The China Shock and The Defense Industrial Base

Peter Devine, Zachary Saunders, Samuel Slocum *

March 26, 2026

Abstract

This paper studies the impact of declining civilian manufacturing on the U.S. defense industrial base. To do this, it uses commuting-zone level data on trade exposure and defense manufacturing procurement. It documents novel results that show the defense industrial base is actually helped in the short-term by trade shocks, but does face longer-run constraints as a result of lost manufacturing capacity. The first result finds that commuting zones in the 75th percentile of trade exposure saw defense obligations increase by 7.6%, and therefore partially "backfill" lost civilian manufacturing demand. However, areas with similar levels of exposure also became "inelastic". They were half as responsive to future defense demand shocks as commuting zones that did not experience severe trade shocks. This result highlights the fungibility of defense and civilian manufacturing and the dynamic trade offs that policymakers face when considering protectionist trade measures to protect the manufacturing base. It also contributes to the broader literature showing the impact of economic factors on national security.

1 Introduction

In this paper, we document the impact of declining civilian manufacturing on the U.S. defense industrial base (DIB). In keeping with broader evidence, we find that import competition with China from 2001-2009 lowered manufacturing employment in exposed areas. In these areas, we find that defense manufacturing procurement partially backfilled the civilian manufacturing decline. However, we also find that exposed areas responded less to future defense demand shocks, indicating a degree of impairment caused by a weakened civilian manufacturing sector.

The increase in Chinese manufacturing exports following its accession to the World Trade Organization (WTO) is commonly referred to as the "China shock". Policymakers and academic researchers have

*Peter Devine(devinpe@bc.edu) and Zachary Saunders(saundeza@bc.edu) are at Boston College Department of Economics

generally identified this expansion in Chinese manufacturing as a major factor in the hollowing of U.S. manufacturing – which fell from 17,000 workers in January 2001, to about 12,000 in January 2013. This sectoral damage precipitated profound political change in the United States [17]. It is also perceived in some policy circles as having threatened U.S. national security by increasing the reliance of the U.S. on China for certain goods, and causing damage to the U.S. ability to produce defense goods due to damage to the broader industrial base. Both of these potential channels have served as rationale for the aggressive economic interventionism seen over the past decade, including tariffs and industrial subsidies. While the reduction of civilian manufacturing output in the U.S. as a result of the China shock has been studied extensively, the defense procurement implications have not. In this paper, we examine how the loss of civilian manufacturing output in certain locations reduced their ability to supply defense goods.

We study this by observing how a pair of shift-share instruments move procurement by the Department of Defense (DoD) across commuting zones. The first is a trade shock reflecting increased exports of manufactured goods by China, which decreases civilian production of manufacturing goods in exposed areas. Our first result is a "backfill" effect. We find that unconditionally, a commuting zones that were more exposed to the trade shock saw more DoD manufacturing procurement over the same time period (a commuting zone in the top quartile of trade exposure saw 7.6% more DoD procurement). This does not hold for non-manufacturing DoD procurement. Therefore, it appears that DoD is specifically capturing slack civilian manufacturing capacity. The second result of the paper makes use of a shift-share instrument for defense demand. Intuitively, commuting zones that are more exposed to growing components of defense manufacturing demand see their defense manufacturing procurement subsequently rise. However, this effect is diminished in areas that experienced a large trade shock in the past. Namely, the counties most exposed to the China shock – in the top quartile – responded only about half as strongly to defense demand shocks as those in the bottom quartile. This "inelasticity" suggests that the loss of civilian manufacturing capacity diminished the ability of those counties to ramp defense output when it was demanded.

The "backfill" and "inelasticity" effects documented in this paper are novel. The backfill effect shows that despite the specialized nature of the defense sector, civilian factors of production can be utilized for defense production when there is slack, and the DoD responds to fill this spare capacity. However, the inelasticity effect makes clear that the loss of civilian manufacturing capacity does have costs for the ability of the defense sector to respond to future needs. This partially confirms the intuition of the damage that the China shock caused to the defense industrial base, but also underscores a dynamic dilemma: Slack in the civilian sector will benefit defense output today, but means there is less headroom for future expansion.

1.1 Related Literature

There are many papers that discuss the impact of increased import competition from China on the U.S. economy. [4] studies the consequences for local labor markets, finding that localities with competing industries had reduced wages, higher unemployment, and lower labor force participation. [1] uses industry-specific measures of import penetration to study the impact on aggregate sectoral employment. They find that import competition damaged U.S. manufacturing employment, and also overall job growth. [16] links this decline in manufacturing employment explicitly to changes in U.S. trade policy in the early 2000s. The shock had implications beyond labor markets, [12] shows that public goods provision was impaired in effected locales.

Our paper sheds light on how trade-exposed localities adjusted to the China shock – partially by substituting into defense manufacturing. Other papers study the persistence of this shock, and how the economy compensates. [5] documents significant labor adjustment costs, finding that low-wage workers in particular have trouble separating from the manufacturing sector. [8] also documents significant labor market frictions, and welfare loss for particular subsets of the U.S. workforce. Although workers struggled to adjust, evidence also suggests that technology provides an outlet for the economy to adapt. [6] found trade shocks induced technological change in effected firms, and also prompted labor market reallocation towards more advanced firms.

We also contribute to a literature studying the political and geopolitical consequences of trade. [3], [10], and [17] show how trade produced domestic political changes in the United States. Broadly, the literature finds that the trade shock had a hand in polarizing politics, shifting the country towards populism, and voters towards candidates that would restrict free trade. The emerging literature about the use of economic tools for political ends, commonly referred to as "geoeconomics" is also relevant. [11] reviews literature in this area and introduces a framework for thinking about economic power. [13] shows how import dependence leads to economic power, and how it has shaped economic interventions in recent years. Our paper shows how economic intervention is not only impactful because of its ability to constrain consumption, but also because it can have concrete defense implications through impacts on the manufacturing base.

