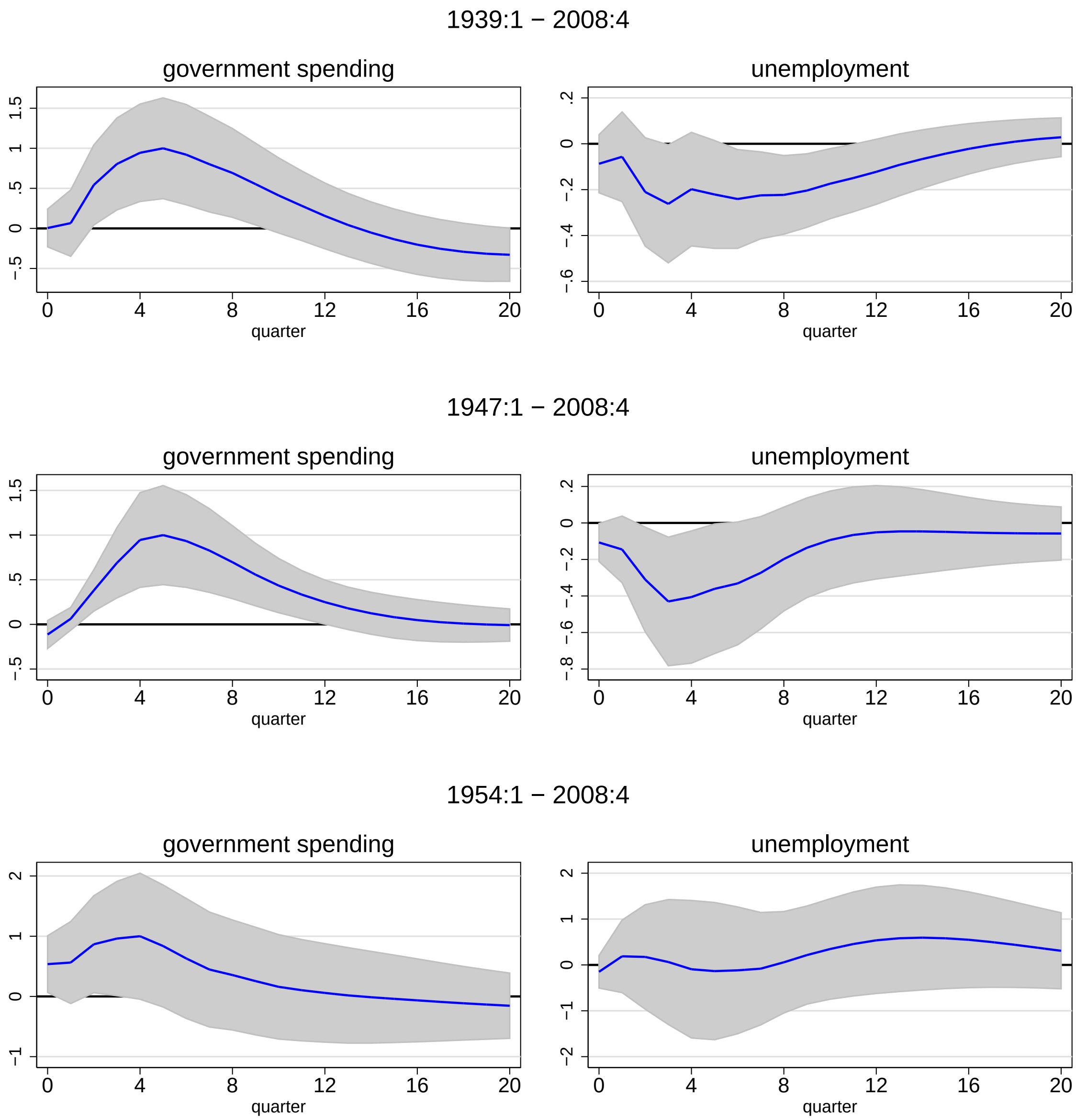
Notes: The government spending shock is identified as the shock to defense spending, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 7. Private Spending Responses: Fisher-Peters News EVAR



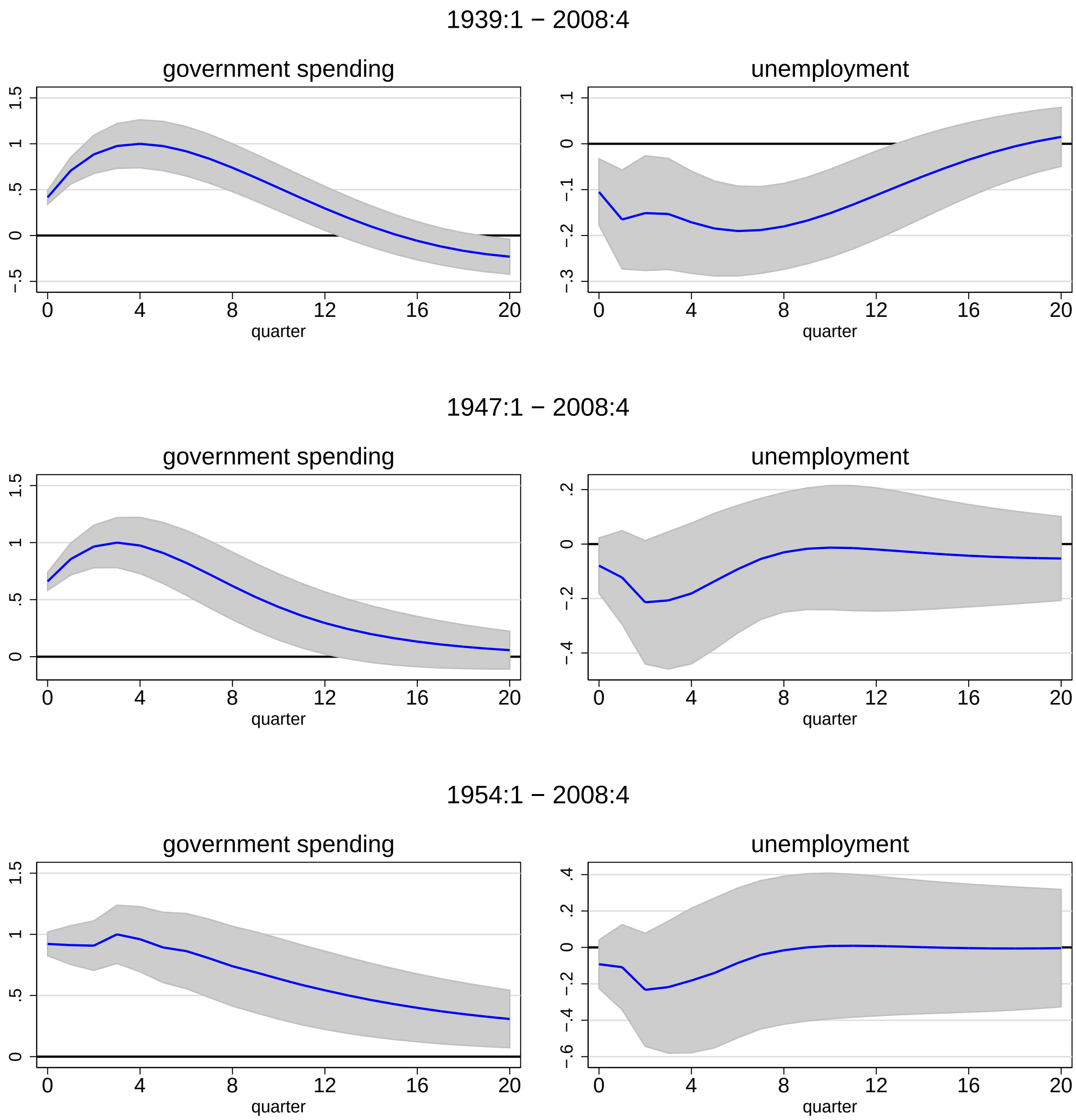
Notes: The government spending shock is identified as the shock to excess stock returns of top defense contractors, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 