

# THE GEOGRAPHY OF DEFENSE PRODUCTION: CONCEPTUAL ISSUES

Scott Campbell

## Introduction

These days it seems as if almost everyone has something to say about defense spending and military production. The political scientist speaks of deterrence and diplomacy, the biologist of nuclear winter, the engineer of accuracy and explosive potentials, the sociologist of nuclear-age paranoia, the businessman of cost-effectiveness and profit trends. What perspective can regional planners add to this debate?

Planners might initially approach this debate by outlining how defense spending affects the subjects of planning: land use, job generation, industrial development, city finances. This approach is certainly a necessary recognition of the dramatic affect of the military on cities and regions. Yet almost any discipline could claim that defense spending affects their subjects of study in some way or another. It thus remains the task of regional planners to trace the impact of defense spending on their discipline, and, more importantly, to demonstrate the contribution that their discipline can make to the defense spending debate at large.

The purpose of this paper is to explore the importance of geography and spatial analysis for defense spending. It is largely intended to analyze and confront conceptual issues, inspired in part because of the frustrating limitations of common economic-geographic concepts in coming to terms with defense spending. Past experience has unfortunately shown that the most extensive and sincere geographical defense spending data has sat unfermented for lack of a clairvoyant theoretical conceptualization to elevate the analysis to a level equal to the importance of the military in society. Hence, this paper will have a speculative, theoretical orientation (the reader may refer to the bibliography for empirical studies).

## The "Defense Industry": Entity, Enigma, or Myth?

Can we speak of a "defense industry" as we do of a "steel" or a "fashion" industry? One aerospace executive vehemently rejected this term: "You academics and journalists use this phrase 'defense industry' as if we were a completely different and separate group. But that's wrong: we're just like any other business." Yet are the makers of B1 Bombers and HARM missiles just like the makers of refrigerators and auto parts?

There are three general ways in which we can conceptually treat defense manufacturing. One extreme is to consider defense production like any other industry, and use the standard civilian industry concepts and analyses. At the other extreme is the view that defense manufacturing should be treated as a wholly separate and unique industry, which lies outside the civilian economy. In between lies the view of compromise: that though defense and civilian production are essentially the same, they vary in degree given their specific differences in production and cost functions. In this case, the resulting comparison between the two sectors is a type of "inter-industry comparative statics."

To clarify this debate, we can separate the various characteristics of this alleged "defense industry"—in relation to their "civilian sector" counterparts—into two groups: (1) those characteristics which *directly* result from the unique demand and consumption of defense products, and (2) those characteristics which *indirectly* result as the manufacture of these products affects the structure and dynamics of the industry. The former leads to differences in essence; the latter leads to differences in degree.

The essential, unique characteristic of defense production is ultimately the final *use* of the product. This use (be it counter-insurgencies, nuclear deterrence, or "surgical air-strikes"), in turn, determines the nature of the *product* (the military hardware and, increasingly, software), the *buyer/user* (the government), the *relationship* between the product and the buyer/user (monopsony), and the nature of *demand* (driven by the vagaries of foreign squabbles and domestic politics). These five factors can be said to be essential in that they describe both the fundamental quality of the "defense industry" and its fundamental contrast to the civilian sector.

As firms, labor markets, and communities struggle to meet the demands of the five essential factors of defense production, institutions and patterns will be created in the economy which will differ from their counterparts in the civilian sector. Firms will generally be larger to incorporate the large economies of scale of defense R&D and production, and will lead to an oligopolistic industry with restrained competition. Production will generally be capital-intensive and involve a great number of highly-skilled engineers, scientists, and technicians with fewer traditional blue-collar jobs. Production runs will tend to be highly specialized and low-volume, preceded by relatively long and costly research and development. Some of these industrial characteristics will vary a great deal from those in civilian industries, others only slightly. But these differences are all *by degree*, and are derivative.