There is a set of literature that uses U.S. government procurement data in macroeconomic analysis. For example, [14] use variation inn military procurement to estimate local fiscal multipliers. [2] does a similar exercise, and also quantifies geographical spillovers. [7] studies the local economic impacts of defense contracting. They find job growth, with much of this growth concentrated in upstream industries. [9] studies how consolidation of defense firms led to less competitive procurement – in particular, more cost-plus contracts.

Our paper uses familiar data and methods as many mentioned here. Its contribution is that it asks what the impact of trade shocks has been on the defense industrial base. This is important to know, because it helps us understand the security implications of international trade.

1.2 Outline of Paper

The rest of the paper proceeds as-follows. In Section 2, we review the procurement data from [15] as well as the Quarterly Census of Employment and Wages (QCEW) that we utilize for our analysis. In Section 3 we discuss a conceptual framework and simple model that elucidates the proposed channels of impact for trade on the defense industrial base. We also discuss how these channels can be quantified using shift-share instruments, and discuss how these instruments are constructed. Afterwards, we go through the precise regression results in Section 4. Finally, we conclude in Section 5. In this section we summarize the implications of our backfill and inelasticity results for policymakers and propose directions for future research.

2 Data

There are two main data sources for this paper. The first is U.S. procurement data, gathered in [15]. The second set of data is the Quarterly Census of Employment and Wages (QCEW). Our time-frame of interest will generally be the 2001-2021 time-period. 2001 will serve as the "base" for the Bartik instruments that we construct. This is the earliest time-period for which consistent location data is available in the Omari 2025 data. Our variables will mainly be chunked into 3-year periods, beginning with 2002-2005. Dependent variables will use the three periods 2002-2005, 2006-2009, 2010-2013. Outcomes will be measured over various horizons, and the last chunk we use is 2018-2021.

In order to provide slightly higher levels of aggregation that are consistent with the broader literature, crosswalks are required from NAICS to SIC codes, as well as from counties to commuting zones. (tell about which crosswalks were used)

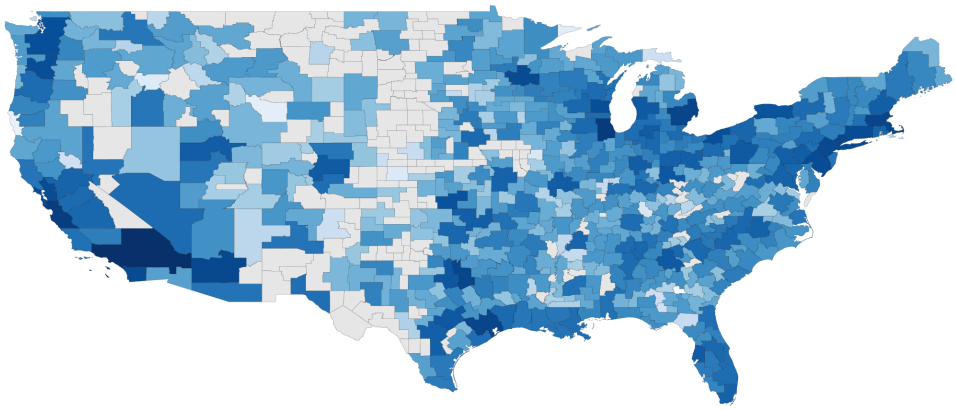
2.1 Defense Procurement Data

The data from Omari et al. is a comprehensive database of contract actions by the U.S. government. Contract actions include awards, but also other actions like modifications and terminations. Contract actions contain economically useful information. For one, contract actions have obligation amounts attached to them. This represents money to be awarded as a result of that action. Actions that confer obligations could include awards, but also modifications. Additionally, some contracts are indefinite-

delivery-vehicles (IDVs) and initial obligations are zero, but an upper-bound is specified. As deliveries are made on the vehicle, obligations appear.

Location of the vendor that the contract was awarded to is also important for our analysis. Location of vendor is distinct from place-of-performance, but for most of our sample we do not have consistent data on place-of-performance. Therefore, we rely on using the location of vendor as a proxy for place of performance. The location provided is zip-code, and we crosswalk this to the county, and then the commuting-zone level. Even at the zip-code level, when we restrict the Omari et al. data to contract actions where place of performance and vendor location data exists, we find that the two variables agree in 80.4% of cases for DoD contracts. This might seem puzzling because defense contracts are concentrated among large prime contractors. However, it is common for contracts to be awarded to subsidiaries that are registered closer to place of performance. For example, in 2011 Boeing won a bid to create a new arial-refueling tanker. Although Boeing is headquartered in Virginia, the contract was awarded to "The Boeing Company", a Seattle WA subsidiary of Boeing. The place of performance is in Tukwila WA – within the Seattle commuting zone. In spite of using vendor location as a proxy for place-of-performance, we find that the coverage and distribution of U.S. geographies is strong. This distribution is mapped in Figure 1.

