The Regional Variation in the Response to Government Spending Shocks*

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Abstract

We simultaneously identify two types of government spending shocks: military spending shocks as defined by Ramey (2008) and federal spending shocks as defined by Perotti (2008). We analyze the effect of these shocks on both state-level personal income and employment. We find regional patterns in the manner in which both shocks affect state-level variables. Moreover, we find differences in the propagation mechanisms for military versus nonmilitary spending shocks. The former benefits economies with larger manufacturing and retail sectors but not necessarily states that have previously dealt with the military. While nonmilitary shocks also benefit states with the proper industrial mix, they also appear to stimulate economic activity in more-urban, lower-income states.

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1 Introduction

Government spending shocks are identified in VARs as innovations to total government spending, which combines both federal and state/local spending [see Blanchard and Perotti (2002) and Perotti

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(2008)].[1] In these papers, government spending shocks are identified by ordering (exclusion) restrictions on the contemporaneous impact matrix of the VAR.[2] One typically assumes that government spending (at a quarterly frequency) is determined before other economic variables (i.e., spending does not contemporaneously respond to the realization of other economic variables). Most of the resulting impulse responses have signs and shapes broadly consistent with the theoretical literature. For example, output rises on impact and exhibits a hump-shaped response over time.[3]

This approach, however, treats shocks to state and local spending as equivalent to shocks to federal spending. Thus, shocks to, say, California's spending are allowed to have contemporaneous (within the current quarter) effects on New Jersey's income and employment. Moreover, combining the spending series ignores the variation in the composition of the government's portfolio. For example, military spending is a large part of federal spending, while education is one of the largest components of state/local spending. One might expect relatively little difference in the dispersion of funds from education; on the other hand, military spending might have more effect in areas where bases or weapons manufacturers are located.[4] Schiller (1999), however, shows that the distribution of per capita federal spending to the states varies quite significantly.

The combined treatment of federal and regional spending also runs contrary to the literatures on intranational macroeconomics. For example, Carlino and DeFina (1998) showed that VAR-identified monetary policy shocks have disparate effects on the regions. The magnitude and duration of the effects of a surprise increase in the federal funds rate depend on, for instance, the industrial mix of the region in question. Owyang, Piger, and Wall (2005) showed that states have their own distinct business cycles. While these cycles may be related to the national business cycle and to each other, they also tend have idiosyncratic timing and magnitudes. Crone (2005) uses k-means clustering to define new regions and finds that states in what he calls the Rust Belt and the Energy Belt have distinct business cycles from the rest of the nation. Thus, one might not

[1] A notable exception to this is Engemann, Owyang, and Zubairy (2008), who consider federal and local spending separately.

[2] Alternative assumptions using sign restrictions typically yield results similar to the timing restriction identifications. Sign restrictions are often used when quarterly data are unavailable and no timing convention can be adopted.

[3] The responses of some variables, however, remain controversial. Consumption and real wages, in particular, may have different impact responses depending on whether government spending shocks are identified using the aforementioned timing convention or alternative methods such as spending dummies (Ramey and Shapiro, 1998; Edelberg, Eichenbaum, and Fisher, 1999; Ramey, 2008).

[4] Christiansen and Goudie (2008), for example, find some differences in regional technological progress based on the variation of military prime contracts.

expect uniformity in the responses of state-level variables, even to changes in *federal* spending.

It is this variation in the state-level response to federal spending that we are interested in. Previous work has considered differences in the responses of state-level economic variables to shocks to state-level spending. Pappa (2005) finds that positive state-level government consumption and investment shocks increase real wages and employment, and shows that federal expenditures tend to be less expansionary than expenditures of the same magnitude at the state level, based on output multipliers. Canova and Pappa (2007) show that shocks to local government spending or taxes are a source of price differentials within monetary unions, like the E.U. or U.S.

The role of military spending shocks in explaining regional fluctuations has also been explored by others. Davis, Loungani, and Mahidhara (1997) consider the role of military contract awards and basing of military personnel as driving forces for regional fluctuations, along with oil shocks. They find asymmetric unemployment responses to positive and negative regional shocks. Negative shocks, involving increases in oil prices or scaling back of military contract awards, cause employment to fall significantly, more so than an equal-sized positive shock causes employment to rise. Hooker and Knetter (1997) also find that adverse military spending shocks have large negative effects on state employment growth rates. Hooker (1996) finds the same effect of military spending shocks on state-level personal income.

In this paper, we consider the potential differences between state-level responses to innovations in federal and military spending. Consistent with the previous literature on federal spending shocks, we identify innovations to federal spending by ordering government spending ahead of the state-level variables of interest. We also identify military spending shocks as per Ramey (2008), ordered first in the VAR.

We find that, while the shapes of the state-level responses of both personal income and employment are largely consistent across states, the magnitudes (and often the signs) vary. We note these variations appear regional in nature, concentrated in states that have similar industrial, fiscal, and demographic characteristics. In light of this, we explore the hypothesis that state-level characteristics determine the concentration of non-military federal spending. We further consider whether military spending has a greater effect in states in which military bases or industries are located.

The remainder of the paper is organized as follows. Section 2 outlines the canonical VAR model of government spending, including a review of the identification based on timing restrictions and

military spending dummies. We then outline the model used to identify the state-level responses to government spending shocks. Our model can be thought of as a restricted panel extension of the baseline aggregate VAR, which rules out contemporaneous co-movements not driven by aggregate shocks. Section 3 presents the results from the estimation summarized in the impulse responses of personal income and employment to two types of government spending shocks. Section 4 analyzes the variation across the state-level responses by regressing the response magnitudes on sets of state-level covariates. Section 5 concludes.

2 Model and Identification

2.1 The Benchmark Aggregate VAR

Consider the structural representation of the VAR(p)

$$A_0 y_t = \sum_{i=1}^{p} A_i y_{t-i} + v_t, \tag{1}$$

where y_t is the $n \times 1$ vector of economic variables that includes government spending and v_t is a vector of structural innovations having diagonal variance-covariance matrix Ω.[5] Here, A_0 represents the contemporaneous impacts of the structural innovations on the variables in y_t.

The objective is to recover the structural innovations ν_t defined by an orthonormal rotation of the reduced-form residuals

$$A_0^{-1} \varepsilon_t = \nu_t. \tag{2}$$

In most cases, we do not estimate (1), and thus A_0, directly. Instead, one typically estimates the reduced-form VAR

$$y_t = \sum_{i=i}^{p} B_i y_{t-i} + \varepsilon_t, \tag{3}$$

where the B_i are the reduced-form coefficients and ε_t is the reduced-form innovation with variance-covariance matrix Σ, where $A_0^{-1} \Omega A_0^{-1\prime} = \Sigma$. The well-known problem in the literature on structural

[5] For ease of exposition, constants and time trends are suppressed.

VARs is that the system of equations $A_0^{-1}\Omega A_0^{-1\prime} = \Sigma$ does not define a unique rotation. Instead, we require a set of identifying restrictions, which may come in several forms. The most common identifying assumptions in the fiscal policy literature are exclusion (or ordering) restrictions, which assume that some variables do not respond contemporaneously to the shock in question. These restrictions are often implemented by setting elements of A_0^{-1} to zero and generally imply a causal ordering across the variables.[6] The particular restrictions used for the identification of government spending shocks are discussed in the following section.

2.2 Identification Strategy

To identify federal spending shocks, Blanchard and Perotti (2002) and Fatás and Mihov (2001) assume that, at a quarterly frequency, government spending does not contemporaneously react to macroeconomic variables. This is typically implemented by ordering government spending first in the VAR; the rotation matrix A_0 can then be identified by taking the Cholesky factor of Σ, where the fiscal shock is represented by the first row of A_0.

However, a number of studies have pointed out that the government spending shock could be anticipated if there is a significant delay between the announcement and the actual change in government spending. Leeper, Walker, and Yang (2008) call this "fiscal foresight" and argue it causes the shocks identified by timing conditions to be misspecified. Ramey (2008) shows that military buildup dummies, which use information from historical accounts and identify government spending shocks as dates where large increases in defense spending were unanticipated, Granger-cause government spending shocks identified by the recursive ordering.[7]

In light of these findings, we add a military spending variable defined by Ramey (2008) to the VAR.[8] We order the Ramey variable before federal government spending. We also include the Hoover and Perez (1994) dates to identify oil shocks. Thus, the federal spending shock identified is orthogonal to any information in the Ramey variable, its lags, and the oil dates.

[6] Sign restrictions on the impulse responses can also be used [see Mountford and Uhlig (2005)].

[7] The military dummy (Ramey and Shapiro, 1998) takes a value of 1 in the following quarters: 1950:3, 1965:1 and 1980:1, which correspond with the start of the Korean War, the Vietnam war, and the Carter-Reagen buildup, respectively. Recently September 11th, 2001, was also added to the list.

[8] Unlike the Ramey-Shapiro dates, this new series does not consist of dummy variables; instead, it is based on narrative evidence that is much richer than the Ramey-Shapiro dates. The new series includes additional events when Business Week began forecasting changes in government spending. For the dates identified, the variable takes on the present discounted value of the change in anticipated government spending.

2.3 Government Spending and Regions

When we extend our analysis to the states, the dimensionality of the problem increases dramatically. One approach to reducing the number of estimated parameters is to assume independence of the regions.[9] A second approach is to use a few large regions.[10] A third approach is to make some assumption regarding the incidence and/or propagation of shocks.[11] One set of restrictions, adopted by Davis and Haltiwanger (2001) and others, allows for the consistent computation of the impulse response to shocks produced by an aggregate block. This is accomplished by estimating a reduced-form VAR for each state that includes an aggregate block, the state's variables of interest, and the sum of the remaining states' variables of interest. While shocks to the regional variables may not be properly identified, the regional responses to the aggregate shocks are estimated consistently.