8. Unemployment Responses: Ramey News EVAR



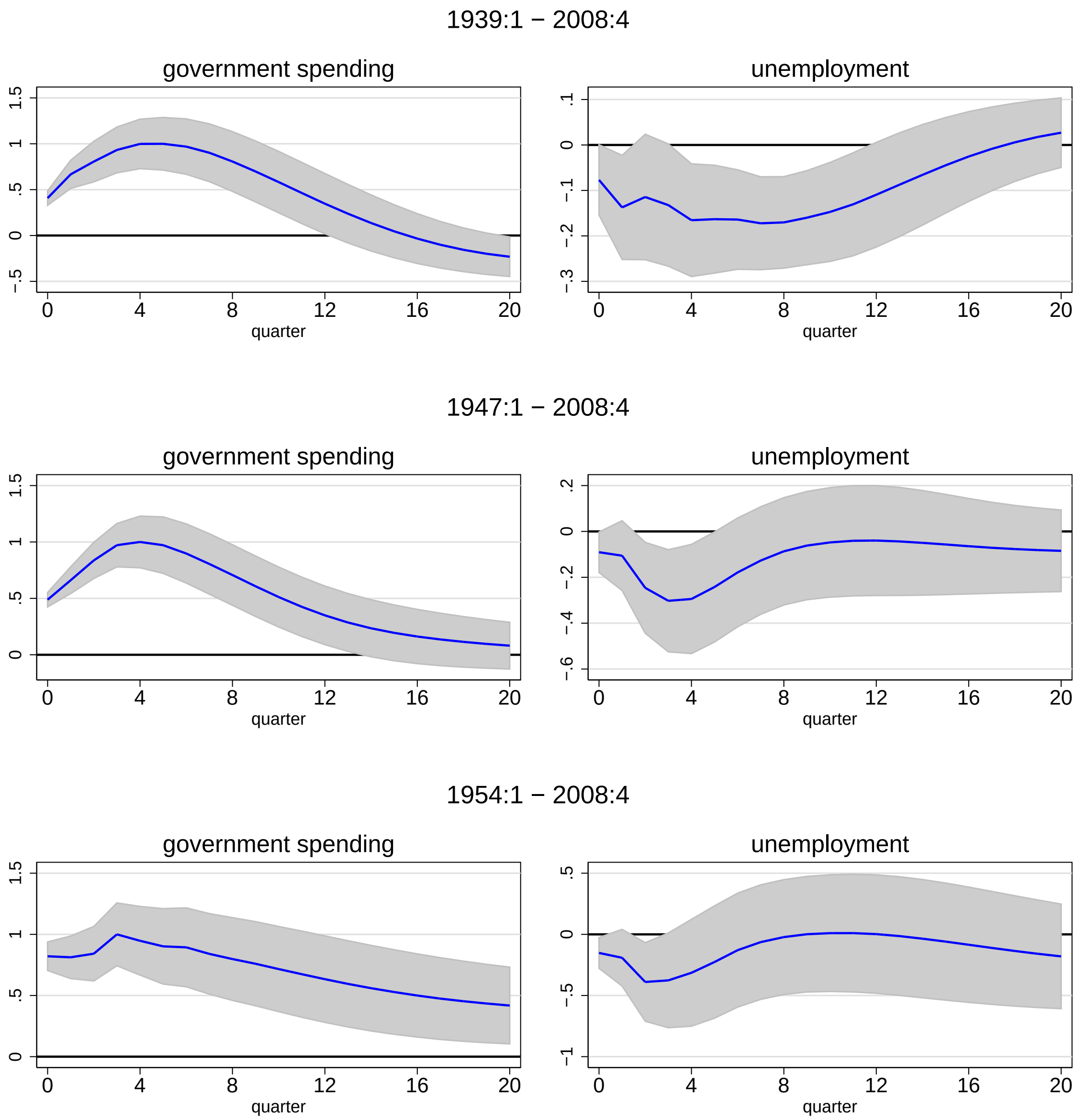
Notes: The government spending shock is identified as the shock to the news variable, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Unemployment is denoted as a percent of the civilian labor force. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 9. Unemployment Responses: Blanchard-Perotti SVAR