Figure 1: The Location of DoD Manufacturing Activity Within The United States

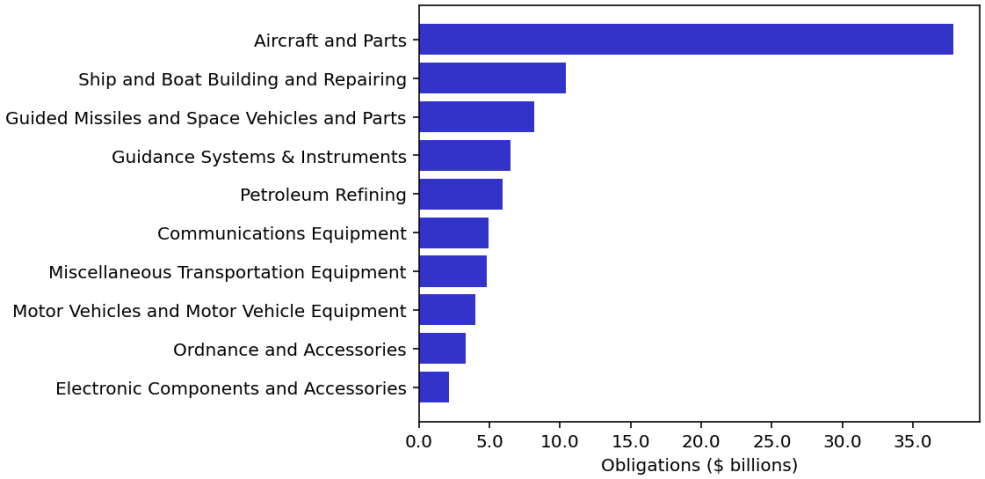


Note: Country is segmented by commuting zones. Color scale is in logs. Commuting zones with less than $1 million in DoD manufacturing activity are shown in grey. Colors represent the average obligations from 2001-2016.

In this paper, we will specifically use the subset of the data that covers defense procurement, and especially defense manufacturing procurement. Procurement is one subset of the DoD budget, and usually accounts for nearly 20% of DoD spending. Even after cleaning out contracts with incomplete data on vendor location and other attributes, the coverage appears fairly complete. For example, in 2016

we accounted for $128 billion in contracts. This represents roughly 24% of the total DoD budget that year. Each contract has a six-digit NAICS code for industry. For example, the Boeing contract discussed above has NAICS code 336411: Aircraft Manufacturing. We crosswalk each NAICS code to a 4-digit SIC code for consistency with the China shock literature, namely [4]. We start from the manufacturing SIC codes used in this paper, but also exclude some SIC codes from defense manufacturing. Namely, we only consider SIC codes with at least $5 million in spending in 2001 and that have activity across at least five different commuting zones. This helps us take out very small or geographically specialized industries. Most of what is removed are consumer product manufacturing and some food manufacturing. After cleaning, Figure 2 shows the top industries by total obligations when aggregated to the SIC-3 level. The data is aggregated to total obligations by SIC-4 and commuting zone by year. This results

Figure 2: Top SIC-3 Manufacturing Industries by Average DoD Obligations (2001-2016)



Note: We average the obligations to SIC-3 industries from 2001-2016 and plot the top ten industries.

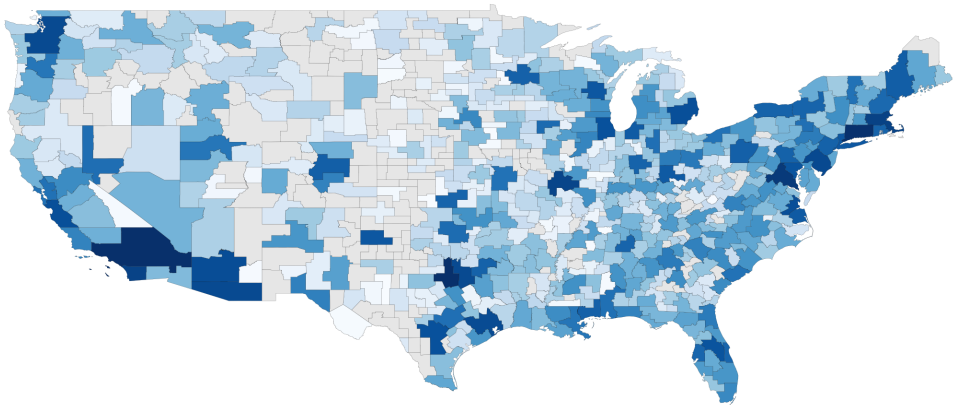
in a panel data set that is used in the analysis. In addition to total obligations by year, industry, and location, we track the number of vendors, the total number of contracts, and the number of dollars that are in competed contracts as opposed to sole-source contracts. These variables will be used to elucidate mechanisms behind our inelasticity and backfill effects. (Add something on firms?)

2.2 Quarterly Census of Employment and Wages

The Quarterly Census of Employment and Wages is a quarterly data set published by the Bureau of Labor Statistics (BLS) that provides county-level data on employment by industry. In addition to total employment by industry, the data also includes total wages, and establishments. This paper makes

use of the annual files, which have annual averages of these variables over each year. Industry data is provided at the six-digit NAICS level, so we also crosswalk this to SIC-4 industries as we did with the DoD procurement data. We crosswalk counties to commuting zones. Again, we are especially concerned with manufacturing labor, with a focus on the SIC codes that we identified as being important to the defense industrial base in the last section. The map in 3 shows the location of this labor within the United States. Notice that manufacturing labor is somewhat more concentrated than DoD procurement. It seems that rural areas in particular receive a higher allotment of defense manufacturing than they do of manufacturing labor.

Figure 3: The Location of Manufacturing Employment Within The United States



Note: Country is segmented by commuting zones. Color scale is in logs. Commuting zones with no manufacturing employment are shown in grey. Colors represent the average obligations from 2001-2016.

3 Methodology

In this section, we first use a simple stylized model to show how falling civilian manufacturing demand could lead to the results that we find in the data – backfill and inelasticity. It will aim to give the reader a general sense of the mechanisms at play with minimal needed complexity. We then discuss how instrumental variables are used to empirically test this conceptual framework.

