

U.S. Military Spending and the Business Cycle

Lecture Notes

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1 Introduction

This short note was motivated by an email sent to me by one of my students. This is what he wrote:

“I heard someone say that the US government tends to ‘find themselves in war’ every time they are in a recession. This person also claimed that the increased government expenditures on war pulled the US out of each of the last few recession they’ve been in. Furthermore, this person said that the ‘military industry’ is one of the biggest industries in the US, which is why greater government expenditures on war always pull the US out of recessions. Also, this person claimed that boom the US had in the last decade was in large part attributed to all their considerable military effort of the last decade.”

Based on conversations that I’ve had with many people in informal settings, I would venture to guess that this sentiment is not at all uncommon. In all likelihood, the feeling is based on what we learned in school about the Great Depression and the Second World War. In particular, we were taught that the 1930s were pretty bad economically and that this episode seemed to end only with the military buildup ordered by the government in response to an impending war.¹

But what is the evidence for statements like “the U.S. government tends to find itself in a war every time they are in recession”; or “the boom in the

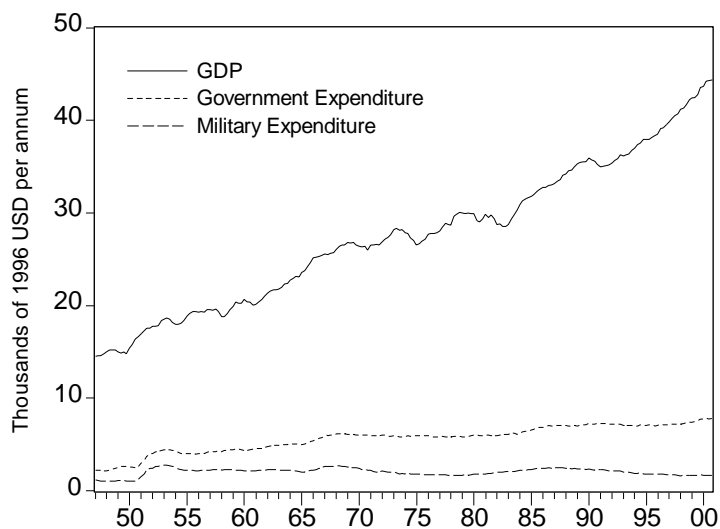
¹When one looks at time-series plots of U.S. GDP and government spending during this period, the evidence seems pretty compelling. Military expenditures rise significantly during the war and so does GDP. As military expenditures fall at the war’s end, so does GDP. It seems quite natural to interpret the direction of causality as running from military expenditure to GDP.

last decade was in a large part attributable to the considerable military effort of that decade"? Well, why don't we take a look at some data on U.S. GDP and government expenditure components and see what they look like.²

2 U.S. Quarterly Data 1947-2000

Consider Figure 1. Here I have plotted three time-series: Total Expenditure (GDP); Total Government Expenditure; and Total Military Expenditure. Each series has been divided by the adult (age 16+) population and are measured in 1996 U.S. dollars. According to this data, GDP per adult has tripled since 1947.

FIGURE 1
U.S. Expenditures per Adult



²The data presented here were downloaded from various links at the *National Bureau of Economic Research* website, www.nber.org.