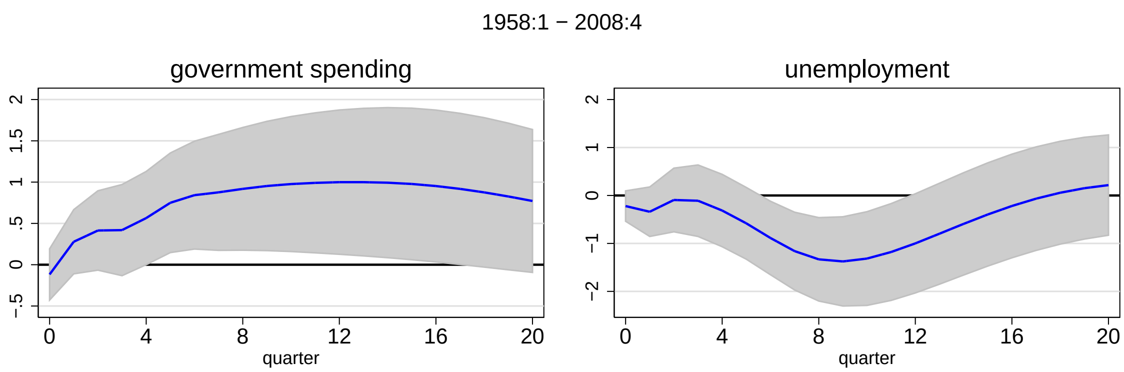
Notes: The government spending shock is identified as the shock to total government spending, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Unemployment is denoted as a percent of the civilian labor force. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 10. Unemployment Responses: Perotti SVAR



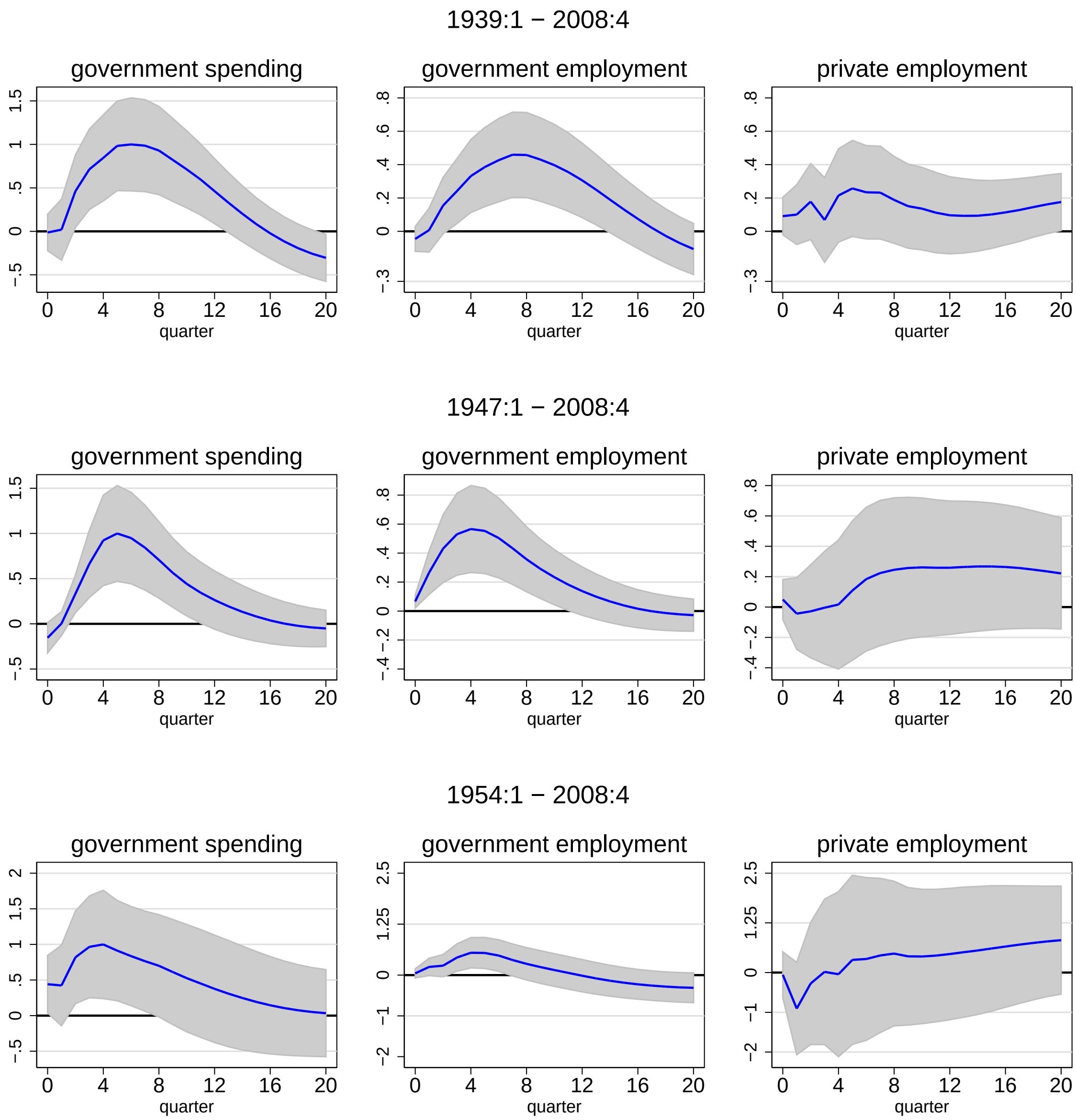