In the model, backfill comes from the fact that DoD has semi-elastic demand. They take advantage of the excess supply in regions that experience high civilian manufacturing demand pullback. This said, the DoD only partially back-fills the demand that is lost by civilian manufacturing. This means that manufacturing firms still choose to exit. After firm exit, the manufacturing sector is less able to provide supply of manufactured goods. A similar sized DoD demand shifter will not move local manufacturing

production as strongly. This is because when there are fewer firms, fulfilling high demand shocks require pushing firms into very high levels of capacity utilization, and thus require very high price compensation. Since the DoD is still elastic, they begin to substitute away before reaching such high price levels.

3.1 Simple Model

Suppose there is a single manufacturing sector that makes goods for both the defense and civilian sectors. The sector has a number of firms N. Each firm chooses a utilization rate $u \in [0, 1)$ while facing costs $c(u)$ that approach infinity as $u \to 1$. Each firm maximizes profits subject to the price of manufactured goods, p_t.

$$\textit{Firm's problem:} \quad \max_u \pi(u) = pu - c(u) \quad \Rightarrow \quad p = c'(u)$$

The firms' choice of utilization rate u, the number of firms, and the capacity of any given firm ($\bar{q}$) determines the total supply, $q^S = N\bar{q} \cdot u$. Demand by the defense department is given by $q^D(p, z^D)$, where z^D is an exogenous shifter of defense demand. Similarly, suppose that civilian demand takes the form $q^C(p, z^C)$, where z^C is an exogenous shifter of civilian demand (a trade shock). The economy is in equilibrium when firms are optimizing on utilization and the market clears.

$$\textit{Market Clearing}: \quad N\bar{q} \cdot \underbrace{(c')^{-1}(p)}_{u^*(p)} = q^D(p, z^D) + q^C(p, z^C)$$

We will now consider how the equilibrium changes under shocks to z^D and z^C and how the responses correspond to the "backfill" and "inelasticity" results we see in the paper. First, consider a shock to z^C. The initial "short-run" response does not include any firm entry or exit (no change in N). We can quantify the elasticity of defense demand output q^D with respect to the shock to civilian demand z^C as the total derivative below:

$$\textbf{Main Result 1 (Backfill):} \quad \frac{d \ln q^D}{d \ln z^C} = \varepsilon_D \cdot \frac{s_C}{\varepsilon_S - s_D\varepsilon_D - s_C\varepsilon_C} \cdot \underbrace{\eta_C}_{\frac{\partial \ln q^C}{\partial \ln z^C}} > 0$$

Where ε_D and ε_C are the price elasticities of defense and civilian demand respectively, s_D and s_C are the market shares, and η_C is the elasticity of civilian demand to the shock z^C. ε_S is the supply elasticity. We can readily see that the backfill result depends on the elasticity of defense demand to price. A significant backfill result is indicative of a defense department that is responsive to slack capacity.

The next result, "inelasticity" arises as a result of increasing constraints on the capacity of industrial firms. Within the context of our model, it corresponds to decreasing $\frac{d \ln q^D}{d \ln z^D}$, the response of realized

defense demand to defense shocks. We compute this below.

$$\frac{d\ln q^D}{d\ln z^D} = \frac{\varepsilon_S - s_C\varepsilon_C}{\varepsilon_S - s_C\varepsilon_C - s_D\varepsilon_D} \cdot \underbrace{\eta_D}_{\frac{\partial \ln q^D}{\partial \ln z^D}} > 0$$

What we find is that the responsiveness of defense demand to shifters is increasing in supply elasticity ε_S. Supply elasticity decreases as capacity utilization, u, reaches 1. Therefore, as capacity becomes more constrained, response to demand shocks is diminished. However, it is not immediate that capacity utilization would increase as a result of a trade shock (shift to z^C). If there is no response to available firm capacity N, capacity utilization would actually decrease, and responsiveness do demand shocks would increase. To understand conditions for inelasticity, we compute the change in log-capacity as a result of a trade shock z^C below. We find that capacity utilization increases only if the capacity loss (firm exit, diminishing N) as a result of the shock is sufficiently high relative to $s_C\eta_C$, where η_C is the elasticity if civilian demand to shocks z^C. Similarly $\eta_N := \frac{\partial \ln N}{\partial \ln z^C}$ is the firm entry/exit as a result of the civilian demand shock.

$$\frac{d\ln u}{d\ln z^C} = \varepsilon_u \cdot \frac{s_C\eta_C - \eta_N}{\varepsilon_u - s_C\varepsilon_C - s_D\varepsilon_D}$$
$$\frac{d\ln u}{d\ln z^C} < 0 \iff s_C\eta_C < \eta_N$$

If firm entry/exit is sufficiently responsive to the civilian demand shock, capacity utilization will rise as a result of the shock. This will produce the inelasticity effect that we find: localities that experience a negative trade shock are less responsive to future defense demand shocks.

Main Result 2 (Inelasticity): *If* $\left(\underbrace{\frac{q^C}{q^D + q^C}\frac{\partial \ln q^C}{\partial \ln z^C}}_{s_C\eta_C} < \underbrace{\frac{\partial \ln N}{\partial \ln z^C}}_{\eta_N} \right)$ *then* $\left(z_C \downarrow \quad \Rightarrow \quad \frac{d\ln q^D}{d\ln z^D} \downarrow \right)$

In the next section we will develop shifters that represent z^D and z^C. We will use these to form an empirical strategy that can test for the presence of backfill and inelasticity.

3.2 Empirical Strategy

The goal of our paper is to study how the hollowing of the U.S. manufacturing base as a result of trade shocks impacted the defense industrial base. We are especially interested in understanding whether less civilian manufacturing impaired the defense industry in certain ways. In order to do this, and establish the main two results of our paper – backfill and inelasticity – the first step is to form shocks to civilian

demand and defense demand. Importantly, our results are cross-sectional, so we will form shocks which represent the relative exposure of a given locale to civilian or defense manufacturing demand.

