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The asymmetric government spending multipliers: Evidence from US regions

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ABSTRACT

This paper tests the asymmetry in government spending multipliers using the panel data in the US postwar states. Empirical results show that output and employment rate respond asymmetrically to military procurement spending shocks with different signs and magnitudes. Our findings suggest that expansionary multipliers are much larger than contractionary multipliers, and that small-scale spending shocks tend to have a greater impact than large-scale ones.

1. Introduction

The size of the government spending multiplier is of critical importance for determining the effect of fiscal policies. Two main approaches have been widely used to estimate the multiplier in the existing literature. The first is the structural vector autoregression (SVAR) approach,[1] while the second is based on narratively-identified shocks associated with wars, plausibly unrelated to prevailing macroeconomic conditions.[2] However, these approaches implicitly assume that 1) expansionary and contractionary fiscal policies have the same (mirror-image) effect; and that 2) the size of the multiplier does not depend on the characteristics (e.g., the sign and the magnitude) of the government spending shock. To advance the understanding of the government spending multiplier, we relax these two assumptions and test the presence of asymmetric effects of government spending using the US postwar data. Specifically, we explore whether or not the sign and the magnitude of the government spending shock matter for multiplier effects.

Following the work by Nakamura and Steinsson (2014), this paper comprehensively examines cross-state multipliers in the US by analyzing the effects of the direction (positive or negative) and size (big or small) of changes in government spending on regional total output and employment. We estimate government spending multipliers associated with military procurement spending using variations in the response of regional spending to national military buildups and drawdowns. Empirical results show that expansionary multipliers, i.e., the multipliers related to a positive shock to government spending, are always larger than contractionary multipliers for output and employment. We also find that small government spending shocks tend to strengthen the effect of fiscal policy and generate larger government spending multipliers, compared to big ones.

This study contributes to the existing literature on the government spending multiplier by relaxing the assumption of linearity in the estimation of multiplier effects with traditional methods, such as VAR models.[3] This is the first paper, to the best of our knowledge, that cross-sectionally investigates the sign-dependent and size-dependent nature of government spending multipliers. On top of that, this paper extends the small but growing literature on state dependence of government spending

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[1] See Auerbach and Gorodnichenko (2012) and Ilzetzki et al. (2013), among others.

[2] See Ramey (2011b), Ramey and Zubairy (2018).

[3] See Ramey (2011b) for a good summary of the general literature on government spending multiplier and Chodorow-Reich (2019) for a review of research about geographic cross-sectional fiscal spending multipliers.

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multipliers by showing that the internal properties, e.g., the sign and magnitude, of government spending shocks also matter for the multiplier effect. Standard VAR techniques that fail to explore nonlinearities can significantly misestimate the government spending multiplier.

The remainder of this paper is organized as follows. Section 2 presents the data and methodology. The empirical results are discussed in Section 3. Section 4 concludes.

2. Data and methodology

We use variations in military procurement spending across states to estimate government spending multipliers. To identify asymmetric effects of spending shocks with different signs and sizes on output, the model specification in Nakamura and Steinsson (2014) is extended and estimated as follows:

$$\begin{cases} \frac{Y_{it}-Y_{it-2}}{Y_{it-2}} = \alpha_i + \gamma_t + \beta_p^+ \times \frac{G_{it}-G_{it-2}}{Y_{it-2}} \times 1_{\Delta G_i/Y_{it-2}>0} + \\ \qquad \beta_n^- \times \frac{G_{it}-G_{it-2}}{Y_{it-2}} \times \left(1 - 1_{\Delta G_i/Y_{it-2}>0}\right) + \epsilon_{it} \\ \frac{Y_{it}-Y_{it-2}}{Y_{it-2}} = \alpha_i + \gamma_t + \beta_p^+ \times \frac{G_{it}-G_{it-2}}{Y_{it-2}} + \\ \qquad \left(\beta_n^- - \beta_p^+\right) \times \frac{G_{it}-G_{it-2}}{Y_{it-2}} \times \left(1 - 1_{\Delta G_i/Y_{it-2}>0}\right) + \epsilon_{it} \end{cases} \tag{1}$$

where Y_{it} and G_{it} are per-capita output and military procurement spending in region i in year t.[4] $1_{\Delta G_i/Y_{it-2}>0}$ is an indicator for a period of positive change in government spending. The effects of expansionary and contractionary government spending are given by β_p^+ and β_n^-, respectively. Similarly, we also define a time dummy for a period when $\Delta G_i/Y_{it-2}$ is big and estimate the effects of large and small government spending shocks.[5] α_i and γ_t denote state and year fixed effects.

