# The Military Multiplier*

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**Abstract**

What determines the effectiveness of military buildups? We introduce the concept of the military multiplier: the percentage increase in military equipment an additional unit of output buys. It varies with the costs of allocating resources to military production, depending, among other things, on the industrial structure and capital reallocation frictions. We show that the response of military-goods prices to military buildups is a sufficient statistic for the military multiplier and that it has declined over time in the U.S. Using a calibrated multi-sector business cycle model, we show this decline stems from the economy's structural shift toward the service sector.

*Keywords:* Military buildup, Government spending, Effectiveness, Sectors, reallocation

*JEL-Codes:* H56, E62

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# 1 Introduction

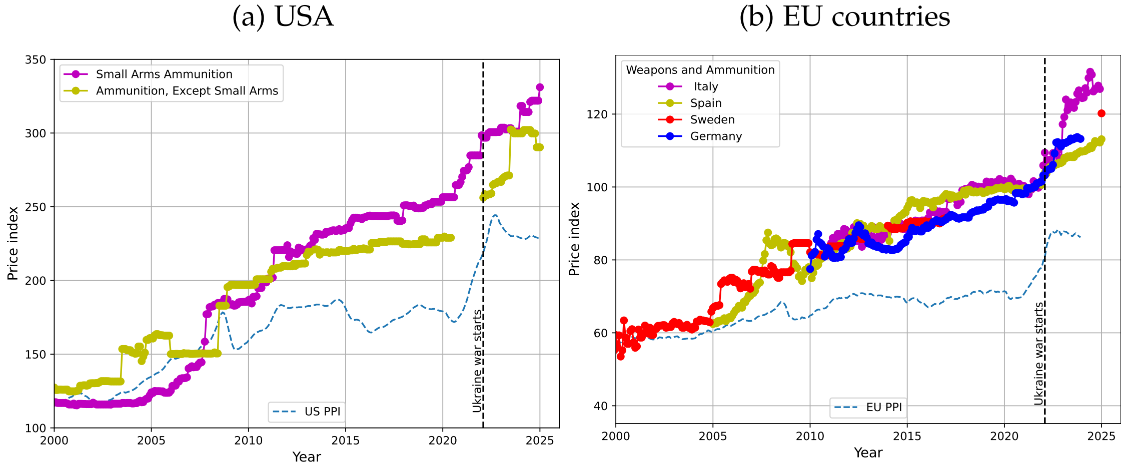
What determines the effectiveness of military buildups? Government spending—particularly military spending—is biased toward specific sectors of the economy (Cox et al., 2024). A large military buildup requires these sectors to expand quickly, potentially requiring the reallocation of resources between sectors—a process that is both costly and time consuming (Ramey and Shapiro, 1998). Depending on these costs and the time horizon under consideration, the amount of military equipment that an additional dollar of government spending can procure will generally vary. Against this background, we define the *military multiplier* as the percentage increase in military equipment that an additional unit of output can buy. The military multiplier is smaller than 1 to the extent that the relative price of military equipment increases in the short run. It also provides a measure for the effectiveness of military buildups.

First, we show that the response of the relative prices of military equipments to military buildups is a sufficient statistic to compute the military multiplier. This follows from our definition of the multiplier, once we contrast it to the conventional fiscal multiplier that is used to compute the percentage change in output due to an increase of government spending by one unit of output.

Next, we document that shocks to U.S. military spending do indeed induce a significant change in relative prices: the price of manufactured goods, which account for the lion's share of defense spending, increases significantly in response to the military spending news compiled by Ramey (2011). Moreover, a sample split shows that prices increase less in the Cold War period than in the post-Cold War period, consistent with the notion that the military multiplier has declined as the economy has become more service-oriented. The price response estimates imply a cumulative military multiplier of 1.05 and 0.8, respectively. The multipliers rise over time, but only above one in the Cold War period, consistent with the notion that military buildups can lead to productivity gains, as recently documented by Antolin-Diaz and Surico (2022) and Ilzetzki (2024).

Finally, we offer a structural perspective on what drives the response of relative prices based on a multi-sector business cycle model, which we calibrate to capture key features of the U.S. economy—distinguishing between the Cold War and post-Cold War periods. The key difference is that the industrial and military sectors are much smaller in the latter period. Under these assumptions, the model's predictions for the size of the military multiplier align with the evidence from both periods.

Figure 1: Weapon and ammunition prices in US and EU over time




*Notes:* Sources: USA - BLS PPI data, EU - Eurostat PPI data.

In the model production capacity in each sector is constrained by a limited amount of sector-specific inputs: labor and capital. It takes time to build up new capital and it is costly to reallocate capital across sectors. The baseline version of the model features three sectors: services, industry, and military goods. For each sector, we pin down capital reallocation costs by targeting the response of relative prices to military news shocks. In the calibrated model, the military multiplier differs strongly across periods. This illustrates that while the size of the economy or economic resources are important determinant of military might, as shown by Federle et al. (2025), they are not a comprehensive measure on its own. Economies may be large, but may still lack the ability to produce military equipment as needed.

In the face of the Russian invasion of Ukraine and rising geopolitical tensions, many observers point to the economic strength of the European Union—its economy is about ten times larger than that of Russia—to argue that an expansion of its defense capabilities, as well as sufficient support for Ukraine, can be fairly easily achieved (for instance, Jensen et al., 2025). However, this argument overlooks the mechanics underlying the military multiplier. In Figure 1 we see that with the start of the Ukraine war in 2022, arms price growth accelerated significantly in both Europe and the US. And indeed, there is suggestive evidence that the recent increase in military spending has, to a not inconsiderable extent, been absorbed by rising prices (see, for example, Reuters, 2023).

We introduce the notion of the military multiplier against the background of a large literature on the fiscal multiplier, which dates back to Keynes (1936), with modern treatments by Woodford (2011), Auclert et al. (2024), and *many* others. The fiscal multiplier measures the percentage increase in output in response to an additional unit of government spending. The fundamental concern of this literature is how private expenditure (consumption, investment, and, in an open economy, net exports) responds to an increase in government spending, as this determines its effectiveness in stabilizing the economy—particularly when monetary policy is constrained by the zero lower bound (Christiano et al., 2011). If private expenditure rises in response to additional government spending (is "crowded in"), the fiscal multiplier is greater than one; if it is crowded out, the fiscal multiplier is less than one.

In contrast, as we show formally below, the response of private expenditure is *irrelevant* for the military multiplier. It is fully determined by the response of prices for military equipment, which, in turn, reflects adjustment costs within the sector that produces military equipment. To see this, consider the limiting case of perfectly elastic supply—as, for instance, in times of economic slack—such that any increase in demand for military equipment is met without a change in relative prices. In this case, the military multiplier is simply unity. However, in the case of large military buildups, the sector which produces military equipment will sooner or later encounter capacity constraints. As a result, prices will rise, pushing down the military multiplier. Our analysis sheds light on this mechanism within a fully specified multi-sector model that we calibrate to the U.S. economy. At the same time, we show that the response of relative prices to military spending shocks provides a sufficient statistic for computing the military multiplier and may be easily applied for cross-country comparisons, provided there is data on the price response of military buildups.