FIGURE 2
U.S. Government and Military Expenditure
per Adult

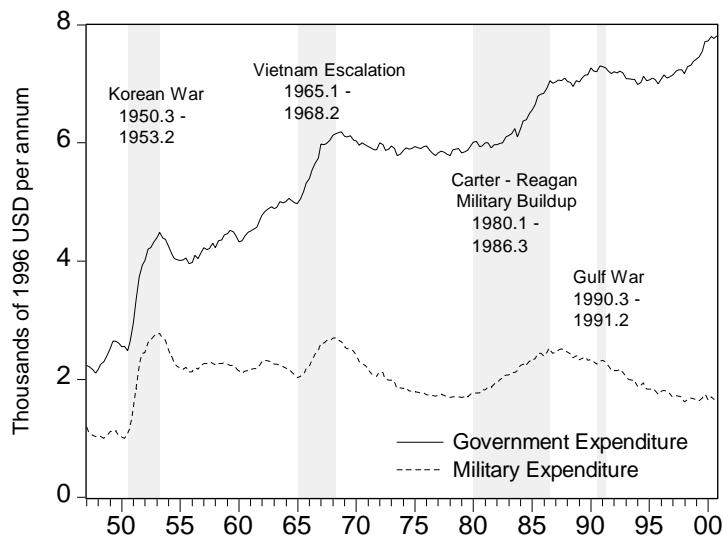
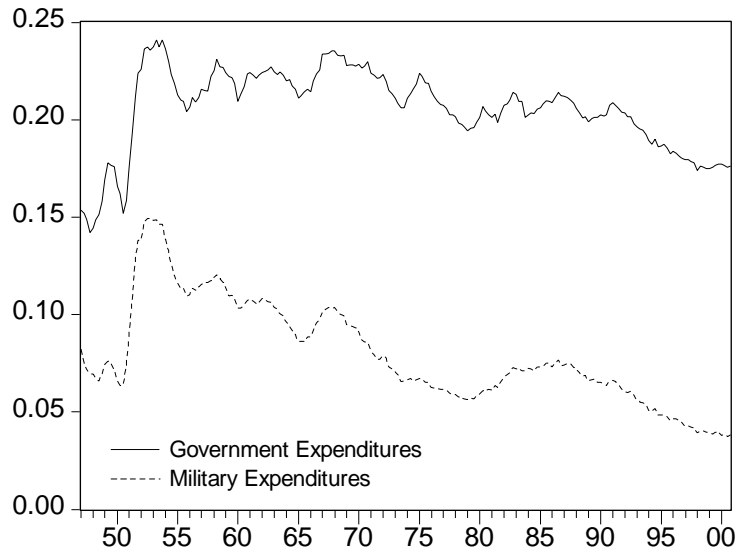


Figure 2 presents a close-up view of the time-pattern of government spending and its subcomponent, military spending. It may come as a surprise to some to discover that there has been no discernible trend in U.S. military spending; i.e., for close to 50 years, it has remained at about \$2000 per adult. (In contrast, notice that total government spending per adult increased by four times over this sample period).

Over this time period, the United States was involved in three major conflicts: Korea, Vietnam, and the Persian Gulf. Only one of these conflicts occurred during a recession (Gulf War). Furthermore, note that there was no significant increase in military spending during the Gulf War. On the other hand, there was a significant increase in military expenditures during the Korean War and the peak of the Vietnam War. There was also a significant military buildup during the first half of the 1980s, even though there was no war.

FIGURE 3
Government Expenditures
as a Ratio of GDP



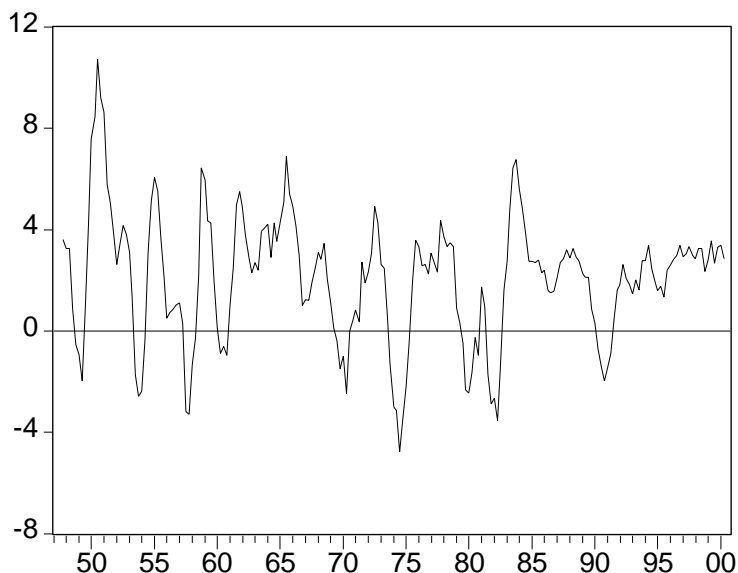
In Figure 3, I plot government spending as a ratio of GDP. Notice that there is hardly any trend in total government spending as a ratio of GDP; it remains close to 20% for most of the sample period. On the other hand, there appears to have been a secular decline military spending as a ratio of GDP, peaking at about 15% during the Korean War and falling more or less steadily to about 4% today.

