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Competition and Bidding Data as an Indicator of the Health of the U.S. Defense Industrial Base

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Introduction

For the past decade, the Defense-Industrial Initiatives Group at the Center for Strategic and International Studies (CSIS) has analyzed trends in government contracting in general, and defense contracting specifically, using publicly available data. This research effort, performed for the Department of Defense (DoD), focuses on effective competition for defense contracts. CSIS believes that examining effective competition, as distinct from measures of competition generally, is the best metric to measure whether the Department of Defense is successfully promoting competition. Effective competition excludes competitively sourced contracts that receive only one offer.

Numerous statements from officials inside DoD and throughout the federal government have emphasized the importance of promoting competition, particularly in a difficult budget environment, as a way to improve quality and reduce cost. This research effort focuses on the generation of a predictive model for effective competition rates within defense contracting. The purpose of the model described in this paper is to better understand the extent to which different factors in defense contracting influence effective competition in the bidding process. By comparing the model's prediction of how different factors influence achieving effective competition, the model can then be used to identify possible weaknesses in DoD contracting and in the industrial base. This effort is an important addition to the literature on defense competition, as it quantifies the correlative effects of different factors through a statistically rigorous analysis.

Earlier under this research effort, the study team reported on levels of effective competition for the military departments, and then disaggregated the effective competition rates for products, services, and research & development (R&D).[1] This approach uses trend analysis to determine whether rates are improving or degrading under Better Buying Power and during sequestration and its aftermath. The larger study analyzes competition via a range of approaches. The study team found that, while recent reports from the Government Accountability Office found reduced competition overall, effective competition rates have held steady in aggregate despite the pressures of sequestration. The team also found that while rates of effective competition for products, services, and R&D have been remarkably consistent over time for DoD as a whole, those rates differ significantly between major DoD components. In particular, there are notable differences between the major DoD components in rates of effective competition for similar categories of products, services, and R&D, which is discussed in some detail in Section I of this report.

The primary focus of this study is on competition for defense contracts at the levels of Major Contracting Commands (MCCs) and U.S. states (as place of performance). By aggregating the data at this deeper level, the study team can look for signs of weakness in the industrial base on both a geographical and functional basis. Additionally, the study team believes that examining rates of effective competition at the MCC level can help identify those MCCs that are either particularly effective or less effective than average at getting competition for certain categories of products, services, and R&D. The utility of this

[1] Jesse Ellman, "Quality of Competition for Defense Contracts under 'Better Buying Power,'" CSIS, October 14, 2014, http://csis.org/publication/quality-competition-defense-contracts-under-better-buying-power.

study will be to go beyond obvious findings, such as low levels of competition for complex defense specific systems, and to instead look at which states and Major Commands are over- or underperforming expectations.

CSIS found that it was first necessary to set a baseline of what to expect. To do so, this paper first examines trends in competition for defense contracts for DoD overall, by major DoD component, and by various taxonomies of what DoD contracts for. This analysis provides context for the analysis that follows, by allowing the study team to understand what levels of competition should be expected for different elements of the DoD contracting portfolio.

The second section of this study examines the relationship between a variety of contract characteristics and the level of competition through the number of offers, at both the state and MCC levels. Based on past experience analyzing competition for defense contracts, the study team identified variables that might correlate with higher or lower levels of effective competition. This analysis guides the decision of which variables have sufficient predictive power to be included in the state and/or MCC predictive models. The evaluated characteristics include:

- **Contracting Methods:** Fixed-Price, Indefinite Delivery Vehicles, Multiple Award Indefinite Delivery Contracts (IDCs), and Single-Award IDCs.
- **Product or Service Categories:** Services, Aircraft, Engines and Power Plants, Ground Vehicles, Missiles and Space, Ships, “Other Products,” Facilities-Related Services and Construction, and Professional, Administrative, and Management Support Services.
- **Platform Portfolios:** Aircraft and Drones, Electronics and Communications, Land Vehicles, Missiles and Space, Ships and Submarines, and Weapons and Ammunition.

After examining the influence of contract characteristics on effective competition in isolation, CSIS proceeded to study this relationship using the same units of analyses as the first phase: states and MCCs. For each geographical and organizational unit, the study team calculated the percentage of obligations that aligned with each contract characteristic using a denominator of constant obligations from FY2000 to FY2013. The study team then used the variables identified in the previous section in a regression model to generate predictions of 2014 effective competition rates, and compared those “estimates” rates to actual 2014 effective competition rates. The study team then examined particular states and MCCs with interesting results, to determine why the models were or were not able to generate accurate predictions.

In examining why the predictive models over- or underestimated effective competition rates for particular states or MCCs, the study team discovered that there are major discrepancies in rates of effective competition within different categories of the DoD contracting portfolio between states and between MCCs. Those states and those MCCs who have higher- or lower-than-average rates of effective competition for particular categories of the DoD contracting portfolio warrant further analysis, to determine whether the difference is the result of practices that can either serve as lessons learned or possible areas for improvement. In this regard, the study team believes that this analysis serves as a "cueing" function for deeper, targeted investigation of potential weaknesses in the industrial base, for

example through the Department's highly detailed Sector-by-Sector, Tier-by-Tier (S2T2) initiative, or as a means for targeting analysis of competition-related practices at certain contracting commands.

Literature Review

Competition in the defense acquisition system is widely advocated within both government and industry, and it remains a major thrust of policy directives issued by both Congress and departmental leadership. This literature review seeks to address several important topics that are shaping the current competition discussion by identifying the key findings from, and limitations of, existing analytical literature on competition in defense acquisition. By examining research studies and government reports, the review will focus on DoD's recent competition-related promotion and reform efforts since 2000, findings on the advantages and drawbacks of competition in different phases of the acquisition process, and various factors that the literature identifies as influencing levels of competition, including who is awarding the contracts and what type of system is being acquired.

Current State of the Academic Literature on Defense Competition

Much of the literature that does exist on defense competition is from government oversight sources, such as the Government Accountability Office (GAO) and Congressional Research Service (CRS), or from official DoD reports like the annual competition report. These reports mostly focus on competition at a high level (DoD overall, or by major DoD component), or, where they deal with competition in more specificity, primarily focus on competition for high-profile weapons systems that qualify as Major Defense Acquisition Programs (MDAPs). The focus on MDAPs is also prevalent in the non-governmental literature

While it is understandable that MDAPs would attract the most attention, focusing entirely on high-profile weapons platforms ignores large portions of the DoD contracting portfolio. Critically, these other portions are both the most competitive and also where commercial practices are most likely to be relevant. There is minimal literature discussing the issues particular to competition for DoD services contracts, which accounted for a plurality (46 percent, excluding R&D contracts) of overall DoD contract obligations in 2014. And, while MDAPs accounted for a significant share of overall DoD products contract obligations in 2014, over half of the obligations awarded for DoD products were for non-MDAPs. Past work by CSIS on competition for DoD contracts has attempted to provide a quantitative analysis of competition for the full range of the DoD contracting portfolio. This study represents a continuation of that effort.

Recent DoD Efforts to Promote Competition

DoD regards competition as a viable tool to bring some of the efficiencies of free market into government investments and service procurement. Accordingly, current Pentagon leadership regularly emphasizes the need to introduce and maintain competition within the acquisition process. In the recently published "Guidelines for Creating and Maintaining a Competitive Environment for Supplies and Services" DoD leadership implores its contracting officers to embrace competition "because it works. Competition, direct or indirect, is the most effective motivator for industry to reduce costs and improve

performance."[2] To various degrees, competition has been a policy objective of the U.S. government for decades.

The use of competition in weapon systems acquisition is widely advocated in policy statements, anchored in statute, and supported by the rules and regulations issued by both Administration officials and DoD. The Competition in Contracting Act (CICA) of 1984 requires U.S. federal government agencies to arrange for competition in their procurement activities subject to a short list of exceptions unless otherwise authorized by law.[3] Under CICA, competition can include competing bids "after exclusion of sources," such as when agencies engage in set-aside acquisitions for small businesses.[4] The theory behind the legislation was that more competition would reduce costs and improve performance. Competition after excluding sources was intended to ensure access to the vibrancy and innovative capacity of small businesses in Federal contracting.

In more recent years, pressure for competition has increased from both the executive and the legislative branches. The White House was intent on reforming the acquisition marketplace by checking schedule slippages, encouraging the use of fixed-price contracts, and promoting competition. On March 2009, President Obama signed a Memorandum that directed the Office of Management and Budget (OMB), to develop and issue government-wide guidance, inter alia, that promotes the optimal "use of full and open competition and other competitive procurement processes."[5]

Congress, which has been very much concerned with cost, waste, and schedule issues in the acquisition system, followed up by passing the Weapons Systems Acquisition Reform Act (WSARA) on May 22, 2009, which directed the Department of Defense to develop and implement measures that encourage greater efficiency and better performance by Defense vendors, as well as more competition during the acquisition process. Section 202 of this law requires the development of competitive acquisition strategies using one or more of several approaches such as prototyping, dual-sourcing, funding of a second source for next generation technology, utilization of open architectures to ensure competition for upgrades, periodic competitions for subsystem upgrades, and licensing of additional suppliers.[6] In response to the President's directive in October 2009, the Office of Federal Procurement Policy in OMB published its guidance to federal acquisition officials that summarized the steps that departments and agencies should take to increase competition and improve the structure of contracts.[7]

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[2] Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, "Guidelines for Creating and Maintaining a Competitive Environment for Supplies and Services in the Department of Defense," 2014, 1.
[3] The Competition in Contracting Act (CICA) was enacted as part of the Deficit Reduction Act of 1984, P.L. 98-369, §§ 2701-2753, 98 Stat. 1175 (1984). It amended the Armed Services Procurement Act of 1947; Federal Property and Administrative Services Act of 1949; Office of Federal Procurement Policy Act of 1974; and Truth in Negotiation Act (TINA) of 1962. It also created a statutory basis for the bid-protest function of the GAO.
[4] Ibid.
[5] The White House Office of the Press Secretary, "Memorandum for the Heads of Executive Departments and Agencies, Subject: Government Contracting," 2009.
[6] Weapons Systems Acquisition Reform Act of 2009, P.L. 111-123, §§ 202, 123 Stat. 1720 (2009).
[7] Office of Federal Procurement Policy, "Memorandum for Chief Acquisition Officers, Senior Procurement Executives, Subject: Increasing Competition and Structuring Contracts for the Best Results," 2009.

Following in the wake of these measures, in June 2010, Under Secretary of Defense (AT&L) Ashton Carter introduced the first iteration of Better Buying Power (BBP 1.0). BBP 1.0, which was part of a broader DoD Efficiency Initiative, sought to "deliver warfighting capabilities needed within the constraints of a declining defense budget by achieving better buying power for the Warfighters and taxpayer." One of the core elements of this strategy was to promote competition. Accordingly, Under Secretary Carter directed DoD to "avoid directed buys and other substitutes for real competition" and to "use technical data packages and open systems architectures to support a continuous competitive environment." Additionally, the initiative emphasized the importance of increasing small business participation in defense.[8]

In November 2012, Under Secretary of Defense (AT&L) Frank Kendall introduced the second iteration of Better Buying Power, BBP 2.0, which continued to build on efforts to promote effective competition. In order to support this effort, BPP 2.0 further detailed the importance of the following: 1) promoting competition strategic and environments; 2) enforcing open system architectures and effectively managing technical data rights; and 3) increasing small business roles and opportunities. BBP 2.0 also identified the "use of the Technology Development phase for true risk reduction" as an important step in promoting effective competition.[9]

The third iteration of Better Buying Power, BBP 3.0, was officially introduced in April 2015 and provided the most detailed BBP directive for promoting competition, with both general guidance and specific actions. In addition to the familiar support for creating competitive environments and increasing small business participation, BBP 3.0 sought to "improve DoD outreach for technology products from global markets." Recognizing that a significant source of innovation now came from beyond the U.S., BBP 3.0 emphasized the importance of "establishing a centralized process that integrates and provides awareness of global technology" as a way of continuing to improve competition for DoD acquisitions.[10]

What are the Costs and Benefits of Competition?

Understanding the benefits and costs of competition is key to predicting where it is more or less likely to occur. The basic argument for competition in defense procurement is that it reduces the cost of purchasing goods and services. Advocates of competition point to significant benefits. These benefits

[8] Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, "Memorandum for Acquisition Professionals, Subject: Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending," 2010.

[9] Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, "Memorandum for Defense Acquisition Workforce, Subject: Better Buying Power 2.0: Continuing the Pursuit for Greater Efficiency and Productivity in Defense Spending," 2012.

[10] Honorable Frank Kendall, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, "Better Buying Power 3.0 Interim Release," 2014. See also Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. Guidelines for Creating and Maintaining a Competitive Environment for Supplies and Services in the Department of Defense. December 2014.

are summarized in DoD's Guidelines for Creating and Maintaining a Competitive Environment for Supplies and Services in the Department of Defense[11]:

> 1. Competition creates an incentive for contractors to provide goods and services at a lower price (economic efficiency);
>
> 2. Competition spurs innovation of transformational technologies, which allows the Department to field the best weapon systems for our warfighters quickly;[12]
>
> 3. Competition yields improvements in the quality of products delivered and services rendered (firms that turn out low quality are driven out of the market and are unable to effectively compete);[13]
>
> 4. Competition affords the Department the opportunity to acquire performance improvements (e.g., faster, lighter, more sustainable) by using "best value" source selection criteria;[14]
>
> 5. Competition provides opportunities for capable small businesses to enter new markets;
>
> 6. Competition enhances (or maintains) a strong defense industrial base which provides an operational surge capability to handle demand spikes, and;
>
> 7. Competition curbs fraud by creating opportunities to re-assess sources of goods and services reinforcing the public trust and confidence in the transparency of the Defense Acquisition System.

Scott Chandler echoes these views, asserting that competition is a "powerful tool for achieving cost effective acquisition," for it "encourages research and innovation; new services, products and uses; and increase quality, reliability and performance from suppliers."[15] However, he also expresses skepticism about current efforts and argues that DoD is failing to meet competition goals because it is unable to attract sufficient vendors. However, Jesse Ellman has shown that much of the decline discussed in Chandler's piece can be attributed to a decline in competition with only a single offer.[16] The decline in obligations for contracts that received only one offer shows that while DoD places great emphasis on competition, contracting officers have at least partially adopted the view of Arena and Birkler of RAND:

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[11] Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, "Guidelines for Creating and Maintaining a Competitive Environment for Supplies and Services in the Department of Defense," 2014.

[12] Jacques S. Gansler, William Lucyshyn, and Michael Arendt, "Competition in Defense Acquisitions," University of Maryland Center for Public Policy and Private Enterprise, 2009, 2.

[13] Ibid., 4.

[14] Ibid., 5.

[15] Scott E. Chandler, "Rethinking Competition in Defense Acquisition," Lexington Institute, 2014, 1.

[16] Jesse Ellman, "Quality of Competition for Defense Contracts under 'Better Buying Power'," Center for Strategic and International Studies, 2014.

"in some cases (especially in the procurement of major systems where the nonrecurring cost is large) it may be less costly for the government to forgo competition and to rely on a single supplier."[17] Given the range of benefits discussed above, why should it be the case that sometimes a sole source is cheaper? The most straightforward answer is that due to the high technology and the defense-specific nature of many products and services acquired by DoD, there is often only one qualified offeror available. Beyond that, competition does have transaction costs. If the contracting officer is satisfied that they already have one reliable supplier, then the additional effort required to develop transparent and fair competitive criteria, the labor required to evaluate the qualifications of any additional producer, and the caution required to avoid bid protests all may prompt hesitation. All three of these factors also have a cost in time, which is particularly troubling during ongoing operations. In addition, the listed costs are all apparent in the short run, while the benefits of competition are often more uncertain and, in some cases, would only occur after the contracting officer has likely moved on to a new post.[18]

Competition can also result in problems on the vendor-side, if vendors make unrealistically low offers in an effort to win. Joachim Hofbauer et al. found evidence of this phenomenon in a paper that examined costs overruns in 92 active and 12 cancelled MDAP programs. They found that "perhaps surprisingly, full and open competition with multiple bidders performs on average worse than no or unclear competition."[19] This result did not hold when multiple offers were received after the exclusion of possible sources. The authors found additional evidence suggesting that unrealistic cost estimates were to blame. "Based on the SAR's data, this can be attributed to full and open competition with multiple bidders having the highest percentage of estimating variance of any of the categories."[20]

Allen Friar drew on the Hofbauer study, along with four others, to reach a broader conclusion: "The ability of competition to help control cost is limited to the ability of the government to adequately define and price their requirement based on the capabilities that exist in the market place. If the required technology doesn't really exist or if only one source can potentially provide the item or service then competition can't even help control the initial cost let alone the final cost."[21]

There is no single, clear answer from the literature reviewed as to whether DoD use of competition is effective and to what extent additional competition would result in better acquisition results. However, the principles of when competition will be most effective and when it will be costly are less controversial, even as specific cases are hotly contested.