As caveats, we note first that our analysis is fairly stylized and that some key military goods are produced in highly specialized industries. By the same token, as the nature of warfare changes over time—say, as drones replace fighter jets—so do to some extent the sectors which are producing military equipment. Second, we consider a closed-economy framework and abstract from the fact that military goods are sometimes imported, as emphasized by Ilzetzki (2025). In the limit, if the domestic economy is small in world markets, the procurement of military goods should not affect prices. However, depending on foreign imports for military goods comes with its own risks. Hence, policy implications which follow from our analysis stands also in the face of these caveats: economic strength is not a comprehensive measure for how easily military capabilities may expand; the industry structure is of first-order importance, too. This, in turn, provides a rationale for well-targeted industrial policies, as we discuss in our conclusion.

The paper is structured as follows. In the remainder of the introduction, we place the paper in the context of the literature. In the next section, we formalize the notion of the military multiplier and derive a simple sufficient statistic. In Section 3 we estimate the impulse response of relative prices for manufacturing to military buildups. Section 4 presents the model. In Section 5 we consider a three-sector version of the model to illustrate our main point.

**Related literature.** This paper relates to the literature on the macroeconomic effects of military spending with costly factor mobility (Ramey and Shapiro, 1998), and more generally fiscal multipliers, as discussed above.[1] This literature is generally not concerned with the amounts of military goods that result from increased government spending; see, for instance, the recent survey by Ilzetzki (2025); he notes, however, that defense procurement should target quantities rather than nominal spending shares. Against this background, we introduce the military multiplier, which captures the effectiveness of military spending more than its impact on the aggregate economy.

Second, we relate to the literature on sectoral shock propagation in multi-sectoral real business cycle economies (Horvath, 2000; Foerster et al., 2011; Atalay, 2017), as well as economies focusing on input-output links in production (Long Jr and Plosser, 1983; Acemoglu et al., 2012; Baqaee and Farhi, 2019) and investment (Vom Lehn and Winberry, 2022). We contribute to this literature by introducing the network of costly reallocation of existing capital and showing that it plays a crucial role in the effectiveness of sectoral government spending.

Finally, we relate to the literature on the costly reallocation of the existing stock of capital (Eisfeldt and Rampini, 2006, 2007; Rampini, 2019; Lanteri and Rampini, 2023). We contribute by showing that capital reallocation is an important mechanism behind effective military buildup.

[1] Ramey and Shapiro (1998), in particular, show the importance of costly factor reallocation for military buildup dynamics in a two-sector RBC model. We expand on their work by introducing costly capital reallocation into the state-of-the-art multisectoral RBC model. Going beyond two sectors allows us to distinguish between the Military sector itself, and two broad non-military groups of sectors: those from which it is easy to reallocate capital to the military, and those from which it isn't. This in turn allows us to study the importance of the sectoral composition of the economy for the effectiveness of the military buildup.

## 2 The military multiplier: a sufficient statistic

The ultimate goal of military spending is to have a certain amount of military equipment produced at a certain date. Hence, we introduce a concept of *military multiplier* aiming to capture the ease with which the economy can convert the resources spent into the military equipment produced.

To fix ideas, we consider an economy where the government only purchases military goods from a specific sector while consumption and investment have the same composition as GDP such that $P_t^{PPI} Y_t = P_t^G G_t + P_t^{PPI} C_t + P_t^{PPI} I_t$. We deflate with $P_t^{PPI}$ and define $P_t$ is the relative price of government spending (in units of when output is the numeraire). Using hats to express the change of variables in terms of steady state output, e.g, $\hat{g}_t = \frac{G_t - G}{Y}$; we write the percentage change of output as follows:

$$\hat{y}_t = \underbrace{\hat{p}_t + \hat{g}_t}_{\equiv \hat{x}_t} + \hat{c}_t + \hat{i}_t. \tag{1}$$

where $\hat{x}_t$ is the percentage change in military spending measured in units of output and $\hat{p}_t \equiv \frac{G}{Y} p_t$ (assuming that $p = 1$ in steady state), where letters without hats measure the percentage deviation of a variable from its steady state value. Given this, we define two different multipliers.

- The **fiscal multiplier** as the percentage change of real output per percentage increase in real government spending:

$$M \equiv \frac{\hat{y}_t}{\hat{x}_t} = \frac{\hat{x}_t + \hat{c}_t + \hat{i}_t}{\hat{x}_t}.$$

- The **military multiplier** as the percentage change of real military spending per percentage increase in real government spending:

$$MM \equiv \frac{\hat{g}_t}{\hat{x}_t} = \frac{\hat{x}_t - \hat{p}_t}{\hat{x}_t} = 1 - \frac{\hat{p}_t}{\hat{x}_t} = \frac{\hat{g}_t}{\hat{g}_t + \hat{p}_t} = \frac{g_t}{g_t + p_t}. \tag{2}$$

Two remarks are in order. First, as we compute the military multiplier, we can disregard the response of the private sector, which is key for understanding the output multiplier. Second, the military multiplier will differ from unity only as long as $\hat{p}_t \neq 0$. Also, in one-sector models $\hat{p}_t = 0$ such that $M$ simplifies to $\frac{\hat{g}_t+\hat{c}_t+\hat{i}_t}{\hat{g}_t}$.

## 2.1 Cumulative mulitpliers.

Here we use the definition of Mountford and Uhlig (2009), because as Ramey (2019)notes, they "moved the literature forward by introducing the policy-relevant multipliers, calculated as the present discounted value of the output response over time divided by the present discounted value of the government spending response over time to the shock. In most applications, different interest rates used for this present discounted value—including the use of a zero discount rate—give nearly identical multipliers because the timing of the government spending and output responses is very similar. These multipliers are often known as present value or cumulative multipliers." Formally, applying this definition to the MM gives:

$$\text{Present value multiplier at lag k} = \frac{\sum_{j=0}^{k}(1+i)^{-j}\hat{g}_j}{\sum_{j=0}^{k}(1+i)^{-j}(\hat{g}_j+\hat{p}_j)} \tag{3}$$

# 3 Empirical evidence

As discussed above, the effectiveness of the military multiplier inversely depends on the movement of the relative prices of military-related goods: the more the relative prices go up, the lower the multiplier. Given this, we proceed by looking into the response of relative manufacturing prices to military buildup shock in the US in the Cold War and post-Cold War periods.