In Figure 4, I plot the (annual) growth rate of GDP per adult.³ One thing that stands out in this picture is the long period of economic expansion, stretching from 1982.4 until today, punctuated by a one-year recession, 1990.2–1991.2. By contrast, the period covering the late 1960s to the early 1980s was marked by three (or four, depending on how one measures things) significant recessions. By and large, the 1960s are characterized by steady economic growth. Growth was also a characteristic of the 1950s, but dis-

³Note that I have ‘smoothed’ the series with a 5-quarter moving average.

played much more volatility relative to other time periods.

FIGURE 4
U.S. GDP per Adult
Growth Rate per Annum



3 Analysis

3.1 Military Expenditure

Let us begin by plotting GDP growth against the growth rate in military spending; this is done in Figure 5. This diagram gives us some impression as to how U.S. military spending is correlated with the business cycle. Remember to keep in mind that correlation itself implies nothing about causation.

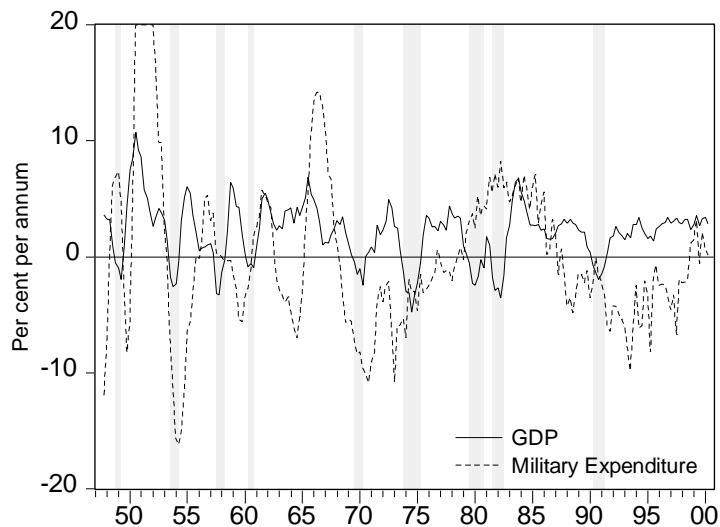
From this picture, it looks like we can question some of the statements made in the earlier quote. Consider the assertion: “The boom that the U.S. had in the last decade was in large part attributable to their considerable military effort.” As Figure 5 shows, U.S. military spending throughout most of the 1990s was *shrinking*. In fact, military spending started shrinking steadily beginning in about 1987, with the economy continuing to boom until

the second quarter of 1990. Furthermore, despite the fact that the recession in the early 1990s coincided with the Gulf War, the economy seemed to recover without the benefit of any increased military spending (military spending continued to fall throughout the war).

What about the assertion that the “increased government expenditures on war pulled the US out of each of the last few recession they’ve been in”. Well, we saw that this was certainly not the case with the most recent recession. What about earlier time periods?

From Figure 5, we see a rapid rise in military expenditure that began under the presidency of Jimmy Carter (around 1978) and peaked under the presidency of Ronald Reagan (around 1982). Notice that military spending continued to grow until about 1987.

FIGURE 5
Growth in U.S. Per Capita GDP
and Military Expenditure



According to this diagram, the U.S. economy entered into recession in the third quarter of 1979. Military spending began to rise in the third quarter of 1978. One interpretation of this data is that the government was able to forecast the oncoming recession a year in advance and, in response to this forecast, decided to expand the military. With the onset of the recession, mil-

itary spending continued to rise, perhaps in part to satisfy Reagan's political agenda and in part to help 'stimulate' the economy. Looks like it worked too, because the economy did eventually recover with a prolonged period of growth.

An alternative interpretation of this period might run as follows. In late 1978, spending on the military began to rise and continued to rise for political reasons. The rapid rise in the demand for military goods and services served to drive up real interest rates (they did shoot up during this period) which, if anything, made the recession much more severe than it would otherwise have been. The economy recovered in 1983 not because of the rapid expansion in military spending, but *in spite of it*. One can come up with similar contrasting interpretations for earlier time periods.