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[17] Mark V. Arena and John Birkler, "Determining When Competition Is a Reasonable Strategy for the Production Phase of Defense Acquisition," RAND Corporation, 2009, 1.
[18] Ibid., 12.
[19] Joachim Hofbauer, Gregory Sanders, Jesse Ellman, David Morrow, "Cost and Time Overruns for Major Defense Acquisition Programs," Center for Strategic and International Studies, 2011, 12.
[20] Ibid.
[21] Allen Friar, "The Limits of Competition in Defense Acquisition," Defense Acquisition University Research Symposium, 2012, 5.

Differences in Contracting Practices Based on Who is Doing the Contracting

Competition in DoD acquisition is also a function of the singular role that government plays in the acquisition marketplace. Within the commercial marketplace, market participants share certain characteristics: they generally offer similar goods and services that can be substituted for one another. In contrast, the government acquisition market is defined by vendors who share an ability to do business with a single customer—the government—but offer unique, high technology products and typically compete on a "winner takes all" basis.[22] The defense acquisition market is distinctive in that the DoD is not only often the sole buyer of goods from certain firms but also directly involved in regulating the market itself.

While the defense market is considered to be a monopsony market, with the government as the sole buyer, the DoD's market power–its ability to affect the market price of purchased goods—is not unlimited. The DoD is not a unitary buyer; rather, it constitutes many program offices that function as the actual customers of defense firms. In this sense, a monopsony model may not be an accurate lens for looking at the defense industry.[23] Still, the emphasis on joint programs and common acquisition policies regulations over the past several decades allows DoD some of the advantages of a monopsony customer.[24]

Looking beyond DoD as a unitary entity, previous CSIS analysis of trends in defense competition has shown significant variation in rates of competition between the different major DoD components. Since 2008, Army contract obligations have been competed at a rate near or higher than the rate for overall DoD contract obligations, while the rates of competition for the Navy and Air Force have been significantly lower than for overall DoD and have, additionally, been declining. Within the major DoD components, there are also significant differences in rates of competition for different areas of the defense contracting portfolio; in the Air Force, for example, the rate of competition for services was more than 20 percentage points below the rate for overall DoD services.[25]

See Section 1 of this study for more discussion of differences in competition for defense contracts based on the DoD component that is doing the contracting.

Differences in Competition Based on What is Being Acquired

While much of existing literature focuses on products, particularly weapon systems, the acquisition of services does play a substantial role in the total DoD acquisition regime. CSIS analysis shows that contract obligations for services have accounted for the largest share of overall DoD contract obligations in every year since 2009, and were consistently nearly equal to the share awarded for products since at

[22] John Driessnack and David King, "An Initial Look at Technology and Institutions on Defense Industry Consolidation," Marquette University, 2004, 65-66.
[23] William E. Kovacic and Dennis E. Smallwood, "Competition Policy, Rivalries, and Defense Industry Consolidation," *Journal of Economic Perspectives*, 1994.
[24] Driessnack and King, 70.
[25] Jesse Ellman, "Quality of Competition for Defense Contracts under 'Better Buying Power'," Center for Strategic and International Studies, 2014, 3.

least 2000. The services DoD buys represent a wide range of deliverables; some, such as lawn care, can be effectively sourced from the commercial market, while others such as science, engineering, and technical advising services often require defense domain-specific expertise.

Recent acquisition reform efforts have emphasized a desire to manage services as aggressively as high value weapon systems. Whereas weapons systems programs attract senior level management involvement and oversight, services generally do not exhibit corresponding management involvement or oversight. [26] In practice, services contracts have higher rates of competition than contracts for R&D or products.[27]

Competition in the Defense Contracting Portfolio

Using data from the publicly-available Federal Procurement Data Systems (FPDS), CSIS has conducted extensive analysis on trends in competition for defense contracts. One of the main findings has been that overall DoD competition rates, which have been largely steady in recent years, mask significant differences in rates of competition in different areas of the defense contracting portfolio. The rate of effective competition for defense services has consistently remained near two-thirds since the mid-2000s, while the rate of competition for defense products has remained near one-third over that same period. [28]

Even within products and services, there are significant differences in rates of competition between different categories of products and services. As discussed in Section 1 of this report, two categories of services (medical services and facilities-related services & construction) have seen rates of competition consistently higher than the rates for overall DoD services since 2000, while the other three categories have seen rates consistently lower over that same period. Similarly, the categories of products that are primarily comprised of platforms, systems, and subsystems have mostly seen rates of effective competition lower than the (already low) rate of competition for overall DoD products, while the rate for categories primarily composed of commodities and commercial goods has consistently exceeded the overall DoD products rate.

See Section 1 of this study for a more detailed discussion of differences in the competitiveness of different areas of the defense contracting portfolio.

Competition in Production for Weapon Systems

While the government has a clearly stated preference for competition when available, the government is often reliant on the original developers for long periods of time when it comes to producing weapon systems. In some cases, due to extraordinary requirements, there may have been only one developer available when a project was first started. In other cases, multiple vendors were available, but the

[26] Ashton Carter, "Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending," Office of the Secretary of Defense for Acquisition, Technology, and Logistics, 2010.
[27] Jesse Ellman, "Quality of Competition for Defense Contracts under 'Better Buying Power'," Center for Strategic and International Studies, 2014, 4.
[28] Ibid.

government chose only one winner and did not take on the costs necessary (in terms of dual-sourcing or acquiring full technical data rights) to allow other vendors to participate in the production phase.[29]

According to Area and Birkler, "at almost every phase in the acquisition cycle and for almost every kind of competition, adding a second competitor requires current-year investment above what a sole-source would cost. During the planning phase, such funds are relatively small in absolute terms. However, when the program moves to the production phase, the magnitude of the funding required for a second, competitive source becomes large relative to program costs and in absolute terms, reaching tens or hundreds of millions of dollars."[30] The amount of time it takes to authorize a second production source, along with the resulting risk of extending program length, can lead to these raised program costs. Adding contractors to the program increases the amount of overall work for the program office, especially when the contracts are cost-based rather than fixed-price.[31] Justifying the up front cost of competition, therefore, can be challenging for DoD . Even after arranging funding, money for competitive programs is a prime target in a budget squeeze, and initial high-level support for competition may evaporate.

RAND's 2009 report, "Determining When Competition Is a Reasonable Strategy for the Production Phase of Defense Acquisition," offers a contemporary examination of cases in which the government might opt for competition during the production phase of the procurement process. Previous research on this topic had been largely inconclusive, in part because the different analytical methods used to estimate the cost benefits of competition in production can yield drastically different results, even when analyzing the same data. A 1981 RAND study[32] utilizing several analytic tools to estimate the cost benefit of a second production source in the development of the Shillelagh missile, for example, showed that the tools' estimates ranged from a cost savings of 79 percent to a cost increase of 14 percent. Moreover, cost reductions caused specifically by the introduction of competition or the use of a second producer in the production phase of procurement can be extremely difficult to isolate and quantify, as they are frequently camouflaged by other program factors.[33]

Using historical data collected from previous RAND studies and RAND's required cost reduction (RCR) methodology, the authors in the 2009 report developed a model that estimates the likelihood that the government would break even if it were to introduce and invest in a competitive second producer. This model furthermore determines whether the cost reductions achieved by the inclusion of a second producer would outweigh the costs of bringing that second source into the weapons program by

[29] K.A. Archibald, A.J. Harman et al. "Factors Affecting the Use of Competition in Weapon System Acquisition," RAND Corporation, 1981.
[30] Mark V. Arena and John Birkler, "Determining When Competition Is a Reasonable Strategy for the Production Phase of Defense Acquisition," RAND Corporation, 2009, 9.
[31] Ibid.
[32] K.A. Archibald, A.J. Harman et al. "Factors Affecting the Use of Competition in Weapon System Acquisition," RAND Corporation, 1981.
[33] Mark V. Arena and John Birkler, "Determining When Competition Is a Reasonable Strategy for the Production Phase of Defense Acquisition," RAND Corporation, 2009.

calculating the percentage of savings in the production phase that would be needed to offset the incremental investment of a second competitive producer.

Applying the model to several high-profile acquisition programs, the authors found that the type of system being developed influences whether, and how much, a second competitor achieves a cost savings for DoD. Specifically, second producers of electronics have been more likely to achieve production cost savings than second producers of ships and missiles. Additionally, their research suggests that competition "is more reasonable in situations where both nonrecurring costs are low and cost improvement is minimal," "where a greater number of units will be produced," and where "there is at least a 50-50 chance of achieving savings."[34]

Focus Areas Supported by the Literature Review

Existing literature provides a firm grounding for using a product or platform type as key criteria when predicting levels of expected competition. Past CSIS research clearly establishes that the prevalence of competition varies greatly based on what is being purchased.[35] This unsurprising result reflects the fact that defense firms are often highly specialized and only one vendor is available for many major projects. RAND's 2009 work shows that these variable competition rates not only reflect the number of available vendors but also the contracting officers' determination as to whether a second competitor would be worth the cost.

Building upon this foundation, this study digs more deeply into available data on competition for DoD contracts. Instead of focusing on competition for DoD overall, or competition for the major DoD components, this study looks at competition at the MCC level as well as by place of performance (at the U.S. state level). In this way, the study team is expanding the breadth of the literature on defense competition by continuing to build evidence that trends in defense competition are driven not at the overall DoD or even major component level, but rather by decisions at lower levels, differences in the strength of the industrial bases in different areas of the country, and variations in how different MCCs approach utilizing competition in their own contracting portfolios.

[34] Ibid., 19-20.

[35] Jesse Ellman, "Quality of Competition for Defense Contracts under 'Better Buying Power'," Center for Strategic and International Studies, 2014, 4-7.

I. Overall Defense Competition Trends

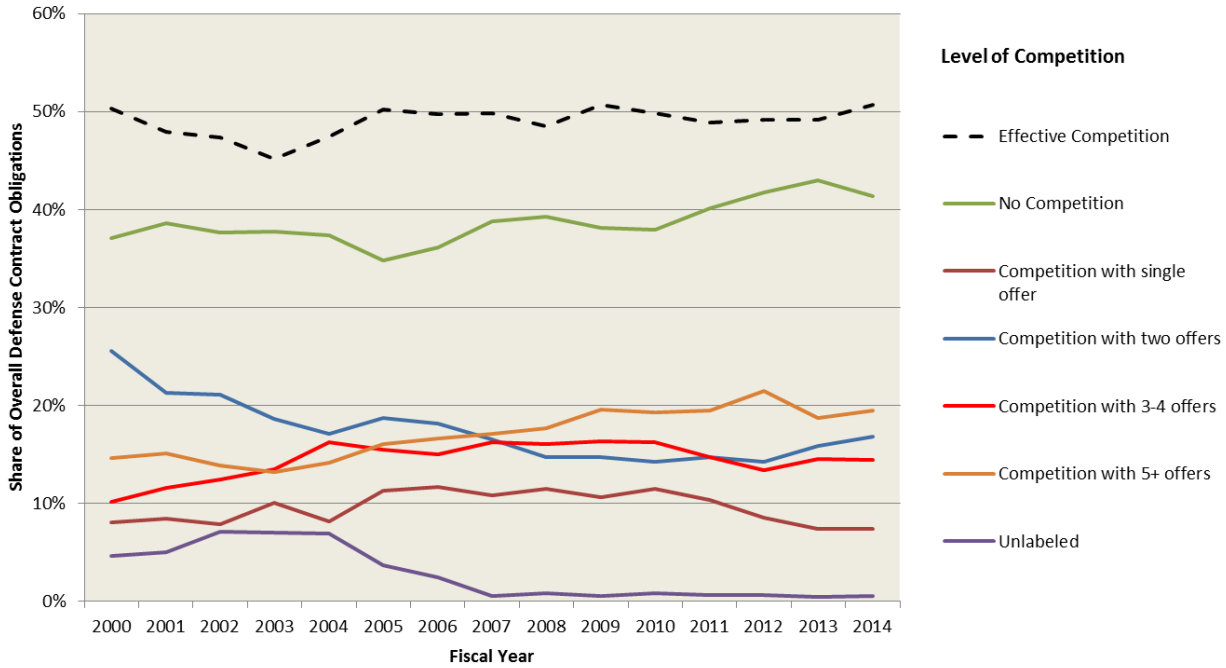
Over the past decade, CSIS has done extensive work tracking trends in competition for defense contracts, for DoD overall, for its major components, and by category of what is being contracted for delivery. While this analysis intends to dive a level deeper into the data on defense competition, some discussion of overall competition trends can provide important context for the analysis that follows.

The study team follows the DoD methodology and calculates competition by using two fields: extent of competition (which is preferred for awards) and fair opportunity (which is preferred for most IDVs). Additionally, to better evaluate the rate of "effective competition," the study team categorizes competitively awarded contracts by the number of offers received. As mentioned in the introduction, CSIS considers "effective competition" to be competitively sourced contracts that are awarded after receiving two or more offers; the study team considers it likely that competitively sourced contracts that receive only one offer are not receiving the full intended benefits of competition. While competitive pressures can and frequently do exist even in contracting scenarios involving less than two offers, the existence of at least two offers still represents a reasonable baseline standard for assessing the degree to which the full benefits intended as a result of the policy preference for competition are likely to be achieved.

Overall DoD

Figure 1-1 shows trends in competition for overall DoD contract obligations between 2000 and 2014.

Figure 1-1: Overall Defense Contract Obligations by Level of Competition, 2000–2014



Source: FPDS; CSIS analysis

As the figure shows, the rate of effective competition for defense contracts has been remarkably consistent in the 2000–2014 period, remaining between 49 percent and 51 percent in every year since 2005, and never falling below 45 percent or exceeding 51 percent. The overall level of competition for DoD contract obligations has remained largely unchanged, despite consistent high-level policy efforts in recent years to increase competition in defense contracting. Within those effectively competed contract obligations, however, there has been a modest, but notable shift: in 2000, the largest share of effectively competed contracts was awarded after receiving two offers, but by 2007 and in every year since, the largest share was awarded with 5+ offers. So while the overall share of contract obligations awarded after effective competition has not increased, there is some evidence that the quality of that competition (as measured by number of offers received) has increased somewhat.

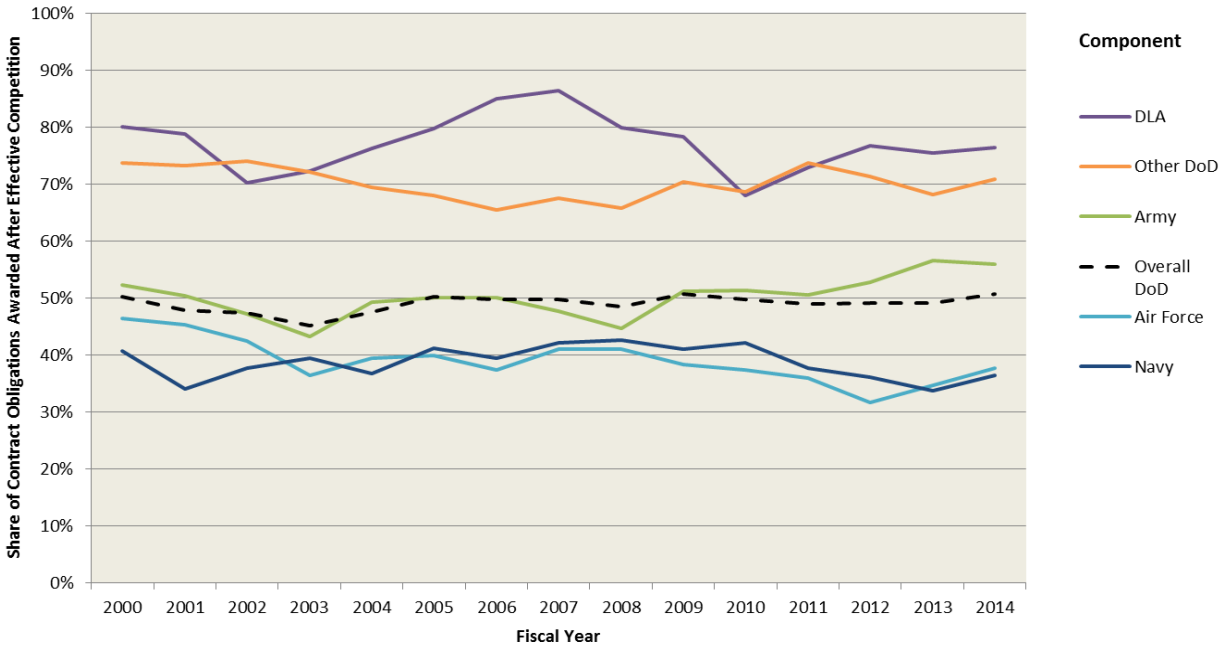
The share of contract obligations awarded after competition with a single offer has declined significantly in recent years, from 11 percent in 2010 to 7 percent in 2013 and 2014, in line with recent DoD guidance to reduce the instances of competitively sourced contracts awarded after receiving only one offer.

While trends in competition for DoD overall have been fairly consistent, this obscures significant differences in levels of competition between the major DoD components and differences based on what is being contracted for delivery. The sections that follow will examine those differences in some detail.

By Major DoD Component

Figure 1-2 shows the rate of effective competition for defense contracts, broken down by major DoD component: Army, Navy, Air Force, the Defense Logistics Agency (DLA), and "Other DoD," which includes all other contracting offices not captured by the first four categories.