The relevance of this (admittedly schematic) discussion is two-fold: first, to distinguish between the essential and derivative

qualities of defense manufacturing; and second, to use this distinction to clarify the nature of differences between defense and civilian production. The first point leads to a tentative answer to our original question of whether there is a unique "defense industry." A bifurcated model of defense production seems appropriate, in which the factors of product use, product type, buyer, and product demand are considered as separate and unique elements, whereas the derivative factors of labor demand, production type, etc., form a more generic element, using civilian industrial counterparts as points of departure (in a type of inter-industry comparative statics mentioned earlier).

The second point leads to a clearer determination of the relationships, similarities and interaction between the defense and civilian production sectors. The labor force and training requirements for defense firms both differ from civilian firms and also potentially drain skilled labor from these non-defense sectors. The value of technological spin-offs from defense work will affect both the competitiveness of new civilian industries as well as sway the political support for costly defense technology projects (such as the Starwars Defense Initiative). The success of economic conversion (to 'peacetime' production) as both a political argument and an actual economic strategy will depend in part on the extent of the chasm between the defense and civilian economy. These are just three issues which will be directly determined by the nature of the links between the civilian and defense production.

And finally, there is the role of space and geography in this discussion. Is the spatial pattern of the defense industry an essential and fundamental quality, or is it merely derivative? Is space a dynamic factor in the structure of defense production, or merely a proxy or reflection of other, non-spatial, forces? In other words, just how fruitful is the pursuit of geography in understanding the military-industrial complex and its impact? These questions will be explored below.

### **The Location of Defense Manufacturing: Does Space Matter?**

A reflective observer of defense spending from the 'spatial sciences' (city planning, geography, regional science) will invariably ask the question: "How significant is my spatial view of this economic activity? Is not the *location* of the plants which produce the arsenal of war modest in importance as compared to the *reasons* and *consequences* of this production?" Certainly the user of these products—and their effect on war, peace, and foreign policy—are of primary consideration. One would likely assign secondary importance to defense spending's role in national resource allocation and its impact on the national economy and

culture. Only thereafter comes geography.

Understanding the significance of geography for defense spending is not a simple exercise, nor can it be reduced to a single measure. Consequently, the approach taken here is to pose four separate but related questions: "Where are defense contractors?", "Why are they there", "What impact do these industries have on communities?", and "What impact does location have on defense spending itself?" (These four questions, respectively, treat defense manufacturing as a phenomenon to be described; an endogenous pattern to be explained; an exogenous factor of development; and an ontological subject of study.)

*Where are defense contractors?*

The first is the simplest of the four to answer, requiring only patience in collating government contract data as entries in tables or as pins in maps. Much of defense money goes to a relatively small club of easily identifiable prime contractors. Tracing the flow of money through subcontractors is more tricky, as it is not publically reported; but even this is merely an annoying problem of accounting, rather than of theory. The primary importance of this question is to serve as a foundation for the next three.

*Why are they there?*

The second question—why they are where they are—seeks to explain the pattern found in the first question. We may first turn to traditional methods of analyzing the location of economic activity for help. Yet many of the traditional factors determining location (availability of capital, land, and labor; proximity to raw materials and/or markets; *et al.*) play a different role for defense contractors, or else are secondary to other factors (e.g., congressional politics, strategic concerns).

This concern necessarily relates to the discussion in the preceding section: how fundamentally do defense firms (as oligopolies with a monopsonistic buyer, non-market demand, cost-plus pricing, and extremely high technical and capital requirements) differ from other firms? At one extreme, we could treat defense contractors like any other firm, and consequently use standard location theory in its unaltered form. At the other extreme, we could treat decisions by defense contractors as completely different from those of civilian firms, and thus create an entirely new location theory for defense manufacturing. The former approach requires the simplest amount of translation, yet may lead to a rather inappropriate set of locational factors. In contrast, the latter approach has the greatest theoretical integrity, but, by not borrowing from existing civilian location theory, would both be an enormous undertaking and might neglect the interaction of civilian and defense manufacturing activity. A

compromise approach is therefore to use traditional location theory until it breaks down, and then determine how and why a theory of defense location differs from civilian industrial theory.