The civilian demand shock that we will use in our empirical analysis is a Bartik instrument. Bartik instruments are constructed for each commuting zone and time-period from shift and share components. In this case, the shifters (g_{jt}) are the same growth in manufacturing imports from China by wealthy countries used in [4]. These shifters exist by SIC-4 industry (j) for each time three-year time period we use in our regressions (t). The shares (s_{ij0}) are the shares of employment by SIC-4 industry (j) in different locations (i) during an initial time-period. In our case, the shares are constructed from 2001 employment. The formula for construction of the shift-share Bartik instrument is given below. In our construction, we will only consider manufacturing industries relevant for defense manufacturing.

$$Z_{it}^{C} = \sum_{j=1}^{K} s_{ij0} g_{jt}$$

Bartik instruments of this form give identification because trade shocks in different industries g_{jt} are assumed to be exogenous. By virtue of their initial employment shares s_{ij0}, different areas (i) have differing exposure to the shock.

The shock to defense demand will be a similar shift-share instrument. The share elements will remain the employment shares of the different industries, but the shifters will be the growth in defense obligations in the given industry. When constructing growth in defense obligations, we aggregate to the SIC-3 level due to the sparseness and year-to-year volatility of some of the four digit industries. For a given commuting zone, we crosswalk to the state level using crosswalks provided on David Dorn's website and exclude procurement growth in that state when computing the growth shifter. The identification argument for defense demand is similar to the trade instrument. We will assume that growth in defense acquisition outside of a given state is an exogenous indicator of local defense demand. We assume that a commuting-zone's exposure (or ability to uptake defense demand) is linked to their employment in the sector that is experiencing the acquisition shock.

We will use our constructed instruments for civilian and defense demand to run a series of regressions of local acquisition outcomes over various horizons on these shifters. For a given variable Y, we run regressions similar to the below.

$$Y_{i,t+k} = \gamma' X_{it} + \beta_0 Z_{it}^{C} + \varepsilon_{i,t+k}$$
$$Y_{i,t+k} = \gamma' X_{it} + \beta_0 Z_{it}^{C} + \beta_1 Z_{it}^{D} + \delta Z_{it}^{D} Z_{it}^{C} + \varepsilon_{i,t+k}$$

Examples of variables might be the cumulative or incremental growth in defense obligations for location i over period $t + k$. Other variables might be the number of vendors or the number of contract actions. In the next section we will run these regressions and report results that support backfill and inelasticity.

4 Empirical Results

In this section we present the main findings of our paper. We begin by establishing the validity of our civilian demand shifter. We will show that the trade shock reduces manufacturing employment, establishments, and wages. This gives us confidence that trade is damaging the manufacturing industrial base and provides consistency with the broader literature. From here, we show the "backfill" result. What we find is that the trade shock is associated with an expanding defense manufacturing sector. This reallocation is specifically about the manufacturing sector, as non-manufacturing defense output does not expand due to the trade shock. The second result – "inelasticity" – comes from studying the interaction between trade and defense shocks. We find that trade shocks reduce the elasticity of defense output to future defense shocks. As we showed in the model, this could be indicative of a degree of capacity impairment as a result of the trade shock. Finally, we elucidate some of the mechanisms and consequences of the trade shock for the industrial organization of the defense industrial base. We find that while the trade shock does lead to reallocation into the defense sector, the number of active vendors and contracts does not expand. This lends credence to the theory we previously presented. Namely, trade shocks prompt reallocation into the defense sector, but

4.1 Validity

In Table 1, we record the contemporaneous response of different local variables on the trade shock. The form of the regression we run is below, where $Y_{i,t}$ are variables that include manufacturing employment, establishment, and wages.

$$\Delta \text{arsinh}(Y_{i,t}) = \gamma' X_{it} + \beta_0 Z_{it}^C + \varepsilon_{i,t}$$

In this case, the controls X_{it} includeTime $\times$ State fixed-effects as well as controls for the initial level of employment and defense obligations. We utilize the arsinh operator because it closely approximates log at levels above 1, but approaches 0 as input falls to 0. In this case, we run the regression only using cases where $Y_{it} > 0$, so the transform is equivalent to using logs. The regression is contemporaneous, so $\Delta \text{arsinh}(Y_{i,t})$ corresponds to the change over the same period as the trade shock.

The results in the table show how the trade shock reduces manufacturing employment and establishments. Wages also decrease, but the impact is smaller. This result is consistent with the broader China

shock literature, whereby increased import competition with China led to a hollowing of U.S. manufacturing. In this case, we find that commuting zones that were more exposed to import competition experienced increased manufacturing decline over the same time period as they experienced the trade shock.

Table 1: Various Manufacturing Outcomes on China Bartik

	Mfg Employment	Mfg Establishments	Manufacturing Wages
	(1)	(2)	(3)
China Bartik	-2.191*	-2.046***	-0.209
	(1.187)	(0.504)	(0.149)
arcsinh(Init Employment)	0.187***	-0.121***	0.016***
	(0.038)	(0.011)	(0.005)
arcsinh(Init Obligations)	0.014	0.004	0.001
	(0.016)	(0.005)	(0.002)
Time x State FE	Yes	Yes	Yes
Observations	1452	1452	1452
R^2	0.153	0.836	0.111
Adjusted R^2	0.054	0.817	0.007
Residual Std. Error	1.461 (df=1299)	0.412 (df=1299)	0.229 (df=1299)
F Statistic	4.505*** (df=152; 1299)	123.765*** (df=152; 1299)	7.697*** (df=152; 1299)
Note:			*p<0.1; **p<0.05; ***p<0.01