Figure 1-2: Rate of Effective Competition for Defense Contract Obligations, by Component, 2000–2014



Source: FPDS; CSIS analysis

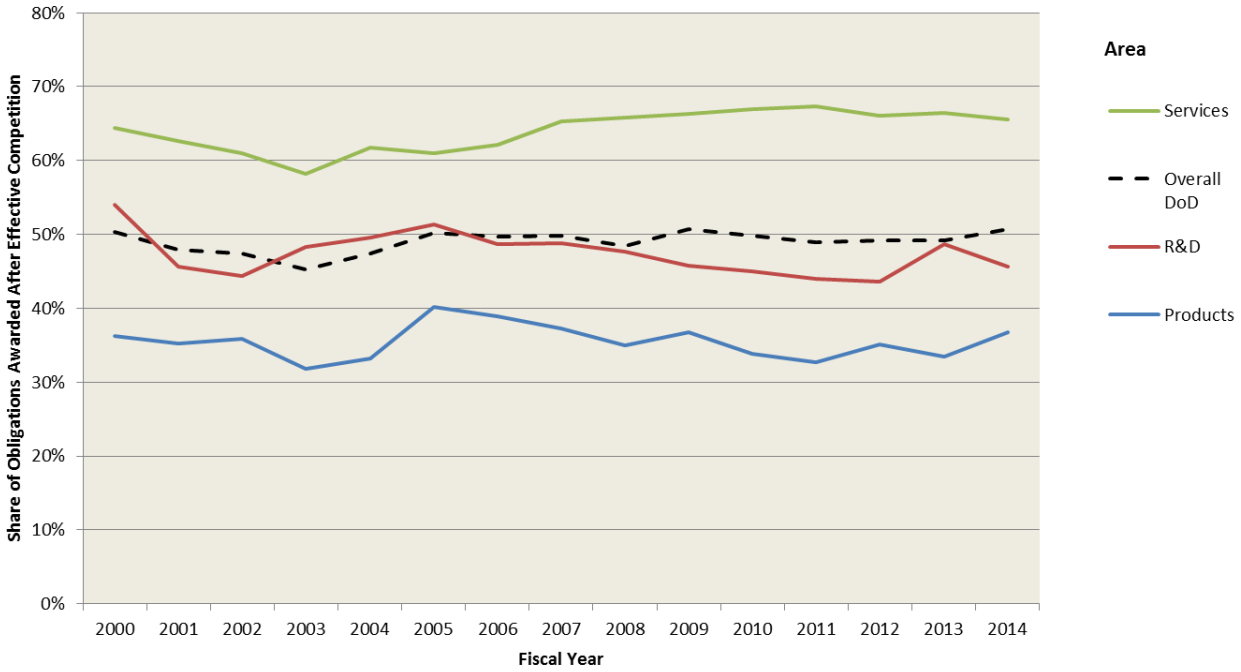
As the figure shows, there are major differences in the rates of effective competition between the major DoD components. Both the Navy and the Air Force have seen rates of effective competition well below the rate for overall DoD throughout the period observed. The rate of effective competition for Navy contract obligations hovered near 40 percent for most of the 2000s, but has declined since, reaching a low of 34 percent in 2013. The rate of effective competition for Air Force contract obligations was 46 percent in 2000, but declined precipitously in the early 2000s, hovering around 40 percent throughout the 2000s and the first years of the 2010s, declining sharply to 32 percent by 2012. The Air Force effective competition rate has rebounded somewhat over the last two years, however, rising to 38 percent by 2014. The low rates of effective competition for both the Navy and the Air Force are not surprising, given the relatively limited industrial bases for both aircraft and ships, and the number of large programs in production (where competition is rare for major weapons platforms) in both services.

By contrast, both DLA and "Other DoD" have seen consistently high rates of effective competition; the contracting inventories of both DLA and "Other DoD" are primarily composed of commodities and commercial goods, so it makes sense that both would see high levels of competition. The Army, meanwhile, has seen rates of effective competition that track closely with the rate for overall DoD contract obligations; the Army's contracting inventory includes more large, complex platforms and systems than either DLA or "Other DoD," but the industrial base supporting those platforms and systems is generally more robust than for the largest Navy and Air Force programs.

By Products, Services, and Research & Development

Figure 1-3 shows the rate of effective competition for DoD contract obligations, broken down by what is being contracted for delivery: products, services, and research and development (R&D), as categorized by government Product and Service Codes (PSCs).

Figure 1-3: Rate of Effective Competition for Defense Contract Obligations, by Products, Services, and R&D, 2000–2014



Source: FPDS; CSIS analysis

Much like effective competition for overall DoD contract obligations, the rates of effective competition for products, services, and R&D have been largely stable over the 2000–2014 period. The rate of effective competition for products has hovered near or slightly above one-third for most of the period observed, while the rate of effective competition for services, which fluctuated near 60 percent for most of the early to mid-2000s, has remained between 66 percent and 67 percent in every year since 2008. R&D, meanwhile, has seen rates of effective competition roughly in line with the rate for overall DoD contract obligations.

This broad stability in rates of effective competition for the three categories of what DoD contracts for, despite significant shifts in what DoD was buying over the period, speaks to broader issues that influence how much competition DoD contracts receive. The study team has done some work on this issue previously, identifying notable differences in the rates of effective competition for products, services, and R&D among the major DoD components.[36] The study team believes that any real conclusions about how to improve competition for DoD contracts will come from even more granular breakdowns of defense competition data; this research effort represents a significant step forward in that effort.

[36] Ibid.

By Product or Service Category

Over the course of prior and current research efforts, the CSIS research team has developed taxonomies of defense contracts, breaking down the overall defense contracting portfolio into categories based on what is being contracted for delivery. The primary taxonomy that the study team uses is based upon government PSCs, and divides defense contracts into five categories of services and 10 categories of products, plus R&D. The following charts will show trends in the rates of effective competition for these product and service categories.

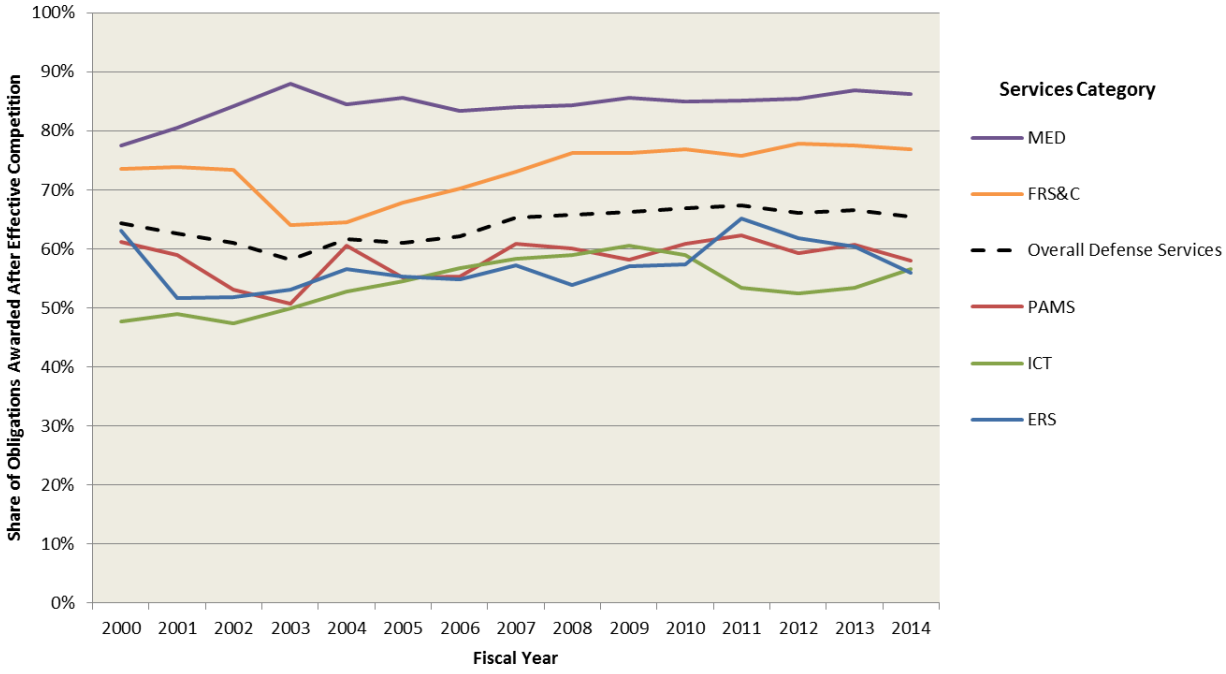
Services Categories

DoD's services contracting portfolio is divided into five service categories:

- Equipment-related Services (ERS)
- Facilities-related Services & Construction (FRS&C)
- Information and Communications Technology (ICT) services
- Medical (MED) services
- Professional, Administrative, and Management Support (PAMS) services

Figure 1-4 shows the rates of effective competition for services contracts in each of these five categories.

Figure 1-4: Rate of Effective Competition for Defense Services Contract Obligations, by Services Category, 2000–2014



Source: FPDS; CSIS analysis

ERS, ICT, and PAMS all have seen roughly similar levels of effective competition through most of the period, fluctuating between 50 percent and 60 percent, consistently below the rate of effective competition for overall defense services. Meanwhile, FRS&C and MED have both experienced rates of effective competition significantly higher than overall defense services.

Products Categories[37]

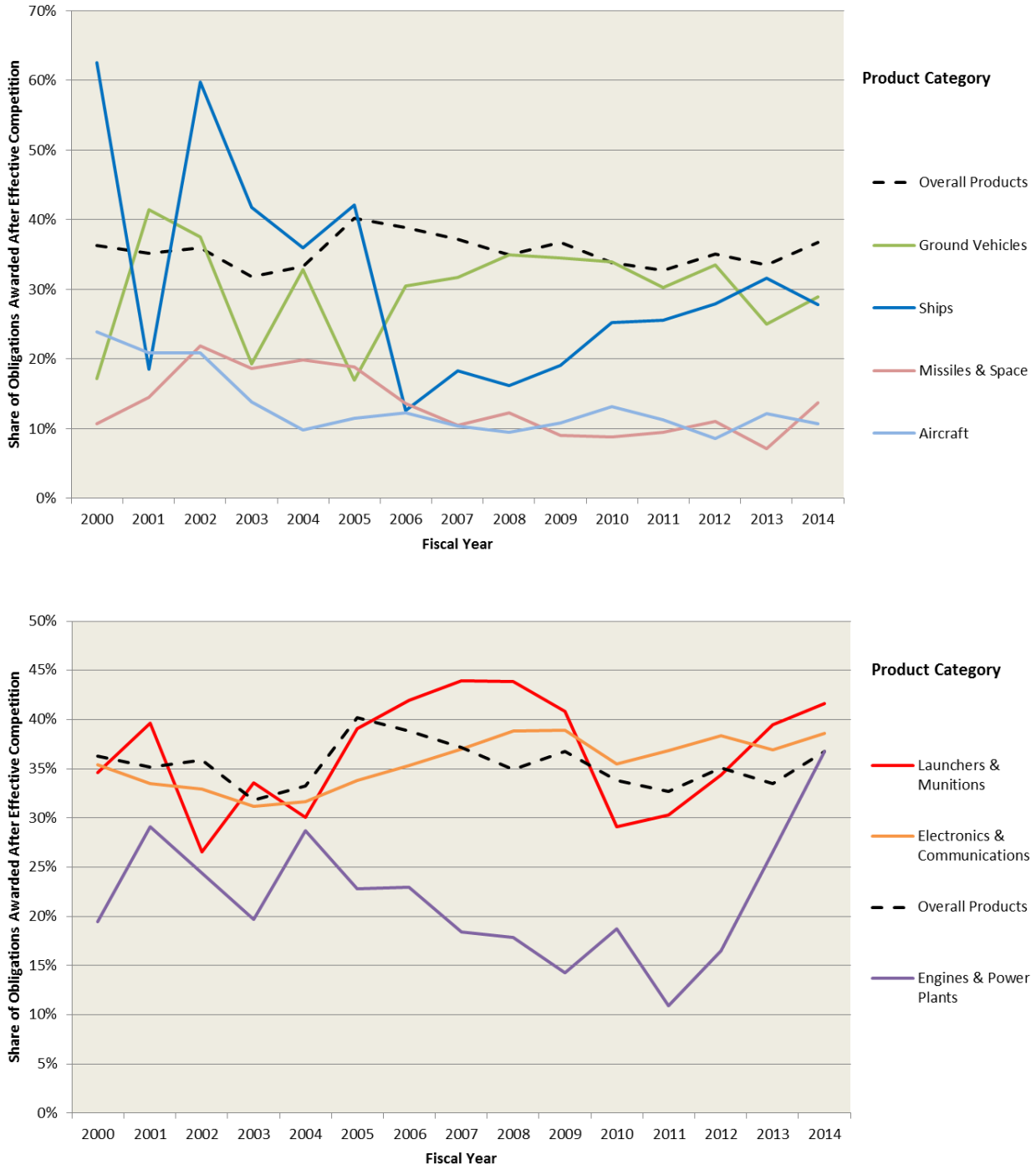
DoD's products contracting portfolio is divided into 10 products categories:

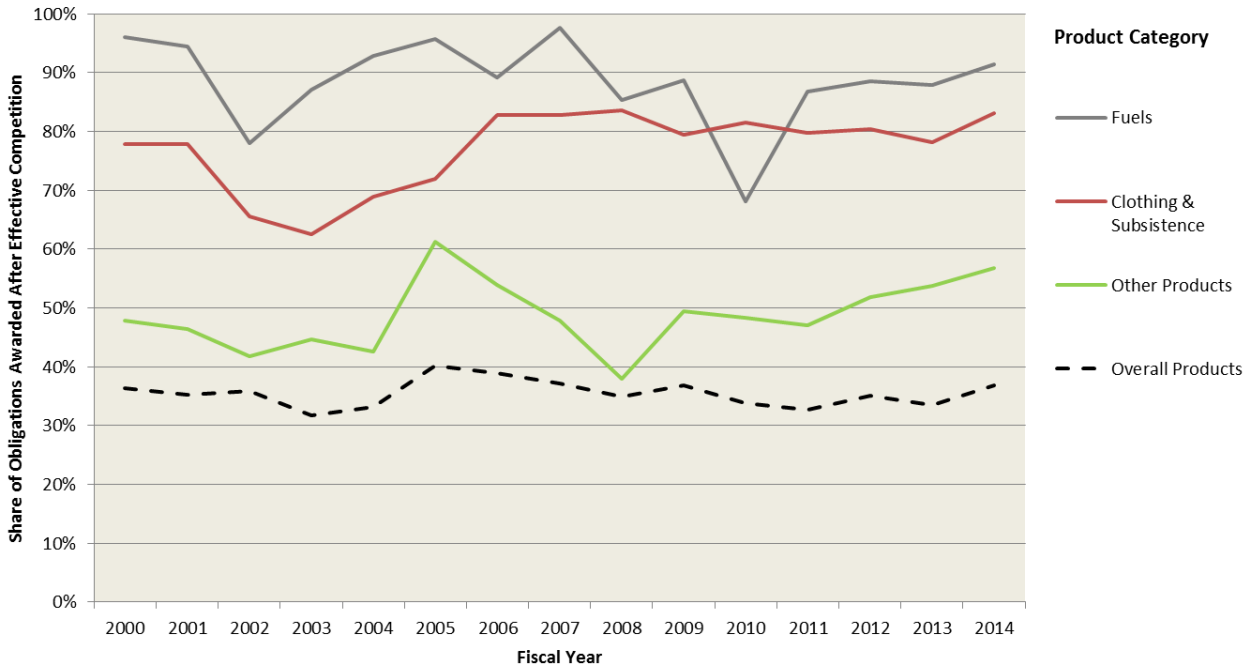
- Aircraft
- Clothing & Subsistence (C&S)
- Electronics & Communications (E&C)
- Engines & Power Plants (E&PP)
- Fuels
- Ground Vehicles
- Launchers & Munitions (L&M)
- Missiles & Space
- Ships
- "Other Products"

Figures 1-5 shows the rates of effective competition for services contracts in each of these 10 categories. For ease of comprehension, the 10 categories are split across three charts, with the dotted line showing the rate of effective competition for overall DoD products for context in each chart.

[37] This section draws from analysis done for a related research effort under this contract, "Analysis of Defense Products Contract Trends, 1990–2014." This analysis is reproduced here to provide context to the discussion of competition trends.

Figure 1-5: Rate of Effective Competition for Defense Products Contract Obligations, by Products Category, 2000–2014





Source: FPDS; CSIS analysis

The first chart of Figure 1-5 shows the four product categories that are primarily composed of major defense acquisition programs (MDAPs). Unsurprisingly, given the technical complexity of these programs and the limited industrial base capable of executing them, the rates of effective competition are quite low. Aircraft and Missiles & Space, in particular, have seen rates of effective competition far below that of overall DoD products, and those rates have declined over the period observed. The rate of effective competition for Ships, meanwhile, has risen significantly in recent years, from below 20 percent from 2006–2009 to 32 percent in 2013. This is likely the result of deliberate decisions to split the procurement of certain high-cost platforms, such as the Littoral Combat Ship (LCS) and Aegis-class destroyers, between two competing shipyards.