2.4 VAR Data

The VAR includes both national and state-level data at the quarterly frequency and spanning the period 1960:I to 2006:IV. The national data include the aforementioned Ramey variable, an oil shock dummy reflecting the Hoover-Perez oil dates, and per capita real federal government spending. The measure of federal government spending we use is the sum of federal current expenditures and gross federal investment.[12] State-level data include real per capita personal income and per capita employment for the 48 continental states (DC, Alaska, and Hawaii are excluded). All data are seasonally-adjusted; real quantities are deflated by the aggregate GDP deflator.[13] Figure 1 shows federal government spending (left axis) along with the Ramey variable (right axis) and the oil dummies (vertical dotted lines).

[9] For example, Owyang, Piger, and Wall (2005) assume independence across regions to identify state-level business cycles.

[10] This approach is undertaken by, among others, Carlino and DeFina (1998), who estimate the response of monetary policy in the eight BEA regions.

[11] See, for example, the heterogeneous agent VAR of Fratantoni and Schuh (2003) and Irvine and Schuh (2005).

[12] Federal current expenditures account for federal government consumption expenditures, transfer payments (government social benefits and grants in aid to state and local governments), interest payments, and subsidies. Gross government investment consists of general government and government enterprise expenditures for fixed assets. All these data are taken from the BEA.

[13] The federal government spending and GDP deflator data are from the BEA.

The data, ordered as follows, used in the VAR are

$$Y_t = [G_t \quad O_t \quad g_t \quad \sum_{-i} PI_{jt} \quad \sum_{-i} EMP_{jt} \quad PI_{it} \quad EMP_{it}]',$$

where G_t is the Ramey military spending variable, O_t is an oil price shock dummy variable, g_t is federal government spending, PI_{it} is the personal income of state i, and $\sum_{-i} PI_{jt}$ is the sum of personal income across all states excluding state i.[14] The employment variables are defined similarly. For choice of lag length, AIC and SBIC suggest an optimal lag length of 2 or 3 lags depending on the equation; results reported are for the specifications with 3 lags.

3 Empirical Results

We are interested in the response of state-level personal income and employment to both the military spending shock, G_t, and a one-standard-deviation federal government spending shock, g_t. For comparison, we present the aggregate responses in the following subsection before presenting the state-level responses in the subsequent subsection.

3.1 Aggregate Responses

Figures 2 and 3 show the response of U.S. aggregate personal income and employment to a military spending and federal spending shock, respectively. The shaded regions indicate the 95-percent confidence bands constructed by Monte Carlo simulations. In response to a military spending shock, both personal income and employment rise with a delay of three quarters, and peak at about 8-10 quarters after the shock hits the economy. In response to an unanticipated one-standard-deviation increase in federal spending, personal income rises on impact but employment does not respond for the first three quarters and starts rising following that. It is important to note that, except for relatively small differences on impact, the shapes of the responses of both variables to either shock are similar.

[14] For ease of exposition, we will refer to the shock identified by the Ramey variable as a *military spending shock* and the shock identified by the innovation to government spending as a *federal spending shock.*

3.2 State-level Responses

Figures 4 and 5 depict the point responses for state-level personal income and employment, respectively, to a federal spending shock for eight of the twenty quarters for which the impulse responses are computed.[15] Darker shades of gray (red) indicate a larger positive (negative) response to the shock. Although the magnitude and timing of the response varies across states, the typical response of personal income is weakly positive in the short run and strongly positive in the long run. Some states experience a brief decline in periods 2 to 4; however, most recover strongly by end of the second year.

In addition, differences in the state-level responses appear to follow a regional pattern. For example, states that do not experience a temporary downturn are, for the most part, located along the east coast; also included in this group are California, New Mexico, Idaho, and Montana. Following the recovery period, the states which still seem to experience significant negative effects are mostly located in energy producing regions: Oklahoma, Texas, West Virginia, Wyoming, and the Dakotas. States in the Southeast have the strongest positive response.

On average, a federal spending shock has a negative impact response but gradually increases employment over the first few years. Again, the magnitude of the employment response varies across states. Similar to the responses of personal income, energy producing states have a persistent negative response, including Texas, North Dakota, Wyoming, and now Louisiana.

For most states, the personal income response to a shock to the Ramey military spending variable is qualitatively similar to that for the shock to federal spending. For military spending shocks, however, the impact responses of personal income for most states are negative; states in the Mideast and a few states in the Rocky Mountains are exceptions (see Figure 6). At longer horizons, the negative PI response appears to be isolated in the energy (and perhaps agricultural) states.

Figure 7 depicts the employment response to a military spending shock for eight of the twenty quarters. For employment, a number of states in the Northeast, Mideast, and Great Lakes have a positive response on impact. At long horizons, however, the negative response in employment appears restricted to some energy states, including Montana, Wyoming, New Mexico, Louisiana,

[15] The full set of impulse responses for both shocks with their error bands are included in the Appendix.

and West Virginia and also Illinois and Kansas.

4 Explaining the Variation in State-level Responses

The similarity in the *shape* of the response of most states to government spending shocks belies fundamental differences in their *magnitude* and *timing* (see Appendix). For example, Maine and Vermont respond to the Ramey military spending shock similarly – both experience a temporary decline followed by a delayed gradual increase. However, the long-run point response of Maine's personal income is, at times, twice Vermont's. In this section we try to understand which state-specific factors explain the differences in the response of personal income and employment to the two spending shocks across states.

In order to study the effects of federal spending, it is important to first consider its composition. Federal spending is typically divided into discretionary spending on defense and non-defense, and mandatory spending on federal programs such as social security, means-tested and non-means-tested entitlements.[16] Over the last couple of decades, federal spending on defense has decreased, while spending on transfer programs and grants-in-aid to states has increased significantly .

To understand the differential responses of states to a federal spending shock, it is useful to think of factors that potentially influence federal spending at the state level. States vary greatly in the need for federal grant programs, and this is determined by a multitude of differences. Presumably, states with higher poverty rates have a greater need for assistance programs such as health care, employment benefits, and other services. However, these states also lack the ability to cover these expenditures themselves as they bring in less tax revenues.[17] Another consideration is the percentage of population aged-65-or-older and qualify-for-assistance programs for elderly.

Besides demographic and economic composition and fiscal need, the industry mix of a state might also be important. For instance, a high concentration of defense-related industries boosts federal procurement dollars, and a larger farming sector means more federal expenditures on agricultural assistance. Other explanations include political determinants; for instance, Hoover and

[16] As explained in Schiller (1999), means-tested entitlements are the ones for which recipients qualify based on income level, such as food stamps, and non-means-tested entitlements are the ones for which qualification is based on some other criterion, for example federal employees' retirement benefits.

[17] Toikka, Gais, Nikolov, and Billen (2004) explore the relationship between fiscal capacity and state spending on social welfare programs.

Pecorino (2005) suggest that states with higher per capita Senate representation have higher federal spending per capita.

To consider the differential effects of military spending, presumably the effects of a military shock are concentrated in states where military bases or industries are located. Another variable of interest is the size of military prime contract awards a state receives, which comprise roughly half of defense spending and exhibit considerable state-level dispersion. Davis, Loungani, and Mahidhara (1997) and Hooker and Knetter (1997), among others, use military prime contracts to identify military expenditure shocks and find sizable employment and unemployment responses for the different regions.

In order to understand the cross-sectional differences in the state-level response to government spending shocks, a summary statistic for the impulse response is used as a dependent variable in a cross-state regression equation. Since the effects of both federal and military spending shocks are very persistent, an indicator for how much personal income and employment are affected by a spending shock is the integral of the impulse response function over the 20-quarter horizon. Our regression looks as follows,

$$IR_i = c + \beta X_i + u_i,$$

where IR_i is the summary statistic for the impulse response to a federal or military spending shock for state i and X_i is the vector of independent state-specific explanatory covariates. The next three subsections describe the set of covariates and the results for federal and military spending shocks.

4.1 State-level Covariates

The state-level covariates we consider can be divided into four major categories. The first category considered is various industry shares, which are constructed by taking the average share of total GSP for the time period of 1963-2001. The industry shares we consider are agriculture, manufacturing, oil, finance (which includes insurance and real estate), construction, and retail.

The second category is state-specific fiscal variables, which include the federal spending a state receives, the federal tax burden of a state, and the fiscal capacity index. Fiscal capacity measures the state's revenue capacity relative to its expenditure need.

Third, we add a few military-related variables. We include the average dollar value of military prime contracts from 1967-1995 received by different states. In addition, we consider the number of military personnel in a given state, which includes active duty personnel, Reserves, and National Guard.

The last category includes a variety of non-policy variables related to the particular demographics of a state. These include state-level population density, median income level, and median age. These particular demographic variables help us test our hypothesis that a government spending shock affects a state through the federal assistance it receives based on the age and income level of the state population.[18]

4.2 Federal Spending Shocks

Tables about here

The covariate regression results in Table 1 suggest that the effect on personal income is larger in states that receive high federal spending; however, states with a higher federal tax burden are not the ones to benefit from an increase in federal spending. Personal income is also more sensitive to federal spending in states with a lower fiscal capacity, which indicates a relatively small revenue base, a relatively high need for expenditure, or a combination of both.

Because we have controlled for large shocks to military spending through the Ramey variable, the federal spending shocks primarily represent innovations to transfer payments, grants in aid to states, and expenditures on infrastructure, health, education, and general public services. This explains why a shock to federal spending is more effective in the more-urban regions and lower-income populations. This might also explain why the military-related variables are not significant in explaining the effects of a federal spending shock. Note also that median age does not have significant explanatory power.

Agricultural subsidies do not seem to be important; however, personal income rises more in states with higher shares of manufacturing, retail, finance, and construction. This points towards

[18] Median income, median age, and population density data are from the U.S. Census Bureau. The federal spending and federal tax burden data are the Northeast-Midwest Institute staff calculations based on statistics from the Census Bureau and the Tax Foundation. The fiscal capacity index is computed in Yilmaz, Hoo, Nagowski, Rueben, and Tannenwald (2006), military prime contract data are from Goudie (2008), and the military personnel data are from the U.S. Department of Defense.

a spending increase on infrastructure and manufactured goods. A higher concentration in the oil sector reduces this effect.