On top of that, we consider a two-year time interval to capture dynamics in the relationship between government spending and output. We use annual panel data in states from 1966 to 2006, and standard errors are clustered by states. To investigate the effects of military spending on employment, we construct a model specification similar to equation (1), except that the dependent variable is now $(L_{it}-L_{it-2})/L_{it-2}$, where L_{it} is the employment rate (employment divided by population). Equations are estimated using the instrumental variables (IVs) approach since military spending can potentially be endogenous.[6] We, therefore, employ the variation in the sensitivity of military spending across states to national military buildups and drawdowns as the IV to identify the multiplier (Nakamura and Steinsson, 2014). In other words, we instrument for state military procurement using total national procurement interacted with a state dummy.

Using the electronic database of DD-350 military procurement forms from the US Department of Defense, we compile the military spending data on total military procurement by state and year for 1966–2006.[7] Our measure of state output is the GDP by state measure constructed by the US Bureau of Economic Analysis (BEA), which is available since 1963. For the employment rate, we use the Bureau of Labor Statistics payroll survey from the Current Employment Statistics program. State population data is from the Census Bureau. Table A.1 in Appendix A shows the descriptive statistics of the primary data.

Table 1
Effects of positive and negative military spending shocks.

	Output (1)	Output (2)	Employment (3)	Employment (4)
β_n^-	−0.1066		0.9677*	
	(0.8038)		(0.5037)	
β_p^+	4.1740***	4.1740***	1.8488**	1.8488**
	(1.4917)	(1.4917)	(0.9377)	(0.9377)
$\beta_n^- - \beta_p^+$		−4.2805**		−0.8811
		(2.1810)		(1.3453)
N	1,989	1,989	1,989	1,989
R^2	0.2724	0.2724	0.5009	0.50099

Note: Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

3. Empirical results

Table 1 shows the effects of positive and negative government spending shocks. We find that the point estimate of β_n^- for the output in Column (1) is close to zero and statistically insignificant, which implies that the decrease of government spending has a negligible effect on the real output. By contrast, positive spending exerts a significant effect on output with a multiplier of 4.17, and the difference between estimates of β_n^- and β_p^+ is also significant. The effect of spending shocks on the employment rate is somewhat similar. Though the estimate of $(\beta_n^- - \beta_p^+)$ in Column (4) is not significantly different from zero, the increase in government spending has a much larger impact on employment than the contractionary spending which has a marginally significant multiplier less than one. Compared to the government spending multiplier estimated in the literature (Ramey, 2011a), the point estimates of β_p^+ become larger. It might be the case that we calculate the cross-sectional, rather than national multipliers (Chodorow-Reich, 2019). It is also probably because military spending generates the largest multiplier among more disaggregated spending (Auerbach and Gorodnichenko, 2012).

In sum, the effects of expansionary and contractionary government spending are asymmetric, and the increase in government spending has a much larger impact on output and employment. It could be due to the fact that government spending multipliers are state-dependent and vary with the overall debt level (Ilzetzki et al., 2013), business cycles (Ramey and Zubairy, 2018) and the monetary policy stance (Amendola et al., 2020). However, the "open economy relative multiplier" estimated in Table 1 is independent of aggregate policy since we "difference out" aggregate shocks by including time fixed effects in the regression.[8] The results in Table 1, therefore, cannot be explained by the state-dependence of government spending multipliers in the literature. Instead, the higher expansionary multiplier is probably due to high labor mobility. Specifically, when local government spending increases, workers may move in from other states in response to rising local labor demand, further raising local employment and output by consuming non-tradeable output and pushing down wages in tradeable sectors. By contrast, the contractionary multiplier is much smaller than the expansionary one. It may be because if a reduction in military spending leads to lower aggregate demand and a mass layoff, it is easier for unemployed workers from defense companies to be re-employed since they are mainly male, young and well-disciplined with focused

[4] Both regional output and military procurement spending are deflated by the national CPI for the United States.

[5] Following the paper by Hooker and Knetter (1997), we set the large shock indicator to 1 for all states in years when $\Delta G_i/Y_{it-2}$ is larger than its 75th percentile (big positive changes) or smaller than its 25th percentile (big negative changes) of the whole sample.

[6] Though military spending associated with wars might be unrelated to macroeconomic conditions (Ramey, 2011b), it is still political and thus likely to be endogenous to regional economic conditions (Mintz, 2002).

[7] https://eml.berkeley.edu/~enakamura/papers/How To Get Military Prime Contract Data.pdf.

[8] See Nakamura and Steinsson (2014) for a detailed introduction of the open economy relative multiplier.

Table 2
Effects of big and small military spending.