Following the local projections approach of Jordà (2005), we estimate the dynamic effects of military buildups using quarterly U.S. data from *1947* to *2018*. Specifically, very much in the spirit of Ramey and Shapiro (1998), we run for each horizon $h$, a regression of the form:

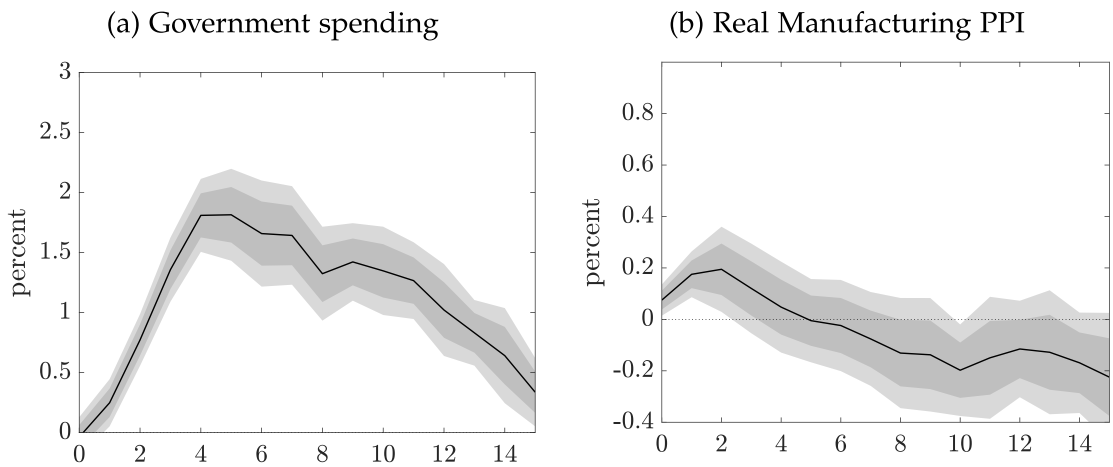
$$y_{t+h} = \alpha_0 + \alpha_1 t + \sum_{i=1}^{8} b_i y_{t-i} + \sum_{i=0}^{8} c_i D_{t-i} + \varepsilon_t, \tag{4}$$

where $y_{t+h}$ denotes the outcome of interest $h$ periods ahead, and $D_{t-i}$ is the military spending shock from Ramey (2011). By estimating a distinct regression for each horizon, this local projections method allows us to trace out the impulse response without relying on a fully specified dynamic model.

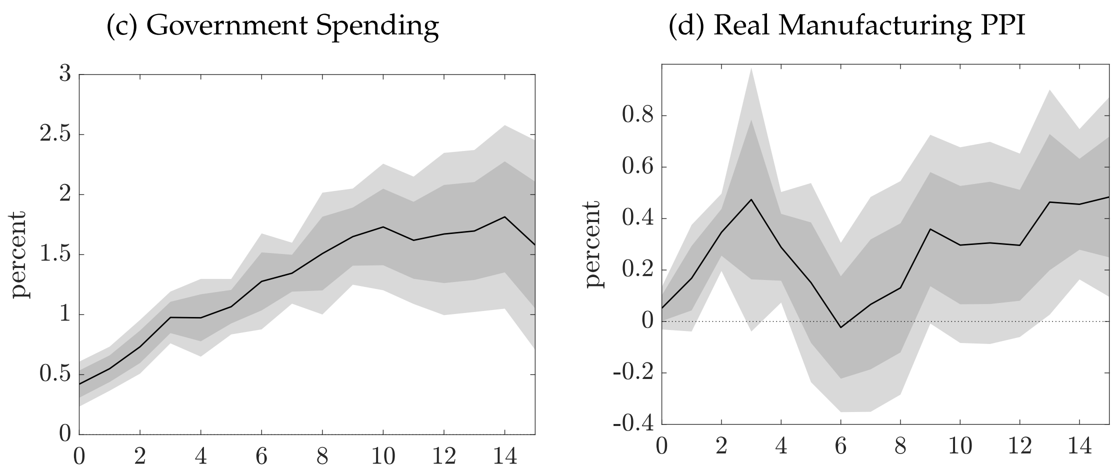
We then split the sample into the Cold War period (1947–1990) and the post–Cold War period (1991–2018). Figure 2b displays the response of real manufacturing prices during the Cold War. The real price of manufacturing goods increases for about four quarters, peaking at approximately 0.2%, before reverting quickly. This result is consistent with Ramey and Shapiro (1998), who use

Figure 2: Relative manufacturing price response during different periods

*Panel A: Cold War Period (1947–1990)*



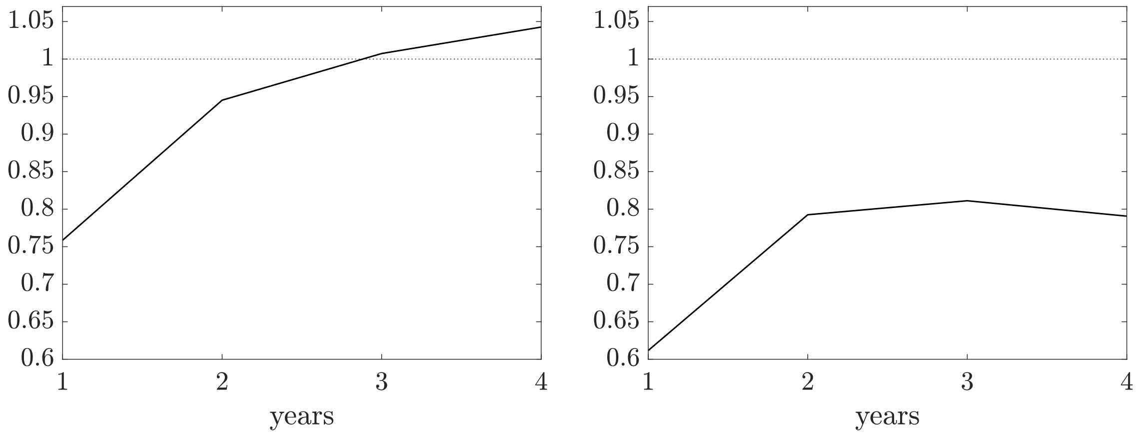

*Panel B: Post-Cold War Period (1991–2018)*




*Notes:* Quarterly response of real manufacturing prices (FRED: WPUDUR0211 divided by GDPDEF) to military spending news from Ramey (2011) during the Cold War (1947–1990) and Post-Cold War (1991–2018) periods. We normalize the peak response of government spending to be the same size across samples.

Figure 3: Cumulative military multiplier

(a) Cold War (b) Post Cold War




*Notes:* Cumulative military multiplier computed based on the response of relative price in manufacturing to military spending shocks, shown in Figure 2b and 2d above.

data through 1996. Figure 2d illustrates that this relationship changes dramatically in the post–Cold War data: the real price of manufacturing goods increases permanently by about 0.4%.

Using our sufficient statistic from the previous section, we can directly compute the U.S. military multiplier and assess how it has changed over time. Specifically, for both sample periods we compute $\hat{p}_t$ as the average response of the real price of manufactured goods over the first four quarters after the military spending shock, as shown in to military spending shocks, shown in Figure 2b and 2d above. The military multiplier on impact, that is, during the first year is then given by $MM_{ColdWar} = 1 - \hat{p}_t = 1 - 0.24\% = 0.76$ and $MM_{PostColdWar} = 1 - 0.31\% = 0.61$. By cumulating the price response, we can also directly compute the cumulative (or present value) military multiplier for various horizons as the discounted value of the response of military equipment over time divided by the present discounted value of the additional spending. Formally, following Uhlig (2010), we compute $MM_k = \frac{\sum_i^k R^{-i}\hat{g}_{t+i}}{\sum_i^k R^{-i}\hat{x}_{t+i}}$ and show results for both samples in Figure 3a and Figure 3b, respectively. Note that the cumulative multiplier increases over time and actually turns positive in the cold-war sample in year three, suggesting that there have been productivity gains in producing military equipment.