The response of employment to a federal spending shock can be explained by the same variables (see Table 2). Employment is more responsive in states with high industry shares of finance, retail, construction, and manufacturing, but less so in states with a high energy share.

4.3 Military Spending Shocks

Tables 3 and 4 depict the results of the explanatory regressions for the personal income and employment responses to a military spending shock. While the responses to federal and military spending shocks can be qualitatively similar, the state-level characteristics important to determining the magnitudes of the responses are different. For example, the response of personal income to a military spending shock is not explained by fiscal variables. This reflects the fact that the disbursement of military funds is not based on the fiscal need of a state.

Similar to the case of federal spending, the response of state-level personal income is higher in states with large manufacturing and retail shares. On the other hand, finance, construction, and other industry shares do not appear to influence the magnitude of the response to military shocks. These results potentially point toward the ultimate destination of military contract funds: The effect of a rise in military spending is concentrated in states that produce goods – either upstream or final.

However, contrary to our initial hypothesis and findings by previous studies [Hooker (1996), Hooker and Knetter (1997), and Davis, Loungani, and Mahidhara (1997), for example], military-related variables do not have much explanatory power. For example, neither the value of prime contracts nor the number of military personnel affect the magnitude of the personal income response to military spending shock.

How can we reconcile these results with the current literature on military spending? One obvious difference is in the specification of our model compared to the previous literature. The aforementioned papers used univariate state-level models to determine the effect of an increase in (for example) state-level contracts. Thus, they are examining the effect of a state-level shock to (state-targeted) military spending, e.g., what happens to Iowa when military spending in Iowa increases? Our shock, on the other hand, is an aggregate shock – i.e., the target state of the increase

in spending is *ex ante* unknown. Thus, we are investigating how the effects of an (average) increase in (total) military spending are distributed across states. We find that states are not better off (in terms of the increase in personal income or employment) when the government raises military spending if the state already has (on average) more personnel or more prime contracts.

5 Conclusions

This paper contributes to the broad literature on the regional effects of aggregate macroeconomic shocks. Similar to previous studies on, for example, monetary policy, we find significant and important variation in the responses of state-level indicators of real economic activity to innovations in both federal government spending and military spending. Moreover, these differences appear to be, at least in part, regionally clustered – that is, similarities in the magnitudes of the state-level responses are often closely tied to geographic proximity.

In addition, we find that industrial mix is an important determinant of the magnitude of the responses of real activity to spending shocks. Which industries are important, however, depends on the nature of the government spending shock. While manufacturing and retail appear to be determinants of the responsiveness to both types of shocks, the responsiveness to federal nonmilitary spending shocks also appears to be influenced by the shares of finance and construction. In addition, state-level fiscal policy indicators and demographic variables influence the responsiveness of the state to nonmilitary spending shocks.

These results highlight the distinct propagation mechanisms for the two types of government spending shocks. Shocks to military spending stimulate economic activity in states with higher manufacturing and retail shares, suggesting a procurement effect. However, these effects are not necessarily higher in states where the military has previously stationed personnel or purchased equipment. Shocks to nonmilitary spending, on the other hand, appear to benefit more-urban, lower-income states, which have expenditure needs greater than their ability to generate revenue.

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Federal spending	3.80*	4.27**					
	(1.97)	(1.91)					
Federal tax burden	-3.28*	-3.58**					
	(1.71)	(1.61)					
Fiscal capacity index			-0.12***	-0.12***			
			(0.03)	(0.03)			
Agricultural share		-0.11		0.01	0.21		
		(0.13)		(0.14)	(0.16)		
Manufacturing share	0.18***		0.14**	0.13**	0.15***	0.27***	0.19***
	(0.06)		(0.07)	(0.06)	(0.08)	(0.07)	(0.07)
Retail share	1.46***						1.84***
	(0.49)						(0.52)
Oil share		-0.44***	-0.42**				
		(0.08)	(0.09)				
Construction share			1.35**		2.24**	1.87**	0.63
			(0.66)		(0.84)	(0.78)	(0.81)
Finance share	0.46**		0.60**	0.80***	0.54***	0.56***	
	(0.14)		(0.18)	(0.18)	(0.18)	(0.18)	
Median income					-0.0003***	-0.0002**	-0.0001
					(0.0001)	(0.0001)	(0.0001)
Population density		0.007			0.012*	0.009	0.016**
		(0.005)			(0.007)	(0.006)	(0.006)
Median age		-0.16			-0.29	-0.24	-0.16
		(0.23)			(0.245)	(0.24)	(0.23)
Military prime contracts				-0.0002			
				(0.0002)			
Military personnel				0.13			
				(0.69)			
Intercept	1.45**	1.35**	2.02***	1.88**	2.06***	2.07***	1.97***
	(0.62)	(0.64)	(0.40)	(0.88)	(0.79)	(0.43)	(0.42)
Adjusted R^2	0.391	0.351	0.484	0.322	0.289	0.281	0.322

Table 1: Results for the response of personal income to a federal spending shock. Standard errors in parentheses. *, ** and *** indicates significance at 10%, 5% and 1% levels respectively.

Federal spending	2.42	2.57*					
	(1.53)	(1.43)					
Federal tax burden	-2.45*	-2.60**					
	(1.35)	(1.21)					
Fiscal capacity index			-0.07**	-0.07**			
			(0.02)	(0.03)			
Agricultural share		-0.17		0.04	0.20		
		(0.11)		(0.13)	(0.12)		
Manufacturing share	0.20***		0.19***	0.17**	0.34***	0.30***	0.27***
	(0.04)		(0.05)	(0.05)	(0.06)	(0.05)	(0.05)
Retail share	1.51***						1.32***
	(0.37)						(0.42)
Oil share		-0.46***	-0.29***				
		(0.07)	(0.08)				
Construction share			1.87***		2.54***	2.17***	1.25*
			(0.50)		(0.64)	(0.62)	(0.64)
Finance share	0.33***		0.29**	0.52***	0.48***	0.45***	
	(0.11)		(0.13)	(0.16)	(0.14)	(0.14)	
Median income					-0.0002**	-0.0002**	-0.0001
					(0.0001)	(0.0001)	(0.0001)
Population density		-0.002			0.002	-0.007	0.005
		(0.004)			(0.005)	(0.005)	(0.005)
Median age		-0.29			-0.34*	-0.29	-0.22
		(0.17)			(0.19)	(0.19)	(0.19)
Military prime contracts				-0.0003*			
				(0.0001)			
Military personnel				0.59			
				(0.599)			
Intercept	2.90***	2.98***	2.97***	2.33***	3.00***	3.01***	2.95***
	(0.48)	(0.48)	(0.27)	(0.69)	(0.32)	(0.33)	(0.33)
Adjusted R^2	0.454	0.502	0.600	0.304	0.430	0.405	0.405

Table 2: Results for the response of employment to a federal spending shock. Standard errors in parentheses. *, ** and *** indicates significance at 10%, 5% and 1% levels respectively.

Federal spending	1.35	0.74					
	(0.86)	(0.78)					
Federal tax burden	-1.23	-0.66					
	(0.76)	(0.66)					
Fiscal capacity index			0.007	0.005			
			(0.15)	(0.16)			
Agricultural share		-0.17*		-0.12*	-0.10		
		(0.06)		(0.07)	(0.06)		
Manufacturing share	0.07***		0.07*	0.05**	0.06*	0.08***	0.07**
	(0.02)		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Retail share	0.49**						0.57**
	(0.21)						(0.22)
Oil share		-0.14***	-0.07				
		(0.04)	(0.05)				
Construction share			0.30		0.33	0.52	0.17
			(0.34)		(0.36)	(0.34)	(0.34)
Finance share	0.24***		0.12	0.12	0.10	0.11	
	(0.06)		(0.09)	(0.08)	(0.08)	(0.08)	
Median income					0.00001	0.00001	0.00005
					(0.00004)	(0.00001)	(0.00003)
Population density		0.002			0.001	0.003	0.004
		(0.002)			(0.002)	(0.003)	(0.003)
Median age		0.17*			0.20*	0.18	0.19*
		(0.09)			(0.10)	(0.10)	(0.10)
Military prime contracts				-0.00001			
				(0.00001)			
Military personnel				-0.05			
				(0.31)			
Intercept	0.39	0.47*	0.57**	0.63*	0.59***	0.59***	0.55***
	(0.27)	(0.26)	(0.19)	(0.37)	(0.18)	(0.18)	(0.18)
Adjusted R^2	0.354	0.443	0.280	0.261	0.328	0.309	0.379

Table 3: Results for the response of personal income to a military shock. Standard errors in parentheses. *, ** and *** indicates significance at 10%, 5% and 1% levels respectively.

Federal spending	0.85	0.18					
	(0.89)	(0.83)					
Federal tax burden	-0.67	-0.06					
	(0.78)	(0.70)					
Fiscal capacity index			0.026	0.030			
			(0.015)	(0.016)			
Agricultural share		-0.15**		-0.07	-0.08		
		(0.06)		(0.07)	(0.07)		
Manufacturing share	0.05**		0.05	0.04	0.06*	0.08**	0.07**
	(0.02)		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Retail share	0.47**						0.51**
	(0.21)						(0.21)
Oil share		-0.15***	-0.10**				
		(0.04)	(0.05)				
Construction share			0.42		0.39	0.53	0.23
			(0.32)		(0.36)	(0.34)	(0.34)
Finance share	0.21***		0.03	0.04	0.09	0.10	
	(0.06)		(0.08)	(0.08)	(0.08)	(0.08)	
Median income					0.00007*	0.00006*	0.0001***
					(0.00004)	(0.00004)	(0.00003)
Population density		0.003			-0.002	-0.0008	0.0006
		(0.002)			(0.003)	(0.003)	(0.003)
Median age		0.09			0.15	0.13	0.14
		(0.10)			(0.10)	(0.10)	(0.10)
Military prime contracts				-0.00001			
				(0.00001)			
Military personnel				0.26			
				(0.31)			
Intercept	0.99***	1.07***	1.22***	0.98***	1.26***	1.26***	1.22***
	(0.28)	(0.28)	(0.17)	(0.36)	(0.18)	(0.18)	(0.17)
Adjusted R^2	0.276	0.343	0.352	0.263	0.303	0.297	0.357

Table 4: Results for the response of employment to a military shock. Standard errors in parentheses. *, ** and *** indicates significance at 10%, 5% and 1% levels respectively.