	Output (1)	Output (2)	Employment (3)	Employment (4)
β_s	3.4970		6.8189	
	(6.2859)		(5.0803)	
β_b	1.4580***	1.4580***	1.3781***	1.3781***
	(0.3674)	(0.3674)	(0.3466)	(0.3466)
$\beta_s - \beta_b$		2.0389		5.4488
		(6.0995)		(4.8219)
N	1,989	1,989	1,989	1,989
R^2	0.3248	0.3248	0.4787	0.4787

Note: Robust standard errors are reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

skills (Braddon, 1995). The indirect job creation offsets the direct job loss due to a decrease in government spending (Hooker and Knetter, 2001). In addition, appropriate policy measures by the government can be employed to counteract the adverse effects of declining defense budgets and facilitate regional economic regeneration (Braddon, 1995).[9]

The results in Table 1 are in contrast, however, to the related study by Barnichon et al. (2021), who find that the contractionary multiplier is above 1, but the expansionary multiplier is below 1. The key difference in our results with those in Barnichon et al. (2021) is that we estimate the open economy relative multiplier associated with military spending changes, while they use US time-series data to measure what happens on average when the aggregate government purchases change in different directions. On the one hand, the relative multiplier for expansionary spending shocks is much higher than the national counterpart probably because national policy responses (e.g., a "lean against the wind" monetary policy) that dampen the aggregate multiplier are "differenced out" with time fixed effects in our estimation. Moreover, the aforementioned high labor mobility across state boundaries in response to favorable local spending shocks may push up local multipliers. On the other hand, the contractionary multiplier for military spending may be smaller than that for aggregate government purchases because of specific attributes of military personnel that facilitate re-employment and supportive policy action by the government to counteract the adverse effects of declining defense budgets.

Next, we investigate the asymmetric impacts of government spending shocks with different sizes. Table 2 reports regression results of the multiplier effects of big and small changes in military spending. The point estimates of β_s for output and employment are larger in magnitude than those of β_b, although the coefficients of β_s and $\beta_s - \beta_b$ are not statistically significant. Note that the significance level of this estimation could be affected by the nature of the data itself. Specifically, small-scale military spending is much less volatile than large-scale spending by definition, which can probably lead to larger but less significant point estimates of β_s and $\beta_s - \beta_b$. The insignificant estimates could also be attributed to possible measurement errors in the procurement-spending data, resulting in a lower signal-to-noise ratio for small spending changes as compared to large ones. Overall, we find that small government spending shocks have larger multiplier effects than large shocks, which is consistent with the work by Erceg and Lindé (2014). They show that the increase in the size of fiscal expansion indicates a larger tax burden in the future and gives rise to a negative wealth effect that reduces the multiplier. Results in Table 2 are also supported by German and Karamysheva (2019). Using US data and time-series analysis, they find that the government consumption multiplier is higher under smaller consumption shocks, probably because of near rational behavior of the households (Fuchs-Schündeln and Hassan, 2016).[10]

Robustness checks and extended tests. Our results are robust to (i) alternative measurements of dependent variables such as real output per working-age and the BEA employment rate; (ii) controlling for the impact of oil price or real interest rate; (iii) employing a longer time change interval (e.g., 4-year change). All these checks are documented in our Appendix A (Table A.2). We find that multipliers generated via OLS (Panel A in Table A.2) are much smaller than multipliers in Table 1, confirming the problem of endogeneity in the model specifications. In an extended test, we estimate the effect of positive and negative military spending changes on sectoral output. Results in Table A.3 show that asymmetric multiplier effects differ across sectors and are significant in some sectors, including construction, manufacture, retail, service, and wholesale.

4. Conclusion

This paper shows that output and employment respond asymmetrically to government spending shocks with different signs and magnitudes. We find large expansionary government spending multipliers that can be attributed to high labor mobility and spillover effects across boundaries at the state level. Contractionary multipliers estimated with a reduction in military procurement expenditure are relatively small, probably because of the easier reemployments of high-skilled unemployed workers from defense companies and supportive measures by the government to mitigate the unfavorable impacts of declining defense budgets. The finding that the fiscal multiplier depends negatively on the size of the government spending changes can be explained by the negative wealth effect when the public expect an increasing tax burden with a greater fiscal stimulus, and near rational behavior of households in case of minor spending shocks. Our results have two important policy implications. First, they strongly strengthen the case for fiscal packages to stimulate the economy. Second, they suggest that fiscal consolidations based on reducing government purchases are unlikely to do much harm to the private sector. Future research could investigate the possible mechanism that generates nonlinearities between government spending and macroeconomic variables.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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[9] For example, in the 1991 Defense Authorization and Appropriations Bill, additional government support was committed for regional communities adversely affected by defense cuts.

[10] Fuchs-Schündeln and Hassan (2016) argue that when households' current income suffers a small shock, their inaction and inattentiveness result in violation of the permanent income hypothesis.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2021.110056.

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