4.2 Backfill

This section establishes one of the main results of the paper. The results are reported in Table 2. The regressions study how the change in defense manufacturing obligations depends on the trade shock. The regressions that are run in this table are identical in form to those in the last section, however instead of varying outcome variables, we vary the controls used in the regression.

$$\Delta \text{arsinh}(\text{Mfg. Obligations}_{i,t}) = \gamma' X_{it} + \beta_0 Z_{it}^C + \varepsilon_{i,t}$$

What we find is that commuting zones that are more exposed to the trade shock experience growth in defense obligations over the same time period. As discussed in the model section above, the significance of the backfill result is twofold. First of all, it indicates a degree of fungibility between defense and civilian industrial capacity. Second, it indicates that the defense department is actually able to capture that slack capacity. One follow-on question is whether the DoD is truly capturing slack manufacturing capacity, or whether they are capturing lower employment and slack in general. We also run analogous regressions on total obligations for the non-manufacturing SIC-codes in Table 4 (See appendix). We find

no significant backfill relationship in these regressions across any of the specifications.

We find further support for the backfill relationship if we study the impact of the trade shock on manufacturing obligations over time. In Figure 4, we see that the significant impact of the trade shock on contemporaneous defense manufacturing obligations is sustained over the subsequent nine-year period. This demonstrates the persistence and robustness of the backfill effect.

Table 2: Mfg. Obligations on China Bartik

	Dependent variable: Mfg Obligations		
	(1)	(2)	(3)
China Bartik	2.943**	3.793**	3.626*
	(1.186)	(1.476)	(1.996)
arcsinh(Init Employment)	0.394***		
	(0.065)		
arcsinh(Init Obligations)	-0.179***		
	(0.037)		
Time FE	No	No	Yes
Time x State FE	Yes	Yes	No
Controls	Yes	No	No
Observations	975	975	975
R^2	0.305	0.256	0.091
Adjusted R^2	0.178	0.123	0.088
Residual Std. Error	1.705 (df=824)	1.761 (df=826)	1.796 (df=971)
F Statistic	26.080*** (df=150; 824)	12.337*** (df=148; 826)	27.645*** (df=3; 971)
Note:			*p<0.1; **p<0.05; ***p<0.01

4.3 Inelasticity

The second main result of this paper is "inelasticity". The results are shown in Table 3 below. It says that after a trade shock, commuting zones are less responsive to defense shocks. To study this, we will be particularly concerned with the interaction of the defense shock Z_{it}^D and the trade shock Z_{it}^C. Therefore, in our regression below, we will be especially concerned with β_1 and δ. The coefficient β_1 yields the response to a defense shock without the trade shock. In our estimation β_1 is positive. δ tells how much the responsiveness to a defense shock decreases with a trade shock. We find $\delta < 0$.

$$\Delta \text{arsinh}(\text{Mfg. Obligations}_{i,t+1}) = \gamma' X_{it} + \beta_0 Z_{it}^C + \beta_1 Z_{it}^D + \delta Z_{it}^D Z_{it}^C + \varepsilon_{i,t+1}$$

Please note, that in regressions, the dependent variable is growth in period-ahead manufacturing obligations. We do this because the defense shock appears to have a delayed effect on local defense obligations. This is very evident in Figure 5. This figure shows the response of defense manufacturing obligations

at different time horizons to defense shock in time 0. It shows that the impact of the defense shock on obligations is most significant at the 3-5 and 6-8 year horizons. However, when we account for commuting zones that have large trade shocks (in this case the 75th percentile of trade shocks) we find that the response to defense shocks is reduced by about half.

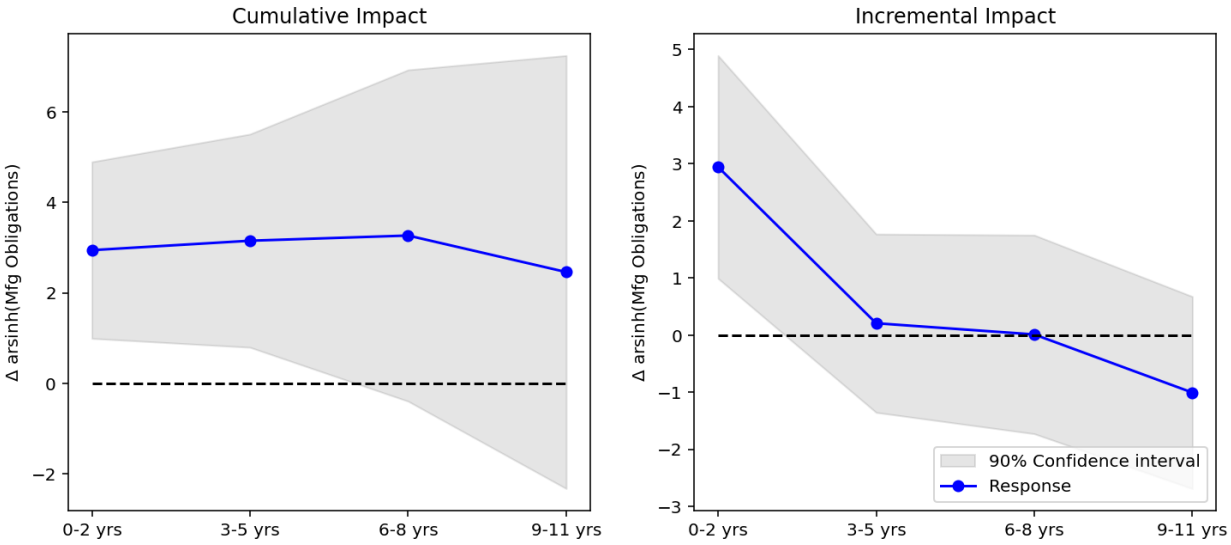
Table 3: Mfg. Obligations on China and Defense Instruments