*What impact do these industries have on communities?*

The third question addresses the role of defense manufacturing in the local economy and in the regional development process. This question can be divided—somewhat arbitrarily—into two elements: current vs. future economic benefits. The former is the easier to determine, by tracing the flow of defense dollars, and the resulting jobs, through firms and communities. The latter is both more elusive and potentially much more important, for it prescribes the estimation of the value of military technological spin-offs, and the effect of defense on the labor market, product innovation, and economic development in general. The significance of this distinction between these two types of impacts is that future benefits may not be proportional to current benefits (e.g., an industry with many jobs may have little future potential and lead to few future jobs or new products; whereas an industry with relatively few current jobs may lead to many product innovations and spin-off industries, with accompanying job growth). Consequently, the ultimate economic impact of defense spending may lie not in its current jobs and revenues, but rather in its shaping of future industrial research and production developments.

A further issue is how we isolate or otherwise identify the unique and specific *impact* that defense spending has on the economy. One way to conceptualize this impact is to hypothesize the state of the economy *without* defense spending. (This method reflects the common identification of *opportunity costs* as the key negative economic impact of defense spending.) This could be done in at least two ways: first, to *historically* retrace the development of a hypothetical economy if there had been a different level of defense spending (e.g., if the U.S. had paralleled Japan by keeping post-war defense spending below one percent of GNP); or second, to speculate what impact a *current* change in defense spending would now have on the economy (e.g., a 50 percent reduction in the budget with corresponding conversion to civilian production). Given the dynamic nature of the defense economic system, these two hypothetical scenarios will have potentially different economic outcomes; consequently, one must be careful not to use one scenario to make inferences about the other (e.g., claiming that a present-day “one percent of GNP” defense budget ceiling would lead to the economic prosperity of post-war Japan).

A further complication in the isolation of defense spending's impact is the simultaneous nature of defense contracting, labor

migration, infrastructure development, product innovation, and related employment growth, as well as the overlapping of civilian and defense elements in individual firms (e.g., Boeing), research (e.g., laser research), and the labor market (e.g., electrical engineering graduates). Consequently, it is very difficult to isolate the precise impact of defense spending or the extent to which it acts either as an impetus or as a reactant in the economy. Yet even if we cannot regard defense spending as the key factor in regional development, its contribution could nonetheless be substantial and pivotal.

Perhaps these conceptual difficulties arise because the networks of defense contracts, subcontractors, R&D, labor, and financing are so intertwined with the economy as a whole that we should more accurately speak of the *role* of defense spending *in* the economy (rather than its *impact on* the economy). This factor, coupled with the massive scale of defense spending, hinders the neat and tidy isolation and quantification of its marginal contribution. Unlike a reduction in an import tax or a new coal subsidy program, defense spending involves a massive and comprehensive change in the economy, and is what some theorists (e.g., Whiteman, 1983) refer to as a “Big Decision”—one which irreversibly changes the context of the decision situation, in which marginal analysis leads to perverse outcomes. Such decisions are self-reinforcing, and tend to sweep away the grounds for opposition. Consequently, standard analytical concepts (such as marginal economics) are often inadequate in comprehending defense spending’s role in the economy.

*What impact does location have on defense spending itself?*

The fourth question is at once the most simple and difficult. It ‘underlies’ the first three because for simplicity we have initially assumed that the absolute amount of national defense spending is a given, and merely addressed the pattern and reason of its spatial allocation, and its subsequent impact. However, if the level of the defense budget is not merely set by foreign policy and national political concerns, but also by local community pressure through their respective contractors and congressional representatives, then we may hypothesize that the spatial pattern and dynamics of defense spending have raised this amount above the level that would be set by foreign policy and national political considerations alone. In essence, the research task here is to determine the role of space (i.e., cities, regions) in the preservation and growth of the military-industrial complex as an institution. It is the most difficult of the four questions to model, and consequently may remain ‘underlying’ as we attempt to answer the first three—yet it is potentially the most fundamental. It also holds great promise in not merely indicating how defense spending

affects geography, but rather how geography affects defense spending itself.