Variable	Mean	St. Dev.	Min	Max
Demographic variables				
Population density	71	97	2	438
Median income	47,403	7,029	35,261	64,168
Median age	35.59	1.89	27.1	38.9
Industry shares				
Agriculture share	3.56	3.34	0.59	15.29
Manufacturing share	20.17	7.67	4.48	34.38
Retail share	9.58	0.89	7.15	11.39
Oil share	2.05	4.82	0.00	21.45
Construction share	4.84	0.72	3.35	7.19
Finance share	14.71	3.51	8.40	25.07
Fiscal variables				
Federal spending	45,502	46,004	4,645	242,023
Federal tax burden	43,773	52,490	3,829	289,627
Fiscal capacity index	99.67	17.96	64	141
Military variables				
Military prime contracts	2803.9	4449.8	64	27381
Military personnel	44,982	45,242	5,125	212,800

Table 5: Summary statistics. Population density is person/km^2, for the year 2000. Median age is also year 2000 values. Median income is the average over years 2005-2007 from the U.S. Census Bureau Population Survey. The industry shares are computed as the average of industry shares of state GSP for 1963-2001. Manufacturing share is the sum of durable and non-durable good production. Finance share refers to the finance, insurance, and real estate share of state GSP. Federal spending and federal tax burden data are in millions, for 2005. Fiscal capacity index is for the fiscal year 2002, and computed in Yilmaz, Hoo, Nagowski, Rueben, and Tannenwald (2006). Military prime contract data are from Goudie (2008) and are the average value of military prime contracts from 1967-1995 in millions of 2000 dollars. Military personnel data are from the U.S. Department of Defense.

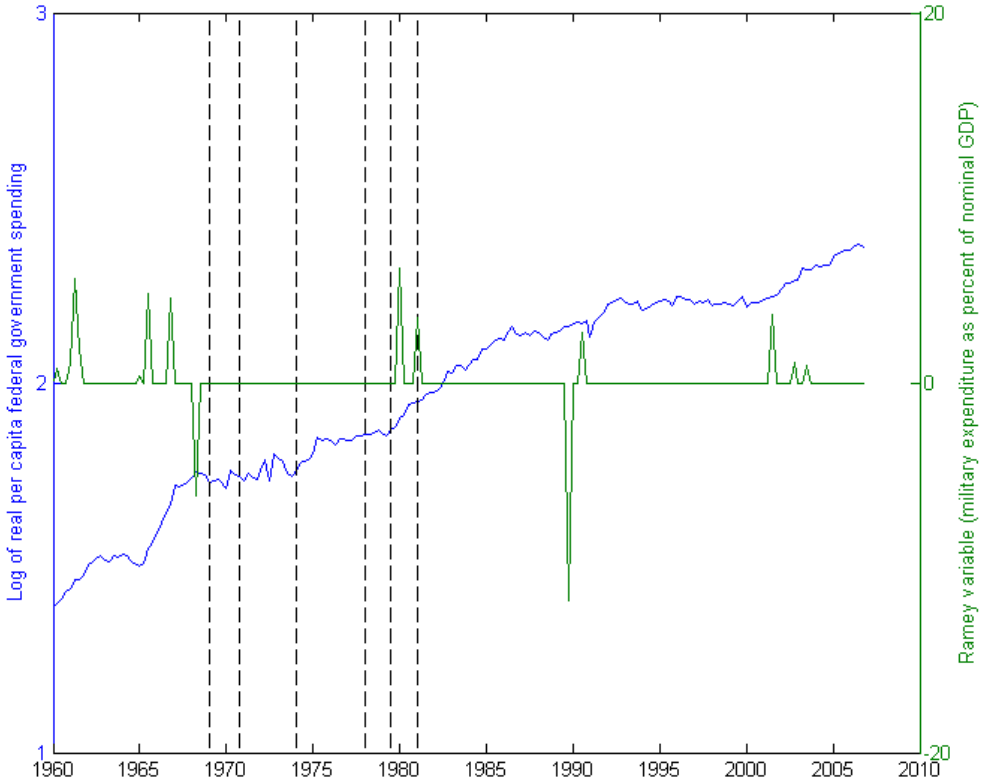

Figure 1: The left axis shows the log per capita federal government spending, the right axis shows the Ramey variable, and the vertical dotted lines are the Hoover-Perez oil dates.