## 4 A multi-sector economy

Our model builds upon the multi-sectoral real business cycle model featuring input-output and investment networks by Vom Lehn and Winberry (2022). To study the effect of military buildups, we extend their framework in two dimensions. First, we allow costly capital reallocation across sectors. Second, we introduce sectoral government spending following Cox et al. (2024).

### 4.1 Households

A representative household maximizes its expected lifetime utility:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[ \log(C_t) - \frac{L_t^{1+\gamma}}{1+\gamma} \right]$$

subject to the budget constraint $C_t + Q_{t,t+1}B_{t+1} = B_t + W_tL_t + T_t$. Here $C_t$ is consumption, $L_t$ is hours worked, $B_t$ is bond holdings, $Q_{t,t+1}$ is the bond price, $W_t$ is the wage rate, $T_t$ are transfers of profits form owning all firms in the economy and government taxes/transfers. Note that consumption price is normalized to one; all other prices (and wages) are expressed in relative terms. The first-order conditions are:

$$Q_{t,t+1} = \beta \cdot E_t \frac{C_t}{C_{t+1}} \qquad \text{(Euler equation)} \tag{5}$$

$$L_t^{\gamma} = \frac{W_t}{C_t} \qquad \text{(Labor supply)} \tag{6}$$

**Sectoral consumption demand.** Consumption index $C_t$ consists of a bundle of $N$ sector-specific consumption goods: $C_t = \bar{b} \prod_{i=1}^{N} C_{t,i}^{b_i}$ where $C_{t,i}$ is consumption of sector $i$ good, $\sum_{i=1}^{N} b_i = 1$, and $\bar{b} = [\prod_{i=1}^{N} b_i^{b_i}]^{-1}$ is a normalizing constant. Let $P_{t,i}$ be a price of sector $i$ good. Then, the sector-specific consumption demand and consumer price index are:

$$P_{t,i}C_{t,i} = b_i \cdot C_t \qquad \text{(Sector } i \text{ consumption demand)} \tag{7}$$

$$\prod_{i=1}^{N} P_{t,i}^{b_i} = 1 \qquad \text{(Consumer price index)} \tag{8}$$

**Sectoral labor supply.** Total hours worked consists of labor supplied to each of $N$ sectors, that is

$$L_t = \sum_{i=1}^{N} L_{t,i} \quad \text{(Labor aggregation)} \tag{9}$$

where $L_{t,i}$ labor supplied to sector $i$.

## 4.2 Sectoral output production

There are $N$ sectors in the economy. Sector $i$ produces output $Y_{t,i}$ according to sector-specific CRS production technology

$$Y_{t,i} = \bar{\omega} A_{t,i} \cdot \left( \hat{K}_{t,i}^{\alpha_i} L_{t,i}^{1-\alpha_i} \right)^{\theta_i} \cdot \left( \prod_{i=j}^{N} X_{t,ij}^{\omega_{ij}} \right)^{1-\theta_i}$$

where $\hat{K}_{t,i}$ is capital input, $L_{t,i}$ - labor input, $X_{t,ij}$ - sector $j$ output used as intermediate input in sector $i$, $A_{t,i}$ - sector-specific productivity, and $\bar{\omega}$ is a normalizing constant. Let sector-specific capital cost be $r_{t,i}$. Firms choose inputs to maximize profits, which yields the following first order conditions:

$$r_{t,i} \hat{K}_{t,i} = \alpha_i \theta_i \cdot P_{t,i} Y_{t,i} \qquad \text{(Sector } i \text{ capital demand)} \qquad (10)$$

$$W_{t,i} L_{t,i} = (1-\alpha_i)\theta_i \cdot P_{t,i} Y_{t,i} \qquad \text{(Sector } i \text{ labor demand)} \qquad (11)$$

$$P_{t,j} X_{t,ij} = (1-\theta_i)\omega_{ij} \cdot P_{t,i} Y_{t,i} \qquad \text{(Sector } i \text{ intermediate input demand)} \qquad (12)$$

The sector-specific price (marginal cost) is given by

$$P_{t,i} = \frac{1}{A_{t,i}} \cdot \left( r_{t,i}^{\alpha_i} W_t^{1-\alpha_i} \right)^{\theta_i} \cdot \left( \prod_{j=1}^{N} P_{t,j}^{\omega_{ij}} \right)^{1-\theta_i} \qquad \text{(Sector } i \text{ marginal cost)} \qquad (13)$$

## 4.3 Sectoral investment production

Investment in each sector is produces according to sector-specific CRS technology, which combines sector-specific goods. Investment in sector $i$ is given by

$$I_{t,i} = \bar{\lambda} \prod_{j=1}^{N} I_{t,ij}^{\lambda_{ij}}$$

where $I_{t,ij}$ is sector $j$ output used to produce investment in sector $i$, $\bar{\lambda}$ is a normalizing constant. Let the sector-specific investment price be $P_{t,i}^{I}$. Investment producer chooses inputs to maximize profits, yielding the following sector-specific investment demand:

$$P_{t,j} I_{t,ij} = \lambda_{ij} P_{t,i}^{I} I_{t,i} \quad \text{(Sector } i \text{ investment inputs demand)} \qquad (14)$$

Then the price of sector $i$ investment good is

$$P_{t,i}^{I} = \prod_{j=1}^{N} P_{t,j}^{\lambda_{ij}} \quad \text{(Sector } i \text{ investment good price)} \qquad (15)$$

## 4.4 Sectoral capital accumulation and reallocation

Sector-specific capital in each sector $i$ is accumulated by corresponding firms, who rent out available capital to output produces in sector $i$, buy/sell capital from other sectors, and make new capital investment by buying sector $i$ investment good. These firms maximize the expected stream of profits:

$$E_0 \sum_{t=0}^{\infty} Q_{0,t} \left[ r_{t,i}\hat{K}_{t,i} - P^I_{t,i} I_{t,i} - \sum_{j=1}^{N} P^o_{t,ij} R_{t,ij} \right]$$

where $R_{t,ij}$ capital reallocated from sector $j$ to sector $i$ and $P^o_{t,ij}$ price of this reallocated capital; $Q_{0,t}$ is a $t$-period stochastic discount factor.