This relationship between space and defense spending is tricky to establish and quantify. In theory, we would like to hypothesize a defense procurement system in the absence of a spatial distribution of defense production, so as to remove the pressure of both community development through defense spending and the pressures of 'geographic constituency building' (in which contracts are intentionally dispersed by region to gain regional political support for controversial projects). At the same time we would need to retain the two key pressures for a large defense budget: (1) strategic and internal-political demands of the armed forces; and (2) self-interest of defense contractors (and their employees and unions). We would then measure the change (i.e., drop) in defense spending after the geographic pressures have been eliminated.

One hypothetical scenario would be that all defense hardware was imported directly by the Department of Defense (e.g., from France). This would isolate the pure strategic and political needs for defense spending; yet by eliminating not only the communities' economic pressures for defense, but also the self-interest of contractors, the unique contribution of geography would remain a mystery. A second scenario would be that all defense production (both prime and sub-contracting) must take place at one point in space (e.g., Las Vegas, Nevada), and that only defense work could be done in this location (essentially forming a huge defense 'company town'). Geographic constituency building would thus be impossible, and no (or little) geographical self-interest of the area would exist outside the self-interest of the defense firms and their employees and dependents.

Clearly, these two scenarios are neither feasible nor necessarily desirable, but rather serve as conceptual puzzles to isolate the role of space in the size of defense spending. A more practical method might be to do case-by-case studies of individual defense contracts, and determine whether the impetus for the project came from the Defense Department (reflecting strategic or foreign policy pressures), from the contractor (reflecting self-interest of the firm, union, and/or employers), or from the plant community or elected officials (reflecting geographic pressures). We would also need to determine whether the community/geographic pressure merely redistributed the pattern of defense contracts, or actually increased the total defense budget.

### **Initial Hypotheses and Tentative Findings**

The discussion in this paper has up until now focused on the conceptual issues which confront a spatial and economic analysis

of defense spending. Using the division of spatial issues into four questions developed above, common hypotheses about defense spending will be compared to recent observations.

### *The location of defense contracting*

Discussions on the location of defense manufacturing activity have often focused on the apparent concentration of these industries in newer areas, far away from the traditional manufacturing belt of the U.S. The image put forth is of defense industries as a reflection and forerunner of the relocation of new manufacturing to suburban territory in the South and West, forming a 'defense perimeter' (e.g., Markusen, 1985a).

How accurate is this portrayal? Without going into the specific geographical contract and employment data, we can nevertheless suggest that this hypothesis is half-true. It *is* true that the South, and particularly the West, receive a disproportionate share of defense spending (California is clearly the leader here, with places such as Seattle, Austin, Denver, Colorado Springs, Fort Worth, and Tucson also receiving large defense contracts.) More remote locations in the 'periphery' are also growing due to recent defense manufacturing activity (such as Hughes Aircraft's recent establishment of five manufacturing plants in small Southern towns). In addition, the Midwest's share of defense contracts has dramatically declined since the Second World War. Yet there is still a very large presence of defense manufacturing in the large, older U.S. metropolises, such as St. Louis, Baltimore, Boston, Chicago, and the New York-Connecticut area. Hence, though defense spending does favor the South and West, it has not abandoned the industrial Northeast, and it still tends to be in metropolitan areas. The term 'defense perimeter' may thus exaggerate the locational disparity between defense and other manufacturing.

### *Explaining the pattern of defense manufacturing*

The array of factors which affect the location decisions of defense firms appears to vary significantly from those of traditional heavy industry, but bears much greater resemblance to its counterparts in civilian 'high technology' production. Hence, traditional locational factors such as raw material transportation costs and land costs don't play a large role. Wage rates sometimes sway locational decisions, but the labor market limitations often accompanying low-wage areas often override the cost advantages. In addition, tax-rate reductions and other benefits are usually seen as "sweetening the deal," but don't seem to affect inter-regional location decisions (though once a specific region has been picked, these factors may affect the actual locality selected within the region).