Notes: The government spending shock is identified as the shock to defense spending, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Unemployment is denoted as a percent of the civilian labor force. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 11. Unemployment Responses: Fisher-Peters News EVAR



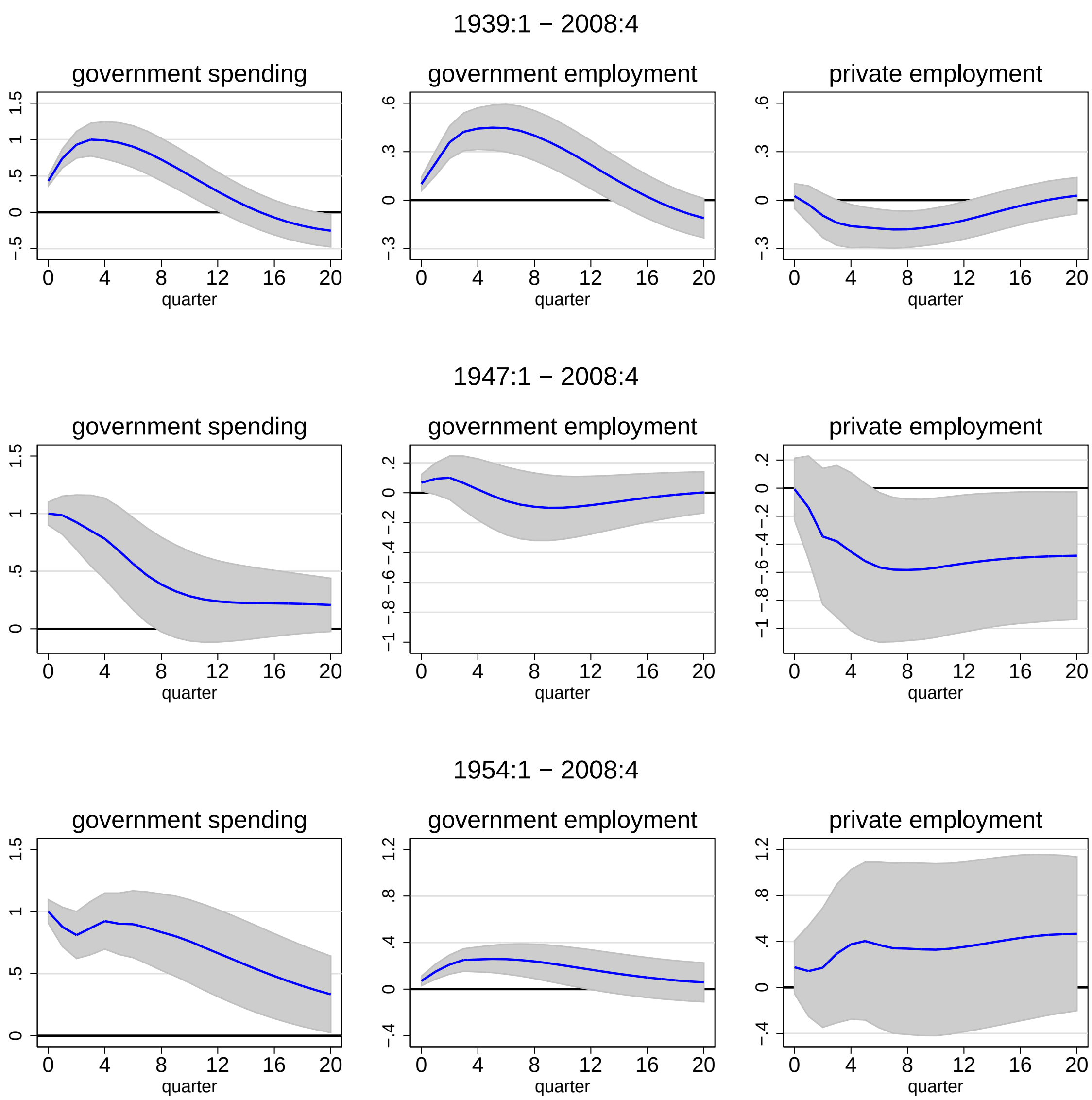
Notes: The government spending shock is identified as the shock to excess stock returns of top defense