	Dependent variable: Mfg Obligations (t+1)		
	(1)	(2)	(3)
Defense Bartik	51.904**	54.025**	35.485*
	(23.952)	(24.245)	(20.248)
China Bartik	0.761	0.872	0.304
	(1.131)	(1.091)	(0.763)
China Bartik x Defense Bartik	-1085.656***	-1088.770***	-675.945*
	(411.230)	(422.408)	(362.590)
arcsinh(Init Employment)	0.056		
	(0.057)		
arcsinh(Init Obligations)	-0.018		
	(0.034)		
Time FE	No	No	Yes
Time x State FE	Yes	Yes	No
Controls	Yes	No	No
Observations	911	911	911
R^2	0.287	0.285	0.083
Adjusted R^2	0.143	0.144	0.078
Residual Std. Error	1.574 (df=758)	1.573 (df=760)	1.633 (df=905)
F Statistic	29.606*** (df=152; 758)	24.688*** (df=150; 760)	19.012*** (df=5; 905)
Note:			*p<0.1; **p<0.05; ***p<0.01

4.4 Mechanisms

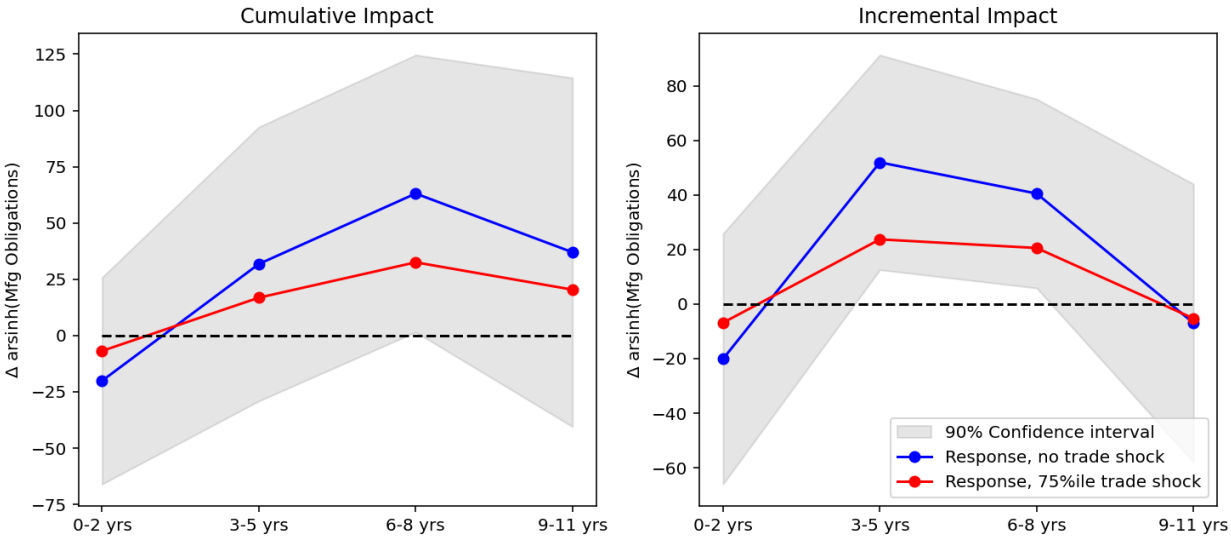
The previous two sections discussed the main results of the paper: backfill and inelasticity. In addition to these main results that are predicted by our model, there are ancillary results that add more context to the way in which backfill and inelasticity take place. First, consider backfill. There are many mechanisms by which substitution into the defense sector could take place, and these have differing implications for the health of the U.S. defense industry. In Table 5 we repeat the same regression we used to establish the backfill result, but study additional variables including total contract actions, number of vendors, and total amount of dollars awarded competitively (as opposed to sole-source). What we find is that although the trad shock increases obligations, it does not meaningfully increase the number of defense vendors, or the number of contract actions. This suggests a reallocation of industrial capacity such as local labor supply to existing defense firms and an expansion of obligations on contracts, as opposed to

Figure 4: The Impact of a Trade Shock on Defense Obligations Over Time



Note: This demonstrates the persistence of the backfill effect. The significant contemporaneous impact of the trade shock on defense manufacturing obligations is sustained in the long-run.

Figure 5: The Impact of a Defense Shock on Defense Obligations Over Time



Note: This shows the response of defense manufacturing obligations to a defense shock. The blue line shows the baseline responsiveness without a trade shock. The red line shows the diminished responsiveness to defense shocks present at a 75th percentile trade shock.

new contracts being awarded and new firms entering the defense sector. Consistent with the lack of new entry, we find that the number of competed dollars increases, but at a slower rate than overall obligations. This suggests that contracts are not becoming more competitive. The fact that there are new entrants and contracts awarded also provides support for the inelasticity result. It suggests that new capacity is not being built as a result of backfill, but this is simply a reallocation of existing capacity from civilian to defense manufacturing.

5 Discussion

This paper studied how civilian trade shocks experienced by the United States from the early 2000s impacted defense procurement and manufacturing. What we find is not a simple story of a weakened DIB as a result of trade shocks. Instead, we find initial "backfill" of falling civilian manufacturing with defense manufacturing. This is an interesting result for two reasons. First, it suggests a degree of fungibility between civilian and defense manufacturing capacity, which is not obvious due to the specialized nature of the defense industrial base. Second, it shows that the department of defense does have some degree of elasticity of substitution and ability to respond to slack capacity. When we investigate the mechanisms further however, we do not find that the DIB becomes more competitive or there are new entrants as a result of shocks. This supports the second main result of the paper which is the "inelasticity" result. This result studies the interaction of defense demand shocks and civilian demand shocks. It finds that past civilian shocks reduce the sensitivity of defense output to defense demand shocks. Within the context of the model we present, this indicates constrained capacity. This is consistent with the validation we present as the first empirical result, which shows declining manufacturing establishments as a result of the trade shock.