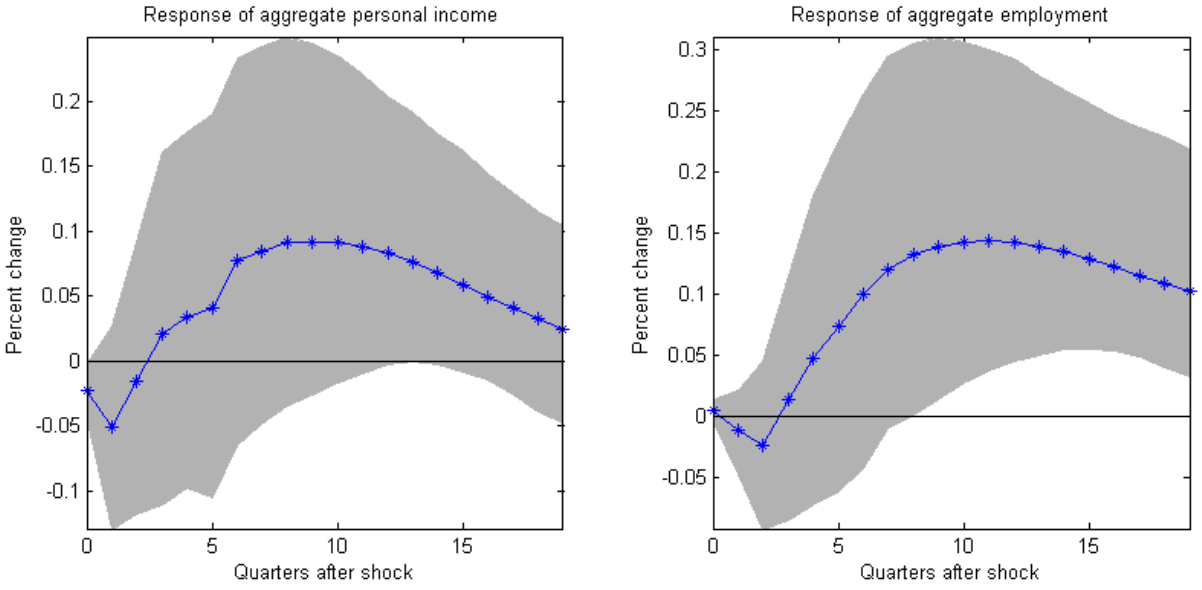

Figure 2: Response of aggregate variables to military spending shock

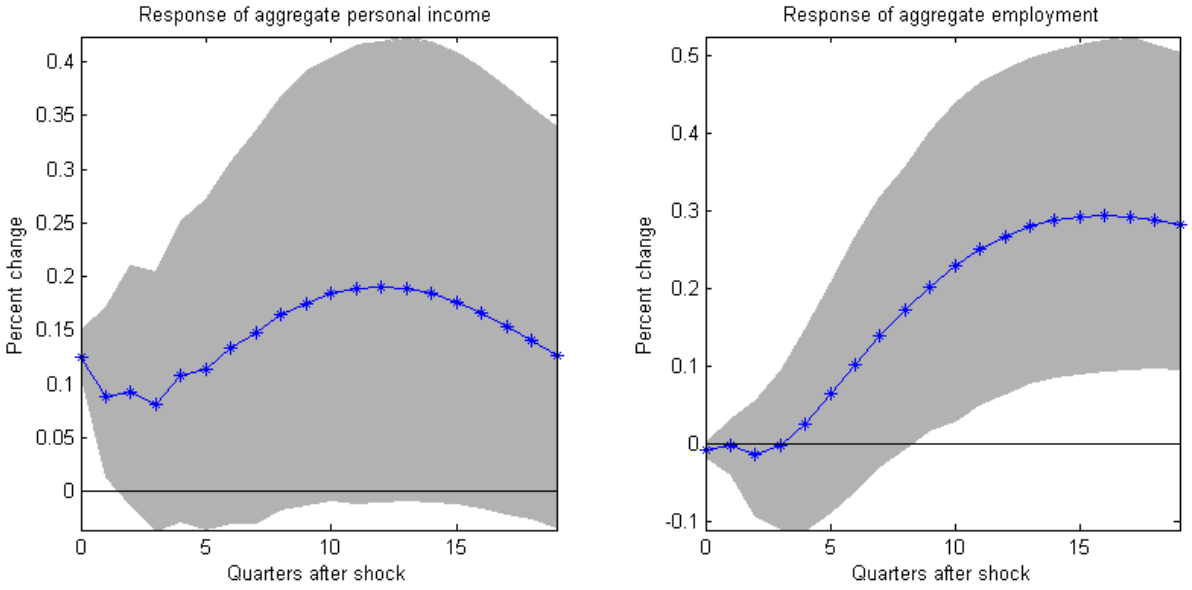

Figure 3: Response of aggregate variables to federal spending shock

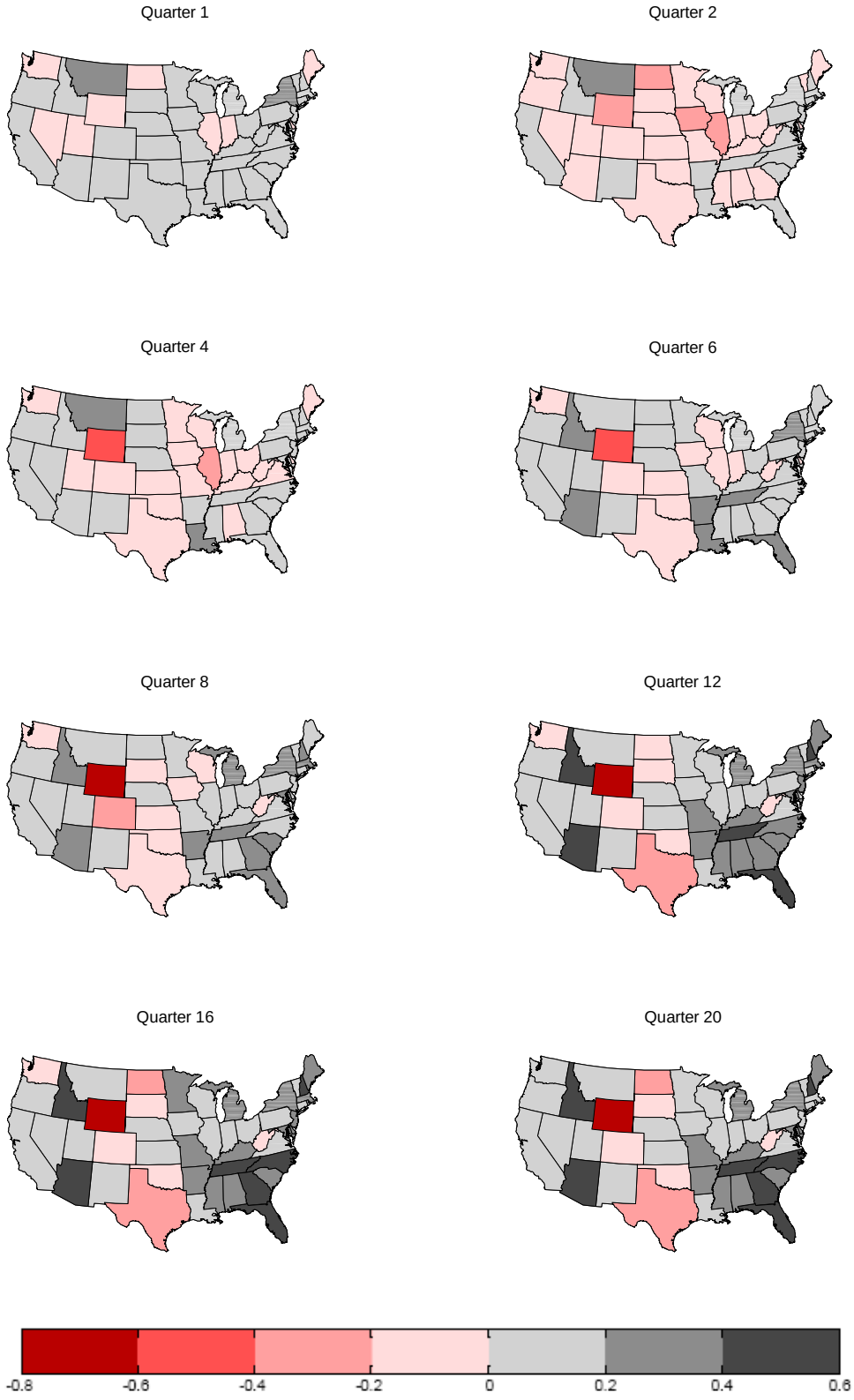

Figure 4: Personal Income Response to a Federal Spending Shock

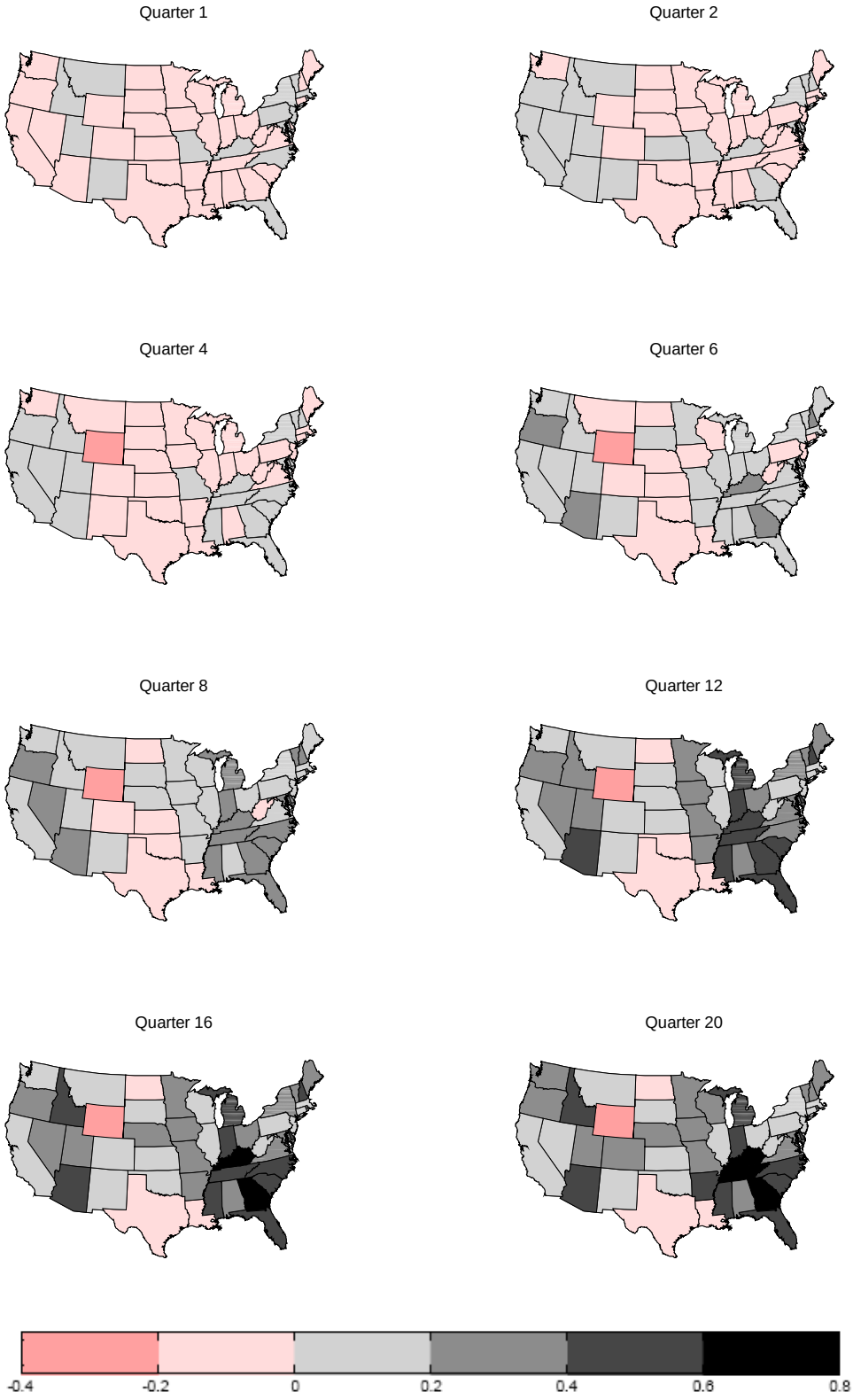

Figure 5: Employment Response to a Federal Spending Shock

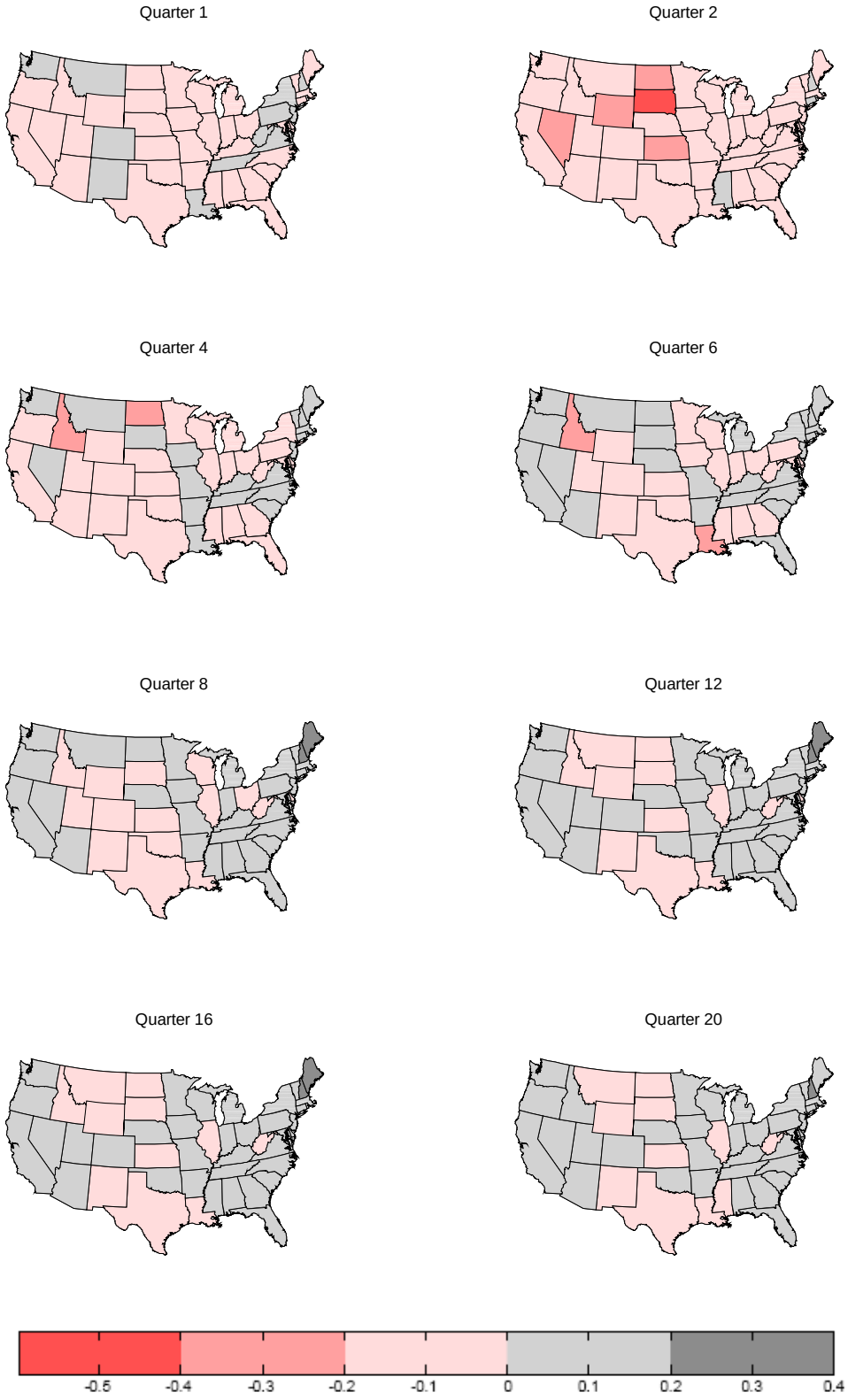