contractors, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Unemployment is denoted as a percent of the civilian labor force. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 12. Employment Responses: Ramey News EVAR



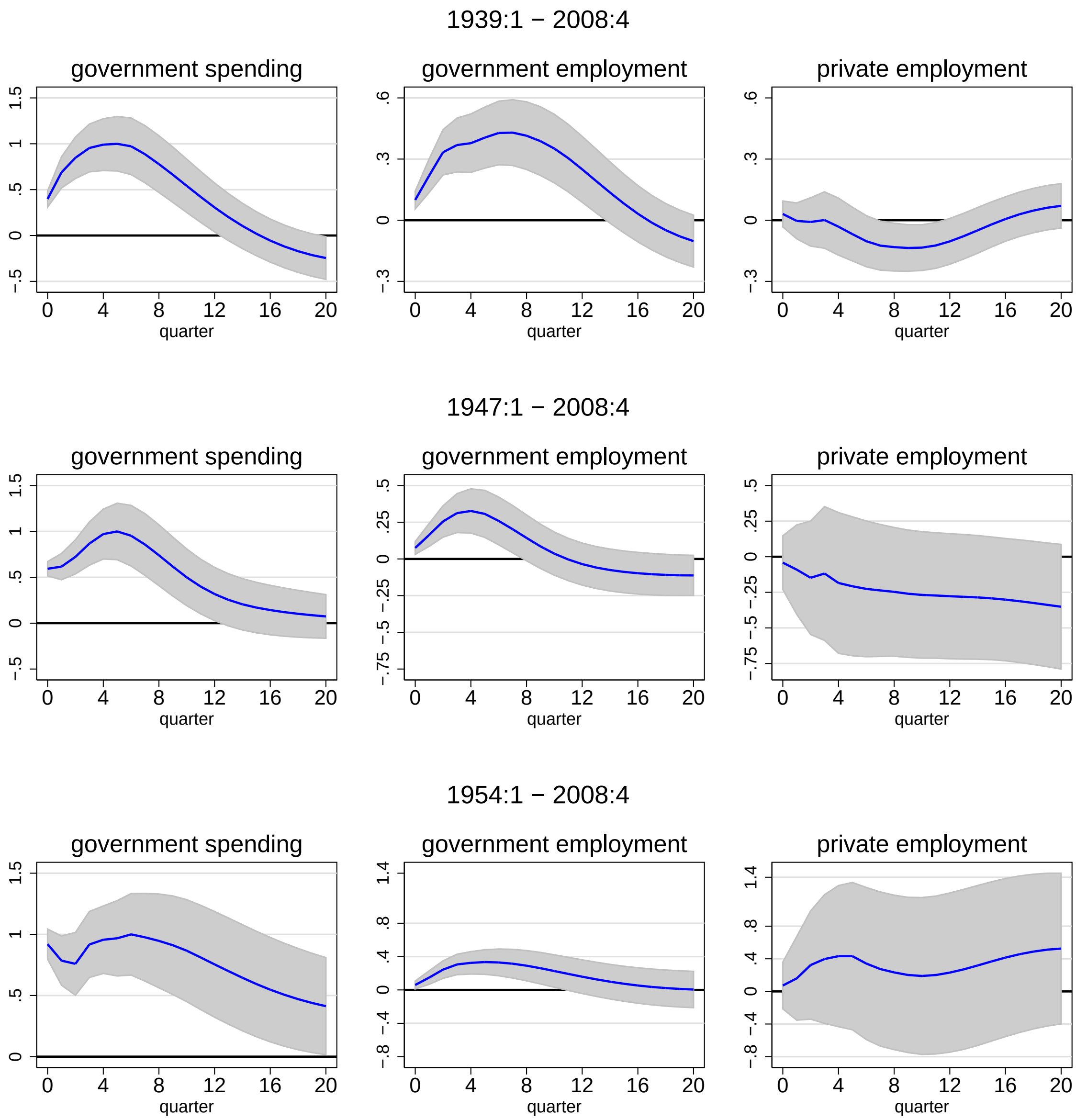
Notes: The government spending shock is identified as the shock to the news variable, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 13. Employment Responses: Blanchard-Perotti SVAR