The second chart of Figure 1-5 shows effective competition rates for the product categories that are primarily composed of systems and subsystems. The rate of effective competition for E&C remained around one-third through the early and mid-2000s, but has risen since, hovering just below 40 percent in most years since 2007. The relatively low rate of effective competition for E&C is somewhat surprising, but it may be a reflection of the barriers to entry for tech firms that are not traditional defense vendors. Competition with a single offer is a particular challenge in this product category; nearly a quarter of all E&C contract obligations were awarded after competition with only one offer in 2005, and though that rate has declined in recent years, 15 percent of E&C contract obligations in 2014 were awarded after competition with only one offer.

The third chart of Figure 1-5 shows effective competition rates for the product categories that are primarily composed of commodities and commercial goods. Fuels and C&S have seen high rates of effective competition, as would be expected, but the rate of effective competition for “Other Products” has, in most years, only slightly to moderately exceeded the rate for overall DoD products. As with E&C,

single-offer competition remains an issue for “Other Products,” with 14 percent of total obligations awarded after competition with only one offer from 2012–2014.

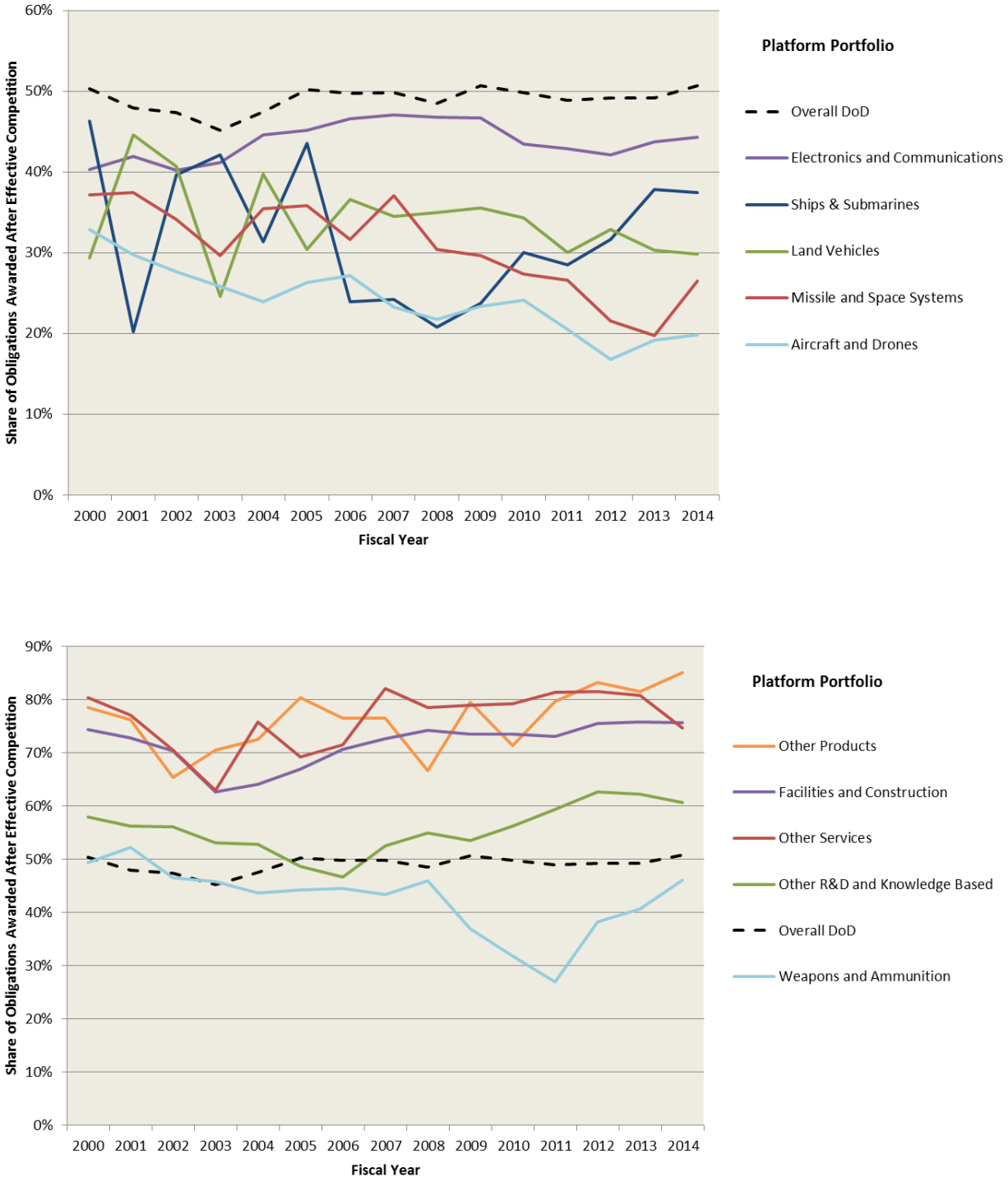
By Platform Portfolio

CSIS has developed platform portfolios as another schema for categorizing defense contract obligations based on what is being contracted for delivery. The base concept of this taxonomy is to focus on types of platforms, and then group together all product, service, and R&D contracts that can be linked to those programs, using both government PSCs and another FPDS field, *ClaimantProgramCode*. There are 10 total platform portfolio categories:

- Aircraft & Drones
- Electronics & Communications
- Land Vehicles
- Missile & Space Systems
- Ships & Submarines
- Weapons & Ammunition
- Facilities & Construction
- Other Products
- Other R&D & Knowledge Based
- Other Services

Figure 1-6 shows rates of effective competition for the 10 platform portfolio categories from 2000–2014. For ease of comprehension, the 10 categories have been divided between two charts within the figure, with the dashed line representing the rate of effective competition for overall DoD contracts in each chart for context.

Figures 1-6: Rate of Effective Competition for Defense Contract Obligations, by Platform Portfolio, 2000–2014



Source: FPDS; CSIS analysis.

The first chart of Figure 1-6 shows the rates of effective competition for the five platform portfolios associated with the largest and most complex DoD programs, which show trends very similar to those of

their related product categories. Aircraft & Drones and Missiles & Space have consistently seen among the lowest rates of effective competition, with those rates declining further over recent years. And as with the Ships products category, the rate of effective competition for the Ships & Submarines platform portfolio has seen a marked increase in recent years, from 21 percent in 2008 to 38 percent in 2013.

The second chart of Figure 1-6 shows the rates of effective competition for the remaining five platform portfolios.

Final Thoughts on Overall DoD Competition Trends

This section provides context for competition trends across the range of who is contracting within DoD and what is being contracted for delivery. In particular, as discussed in the next section, many of the product and service categories and platform portfolios were evaluated for use as variables in the predictive model that forms the core of this research effort. Knowing the degree of effective competition for those categories and portfolios will allow the study team to better understand why a particular state or MCC over- or underperforms its “estimated” rate of effective competition within the model. The overall competition trends therefore help establish a baseline for comparison as context for understanding the significance of the model's predictions.

II. Variables

This section examines the range of variables the CSIS study team considered and evaluated for inclusion in a predictive model of effective competition. CSIS utilized its experience in evaluating trends in defense contracting to identify variables that might reasonably be assumed to correlate with higher or lower rates of effective competition. The study team then performed a regression analysis on each variable with Effective Competition (the dependent variable for this study) in order to determine both the presence and direction of a correlative relationship. This analysis was done for the two contracting data groupings that this research effort focuses on:

- Place of Performance - States: This breakdown examines in which state a contract is to be performed. This is done by using each state as an observation and aggregating the data from each state for each variable over the period from 2000 to 2013. This can provide indications of the vibrancy of the industrial base available to perform contracts activity within a particular state.[38]
- Major Contracting Command (MCC): Going a level below the analytic level of "component," this breakdown allows for analysis of how successful different major contracting commands have been in promoting effective competition relative to the goods or services for which they are contracting and the types of contracts for which they are responsible. This is done by using each MCC as an observation and aggregating the data from each MCC for each variable over the period from 2000 to 2013.

For each variable considered, this section will provide a brief description, an analysis of the distribution of contract obligations with that variable among the MCCs and states, and the relationship between that variable and effective competition. The variables are divided into four categories:

- Dependent Variable
- Contract Characteristics
- Product or Service Categories
- Platform Portfolios

Dependent Variable

Effective Competition

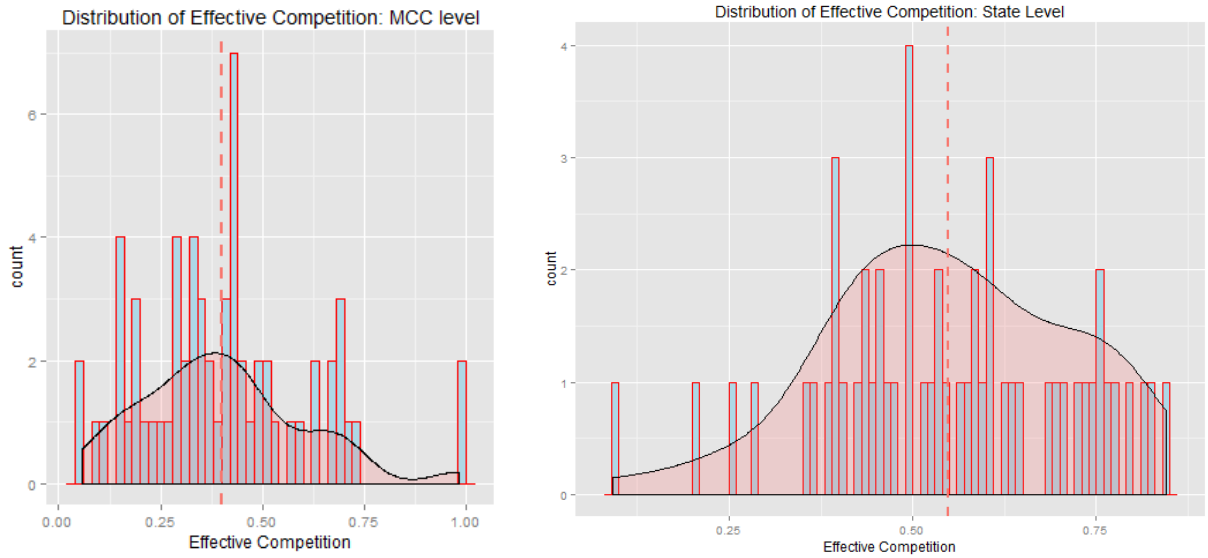
Effective competition, defined as the total obligated value of all competitively sourced contracts that received two or more offers divided by the total obligated value of all contracts, is the measure of value that this study uses to estimate effective competition in defense contracting. As the study team's dependent variable, the following analyses use the collected data to estimate how different

[38] Because the issues involved with competition for contracts performed overseas and/or in contingency environments are notably different than those for most domestically performed contracts; contracts whose place of performance is outside the United States are excluded from the "place of performance" analysis. CSIS will consider whether and how foreign countries should be included for future iterations.

characteristics of defense contracting affect effective competition. Before defining the model, effective competition and the other variables estimated to impact effective competition will be examined in order to understand the magnitude of the relationships and robustness of the model.

As seen in the previous section, there are significant variations in rates of effective competition based on both what components within DoD are doing the contracting, and based on what is being contracted for delivery. A core assumption of this research effort is that there is some level of disparity in rates of effective competition between different states and different MCCs. Figure2-1 displays the distribution of effective competition at the MCC level and at the state level.

Figure 2-1: Distribution of Effectively Competed Contracts, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of the effective competition rate is skewed to the right with a mean of 40 percent, a median of 39 percent, and a range from 6 percent to 98 percent. At the State level, the distribution is more normally distributed with a mean of 55 percent, a median of 54 percent, and a range from 1 percent to 84 percent. In order to make predictions about the data for effective competition, it is important to understand what the average for effective competition is. Since the distribution for effective competition at both the MCC and State level is not a perfect normal distribution, the mean, median, or mode can describe the average of effective competition. With this in mind, the impact that the predictive variables are estimated to have on effective competition all have to be analyzed with these distributions in mind.

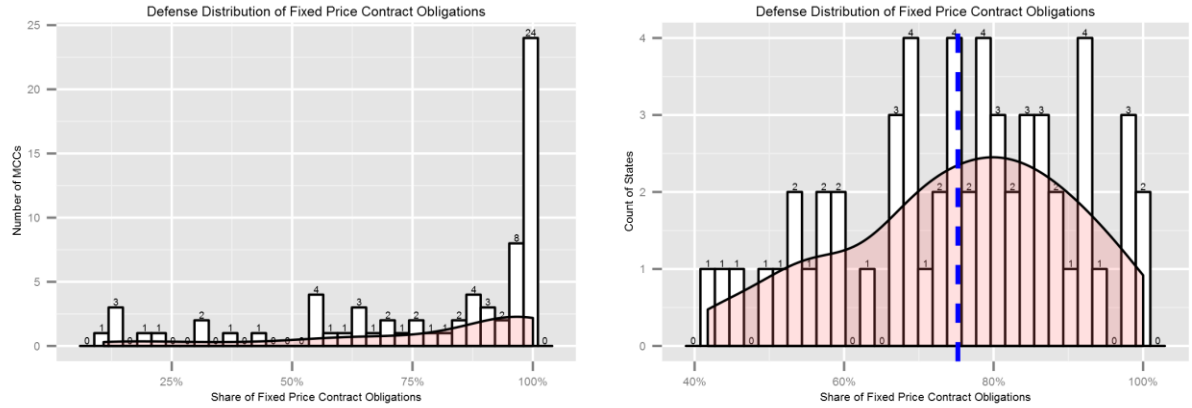
Contract Characteristics

This section examines the relationship between rates of effective competition and four contract characteristics: Fixed Price, Indefinite Delivery Vehicles, and two subcategories of Indefinite Delivery Vehicles: Multiple-Award Indefinite Delivery Contracts (IDCs) and Single-Award IDCs.

Fixed Price

Fixed price refers to a category of contract pricing mechanisms where the cost per unit or rate cost is set in the terms of the contract. This includes both firm fixed-price contracts and other variations, such as fixed price incentive fee. Fixed price is used as a predictor to estimate rates of effective competition. Over the 2000–2014 period, between three-fifths and two-thirds of overall defense contract obligations were awarded under fixed-price contract types in every year. In general, fixed-price contracts are expected to receive more effective competition than cost-reimbursement contract types; fixed-price contracts are traditionally used where requirements are more certain, which indicates lower risk to vendors. Figure 2-2 displays the distribution of FP contract obligations at both the MCC level and state level.

Figure 2-2: Distribution of Fixed-Price Contract Obligations, by MCC and Place of Performance

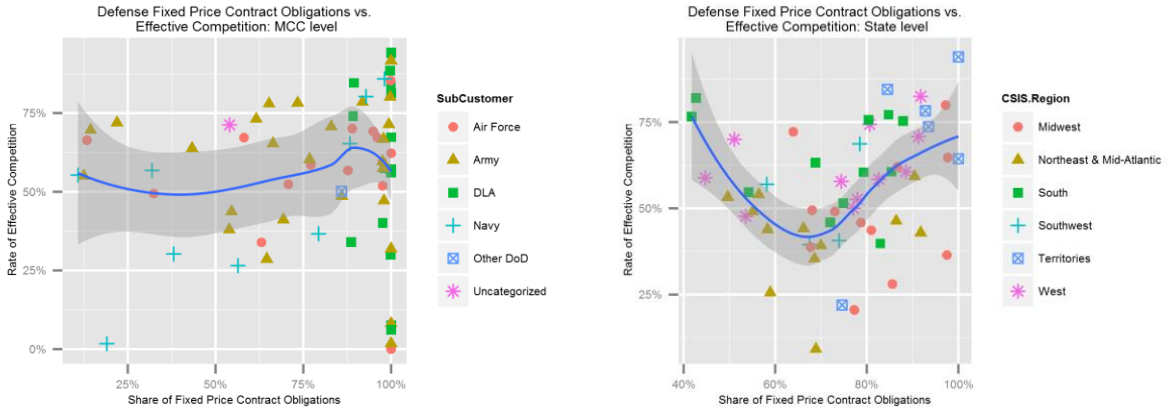


Source: FPDS; CSIS analysis

At the MCC level, the distribution of fixed-price contract obligations is skewed to the left and unimodal. The data range from 10 percent to 100 percent, with a mean of 78 percent and a median of 89 percent. This indicates that, for the majority of MCCs, fixed-price contract obligations account for more than 79 percent of their total contract obligations; the third quartile is at 99 percent, indicating that 25 percent of MCCs see fixed-price contracts for shares equal to or greater than 99 percent. At the state level, the spread of fixed-price contract obligations is more normally distributed, with a mean of 74 percent and median of 77 percent. The distribution is slightly skewed to the left, and ranges from 42 percent to 98 percent.

The predicted relationship between fixed-price contract obligations and effective competition at both the MCC level and state level is displayed in Figure 2-3.