What does this mean for policy? Backfill and inelasticity do not present a straightforward story of defense decline as a result of the China shock that would have been fixed by protectionism. Instead, policymakers are presented with a dynamic trade off. Yes, the defense industrial base did become less elastic as a result of trade shocks, but in the short-run trade shocks help the local defense industrial base. In the longer-run, areas experiencing trade shocks are less able to respond to increases in defense demand.

References

[1] Daron Acemoglu, David Autor, David Dorn, Gordon H Hanson, and Brendan Price. Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics*, 34(S1):S141–S198,

2016.

[2] Alan J Auerbach, Yuriy Gorodnichenko, and Daniel Murphy. Local fiscal multipliers and fiscal spillovers in the united states. Technical report, National Bureau of Economic Research, 2019.

[3] David Autor, David Dorn, Gordon Hanson, and Kaveh Majlesi. Importing political polarization? the electoral consequences of rising trade exposure. *American Economic Review*, 110(10):3139–3183, 2020.

[4] David H Autor, David Dorn, and Gordon H Hanson. The china syndrome: Local labor market effects of import competition in the united states. *American economic review*, 103(6):2121–2168, 2013.

[5] David H Autor, David Dorn, Gordon H Hanson, and Jae Song. Trade adjustment: Worker-level evidence. *The Quarterly Journal of Economics*, 129(4):1799–1860, 2014.

[6] Nicholas Bloom, Mirko Draca, and John Van Reenen. Trade induced technical change? the impact of chinese imports on innovation, it and productivity. *The review of economic studies*, 83(1):87–117, 2016.

[7] Edoardo Briganti, Holt Dwyer, Ricardo Duque Gabriel, and Victor Sellemi. Breaking down the us employment multiplier using micro-level data. *Available at SSRN 5580413*, 2024.

[8] Lorenzo Caliendo, Maximiliano Dvorkin, and Fernando Parro. Trade and labor market dynamics: General equilibrium analysis of the china trade shock. *Econometrica*, 87(3):741–835, 2019.

[9] Rodrigo Carril and Mark Duggan. The impact of industry consolidation on government procurement: Evidence from department of defense contracting. *Journal of Public Economics*, 184:104141, 2020.

[10] Yi Che, Yi Lu, Justin R Pierce, Peter K Schott, and Zhigang Tao. Does trade liberalization with china influence us elections? Technical report, National Bureau of Economic Research, 2016.

[11] Christopher Clayton, Matteo Maggiori, and Jesse Schreger. A framework for geoeconomics. Technical report, National Bureau of Economic Research, 2023.

[12] Leo Feler and Mine Z Senses. Trade shocks and the provision of local public goods. *American Economic Journal: Economic Policy*, 9(4):101–143, 2017.

[13] Ernest Liu and David Y Yang. International power. Technical report, National Bureau of Economic Research, 2025.

[14] Emi Nakamura and Jón Steinsson. Fiscal stimulus in a monetary union: Evidence from us regions. *American Economic Review*, 104(3):753–792, 2014.

[15] Aymane Omari, Nasser Alansari, Brian Libgober, and Aaron R Kaufman. A comprehensive dataset of united states federal procurement from 1979 to 2023. *Scientific data*, 12(1):1368, 2025.

[16] Justin R Pierce and Peter K Schott. The surprisingly swift decline of us manufacturing employment. *American economic review*, 106(7):1632–1662, 2016.

[17] Dani Rodrik. Why does globalization fuel populism? economics, culture, and the rise of right-wing populism. *Annual review of economics*, 13(1):133–170, 2021.

A Supplementary Results

Table 4: non-Mfg. Obligations on China Bartik

	Dependent variable: Non-Mfg Obligations		
	(1)	(2)	(3)
China Bartik	-0.213	-0.061	0.363
	(0.685)	(0.713)	(0.526)
arcsinh(Init Employment)	0.043		
	(0.055)		
arcsinh(Init Obligations)	-0.013		
	(0.031)		
Time FE	No	No	Yes
Time x State FE	Yes	Yes	No
Controls	Yes	No	No
Observations	975	975	975
R^2	0.228	0.227	0.088
Adjusted R^2	0.087	0.088	0.085
Residual Std. Error	1.487 (df=824)	1.486 (df=826)	1.488 (df=971)
F Statistic	43.046*** (df=150; 824)	5809.667*** (df=148; 826)	29.778*** (df=3; 971)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5: China Bartik on Manufacturing Outcomes

	Contract Actions	# Vendors	Competed Obligations
	(1)	(2)	(3)
China Bartik	0.120	0.259	2.493
	(0.690)	(0.267)	(2.148)
arcsinh(Init Employment)	0.092***	0.043***	0.497***
	(0.024)	(0.016)	(0.123)
arcsinh(Init Obligations)	-0.023	-0.002	0.005
	(0.015)	(0.009)	(0.083)
Time x State FE	Yes	Yes	Yes
Observations	975	975	975
R^2	0.393	0.571	0.281
Adjusted R^2	0.283	0.493	0.150
Residual Std. Error	0.774 (df=824)	0.463 (df=824)	3.878 (df=824)
F Statistic	10.116*** (df=150; 824)	18.704*** (df=150; 824)	8.472*** (df=150; 824)

Note: *p<0.1; **p<0.05; ***p<0.01