While the new investment becomes available with a lag, the reallocated capital becomes available immediately. Let $K_{t-1,i}$ be sector $i$ capital at the beginning of the period $t$ and let the total capital reallocated towards sector $i$ is $R_{t,i} = \sum_{j=1}^{N} R_{t,ij}$. Then, the capital available for production at time $t$ is

$$\hat{K}_{t,i} = K_{t-1,i} + R_{t,i} - \underbrace{\frac{1}{2}\sum_{j=1}^{N} \phi_{ij} R^2_{t,ij}}_{\text{realloc. cost}} \quad \text{(Sector } i \text{ available capital)} \tag{16}$$

where the third term on the RHS captures the reallocation costs paid by sector $i$ firms for reallocating capital from each sector. Capital accumulation is given by

$$K_{t,i} = (1-\delta)\hat{K}_{t,i} + I_{t,i} \quad \text{(Sector } i \text{ capital accumulation)} \tag{17}$$

First order conditions of the firms' optimization problem yield

$$P^I_{t,i} = E_t Q_{t,t+1} \left[ r_{t+1,i} + (1-\delta) P^I_{t+1,i} \right] \qquad \text{(Investment price dyn.)} \tag{18}$$

$$P^o_{t,ij} = \left[ r_{t,i} + (1-\delta) P^I_{t,i} \right] \cdot (1 - \phi_{ij} R_{ij}) \qquad \text{(Reallocation price)} \tag{19}$$

Reallocation between each pair of sectors implies the following reallocation constraints

$$R_{t,ij} = -R_{t,ji} \qquad \text{(Reallocation quantity symmetry)} \tag{20}$$

$$P^o_{t,ij} = P^o_{t,ji} \qquad \text{(Reallocation price symmetry)} \tag{21}$$

**Reallocation demand.** Let us define the sector-specific price of old capital in sector $i$ as

$$P^o_{t,i} = r_{t,i} + (1-\delta) P^I_{t,i} \quad \text{(Sector } i \text{ old capital price)} \tag{22}$$

Then the equation 19 becomes $P^o_{t,ij} = P^o_{t,i}(1 - \phi_{ij} R_{ij})$. Then, using the reallocation constraints 20 and 21, we get the sector-pair specific reallocation as

$$R_{t,ij} = \frac{P^o_{t,i} - P^o_{t,j}}{\phi_{ij} P^o_{t,i} + \phi_{ji} P^o_{t,j}} \tag{23}$$

That is, capital is reallocated from $j$ to $i$ as long as $P^o_{t,i} > P^o_{t,j}$ and the reallocation amount is decreasing in reallocation cost parameters $\phi_{ij}$ and $\phi_{ji}$. Then, the total capital reallocated towards sector $i$ is

$$R_{t,i} = \sum_{j=1}^{N} R_{t,ij} = \sum_{j=1}^{N} \frac{P^o_{t,i} - P^o_{t,j}}{\phi_{ij} P^o_{t,i} + \phi_{ji} P^o_{t,j}} \quad \text{(Capital reallocation)} \tag{24}$$

### 4.5 Goverment policy and resource constraint

There is an exogenous stream of government purchases each sector $i$, denoted by $G_{t,i}$. The resource constraint on output in sector $i$ implies that

$$Y_{t,i} = C_{t,i} + \sum_{j=1}^{N} X_{t,ji} + \sum_{j=1}^{N} I_{t,ji} + G_{t,i} \quad \text{(Sector } i \text{ resource constraint)} \tag{25}$$

That is, sector $i$ output is either consumed by household, used as intermediate input in production of output and investment goods, or consumed by the government.

The model is log-linearized around the zero-reallocation steady state, and solved using a standard Blanchard-Khan solution method.

## 5 Quantification: 3-sector model

Now, we illustrate how the ease of reallocating existing capital toward the military sector—linked to the size of the existing industrial complex—affects the military multiplier within the model. Our illustration is based on a three-sector model consisting of the Military, Industry, and Services sectors. We consider two versions of the model: an Industrial Economy and a Services Economy. The Industrial Economy refers to an economy with a relatively large industrial sector, while the Services Economy represents an economy with a smaller industrial base.

Table 1: Size of Industry, Services, and Military Sector in the U.S. (share of GDP)

| Period | Industry | Services | Military |
|---|---|---|---|
| **1950s** | 0.25 | 0.45 | 0.10 |
| **2020s** | 0.10 | 0.75 | 0.04 |

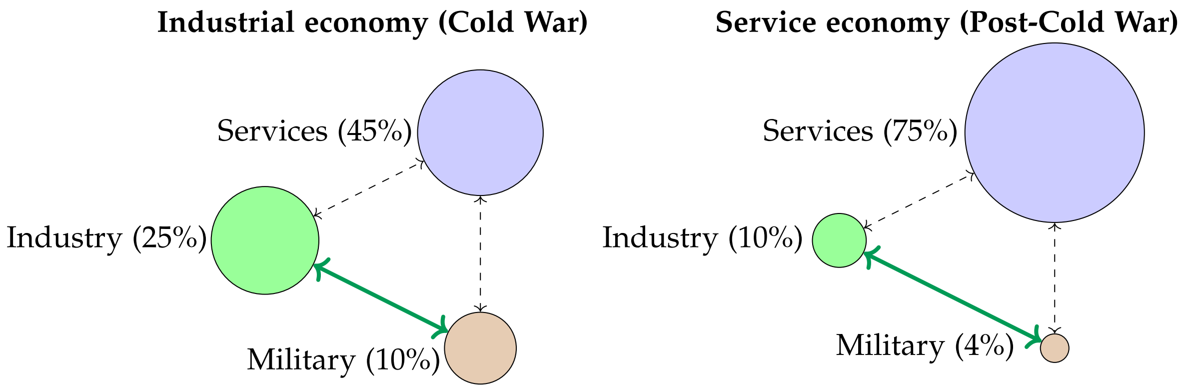
*Source:* Cold War to Post-Cold War period as a percentage of GDP. Calculations based on GDP by industry tables from the BEA.

## 5.1 The U.S. economy during and after the Cold War

The U.S. economy during the Cold War period is a good example of an industrial economy. Table 1 shows the size of each of the three sectors as a percentage of GDP at the start of the Cold War and their corresponding sizes in the 2020s. We observe that not only has the Military sector shrunk significantly since the Cold War, but the Industrial sector has also declined. This indicates that the U.S. economy was much more industrialized during the Cold War than it is today. Currently, the U.S. economy is far more service-oriented.

Figure 4 visually represents the sectoral composition of the two economies. Our analysis of military multipliers rests on the premise that capital (and potentially labor) can be reallocated more easily from the Industrial sector to the Military sector than from the Services sector. For example, a steel plant or an automobile factory in the private sector can be readily converted into a military equipment production facility in response to a military buildup, whereas using a chain of restaurants or shopping malls for military production would be far more challenging.