Figure 2-3: Rate of Effective Competition for Fixed-Price Contract Obligations, by MCC and Place of Performance



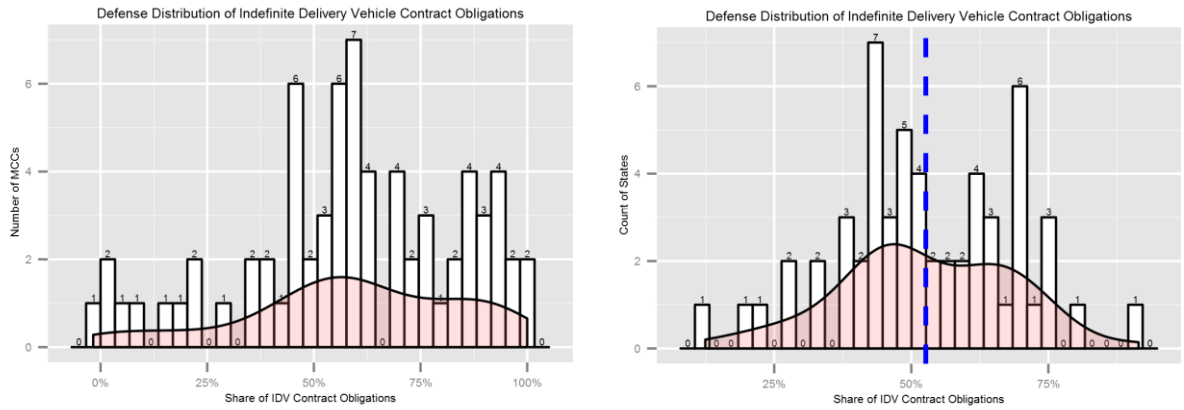
Source: FPDS; CSIS analysis

The predicted relationship between fixed-price contract obligations and effective competition at the MCC level is slightly positive and linear. At the state level, the relationship resembles a positive parabolic function such that effective competition increases as contract pricing mechanism usage within a state becomes less mixed.

Indefinite Delivery Vehicle

Indefinite Delivery Vehicle (IDV), which refers to a number of types of contract vehicle where the duration and/or scope of the contract are not explicitly limited, is used as a predictor to estimate rates of effective competition. Between two-fifths to a half of all DoD contract obligations were awarded under various IDV contract types between 2000 and 2013. In general, IDV contracts see higher rates of effective competition than do definitive contract types, though this is partially a function of the fact that most large weapon system acquisition projects, which are often awarded without competition, are structured as definitive contracts. Figure 2-4 displays the distribution of IDV contracts at both the MCC level and state level.

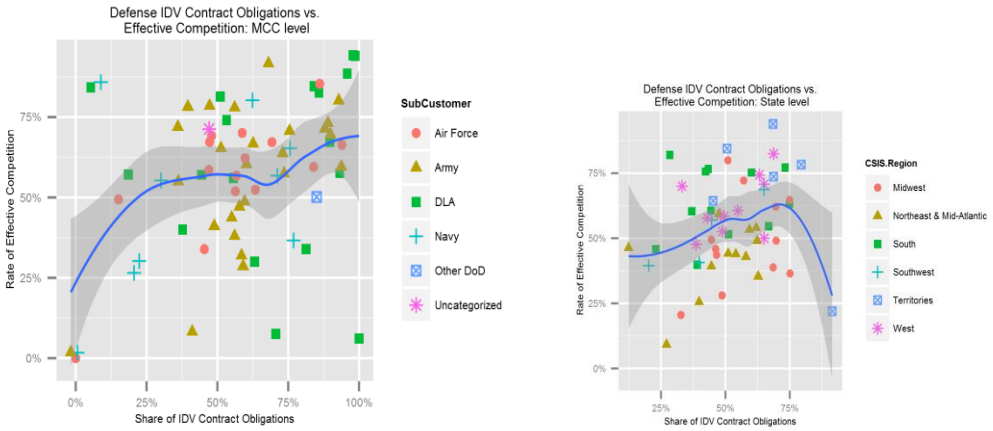
Figure 2-4: Distribution of IDV Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of IDV contracts ranges from 0 percent to 99 percent, with a mean and median of 59 percent. This distribution resembles a normal distribution more than the other predictive variables and, according to the median and mean, has a more concrete average value. Thus, the likelihood of IDV estimating an unbiased and efficient level of effective competition is greater. At the state level, the distribution of IDV contracts ranges from 12 percent to 75 percent, with a mean and median at 51 percent. The state level distribution for IDV is slightly skewed to the left and, similar to the MCC level, resembles a normal distribution more than other variables. The relationship between IDV contracts and effective competition is displayed in Figure 2-5.

Figure 2-5: Rate of Effective Competition for IDV Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the relationship between IDV contracts and effective competition resembles a positive linear function, which matches the general trend of IDV contract types having higher rates of effective

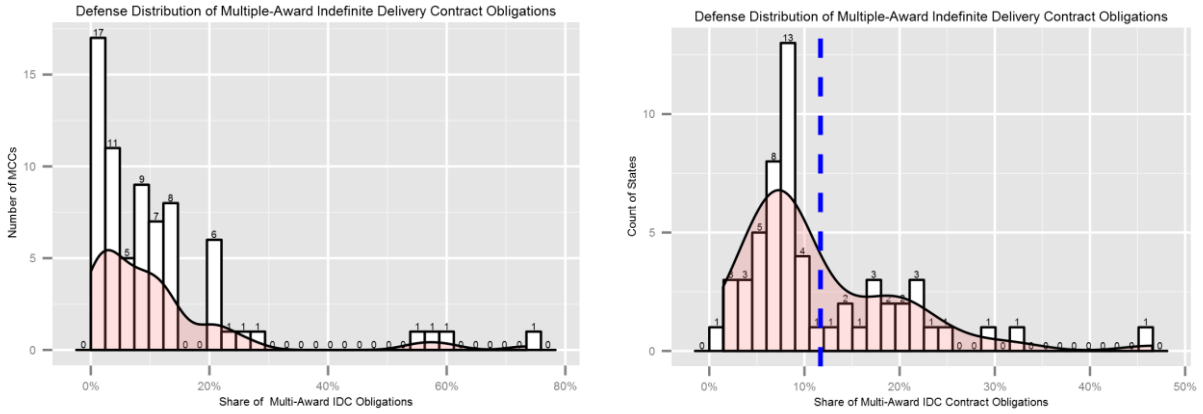
competition than other types of contract vehicles. At the state level, the relationship between IDV contracts and effective competition is negative and parabolic, with higher shares of IDV contract obligations correlating with higher rates of effective competition until around 75 percent, though that is the function of one outlier data point, and is not statistically significant.

The study team also examined single-award IDCs and multiple-award IDCs separately from overall IDVs, in case the differing reporting rules between the two types of contract vehicle led to disparate trends that might be masked while only looking at overall IDVs, a concern that was particularly acute with respect to competition.

Mutiple-Award IDC

Multipe-award IDCs are a type of IDV where vendors compete initially to become prequalified vendors for an IDV contract, and only those limited number of prequalified vendors are permitted to compete for contract actions under that contract. Over the 2000–2014 period, 11 percent of overall defense contract obligations were awarded under multiple-award IDCs, though the share has risen significantly over the period, from 8 percent in 2000 to a high of 16 percent in 2011. Over the 2000–2014 period, 70 percent of multiple-award IDC contract obligations were awarded after effective competition; for that same period, the share of contract obligations awarded after competition with only one offer (16 percent) was more than double the share awarded without competition (7 percent). The distribution of multiple-award IDC contract obligations is displayed in Figure 2-6.

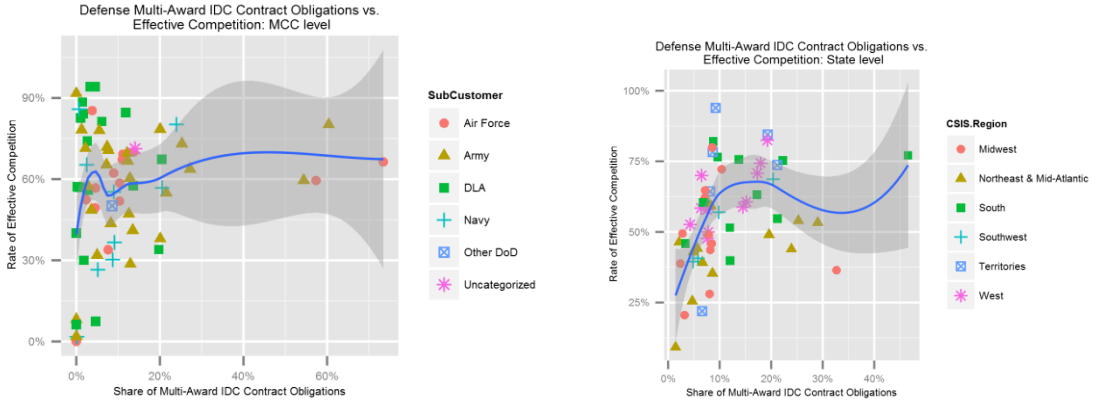
Figure 2-6: Distribution of Multiple-Award IDC Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

For both the MCC and the state level, the distribution of multiple-award IDC obligations is skewed to the right. For MCCs, obligations range from 0 percent to 60 percent, with a mean of 11 percent and a median of 9 percent. For states, obligations range from 1 percent to 47 percent, with a mean of 12 percent and a median of 8 percent. The relationship between multiple-award IDC contract obligations and effective competition displayed in Figure 2-7.

Figure 2-7: Rate of Effective Competition for Multiple-Award IDC Contract Obligations, by MCC and Place of Performance



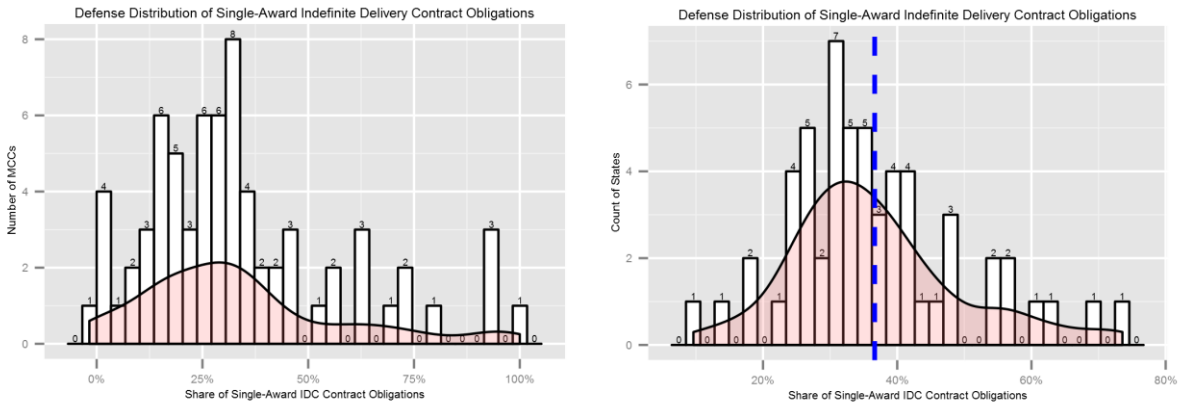
Source: FPDS; CSIS analysis

Once the outliers are accounted for, MCCs show a small positive linear relationship between multiple-award IDC usage and effective competition; that is, as the former increases, the latter also increases. For states, there is a positive linear relatioship at low shares of obligations, with a sinosodal relationship at higher shares that is primarily the result of a few outlier data points.

Single-Award IDC

Single-award IDC contracts are IDV contracts where a single bidder is chosen to perform all contract actions. Between 2000 and 2014, single-award IDCs accounted for 32 percent of overall DoD contract obligations. For the 2000–2014 period, 56 percent of single-award IDC contract obligations were awarded after effective competition. Figure 2-8 displays the distribution of Single-Award IDC contract obligations.

Figure 2-8: Distribution of Single-Award IDC Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

For both MCCs and states, the distribution of contract obligations resembles a normal distribution, with the state level closer to the "ideal" normal distribution. For MCCs, obligations ranged from 0 percent to 94 percent, with a mean of 35 percent and a median of 32 percent. For states, obligations ranged from 10 percent to 64 percent, with a mean of 35 percent and a median of 34 percent. The predicted relationships between single-award IDC contract obligations and effective competition at the MCC and state levels are displayed in Figure 2-9.

Figure 2-9: Rate of Effective Competition for Single-Award IDC Contract Obligations, by MCC and Place of Performance

Source: FPDS; CSIS analysis

At the MCC level, the data show an overall positive linear relationship; as the share of single-award IDC contract obligations increases, effective competition also increases. At the state level, there is a slight positive linear relationship, discounting a few outlier data points.

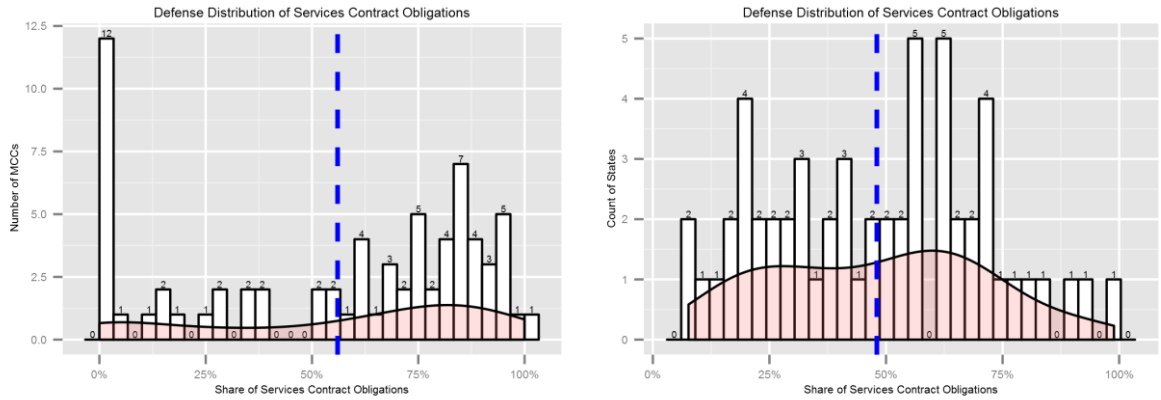
Product or Service Categories

This section examines the relationship between effective competition and a number of product or service categories, as well as overall services contracting.

Services

Government Product or Service Codes (PSCs) are used in FPDS to identify what is being purchased for a particular contract action. DoD defines all codes that start with a letter as Services; CSIS defines Services similarly, except that the CSIS taxonomy separates out what the study team considers to be Research & Development (R&D) into a separate category. Between 2000 and 2013, Services accounted for between 39 percent and 45 percent of overall defense contract obligations in every year. The rate of effective competition for Services overall has been fluctuating around 60 percent in the early to mid-2000s, but has held steady between 65 percent and 67 percent since 2007. Figure 2-10 displays the distribution of Service contracts at the MCC level and the state level.

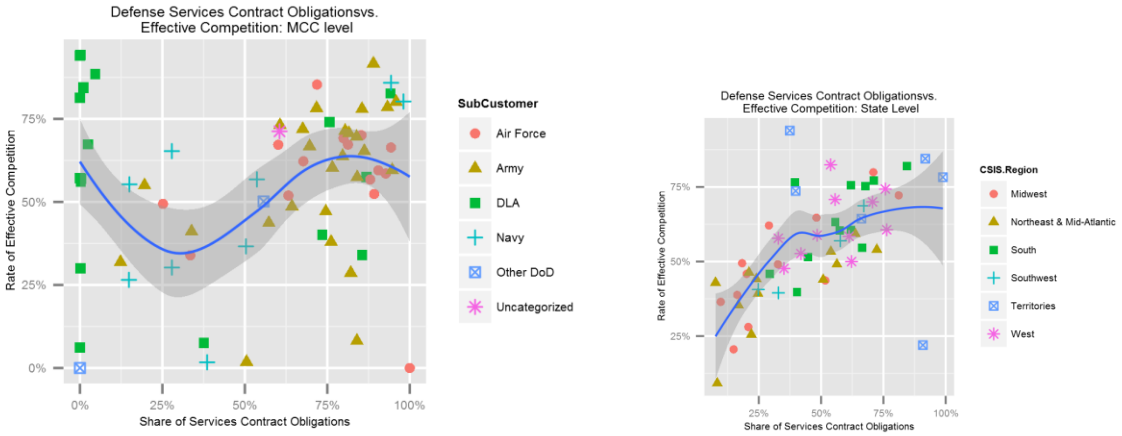
Figure 2-10: Distribution of Services Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution for Services ranges from 0 percent to 98 percent, with a mean of 56 percent and a median of 68 percent. Services is not nearly a normal distribution and its variability should be taken into consideration when it is used to predict effective competition. The ambiguous measure of value for its average limits its power to predict effective competition at the MCC level. At the state level, the Services distribution ranges from 8 percent to 92 percent, with a mean of 46 percent and median of 48 percent. At the state level, the distribution for Service contracts is more normally distributed than at the MCC level and its average is less ambiguous than at the MCC level. The relationship between Services contracts and effective competition is displayed in Figure 2-11.