In Table 1, I report the correlation between GDP growth and the growth rate in military spending at various leads and lags. Let $y(t)$ denote the growth rate in real per capita GDP at some date t and let $m(t + j)$ denote the growth rate in real per capita military spending at date $t + j$.

Table 1									
	$Cor(y(t), m(t + j))$								
j	-4	-3	-2	-1	0	+1	+2	+3	+4
$m(j)$	-0.02	-0.05	-0.00	0.02	0.18	0.21	0.20	0.28	0.30

Table 1 reveals that changes in military spending tend to *lag* changes in total spending. In other words, the growth rate in military spending tends to peak about four quarters (one year) *after* the growth rate in GDP peaks. One interpretation of this correlation structure is that when the economy is peaking cyclically, the government finds it easier to implement legislation that calls for increased military spending (with the legislation taking effect with about a one year lag). Another interpretation is that the private sector anticipates (years in advance) exogenous changes in government orders for military goods and services. Or, it may be the case that each variable has some influence on the other.

One way in which we might get a handle on this latter hypothesis is to run a vector autoregression (VAR) that specifies $y(t)$ and $m(t)$ as dependent

variables. As independent variables, I include two lags of y and m , as well as the log of the ratio of military spending to GDP (lagged one period), which I label R . In other words, the system of equations to estimate is given by:

$$\begin{aligned} y(t) &= a_0 + a_1y(t-1) + a_2y(t-2) + a_3m(t-1) + a_4m(t-2) + a_5R(t-1) + \epsilon_y(t) \\ m(t) &= b_0 + b_1y(t-1) + b_2y(t-2) + b_3m(t-1) + b_4m(t-2) + b_5R(t-1) + \epsilon_m(t), \end{aligned}$$

where $\epsilon_y(t)$ and $\epsilon_m(t)$ are interpreted to be exogenous ‘innovations’ (shocks) to $y(t)$ and $m(t)$. When I run this VAR using my Eviews software, this is what I get:

	a_0	a_1	a_2	a_3	a_4	a_5
Parameter Estimate:	1.52	0.30	0.13	0.00	-0.01	0.12
T-statistic:	2.15	4.26	1.88	0.10	-0.46	0.15
	b_0	b_1	b_2	b_3	b_4	b_5
Parameter Estimate:	-6.96	0.08	0.48	0.52	0.11	-2.39
T-statistic:	-1.14	0.42	2.46	7.49	1.61	-1.03

The adjusted R-squared for the two equations are 0.13 and 0.41, respectively.

These estimates reveal that lagged measures of military spending do not forecast output growth, but do forecast growth in military spending. Output growth lagged by two quarters also appears to forecast growth in military spending. There is also some (weaker) evidence that when the ratio of military spending to GDP is high, future military spending is likely to contract.