Figure 6: Personal Income Response to a Military Spending Shock

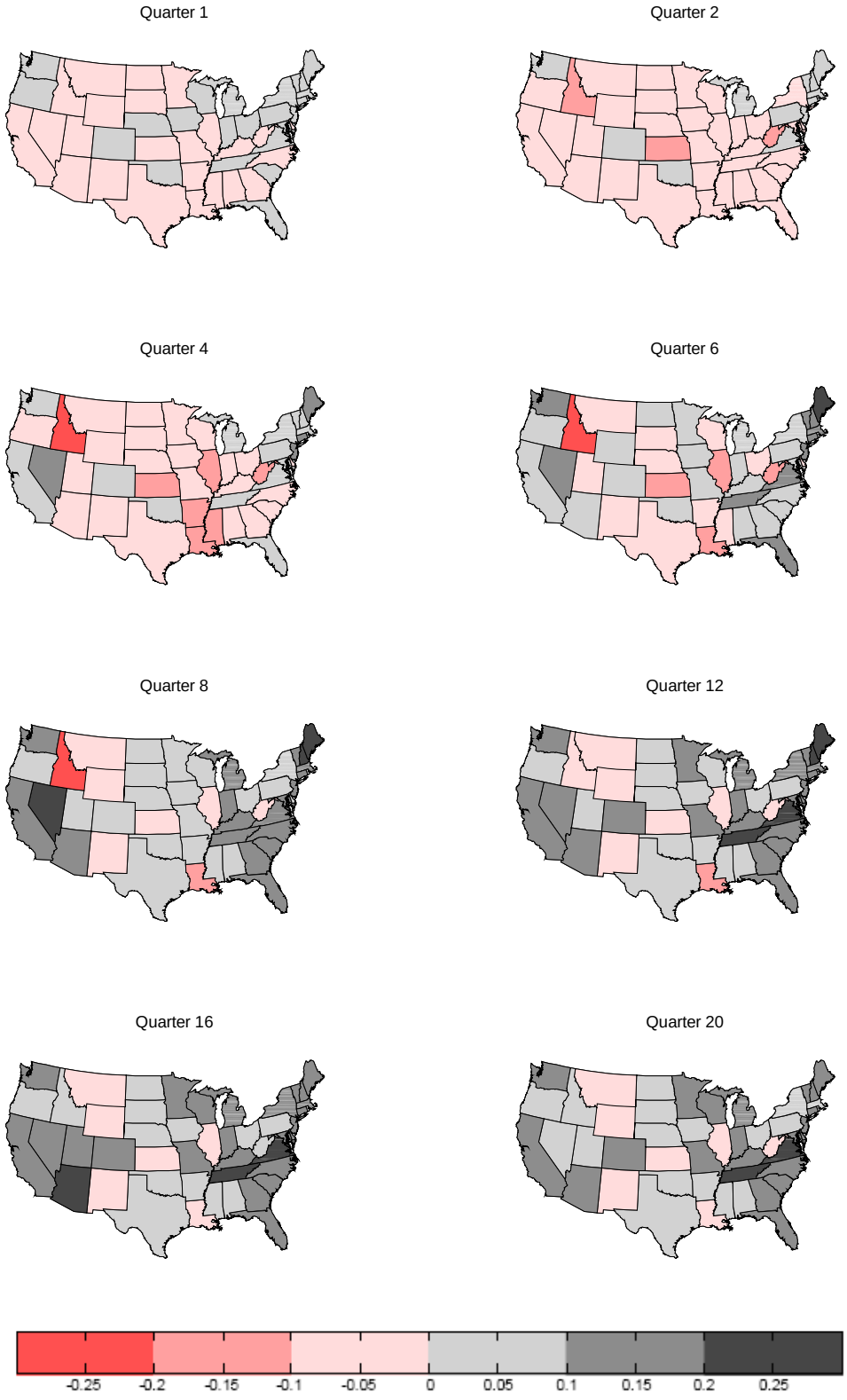

Figure 7: Employment Response to a Military Spending Shock

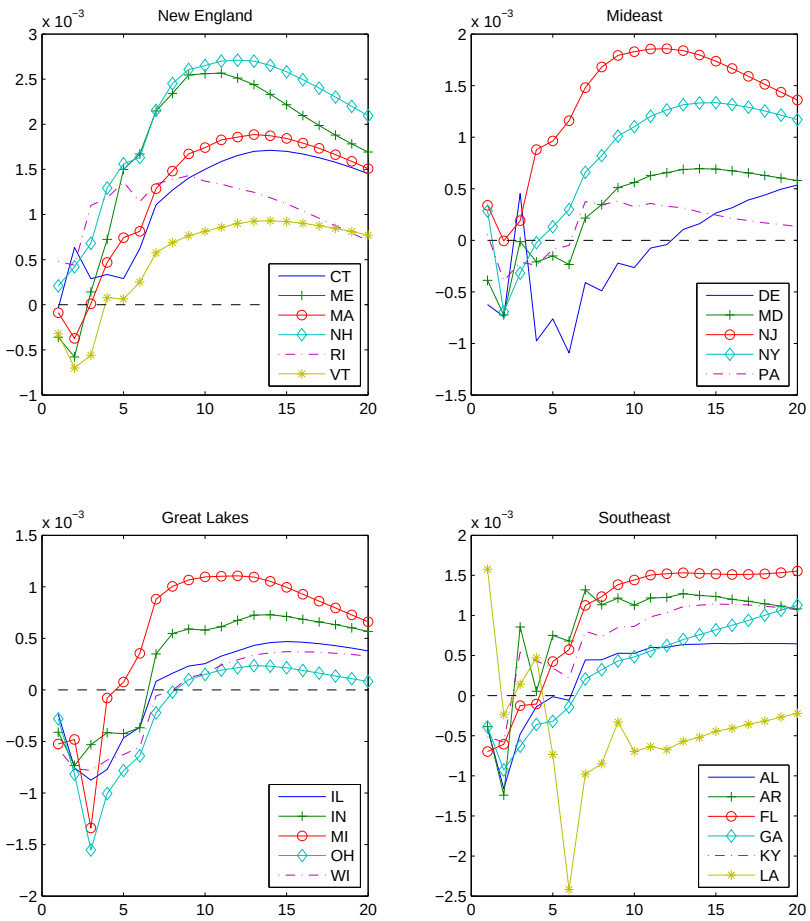

Figure 27: Response of personal income to Ramey variable

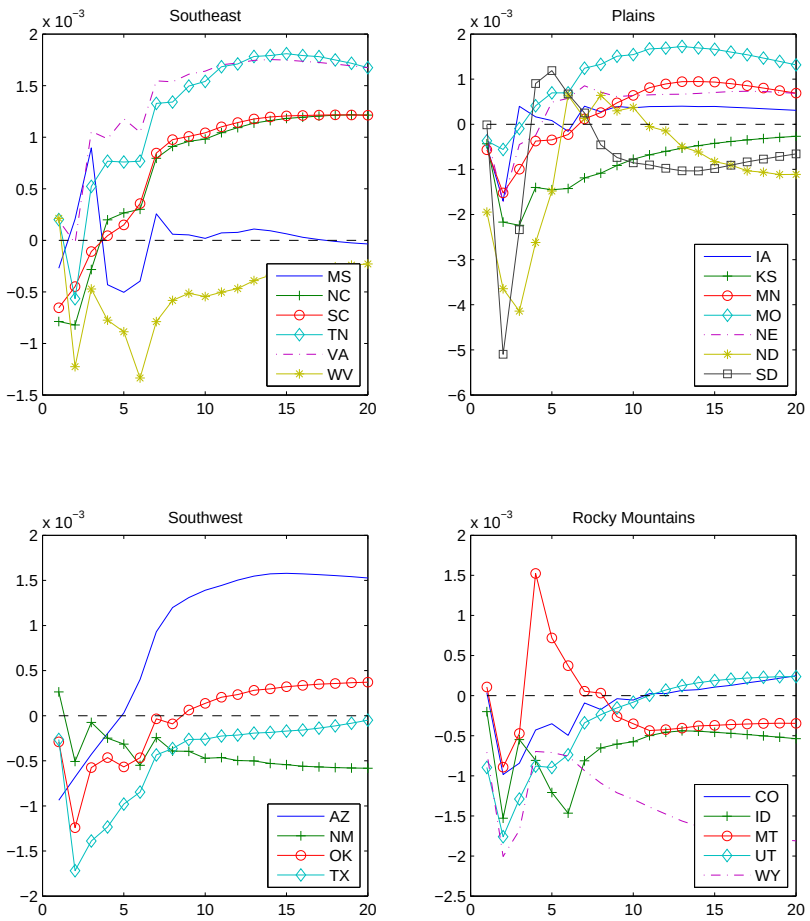

Figure 28: Response of personal income to Ramey variable

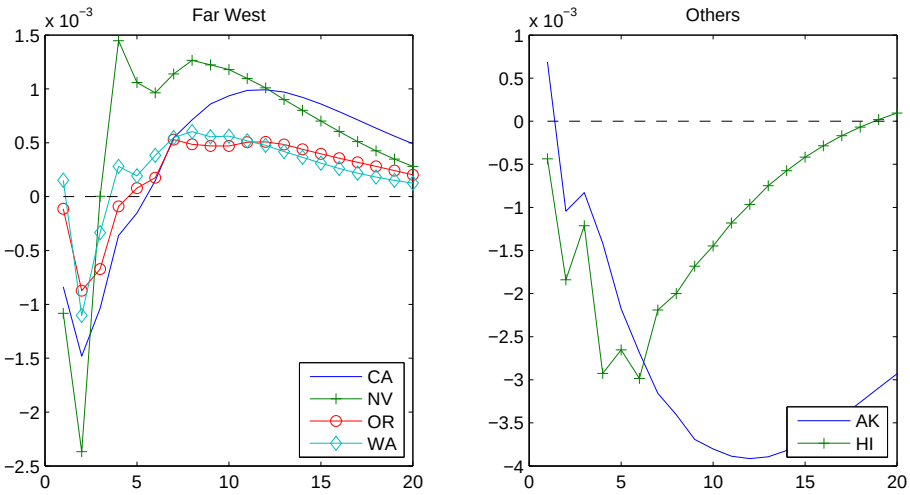

Figure 29: Response of personal income to Ramey variable