Figure 4: Military-industrial complex size and capital reallocation potential




Therefore, in an industrialized economy, where capital is more accessible and

Table 2: Model calibration: Empirical targets and parameter values

**Panel A: Manufacturing-to-CPI Price Ratio Response to a Military Shock**

| Period | Empirical (%) | Model (%) |
|---|---|---|
| Cold War | 0.05 | 0.05 |
| Post Cold War | 0.20 | 0.20 |

**Panel B: Capital Reallocation Cost Parameters**

| Sector Pairs | Reallocation Cost Parameter $\phi_{ij}$ |
|---|---|
| Industry to Military | 0.01 |
| Services to Military | 0.50 |

*Notes:* Panel A: Empirical price response is computed as the manufacturing-to-CPI price ratio response to a 1% GDP military spending shock; the model response is obtained from a 3-sector model with costly capital reallocation (4-year average).
Panel B: The reallocation cost parameter in the quadratic cost function reflects the relative increase in cost with each additional unit of reallocated capital.

adaptable for military purposes, military spending should be more effective. Expanding military production in such an economy requires less additional investment in military sector capacities, as existing industrial resources can be more easily repurposed. This suggests that the military multiplier was likely higher in the Cold War economy, where a larger Industrial sector facilitated the conversion of production capacities to support military needs.

## 5.2 Calibration

Since the impact of military spending heavily depends on how easily capital can be reallocated across sectors, we calibrate the reallocation cost parameters by matching the response of relative prices observed in the data with those generated by the model. Specifically, we target two key metrics: the average response of relative manufacturing prices during and after the Cold War over the four-year period estimated earlier. We then adjust the reallocation cost parameters so that the model's relative price responses align with these targets.

Table 2 Panel A presents the empirical targets alongside the corresponding model-based relative price increases. In the post-Cold War economy, the relative price increase is significantly larger, possibly reflecting the greater scarcity of industrial capital. Table 2 Panel B reports the calibrated capital reallocation cost

Table 3: Model parameters

| Parameter Description | Symbol | Value |
|---|---|---|
| Depreciation rate | $\delta$ | 10% |
| Discount rate | $\beta$ | 0.96 |
| Frisch labor supply elasticity | $\gamma$ | 1 |
| Share of primary factors in production | $\theta_i$ | 1 |
| Capital share in primary factors | $\alpha_i$ | 0.3 |
| Persistence of military spending, AR(2) | $\rho_g^1$, $\rho_g^2$ | 1.4, -0.6 |

parameters. While reallocating capital from the Industrial sector to the Military sector incurs relatively low costs, shifting capital from the Services sector results in substantial capital losses.

The steady-state sizes of Services and Industry sectors in the private consumption, as well as the Military government spending-to-GDP ratios are calibrated in line with Table 1. The Industry economy is calibrated to the Cold-war shares, and the Services economy - to the post-Cold War shares. Calibration of the remaining model parameters is in Table 3. Note that the baseline version of the model abstracts from IO links in production (output is produced using primary factors only). We calibrate investment network such that the Industry and Services sectors use exclusively their own output to produce sector-specific investment good, (see Vom Lehn and Winberry (2022) for evidence that the U.S. investment network is concentrated in ). The military sector uses output from the Industry sector to produce its investment good. [2] In the analysis below we highlight the elements of the model economy structure, which crucially drive our quantitative results.

## 5.3 Results

### 5.3.1 Military multiplier

We are now ready to examine the response to a military buildup shock in both economies. Specifically, we consider a 1% shock, which leads to a 1% increase in military equipment production. Figure 5 (left panel) illustrates the dynamics of the military spending, following the shock as well as the government

[2] This calibration ensures that the Military consumption goods and military investment goods are not perfectly substitutable, and an increase in Military consumption cannot be achieved by decreasing Military investment.

spending required to achieve this buildup in the Industrial and Service economy respectively. We see that in the Services economy, military spending is not fully converted into the Military equipment. Figure 5 (right panel) shows that an increase in relative Military prices is much stronger in Services economy - hence a larger part of the increase in government spending is absorbed by an increase in price, rather than quantity of Military equipment produced.

The different Military good price response in Services and Industry economies indicates the different degree of effectiveness of Military spending. Figure 6 illustrates the cumulative military multiplier, capturing this differential effectiveness of military spending. In an industrial economy, the impact multiplier is 0.94, meaning that a 1% increase in government spending results in a 0.94% increase in military equipment production. In contrast, in a services-based economy, where the industrial sector is smaller, the military multiplier is lower—0.76. This suggests that military spending is less effective in generating the desired increase in military equipment, as part of the spending is absorbed by rising prices of military products.

Even over time, the military multipliers in both economies do not fully converge. As the services economy continues to respond to the military buildup shock, it makes the necessary investments in new military capital, eventually narrowing the gap between the two economies.

Figure 5: Military spending and Relative prices

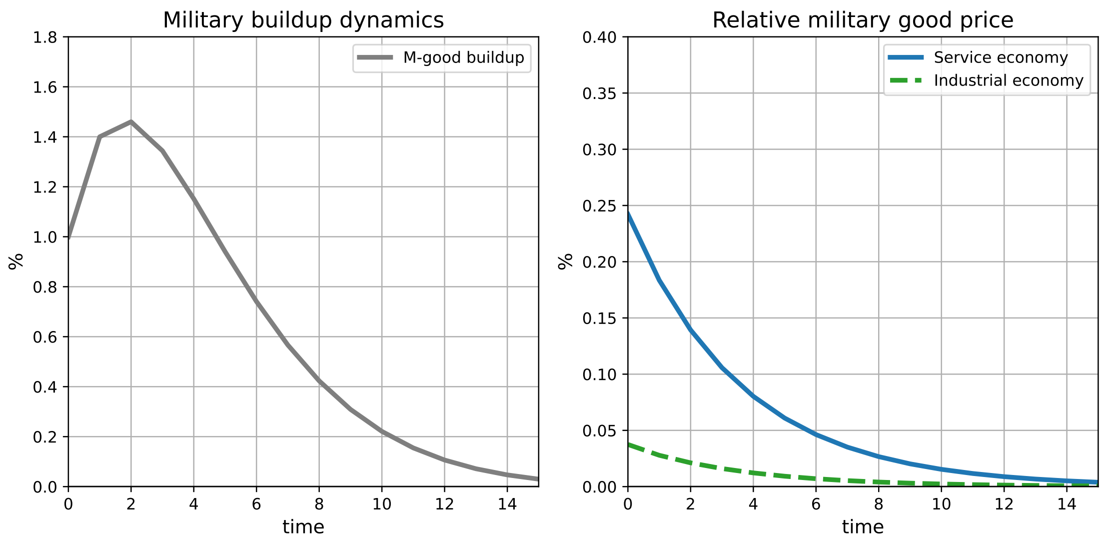
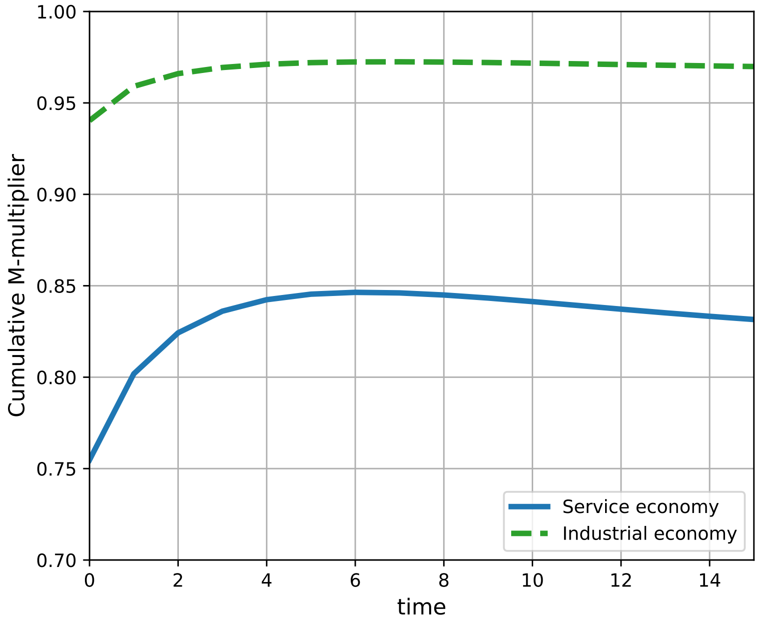