Figure 2-11: Rate of Effective Competition for Services Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

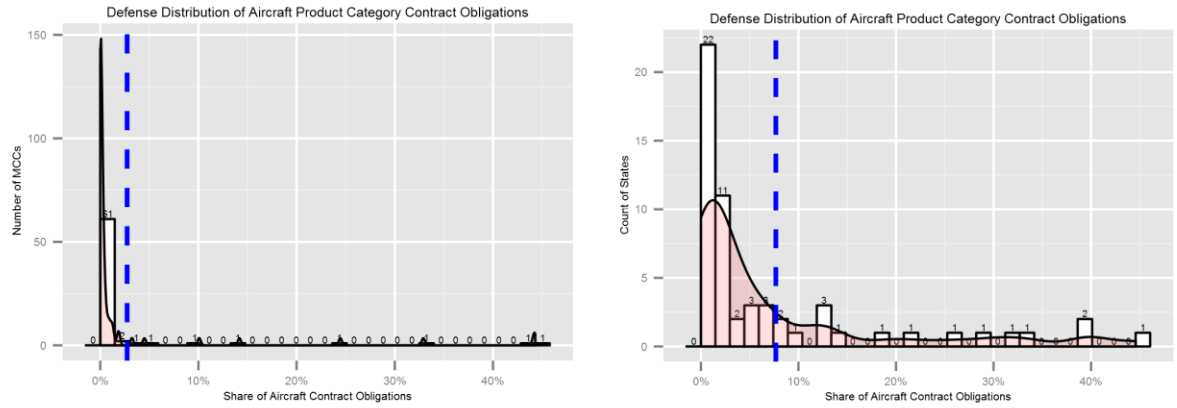
At the MCC level, the relationship between Services and effective competition is parabolic. It also has a few outliers that influence the relationship's predicted slope. Generally speaking, this means that MCCs with a more "mixed" contracting portfolio (in terms of Products, Services, and R&D) will tend to have

lower rates of effective competition than those that either contract primarily for Services or do very little Services contracting. In response to this nonlinear relationship, the model will be built using a second-order polynomial regression at the MCC level. At the state level, the relationship between Services and effective competition is more linear and includes fewer outliers. Higher levels of obligations going to Services therefore correlate with higher levels of effective competition for states. Therefore the model in relation to the Services variable will be built as a linear regression.

Aircraft

The Aircraft product category accounted for 12 percent of overall DoD contract obligations over the 2000–2014 period, tied for the second-largest share of any product or service category. Over that same period, only 13 percent of contract obligations for Aircraft were awarded after effective competition. The distribution of Aircraft contracts is displayed in Figure 2-12.

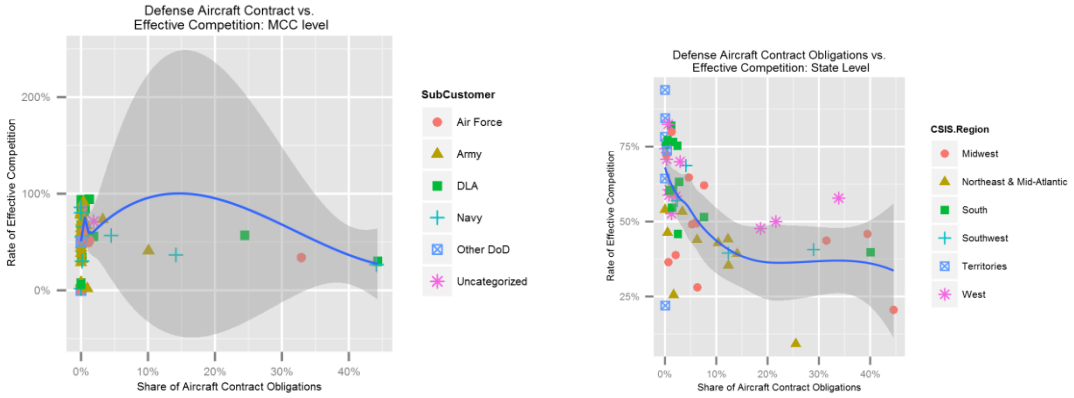
Figure 2-12: Distribution of Aircraft Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Aircraft contract obligations ranges from 0 percent to 45 percent, with a mean of 3 percent and a median of 0 percent. The distribution is unimodal and skewed to the right. This indicates that there are not very many MCCs with large shares of contract obligations awarded for Aircraft. At the state level, the distribution is more evenly spread and ranges from 0 percent to 45 percent, with a mean of 8 percent and a median of 3 percent. The distribution is still unimodal, with the most frequently occuring percent at 0. The predicted relationship between Aircraft contract obligations and effective competition is displayed in Figure 2-13.

Figure 2-13: Rate of Effective Competition for Aircraft Contract Obligations, by MCC and Place of Performance



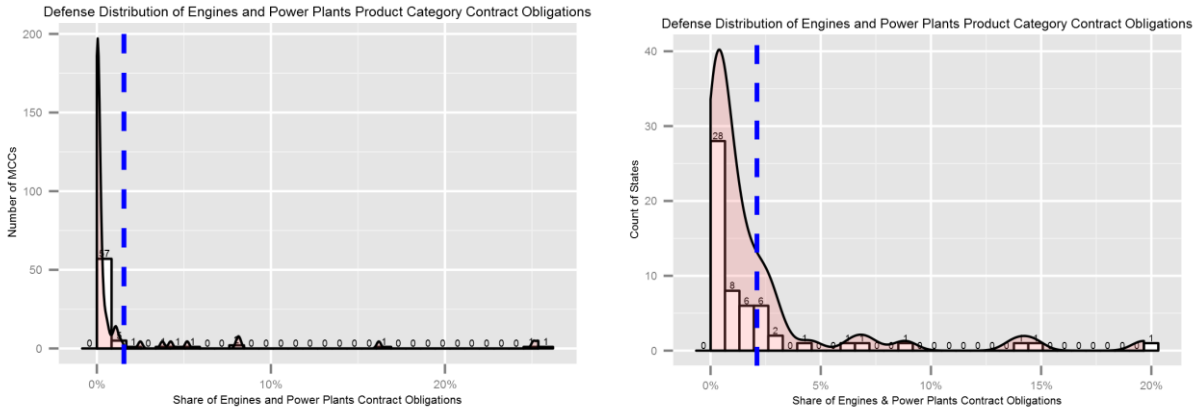
Source: FPDS; CSIS analysis

At the MCC level, the relationship between Aircraft contract obligations is for the most part a verticle slope at 0 percent. However, there are a few data points that form a slightly negative, linear relationship. Because there are so few data points to form this relationship, the confidence interval around the fitted line is very large. At the state level, the data are more spread and there is a negative relationship between increasing Aircraft contract obligations and increasing effective competition. This appears to primarily be a function of the the highest-value, least-competitive Aircraft contract obligations (mostly for production/procurement of actual Aircraft platforms) being concentrated in a few states, while a number of states have small amounts of obligations for aircraft parts, for which the market is notably more competitive.

Engines and Power Plants

Engines and Power Plants have accounted for 3 percent of overall defense contract obligations from 2000–2014, and accounted for between 2 percent and 4 percent in every year during that period. Between 2000 and 2014, only 22 percent of Engines and Power Plants contract obligations were awarded after effective competition. The distribution of Engines and Power Plants contract obligations is displayed in Figure 2-14.

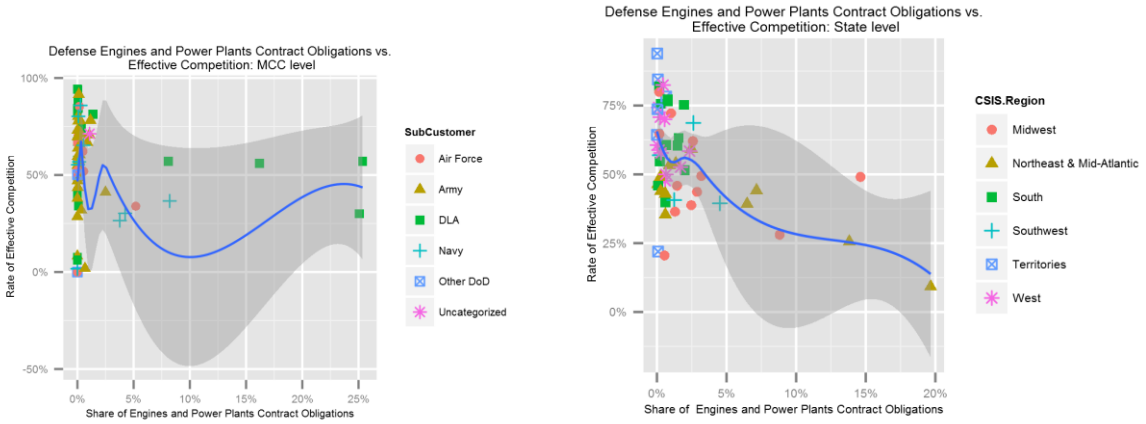
Figure 2-14: Distribution of Engines and Power Plants Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, 75 percent of MCCs award less than 0.4 percent of their contract obligations for Engines and Power Plants. The distribution ranges from 0 percent to 25 percent, with a mean of 2 percent and a median of 0 percent. At the state level, the distribution ranges from 0 percent to 20 percent, with a mean of 2 percent and a median of 1 percent. The predicted relationship between Engines and Power Plants contract obligations and effective competition is displayed in Figure 2-15.

Figure 2-15: Rate of Effective Competition for Engines and Power Plants Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

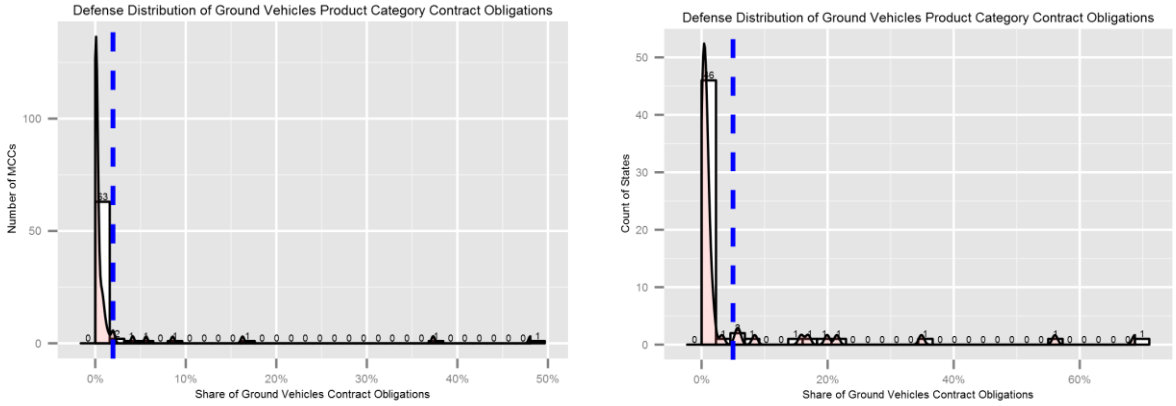
At the MCC level, the majority relationship between Engines and Power Plants contract obligations and effective competition is vertical at about 0 percent of contracts obligated. On the whole, however, there is no correlative relationship at the MCC level between Engines and Power Plants and effective competition. At the state level, shares of Engines and Power Plants contract obligations between 0 percent and 5 percent result in decreasing levels of effective competition. After 5 percent of contract

obligations, the relationship depends on a few outlier data points, but continues to see declining rates of effective competition.

Ground Vehicles

The Ground Vehicles product category accounted for between 3 percent and 6 percent of overall DoD contract obligations in all but one year (9 percent in 2008) between 2000 and 2012. In 2013 and 2014, that share declined to 2 percent. Over the 2000-–2014 period, the rate of effective competition for Ground Vehicles contract obligations was 30 percent. The distribution of Ground Vehicles contracts is displayed in Figure 2-16.

Figure 2-16: Distribution of Ground Vehicles Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At both the MCC level and state level, the distribution of Ground Vehicles contracts is unimodal and skewed to the right. At the MCC level, the distribution ranges from 0 percent to 48 percent, with a mean of 2 percent and a median of 0 percent. At the state level, the distribution ranges from 0 percent to 69 percent, with a mean of 5 percent and median of 1 percent. The relationship between Ground Vehicles contract obligations and effective competition at both the MCC level and state level is displayed in Figure 2-17.

Figure 2-17: Rate of Effective Competition for Ground Vehicles Contract Obligations, by MCC and Place of Performance

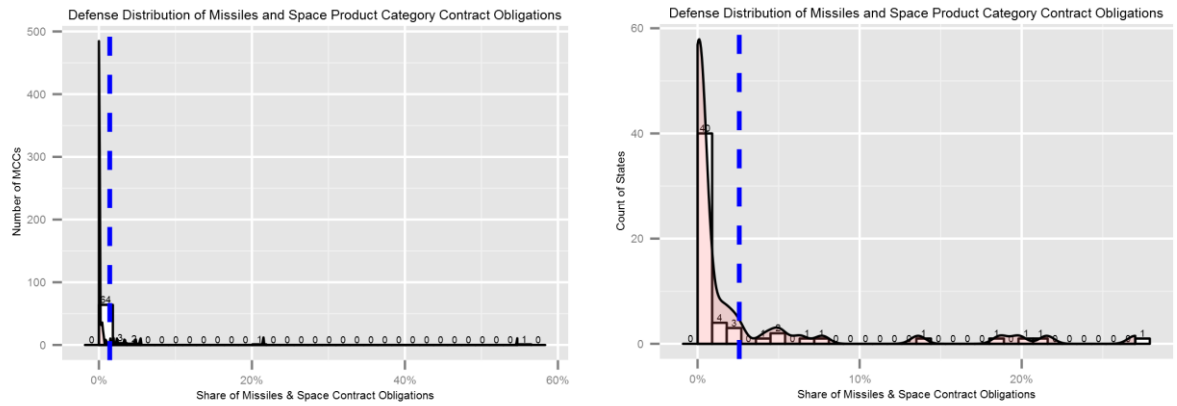
Source: FPDS; CSIS analysis

At the MCC level, effective competition does not change by more than 1 percent at different levels of Ground Vehicles contract obligations, and less than 25 percent of the distribution lies above 0.7 percent of contract obligations. For MCCs, the share of Ground Vehicles contract obligations does not impact the level of effective competition. At the state level, the impact Ground Vehicles contracts have on effective competition does not change by more than a percent throughout the whole distribution of Ground Vehicles contract obligations.

Missiles & Space

The Missiles & Space products category has accounted for 3 percent of overall defense contract obligations over the 2000–2014, and remained between 2 percent and 4 percent in every year during that period. For the 2000–2014 period, the rate of effective competition for Missiles & Space contract obligations was 13 percent, tied for the lowest rate of any products or services category. The distribution of Missiles & Space contracts is displayed in Figure 2-18.

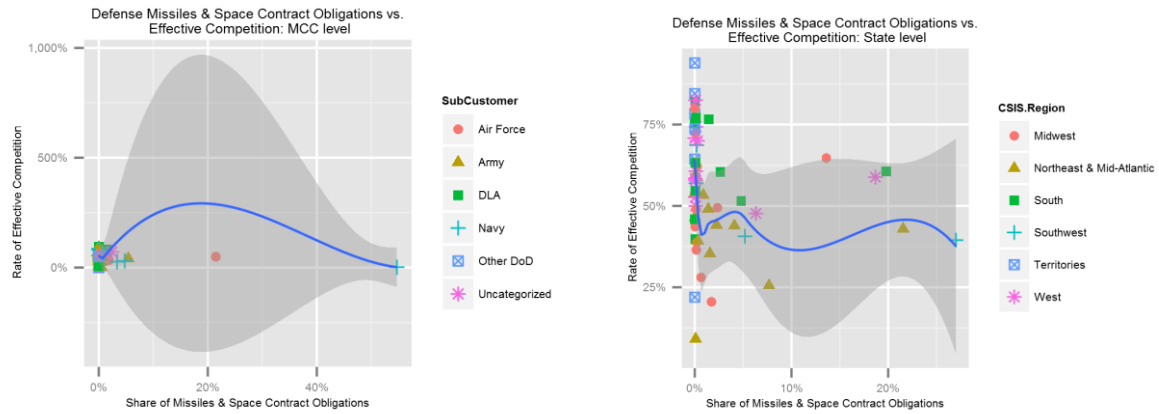
Figure 2-18: Distribution of Missiles & Space Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution ranges from 0 percent to 56 percent, with a mean of 2 percent and a median of 0 percent; Missiles & Space contract obligations are highly concentrated in a few MCCs. At the state level, no state awards more than 27 percent of its contract obligations for Missiles & Space. The distribution ranges from 0 percent to 17 percent, with a mean of 3 percent and median of 0.1 percent. The predicted relationship between Missiles & Space contract obligations and effective competition at both the MCC and state level is displayed in Figure 2-19.