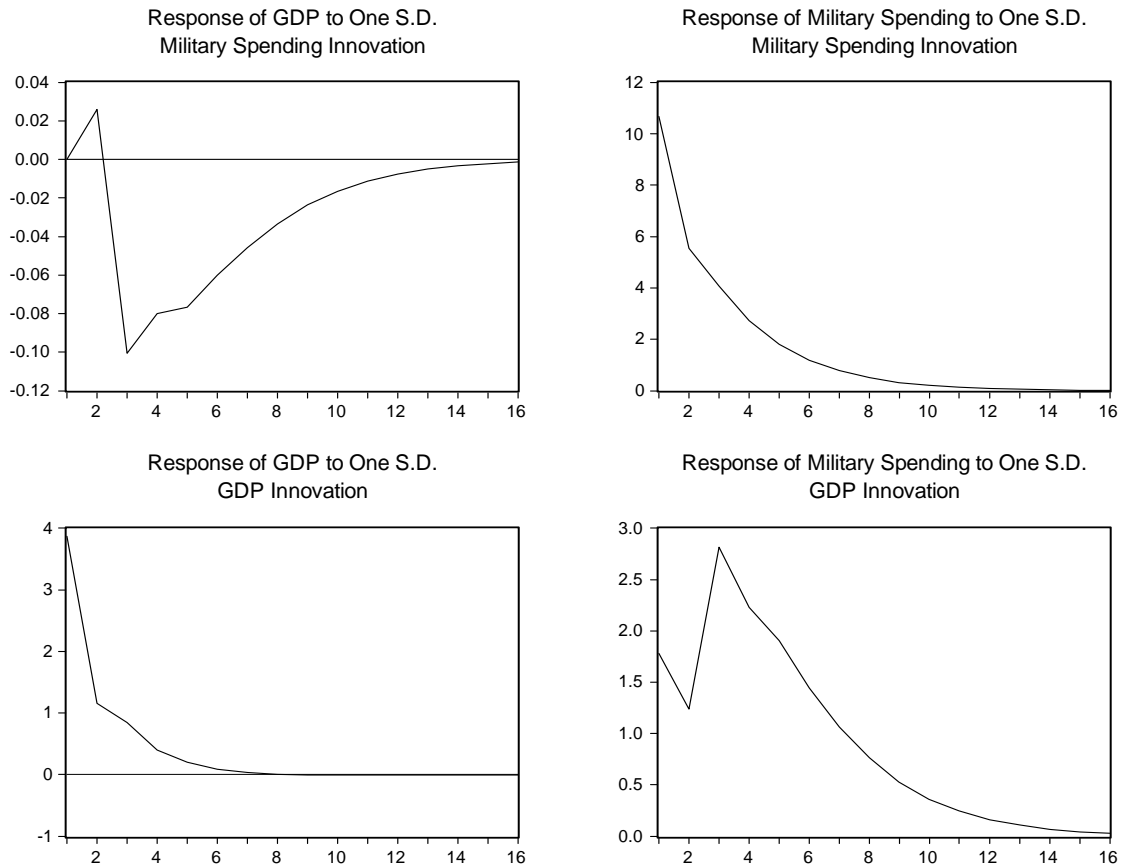
In Figure 6, I display the impulse-response functions associated with one-standard-deviation shocks to each of the innovations $\epsilon_y(t)$ and $\epsilon_m(t)$. Each vertical axis measures the percent deviation of the variable from its long-run value in response to the shock in question. Each horizontal axis measures the number of quarters along which the adjustment to any shock takes place.

According to Figure 6, when the growth rate military spending increases unexpectedly by 10% (one standard deviation), GDP growth responds hardly at all, peaking two quarters after the shock by a paltry 0.02%. Beginning in the third quarter, the *level* of GDP is predicted to fall for about three years (although, this effect is also very small).

In contrast, when GDP growth increases unexpectedly by 4 percent (one standard deviation), growth in military expenditures rises by 1.5% early on,

peaking in the third quarter at 2.75% above trend. Military expenditures continue to grow for about three years following the shock.

FIGURE 6
Impulse-Response Dynamics

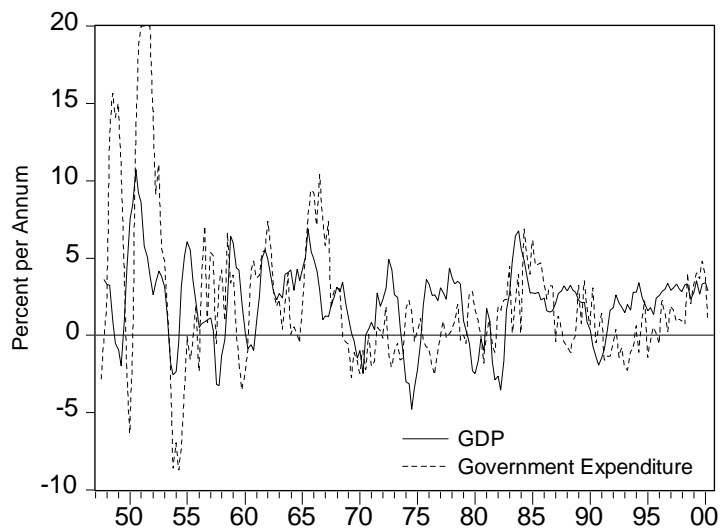


3.2 Total Government Expenditure

Do the results reported above continue to hold when one considers total government spending? Figure 7 displays the time-series properties of GDP growth and growth in total government spending (a 5-quarter moving average

has been used to smooth the data).