Emerging as the crucial locational factor is the presence of a very high-skilled, educated workforce, and the associated local amenities to attract and retain such a workforce (e.g., major universities, cultural amenities, affordable housing). Rather than land, equipment, or natural resources, the greatest resource of many defense contractors is human capital (in the form of technical knowledge and federal procurement experience), and networks to link this knowledge (ranging from a systems engineering mentality to in-house telecommunications networks). Since much of the work is highly specialized and is in the context of oligopolistic competition, it is particularly critical for defense firms to attract superior technical and scientific talent.

The standard locational factor of proximity to markets is a curious and complex factor for defense manufacturing. In theory, there is but one buyer (located in Washington, D.C.). Yet rarely does the Pentagon itself “take delivery” of the contracted good, and in any case, the transportation cost of the item is usually trivial compared to its value. To complicate matters, there is actually not one, but several buyers; and though the Navy’s procurement operations are in Washington, both the Army’s and the Air Force’s operations are elsewhere. A further distinction arises when we consider the nature of the product delivered: it is important for a company delivering a processing system (such as a new radar system) to be located near its respective military installation; yet it is nearly irrelevant where a finished good (such as a KC-10 tanker-jet) is manufactured relative to the final stationing of that good. The resulting locational pattern can often be rather complex, such as the functional separation of TRW’s main R&D and engineering in Los Angeles, its operations and maintenance facilities near its military base clients, and its new government-relations facilities outside Washington, D.C. (with its corporate headquarters still in Cleveland).

In addition, the influence of both Congressional lobbying and corporate strategies of “geographic constituency building” shape the location of defense manufacturing. The former may lead to concentration of contracts in powerful Congressional districts, whereas the latter leads to a geographic dispersion of contracts so as to build a political base of support. Unfortunately, though these two activities are particularly interesting, important, and insidious, they are hard to quantify beyond a creation of anecdotes, and are worthy of further investigative journalism and research.

The confluence of all these factors leads to a locational matrix which is more beneficial for metropolitan regions than initially suspected. The critical role of highly educated labor markets with associated universities and cultural amenities, and the need for a hub airport nearby—combined with the de-emphasis of low-wage,

low-skilled labor markets with cheap land—keeps many defense firms in the larger urban areas. The key locational drawbacks of these urban areas are often high housing prices, congestion, and other problems of cities which retard skilled-labor recruitment, leading to a dispersion of defense firms to increase the size of their potential labor market. However, defense firms—particularly the large aerospace companies—exhibit a dramatic spatial inertia, which also restrains their flight to more ‘peripheral’ locations (Los Angeles aerospace concerns being the classic example). Consequently, though a company’s “ideal location,” given a locational *tabula rasa*, would be outside a modest metropolitan central city, its “rational location,” given their existing position, is still in the large metropolis.

*Regional economic impacts of defense spending*

This question (and the one following) are the most difficult and have been the subject of the least satisfactory research; consequently, the following comments will necessarily be brief and speculative.

Regarding the overall effect of defense spending on the economy, one must remember that defense is a form of public consumption, and cannot be justified on purely economic grounds. Conversely, one cannot reject military spending simply because it does not result in an economically optimal outcome. (This reveals the precariousness of using solely economic arguments to legitimate ideological support or opposition to defense spending.) In addition, the argument for military Keynesianism is theoretically flawed, since stimulation of the economy through civilian spending would be more efficient (however, in reality one must question the crucial assumption here that civilian spending could assemble a lobbying force equal to that of the military-industrial complex and thereby maintain an equal level of federal spending).

The standard argument in praise of civilian spin-offs from defense spending may be true, but again we must consider the opportunity costs involved: is not the best way to support civilian R&D through civilian R&D funding? (Though again, in reality, civilian R&D might not receive the same lobbying support as defense R&D.) To better determine the value of defense spin-offs, we should distinguish between product innovation and process innovation. In both cases, spin-offs seem to be diminishing over time: the gap between defense and civilian products is growing; and the small-volume, specialty production runs of defense production lead to fewer innovations in process technology (see Thurow, 1986).