Figure 6: Military multiplier (cumulative)



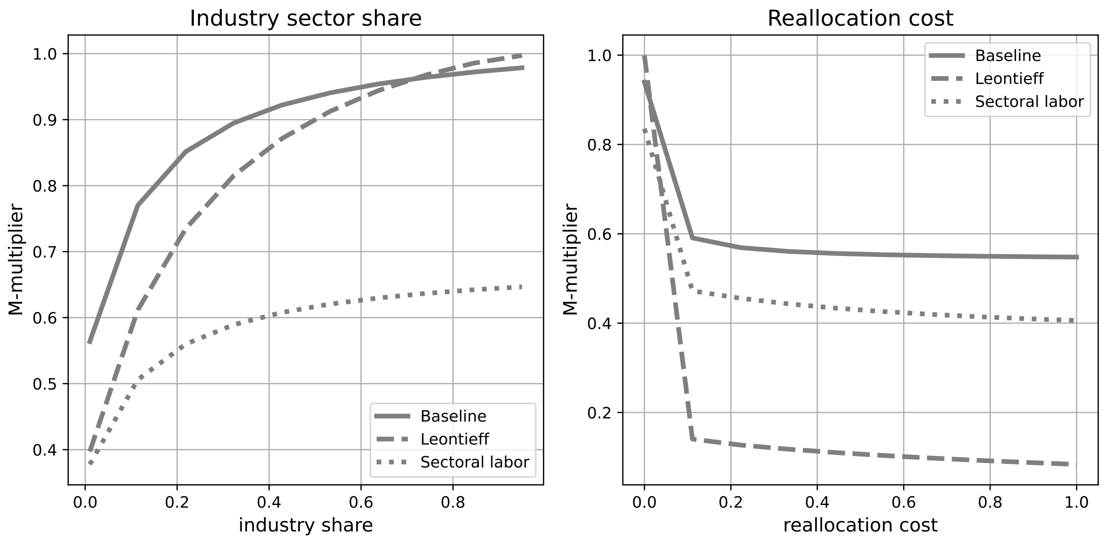

### 5.3.2 What drives the M-multiplier?

Next, we examine how the on-impact military multiplier generally depends on the size of the industrial base and on the reallocation cost. Figure 7 (left panel) shows that for a given distribution of reallocation cost across sectors, the M-multiplier increases with the relative size of industry sector. The reason is that capital reallocation from Industry to Military is lower than from Services. Hence, when the Industrial base is large, there is more suitable capital that can be relatively easily repurposed for military, which increases the effectiveness of military spending. We also consider alternative specifications of the model - the one with Leontieff production function, and the one with sector-specific labor. Under Leontieff technology factors cannot be substituted one for another. And sector-specific labor excludes labor mobility across sectors. We see that the size of the multiplier if affected by assumptions regarding the subsitutability and mobility of labor.

Figure 7 (right panel) plots the dependence of the multiplier on the capital reallocation cost between Military and Industry sectors (while keeping the relative cost across sector pairs). The larger the reallocation costs are (the less mobile capital is) the smaller the multiplier. Note that in the baseline version of the model (Services economy) there is a lower bound on the multiplier in the area of 0.55. The reason is that even if capital is fully immobile (very high reallocation cost), labor is still mobile, and capital and labor are somewhat substitutable under Cobb-Douglas production technology. Hence, Military output can be increased by shifting labor across sectors.

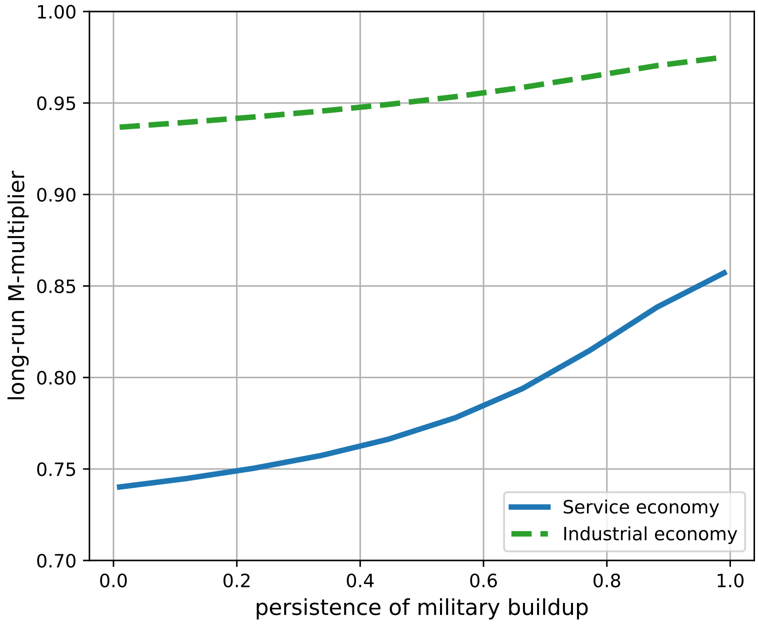
However, as we see, an alternative Leontieff production technology eliminating the substitutability of capital with the mobile factor (labor) in production yields smaller multipliers, notably for high reallocation cost.

Figure 7: M-multiplier: Role of industry share and reallocation cost




Next we look into how M-multiplier depends on the persistence of Military buildup. Figure 8 presents the cumulative M-multiplier over 12 periods as a function of the persistence of the goverment spending following the shock. We see that the effectiveness of military spending increases with the persistence of the military buildup in both Industrial and Services economies.