Figure 2-19: Rate of Effective Competition for Missiles & Space Contract Obligations, by MCC and Place of Performance



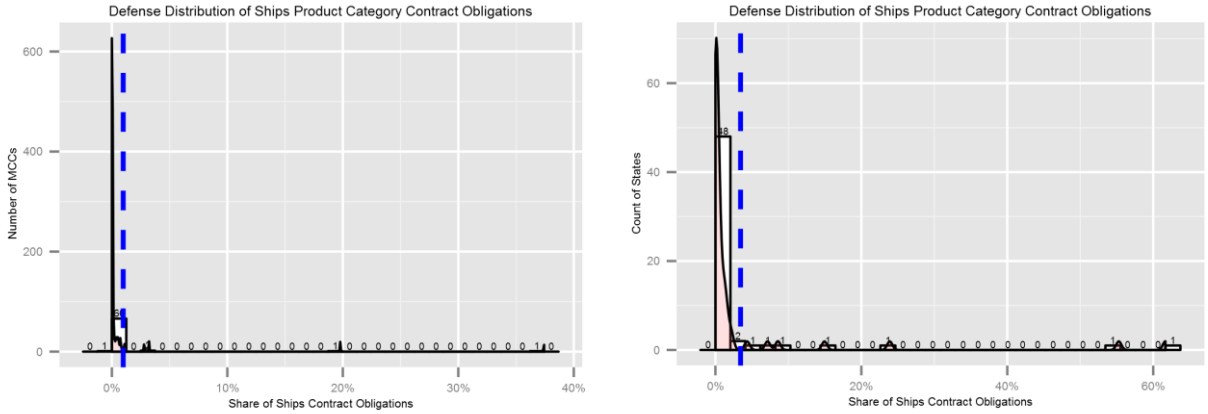
Source: FPDS; CSIS analysis

At the MCC level, there is no strong relationship bewteen Missiles & Space PSCs and effective competition, the only non-vertical relationship is determined by a few outliers. At the state level, the data are distributed a little more widely; however, the majority of the data form a vertical line at 0 percent of contract obligations, with a sinosidal relationship in those states that had significant shares of Missiles & Space obligations.

Ships

The Ships products category has accounted for 4 percent of overall defense contract obligations between 2000 and 2014, and has remained between 3 percent and 5 percent throughout the period. From 2000–2014, 31 percent of Ships contract obligations were awarded after effective competition, though this rate has varied widely, ranging from a low of 13 percent in 2006 to a high of 60 percent in 2002. The distribution of Ships contract obligations is displayed in Figure 2-20.

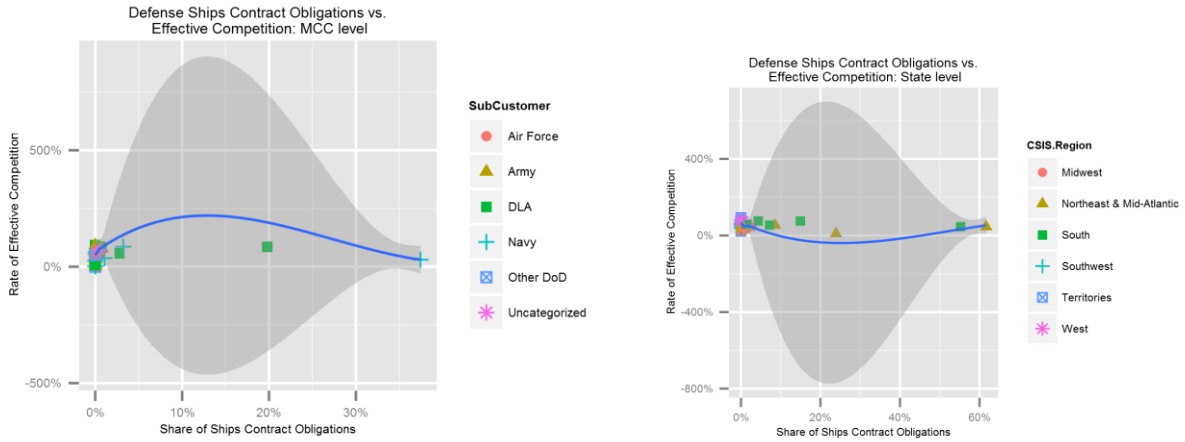
Figure 2-20: Distribution of Ships Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At both the MCC and state level, the distribution is centered at about 0 percent. At the MCC level, the distribution of Ships contract obligations ranges from 0 percent to 38 percent, with a mean of 1 percent and median of 0 percent. At the state level, the distribution of Ships contract obligations ranges from 0 percent to 62 percent, with a mean of 4 percent and a median of 0.3 percent. The predicted relationships between Ships contract obligations and effective competition at both the MCC and state level is displayed in Figure 2-21.

Figure 2-21: Rate of Effective Competition for Ships Contract Obligations, by MCC and Place of Performance



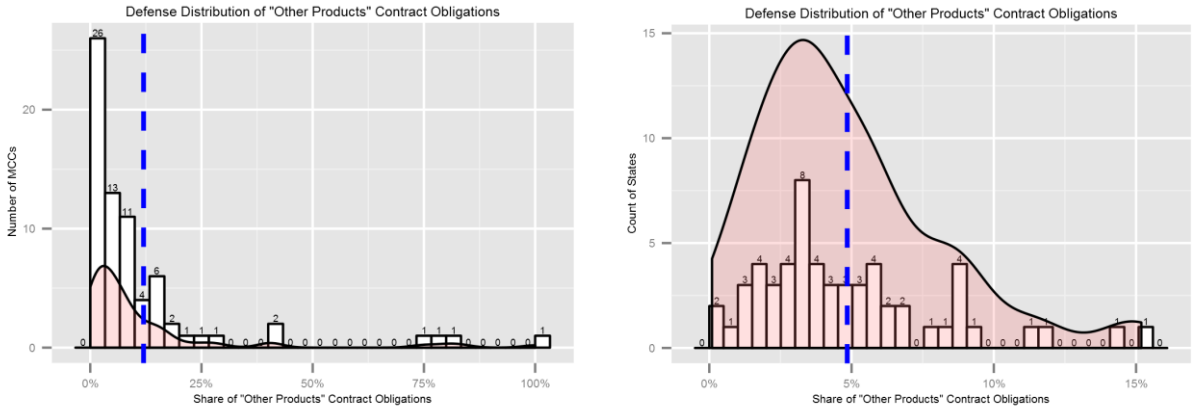
Source: FPDS; CSIS analysis

At the MCC level, Ships contract obligations do not appear to correlate with changes in effective competition, due to the limited number of MCCs with significant levels of Ships contract obligations. At the state level, this relationship is a little more varied at x-intercept 0 percent; however, this does not result in any inference on whether or not Ships contract obligations affect effective competition. As with MCCs, the only varying levels of effective competition depending on Ships contract obligations are from a few outliers.

"Other Products"

"Other Products," a product category that is primarily composed of commodities and commercial goods, has accounted for 5 percent of overall defense contract obligations between 2000 and 2014, and has remained between 3 percent and 6 percent in all but one year (8 percent in 2005.) From 2000–2014, 49 percent of contract obligations for "Other Products" were awarded after effective competition. The distribution of "Other Products" contract obligations is displayed in Figure 2-22.

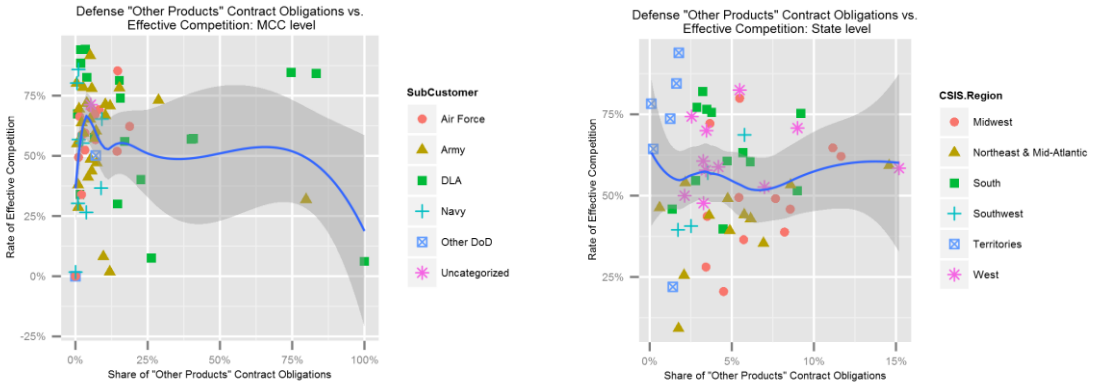
Figure 2-22: Distribution of "Other Products" Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of "Other Products" contracts obligated is skewed to the right and ranges from 0 percent to 83 percent, with a mean of 11 percent and a median of 5 percent. At the state level, the distribution ranges from 0 percent to 15 percent, with a mean of 5 percent and a median of 4 percent. "Other Products" contracts obligated at the state level are slightly skewed to the right, showing a more even distribution than at the MCC level. The predicted relationship between effective competition and "Other Products" contract obligations is displayed in Figure 2-23.

Figure 2-23: Rate of Effective Competition for "Other Products" Contract Obligations, by MCC and Place of Performance



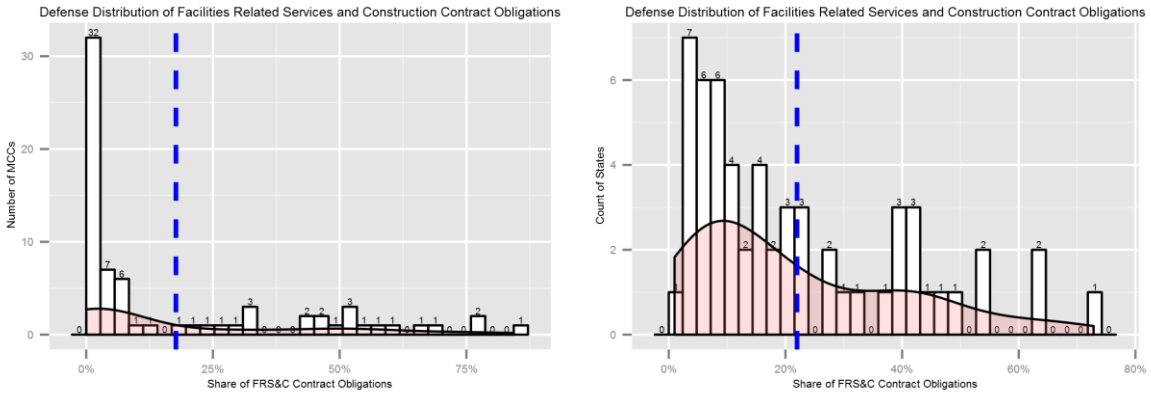
Source: FPDS; CSIS analysis

At the MCC level, most of the MCCs award less than 10 percent of their overall contract obligations for "Other Products" and do not form a significant prediction for effective competition. The few outliers are not helpful for accurately estimating effective competition. At the state level, the distribution is more evenly spread but has a much smaller range. The overal trend shows that the share of "Other Products" contract obligations has a sinosidal relationship with rates of effective competition.

Facilities-Related Services & Construction

Facilities-Related Services & Construction (FRS&C) has accounted for 12 percent of overall defense contract obligations over the 2000–2014 period, remaining between 10 percent and 14 percent in every year. FRS&C contract obligations have been highly competitive, with 73 percent awarded after effective competition between 2000 and 2014.The distribution of FRS&C contract obligations is displayed in Figure 2-24.

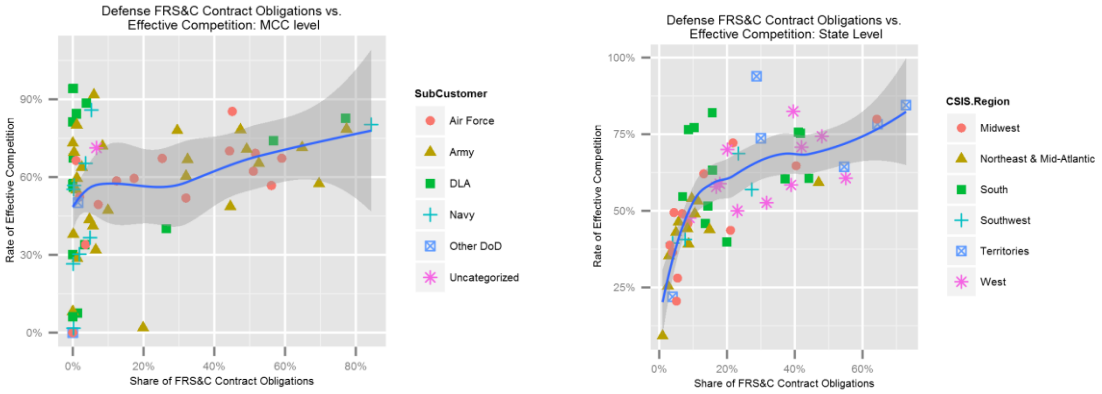
Figure 2-24: Distribution of FRS&C Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At both the MCC level, the distribution of FRS&C contract obligations is skewed to the right and unimodal. The distribution of obligations range from 0 percent to 84 percent, with a mean of 19 percent and a median of 5 percent. For states, obligations range from 1 percent to 73 percent, with a mean of 21 percent and a median of 15 percent. The predicted relationship between effective competition and FRS&C contract obligations is displayed in Figure 2-25.

Figure 2-25: Rate of Effective Competition for FRS&C Contract Obligations, by MCC and Place of Performance



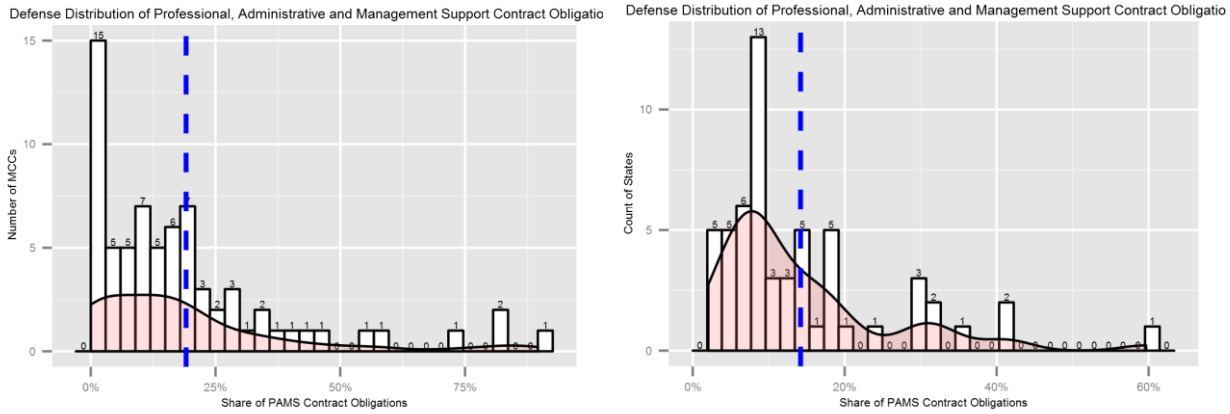
Source: FPDS; CSIS analysis

At the MCC level, the data show an overall increasing, linear relationship. As the share of FRS&C contract obligations within an MCC increases, the rate of effective competition increases. At the state level, a similar trend is observed, with higher shares of FRS&C correlating with higher rates of effective competition.

Professional, Administrative, and Management Support Services

Professional, Administrative, and Management Support (PAMS) have accounted for 15 percent of overall defense contract obligations between 2000 and 2014, and have remained between 13 percent and 17 percent in every year during that period. From 2000–2014, 58 percent of PAMS contract obligations were awarded after effective competition. The distribution of PAMS contract obligations is displayed in Figure 2-26.

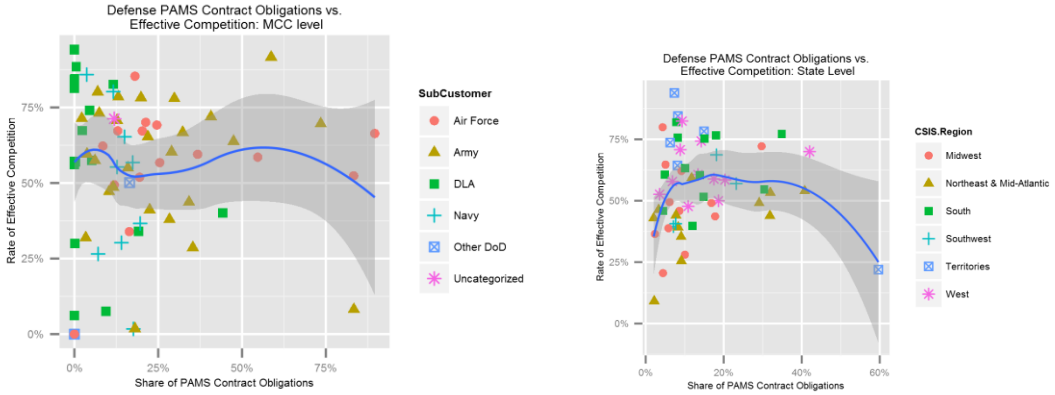
Figure 2-26: Distribution of PAMS Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

The distributions of PAMS contract obligations are skewed to the right for both MCCs and states, with the MCC distribution unimodal at 0 percent. For MCCs, obligations range from 0 percent to 82 percent, with a mean of 18 percent and a median of 13 percent. For states, obligations range from 2 percent to 32 percent, with a mean of 14 percent and a median of 9 percent. The predicted relationships between PAMS and effective competition at the MCC and state levels are displayed in Figure 2-27.

Figure 2-27: Rate of Effective Competition for PAMS Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the relationship between the share of PAMS contract obligations and effective competition appears to be largely sinosidal. At the state level, there appears to be a positive linear relationship at very low shares of obligations, and no significant relationship at higher shares of obligations, with the decline at high shares being due to a single outlier data point.