Finally, there is the argument that defense spending diverts scarce engineering and scientific talent from the civilian sector. We could counter this claim with neoclassical logic that the labor market will respond to this shortage by increasing the supply of this personnel; yet the clearing of this labor market may take an excessive amount of time, and will be hindered by the volatility of the defense labor market. In addition, the supply of truly talented engineers and scientists may be limited not just by the short-term inflexibility of the labor market, but also by a more basic limit in the number of gifted individuals in a society. Consequently, the supply of talented engineers and scientists should be considered a limited social resource which requires trade-offs—even in the long run.

While most economic impacts appear to have negative consequences on the national level, it is clear that some regions in the U.S. benefit substantially from defense spending. These regions receive far more federal funds than they would probably receive given a non-military economy. They gain high-paying jobs and corporate revenues, as well as substantial funding for university and private research, leading to expansion of their physical, financial, and informational infrastructures, plus a more skilled labor market. Consequently, the community gains both current benefits as well as an improved base for future economic development.

One might argue that this money, if diverted to civilian spending, could lead to both more jobs and greater economic development infrastructure, while avoiding the boom-town volatility of defense contracting. Yet there is no assurance that civilian funds would be geographically allocated in the same way as military funds. In addition, there is no assurance that the new jobs created would be as well-paid or as challenging, or that they would go to those who lost their jobs. Hence, the current choice for most communities is not between civilian and military funds, but rather between military or no funds. This unavoidable conflict with community self-interest poses a major and underestimated obstacle to the push for economic conversion to a civilian economy. (To understand this difficulty, we should simply attempt to convince a well-paid Los Angeles aerospace engineer that he would be better off after conversion, since the loss of his job would lead to 1.4 new jobs [poorly-paid service jobs] in the nation [but not in his town.] This is not to refute the value of conversion, but rather to highlight its political difficulties.

#### *The impact of geography on defense spending*

There are no simple answers to this question, which is the most speculative of the four. There is certainly evidence that Congressional members have pushed for defense projects which

were not even supported by the Defense Department, often to please "folks and firms back home." Cases of "geographic constituency building" are also clearly documented (the key example being Rockwell's concerted effort to have a B1 Bomber contract in all 50 states, so as to gain support for this contested program). That such actions lead to an increase in the defense budget seems true; that "geography" itself plays a key role, rather than simply being the terrain of political battles, is less clear. This may be an instance where the distinction between "people" and "place" is arbitrary and obscures the interaction between the two.

### **Conclusion**

The object of a conceptual/analytical paper such as this one is usually to reveal the common logic and structures which underlie complex institutions. In this case, however, the underlying structure of the geography of defense spending remains complex and thereby conceals logical simplicity. Several reasons have been offered for this: First, defense manufacturing is an anomalous industry, containing both qualities unique to itself, as well as qualities overlapping with civilian industries. Its ultimate origin and function lies in the uncertainties of foreign policy, war, and political power, rather than simple "consumer behavior." This also ascribes to the industry a unique and absolute moral element. Finally, the massive size of defense spending also gives it the quality of "Big Decisions," and further confounds typical marginal impact analysis.

The nagging question of the actual relevance of spatial analysis is not merely to measure the relevance of defense spending for the "spatial disciplines" (itself a worthy effort), but to determine the contribution that such analysis can make to the defense debate at large. In this regard, answers to the four spatial questions outlined in this paper can contribute to the following policy areas: First, if defense spending, as a form of implicit industry policy, is leading to undesirable regional economic balances, then knowing the determinants of defense manufacturing locations will permit the readjustment of procurement policy to redress these imbalances. Second, knowing the economic impact of defense spending will permit understanding of the impact of an economic conversion, and address the current concern of industrial innovation and defense spin-offs (particularly with regard to "Star Wars"). It will also further the argument against "military Keynesianism." Third, determination of the unique impact of geography on the size of defense spending ideally permits the separation of actual strategic needs from local political pressures in determining the minimum-size budget necessary for defense. If spatial analysis can offer tentative answers to these questions, then it can potentially make a significant contribution to the resolution

of the defense dilemma.

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