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Who benefits from increased government spending? A state-level analysis

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ABSTRACT

We simultaneously identify two government spending shocks: military spending shocks as defined by Ramey (2011) and federal spending shocks as defined by Perotti (2008). We analyze the effect of these shocks on 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 non-military spending shocks. The former benefits economies with larger manufacturing and retail sectors and states that receive military contracts. While non-military shocks also benefit states with the proper industrial mix, they appear to stimulate economic activity in lower-income states.

1. Introduction

The result of fiscal stimulus is often measured as the increase in gross domestic product (GDP) per dollar spent by the government, the so-called government spending multiplier. Unfortunately, an aggregate multiplier does not capture the potential industrial, geographic, or demographic heterogeneity in the effects of a spending increase. Such dispersion, in addition to determining who benefits, may help us determine the channels through which fiscal stimulus acts.

Government spending shocks are often identified in vector autoregressions (VARs) as innovations to total government spending, which combines both federal and state/local spending (see Blanchard and Perotti, 2002; Perotti, 2008).[1] In these papers, government spending shocks are identified under the assumption, that at a quarterly frequency, government spending does not contemporaneously respond to the realization of other economic variables. This is implemented by ordering (exclusion) restrictions on the contemporaneous impact matrix of the VAR.[2] 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]

These aforementioned VARs, however, treat 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 of an effect in areas where bases or weapon manufacturers are located.[4] Indeed, Schiller (1999) 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 literature on intranational macroeconomics. For example, Carlino and DeFina (1998) show that VAR-identified monetary policy shocks have disparate effects on the regions. The

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

[2] Alternative identification techniques using sign restrictions yield results similar to the timing restriction. 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 narrative evidence on military buildups. (Ramey and Shapiro, 1998; Edelberg et al., 1999; Ramey, 2011).

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

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magnitude and duration of the effects of a surprise increase in the federal funds rate depend on, for instance, the industrial mix or the banking concentration of the region in question. Owyang et al. (2005) show 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 to 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 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 in which we are interested. States provide a natural level of disaggregation because of availability of data on economic activity at quarterly frequency. In addition, the U.S. states provide a rich cross-sectional data set with industrial, demographic and fiscal differences across them, in order to help us understand the propagation of federal fiscal policy throughout the country. 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 differential within monetary unions, like the E.U. or U.S. There is also a recent literature looking at the effectiveness of fiscal stimulus in a monetary union. A leading example would be Nakamura and Steinsson (2011) who suggest that a state level response to federal spending can be thought of as an open economy multiplier in a monetary union, versus the national multiplier being the closed economy multiplier. However, differently from this paper, they rely on semi-annual data on variation in regional military procurement associated with aggregate military build ups and draw-downs to estimate these effects.[5] This is similar in spirit to earlier work that considers the role of military spending shocks in explaining regional fluctuations. Davis et al. (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.

In this paper, we consider the potential differences between state-level responses to innovations in both federal non-military and military spending. Consistent with the previous literature on government spending shocks, we identify innovations to federal spending in VARs by ordering government spending ahead of the state-level variables of interest. We also identify large military spending shocks using the narrative evidence of military buildups provided in Ramey (2011).

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 occasionally the signs on impact) vary. We note that 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 may determine the concentration of either military or non-military federal spending. We further consider whether military spending has a greater effect in states in which military bases or industries are located.

Our results suggest that the industrial mix is an important determinant of the magnitude of the responses of real activity to spending shocks. The industries of importance depend on the nature of the government spending shock. A state's responsiveness to federal non-military spending shocks is influenced by its shares of manufacturing, agriculture and construction. In addition, state-level fiscal policy indicators and demographic variables can influence the responsiveness of the state to non-military spending shocks. Shocks to military spending stimulate economic activity in states with higher manufacturing and retail shares, and in those that receive a large share of military prime contracts, suggesting a procurement effect.

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 the two types of government spending shocks. We also consider cross-sectional differences in the explanatory power of the two government spending shocks for each state's unconditional variances. 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

The workhorse framework for identifying the effect of government spending shocks is the structural VAR. The following discussion outlines the canonical VAR used to measure the effect of innovations in federal spending shocks. We show how the model can be modified to identify both standard spending shocks and military spending shocks. We then further modify the model to estimate the effects on state-level economic indicators.

2.1. The benchmark aggregate VAR

Consider the structural representation of the VAR(p),

$$A_0 Y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} A_i Y_{t-i} + v_t, \tag{1}$$

where Y_t is the $n \times 1$ vector of economic variables that includes government spending and state-level variables and v_t is a vector of structural innovations having diagonal variance–covariance matrix Ω. Note that α_0 is a constant and α_1 is the coefficient for the linear time trend. 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 v_t defined by an orthonormal rotation of the reduced-form residuals,

$$A_0 \varepsilon_t = v_t. \tag{2}$$

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

$$Y_t = \beta_0 + \beta_1 t + \sum_{i=1}^{p} B_i Y_{t-i} + \varepsilon_t, \tag{3}$$

where 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 VARs is

[5] Fishback and Kachanovskaya (2010) and the references within also provide federal spending multipliers across different states, focusing on specific time periods, or components of federal spending.