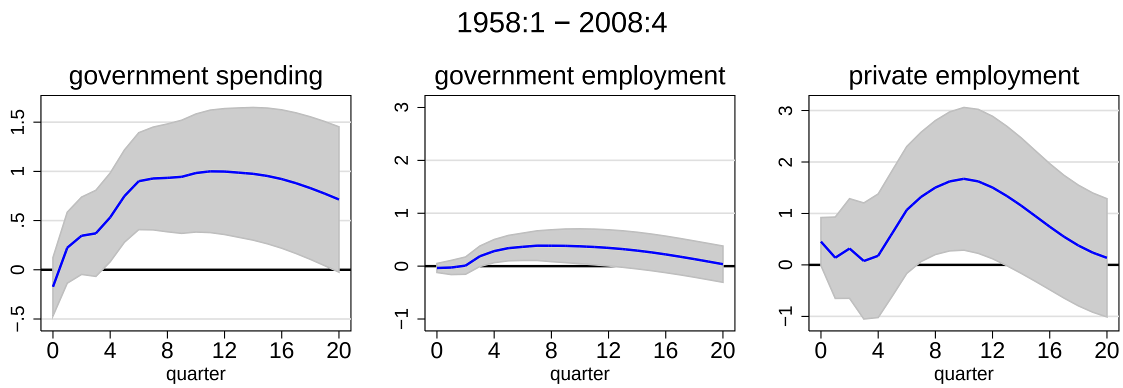
Notes: The government spending shock is identified as the shock to total government spending, ordered first. The shock is normalized so that government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 14. Employment Responses: Perotti SVAR



Notes: The government spending shock is identified as the shock to defense spending, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.

Figure 15. Employment Responses: Fisher-Peters News EVAR



Notes: The government spending shock is identified as the shock to excess stock returns of top defense contractors, ordered first. The shock is normalized so that total government spending peaks at one percent of GDP. Private GDP is denoted as a percent of total GDP. The standard error bands are 95 percent bands based on bootstrap standard errors.