FIGURE 7
Growth in U.S. Per Capita GDP
and Government Expenditure



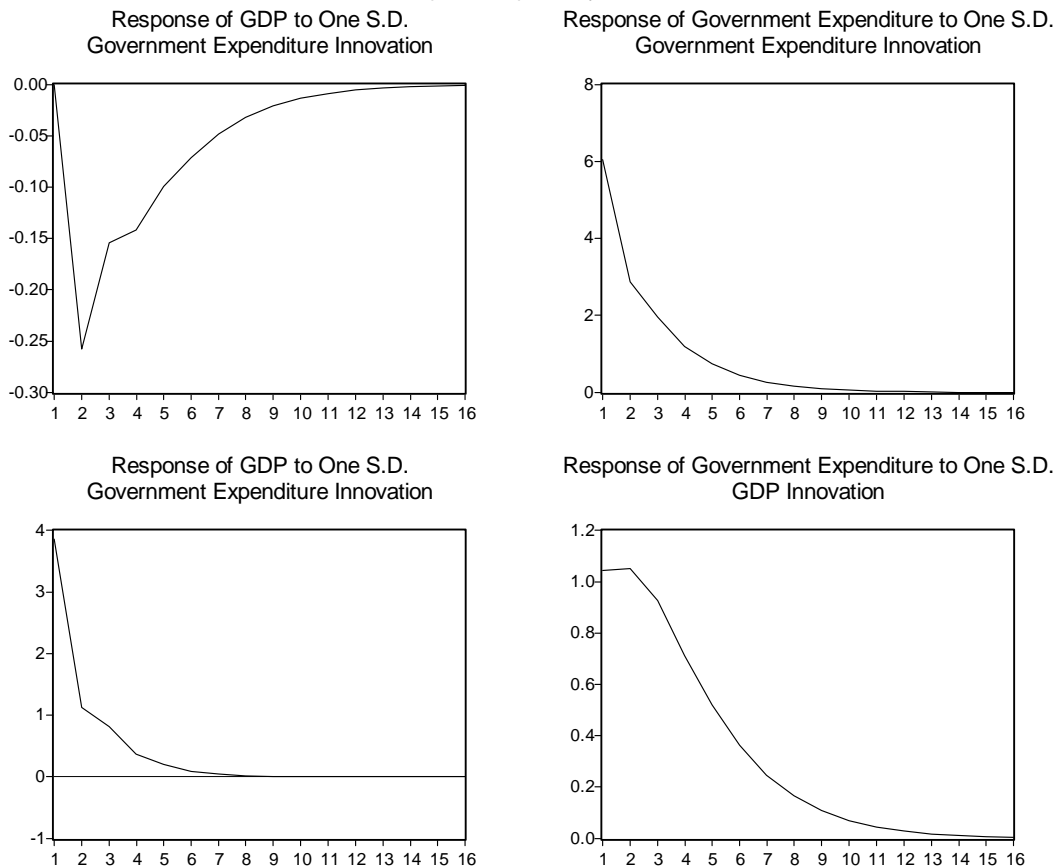
The results of a similar VAR are given as follows:

	a_0	a_1	a_2	a_3	a_4	a_5
Parameter Estimate:	-1.58	0.30	0.13	-0.04	0.01	-1.80
T-statistic:	-0.38	4.33	1.84	-1.00	0.18	-0.67
	b_0	b_1	b_2	b_3	b_4	b_5
Parameter Estimate:	-24.91	0.14	0.04	0.47	0.10	-16.13
T-statistic:	-3.72	1.28	0.36	6.98	1.54	-3.81

These results are qualitatively very similar to those derived earlier. Figure

8 displays the impulse-response dynamics.

FIGURE 8
Impulse-Response Dynamics



4 Conclusions

Based on this very simple empirical investigation, I think that one could safely conclude that most, if not all, the assertions made in the opening quote are rather tenuous. But perhaps the results I derive here are not robust to more sophisticated empirical investigation. For those who are interested in pursuing this question, take a look at some recent work by Jonas Fisher.⁴

⁴<http://www.chicagofed.org/economists/JonasFisher.cfm>