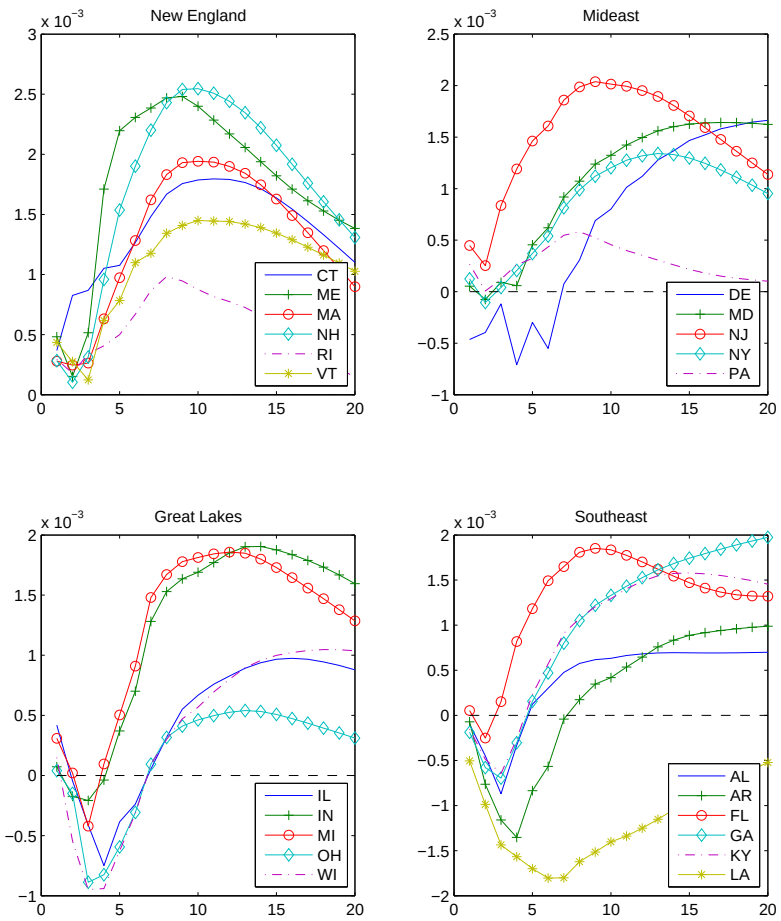

Figure 30: Response of employment to Ramey variable

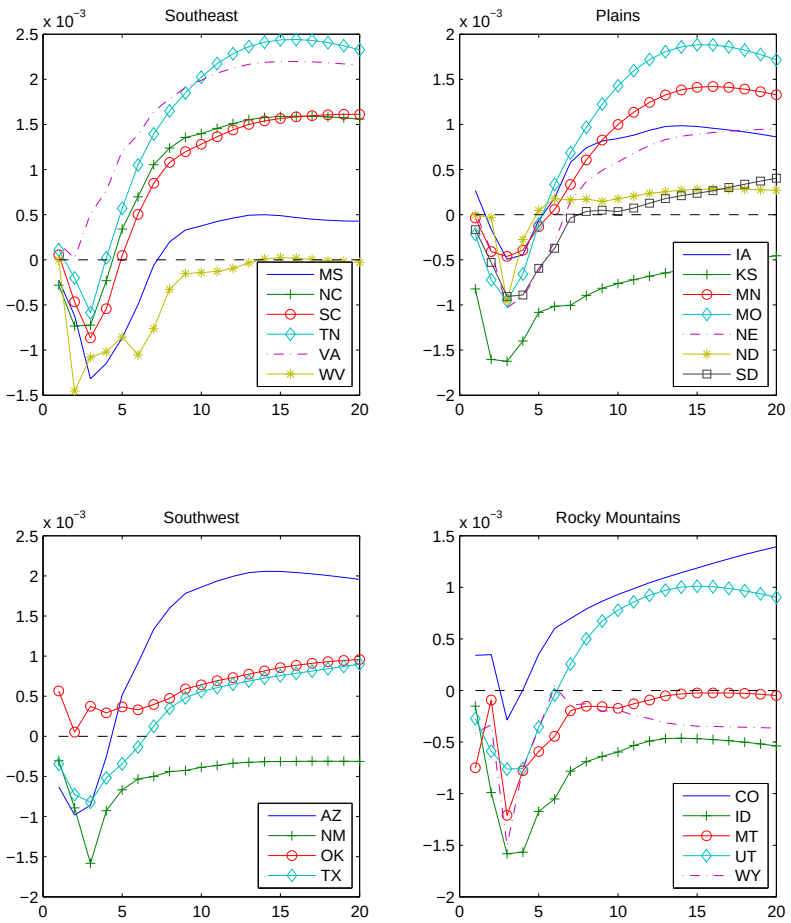

Figure 31: Response of employment to Ramey variable

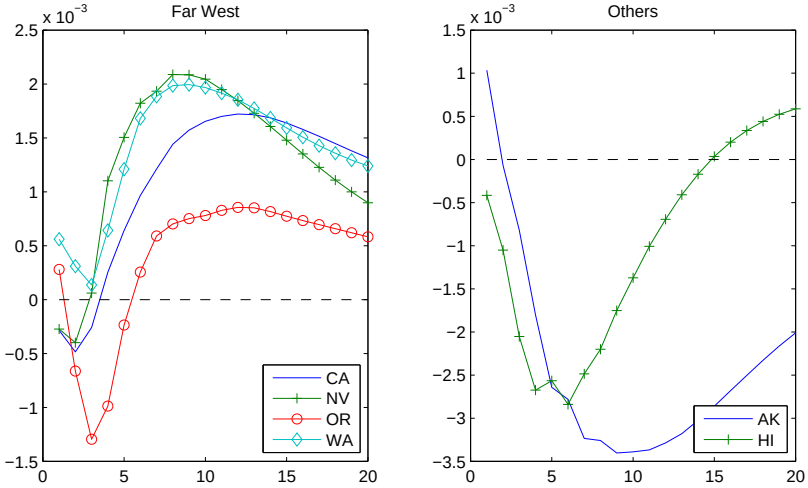

Figure 32: Response of employment to Ramey variable

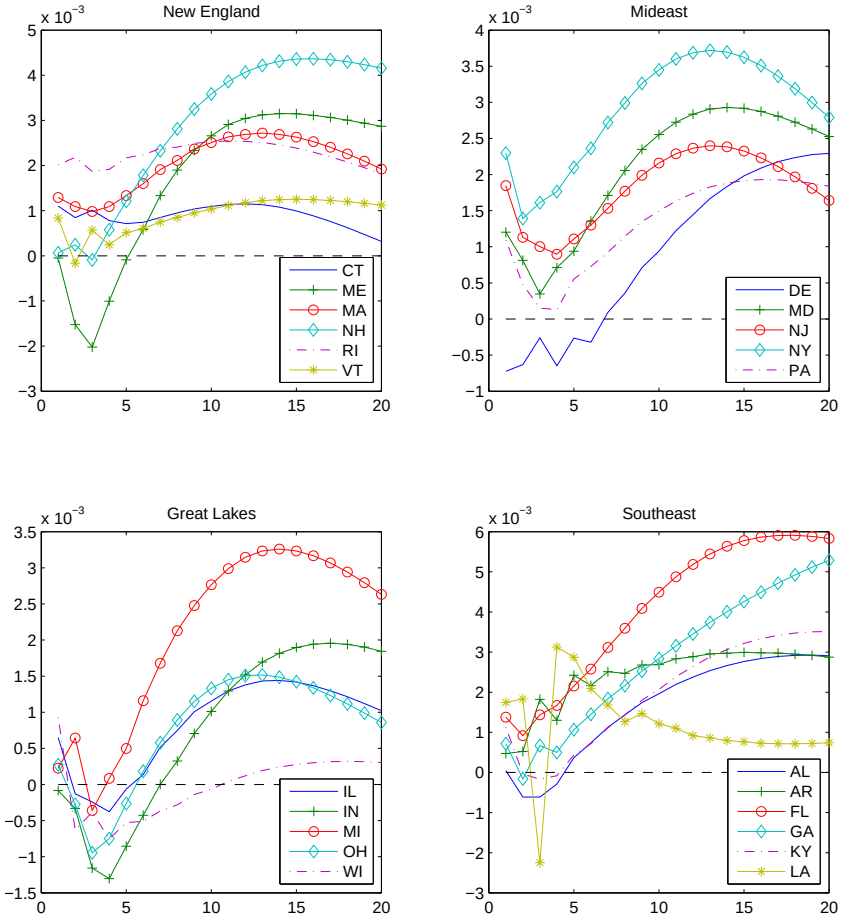

Figure 39: Response of personal income to federal spending shock

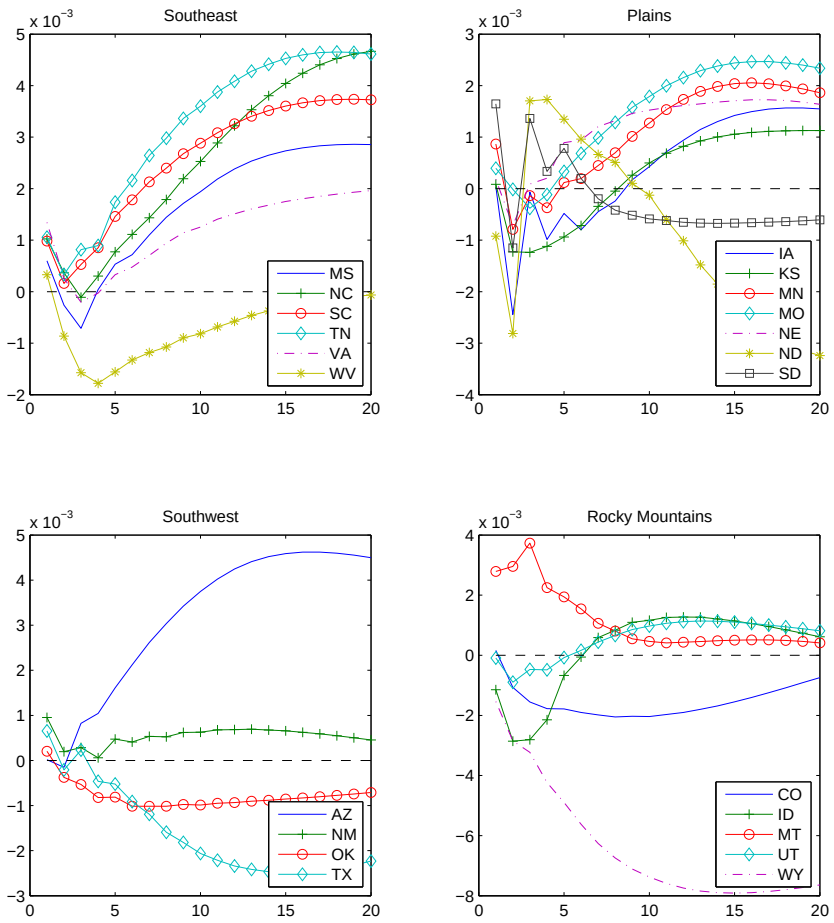