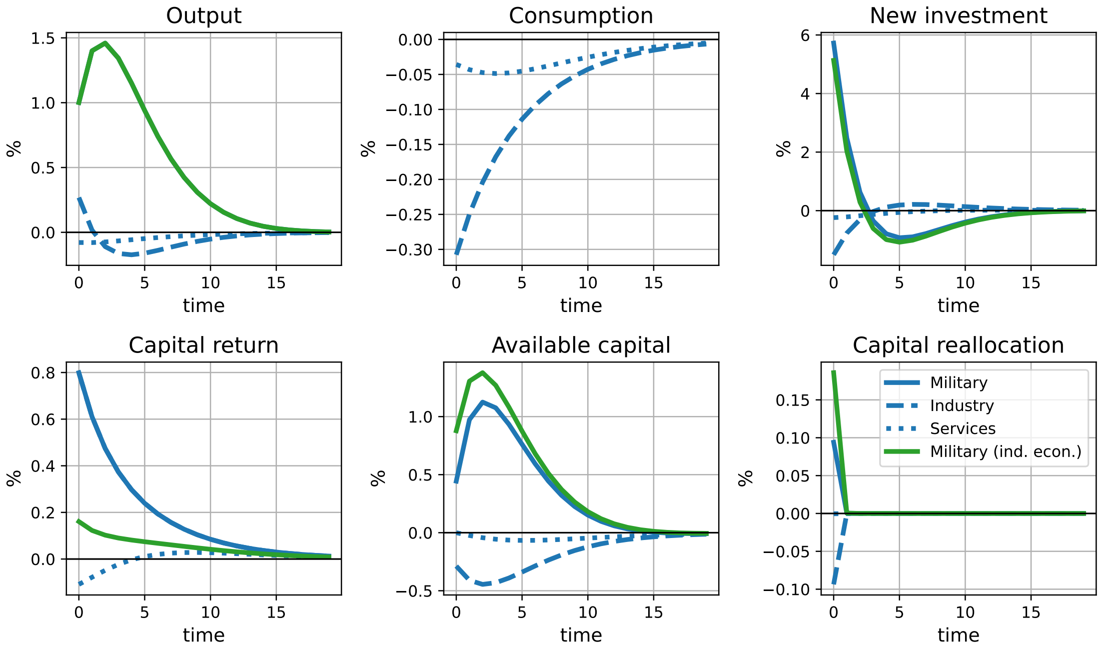
Figure 8: Cumulative M-multiplier after 12 quarters and Buildup persistence




#### 5.3.3 Sectoral adjustment

Now we examine the sectoral adjustments in response to military spending shock in our baseline economy. Figure 9 plots the impulse responses of various variables across sectors. In response to the Military buildup, output in the military sector and Industry goe up, while it drops in Services. Investment and capital return in the military sector also go up. Note that, while the new investment becomes available only in the second period, the available capital rises on impact as a result of capital reallocation. Note also, that capital is reallocated from the Industry sector, but not from Services. This is due to different reallocation costs, making reallocation from Industry easier. The green line plots the dynamics in Military sector in the Industrial economy. We see that in this economy, Military output increases more, and more capital is reallocated, while the return on capital does not rise as much a s in the Services economy.

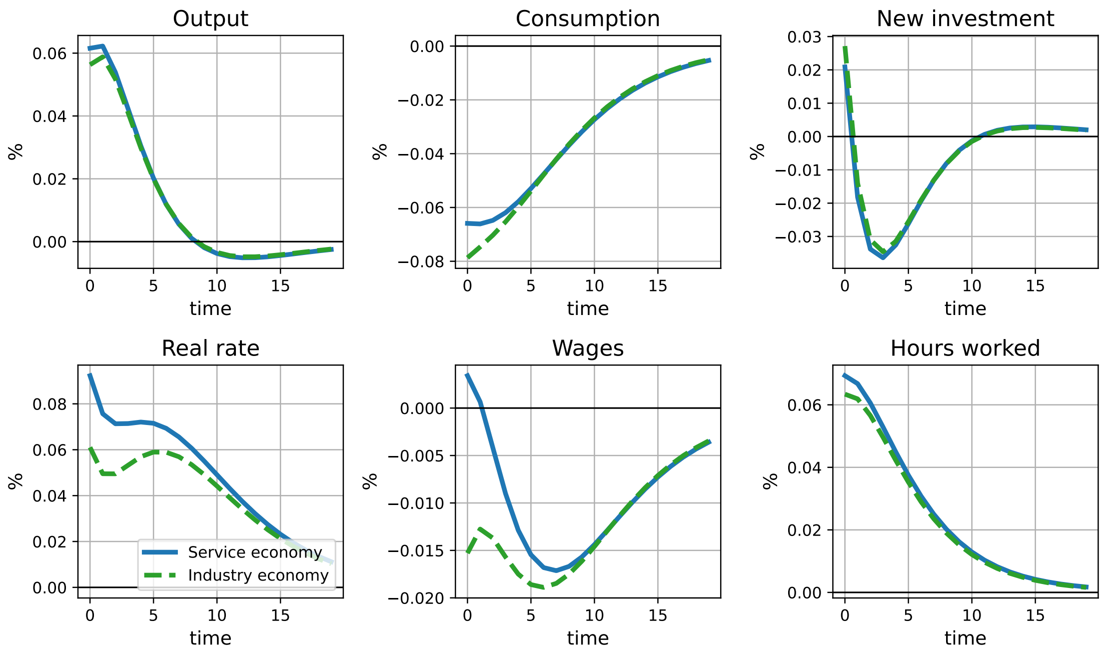
Figure 9: Military spending shock: Sectoral response




### 5.3.4 Aggregate response and fiscal multiplier

Finally, we examine the aggregate response of the economy. Figure 10 shows the response of aggregate variables in the Services and Industrial economy. We see that the response of aggregate variables does not differ too much across these two models. In response to Military spending shock, aggregate output increases, which makes the Military spending expansionary in the model. The persistent boom is driven by hours worked, while additional capital formation recedes quickly. Consumption persistently declines as the military sector expands.

Figure 10: Aggregate responses: Services v Industrial economy




# 6 Conclusion

For the longest time, macroeconomics has been concerned with the business cycle impact of government spending. Changes in military spending, in particular, have been used to study the fiscal multiplier because they arguably vary for reasons exogenous to the business cycle. Ultimately, however, military spending serves a different objective than stabilizing the business cycle. Whether these objectives—external security or geopolitical ends—can be meet, depends on economic factors, among other things, namely how quickly and efficiently economic resources can be mobilized to meet a certain level of military capacity.

In this paper, we put forward the notion of the military multiplier to account for this fact. In the short run, the multiplier can fall significantly below one because allocating resources to military production is costly. We show that these costs depend on initial conditions, such as industrial structure and capital reallocation frictions. We further document, based on military spending shocks, that the military multiplier has declined over time. Using a calibrated multi-sector business cycle model of the U.S economy, we show that this decline stems from the economy's structural shift toward the service sector.

As next steps, we will refine our analysis by quantifying reallocation costs across more disaggregated sectors, constructing a capital reallocation network to better understand sector-specific frictions in mobilizing resources for military production. This will allow us to capture the heterogeneity in adjustment costs across industries and improve estimates of military production efficiency. Additionally, we will compute the military multiplier across countries, accounting for differences in sectoral composition, to assess how national industrial structures influence the responsiveness of military capacity to additional spending. Finally, we will apply these insights to address the question of how to coordinate military procurement within the European Union, evaluating how cross-country variations in military multipliers impact collective defense strategies and the efficiency of joint procurement initiatives.

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