Figure 40: Response of personal income to federal spending shock

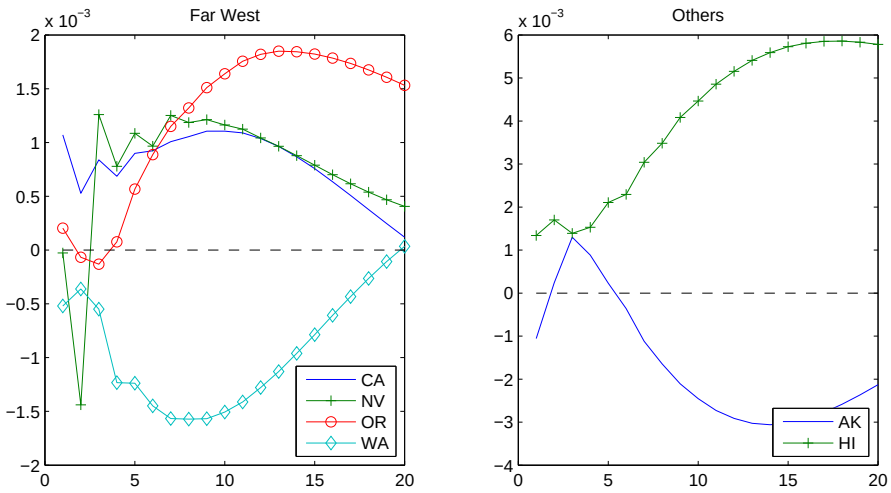

Figure 41: Response of personal income to federal spending shock

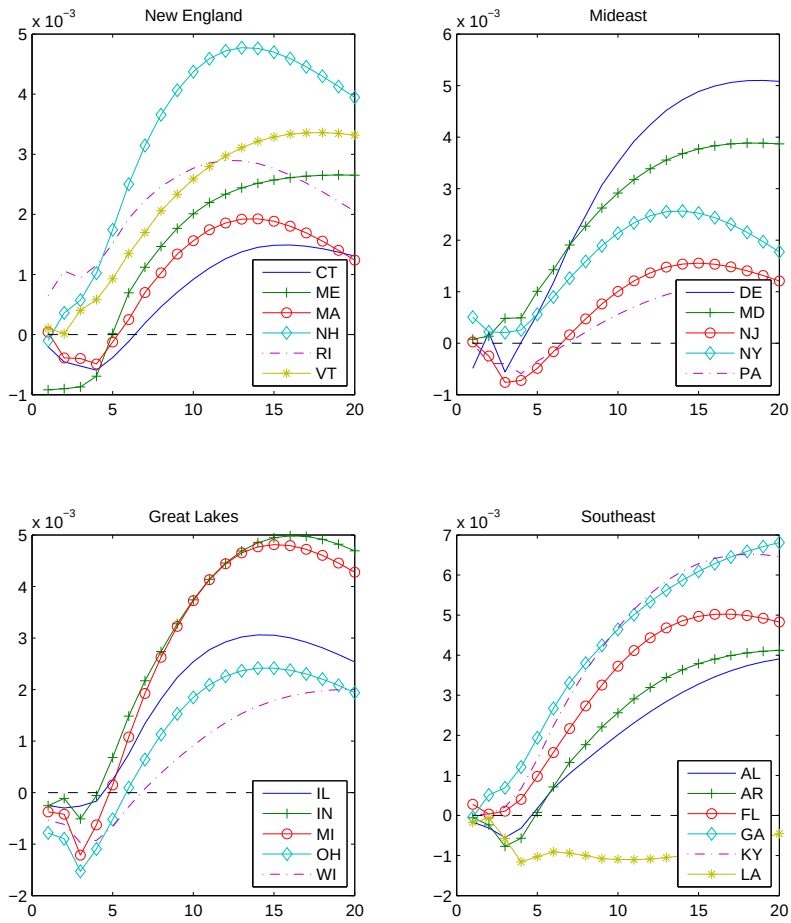

Figure 42: Response of employment to federal spending shock

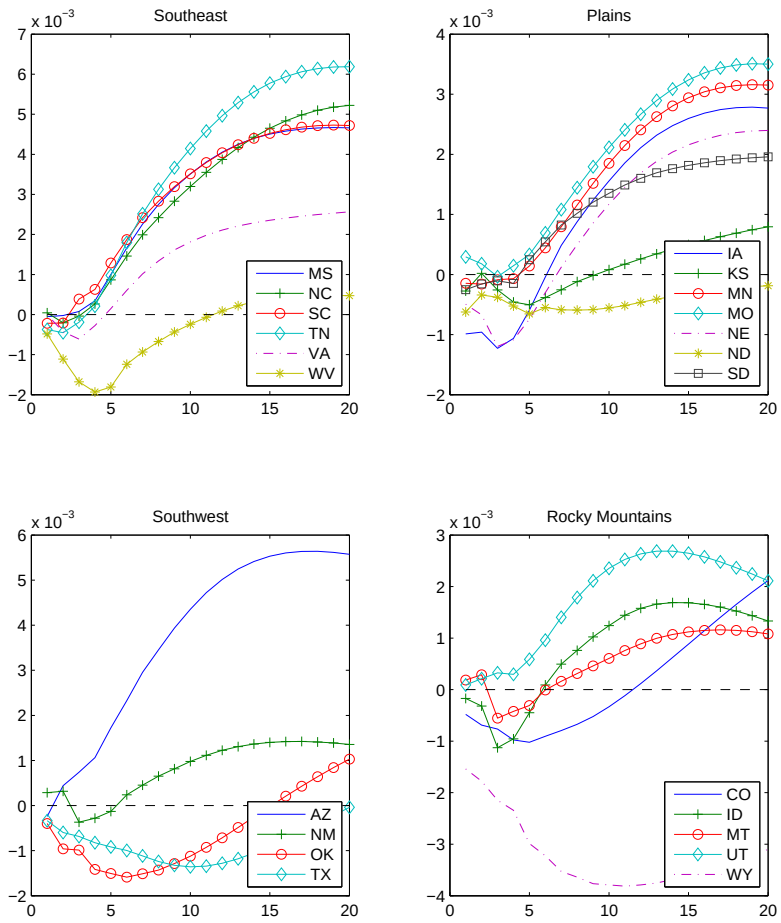

Figure 43: Response of employment to federal spending shock

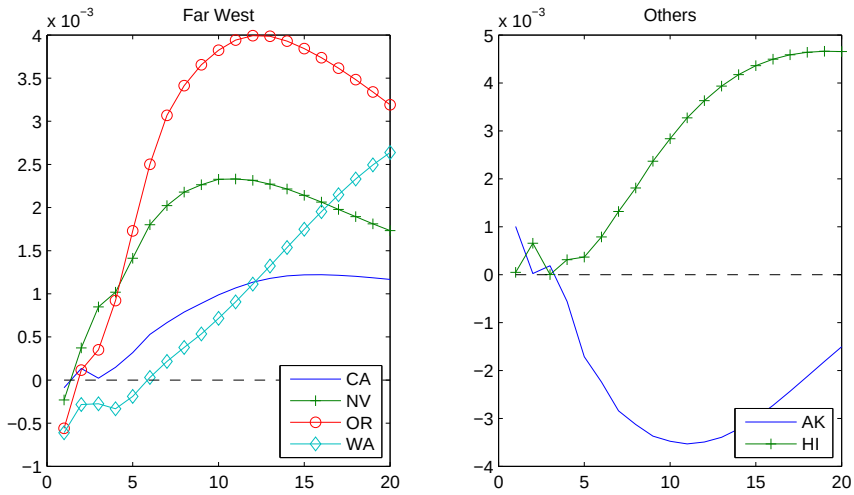

Figure 44: Response of employment to federal spending shock