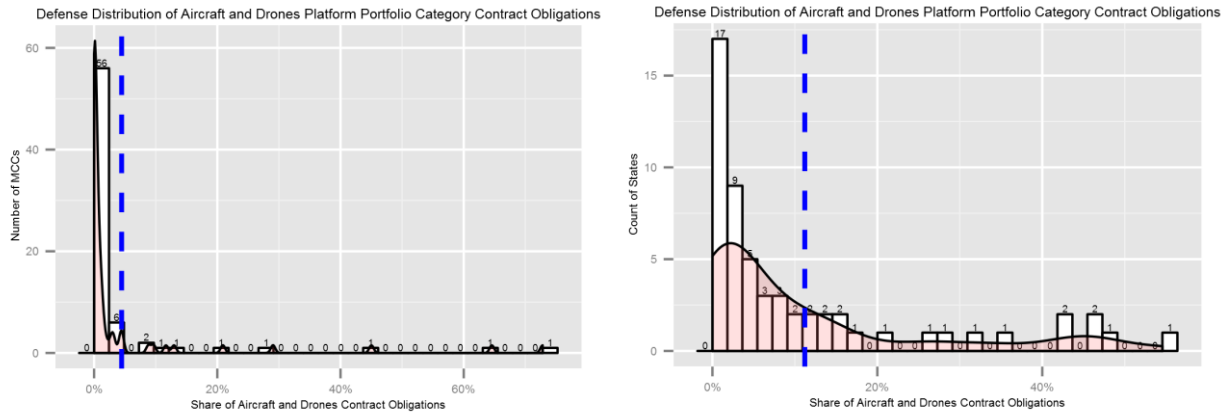
Platform Portfolios

This section examines the relationship between effective competition and a number of platform portfolios, which combine product, service, and R&D contracts related to a particular type of platform or system into one category.

Aircraft and Drones

Aircraft and Drones, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. For the 2000–2014 period, an average of 19 percent of overall defense contract obligations in each year were awarded for Aircraft and Drones. Over that same period, only 23 percent of Aircraft and Drones contract obligations were awarded after effective competition, the lowest rate of any platform portfolio. Figure 2-28 displays the distribution of Aircraft and Drones contracts at both the MCC level and state Level.

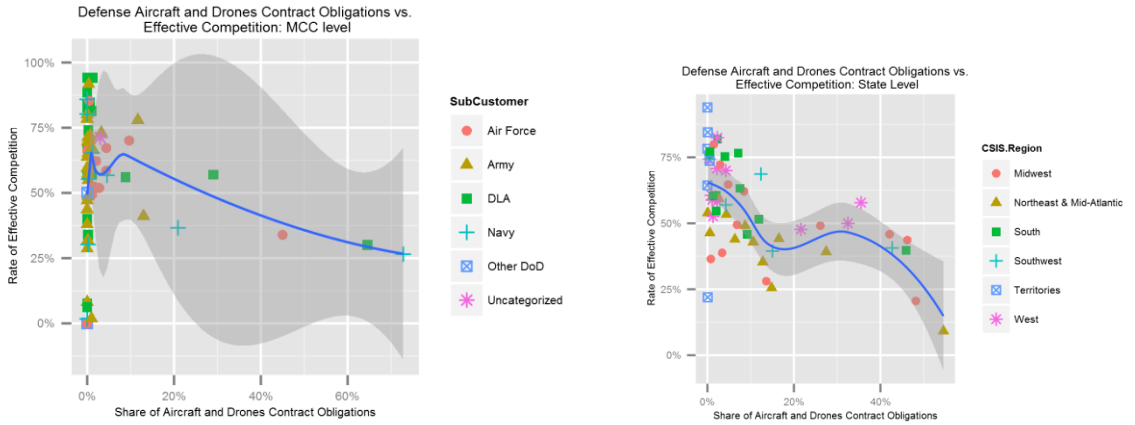
Figure 2-28: Distribution of Aircraft and Drones Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Aircraft and Drones contracts is largely skewed to the right and strongly unimodal (median = 0 percent), the result of Aircraft and Drones contracts being concentrated in a relatively small number of MCCs. Because of this, Aircraft and Drones is unlikely to have significant predictive power for effective competition within MCCs. The data range from 0 percent to 71 percent, with a mean of 5 percent and median of 0 percent. At the state level, the distribution of Aircraft and Drones contracts is also skewed to the right but with a more evenly distributed spread. The data range from 0 percent to 55 percent, with a mean of 12 percent and a median of 5 percent. The relationship between Aircraft contracts and Effective Competition is displayed in Figure 2-29 below.

Figure 2-29: Rate of Effective Competition for Aircraft and Drones Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

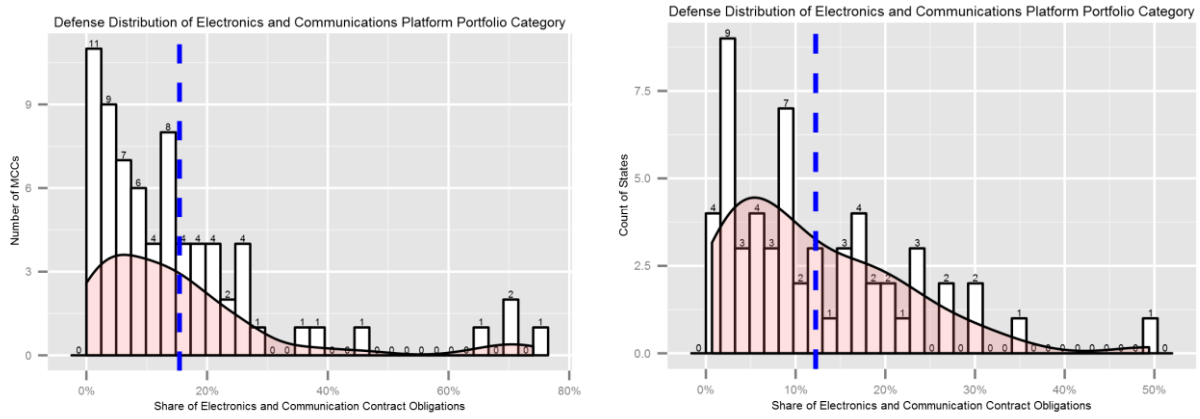
The predicted relationship between Aircraft contracts and effective competition at the MCC level is largely influenced by a few outliers. Other than these outliers, the relationship hardly exists. Including

the outliers, there is a negative linear relationship. At the state level, the relationship has a stronger pattern with lower confidence intervals and resembles a negative cubic function. As Aircraft contract obligations increase, effective competition decreases at different rates depending on what level of Aircraft obligations is being examined. This makes a certain degree of intuitive sense, as states with high shares of contract obligations awarded for Aircraft and Drones are likely to include those where major weapons systems are produced, and there is very little (if any) competition for production of most Aircraft and Drones platforms.

Electronics and Communications

Electronics and Communications, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. Electronics and Communications have accounted for a significant share of overall defense contract obligations in recent years, averaging 13 percent between 2010 and 2014. Only 43 percent of contract obligations for Electronics & Communications were awarded after effective competition over the same period, in part due to unusually high levels of competitive contracts awarded after receiving only one offer. Figure 2-30 displays the distribution of Electronics and Communications contracts at both the MCC level and State Level.

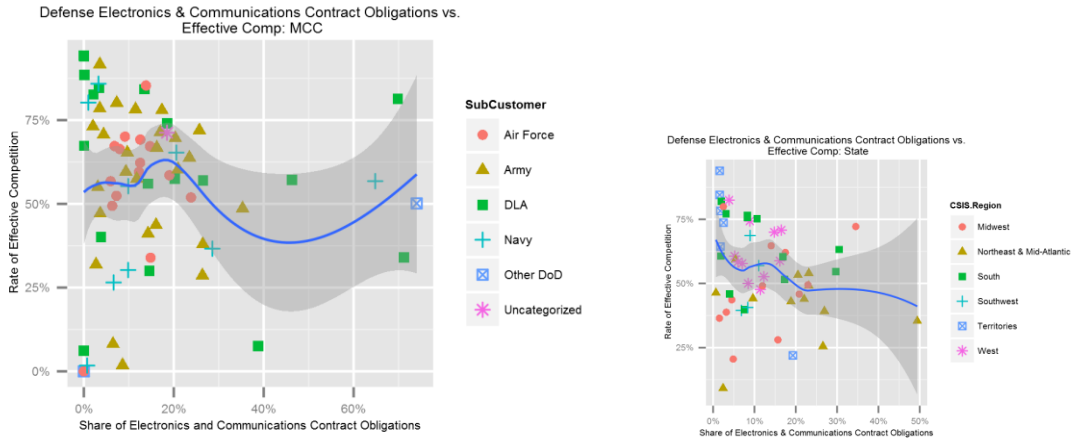
Figure 2-30: Distribution of Electronics & Communications Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Electronics and Communication is skewed to the right with a range from 0 percent to 74 percent, with a mean of 17 percent and median of 13 percent. At the state level, the distribution of Electronics and Communications is also skewed to the right with a range from 1 percent to 50 percent, a mean at 13 percent, and median at 10 percent. The relationship between Electronics and Communication and effective competition is displayed in Figure 2-31.

Figure 2-31: Rate of Effective Competition for Electronics and Communications Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

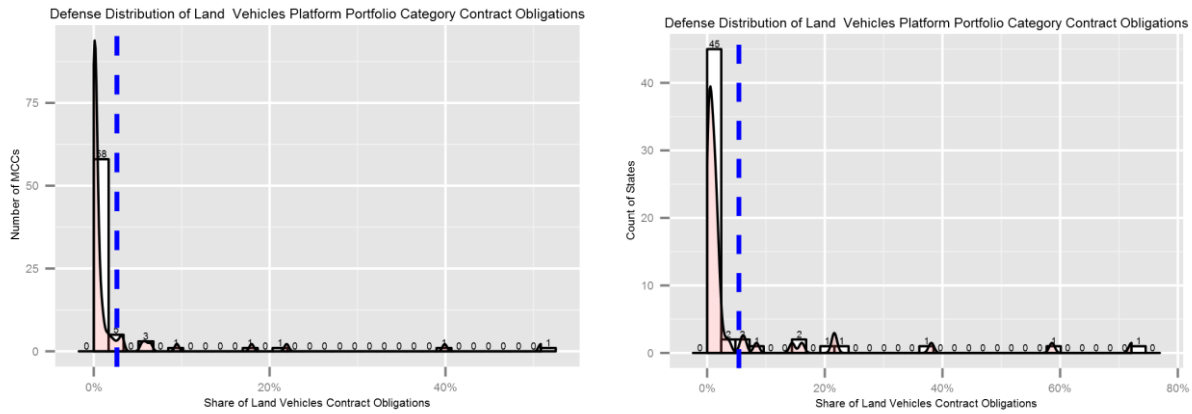
At the MCC level, the relationship between Electronics and Communication and effective competition is nonlinear, has varying confidence, and is affected by outliers. At the state level, the relationship resembles a more linear pattern and looks as though when Electronics and Communication contract obligations increase, effective competition decreases. The confidence intervals for this relationship are high, which limits the predictive power for Electronics and Communication on effective competition.

The relatively low rate of effective competition for Electronics and Communications is somewhat counterintuitive, given the broad industrial base for such products and services. However, much of this industrial base is in the commercial sector, and DoD has long had difficulties in identifying innovation in the commercial sector and convincing innovative vendors to go through the hurdles necessary to contract with DoD.

Land Vehicles

Land Vehicles, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. Land vehicles accounted for a significant share of contract obligations (peaking at 10 percent in 2008) during the mid-2000s as operations in Iraq and Afghanistan were at their peaks, but since 2010, only 4 percent of overall defense contract obligations have been for Land Vehicles. The rate of effective competition for Land Vehicles has been relatively low, with an average of just 33 percent of contract obligations awarded after effective competition between 2000 and 2014. Figure 2-32 displays the distribution of Land Vehicles contracts at both the MCC level and state level.

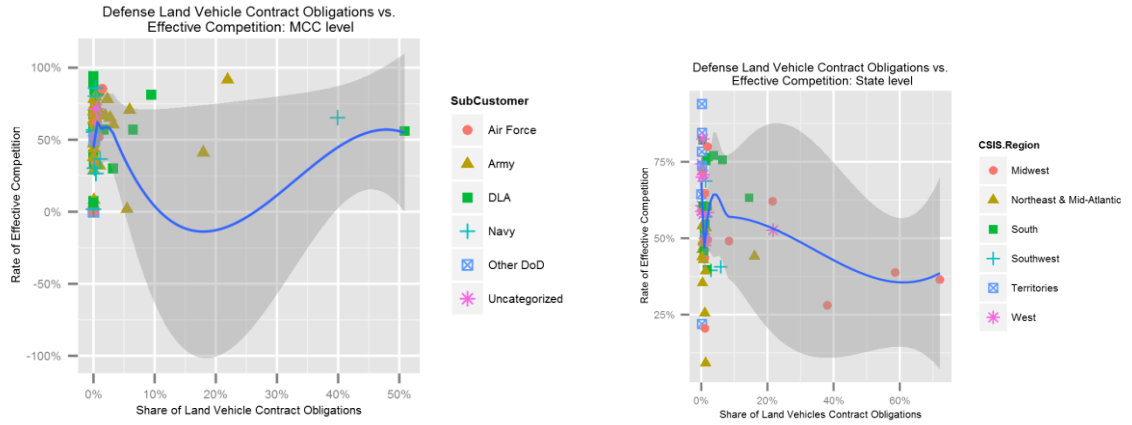
Figure 2-32: Distribution of Land Vehicles Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At both the MCC level and state level, the distribution of Land Vehicles contracts is strongly unimodal and skewed to the right. At the MCC level, Land Vehicles ranges from 0 percent to 50 percent, with a mean of 0.2 percent and a median of 0 percent. At the state level, Land Vehicles ranges from 0 percent to 72 percent, with a mean of 6 percent and a median of 1 percent. The relationship between Land Vehicle and effective competition is displayed in Figure 2-33.

Figure 2-33: Rate of Effective Competition for Land Vehicles Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

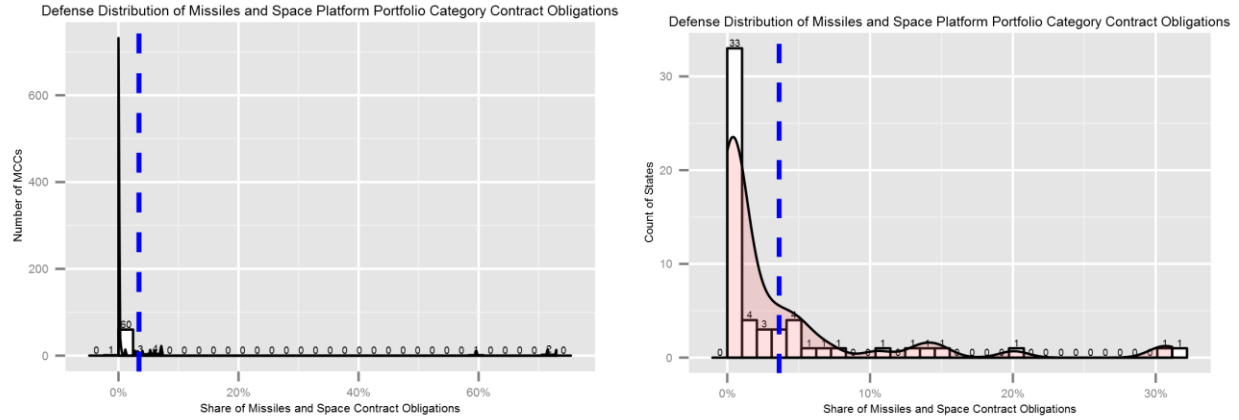
The predicted relationship between Land Vehicles contracts and effective competition at the MCC level is strongly influenced by the outliers in Land Vehicles contracts. For the majority of the data, there is little to no relationship between Land Vehicles and effective competition. Similar results occur on the state level, where, even the general trend looks as though it's decreasing, the relationship depends on a few outliers. Even though the rate of effective competition for Land Vehicles is low, the small number of

states and MCCs that see significant amounts of contract obligations for Land Vehicles means that the variable does not have significant explanatory power.

Missiles and Space

Missiles and Space, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. Missiles and Space has accounted for between 7 percent and 8 percent of overall defense contract obligations in every year in the 2000–2014 period. For that same period, the average rate of effective competition for Missiles and Space contract obligations has been 28 percent, well below the overall rate for DoD contract obligations. Figure 2-34 displays the distribution of Missiles and Space contracts at both the MCC level and State level.

Figure 2-34: Distribution of Missiles and Space Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Missiles and Space contract obligations ranges from 0 percent to 73 percent, with a mean of 4 percent and a median of 0 percent. This indicates that Missiles and Space contract obligations most likely will not have a statistically significant effect on effective competition, and if they do then it would be negative. At the state level, the distribution for Missiles and Space contract obligations has a more even spread, if skewed to the right and unimodal. Missiles and Space contract obligations at the state level range from 0 percent to 31 percent, with a mean of 4 percent and a median of 1 percent. The relationship between Missiles and Space contract obligations and effective competition at both the MCC and state level is displayed in Figure 2-35 below.

Figure 2-35: Rate of Effective Competition for Missiles and Space Contract Obligations, by MCC and Place of Performance

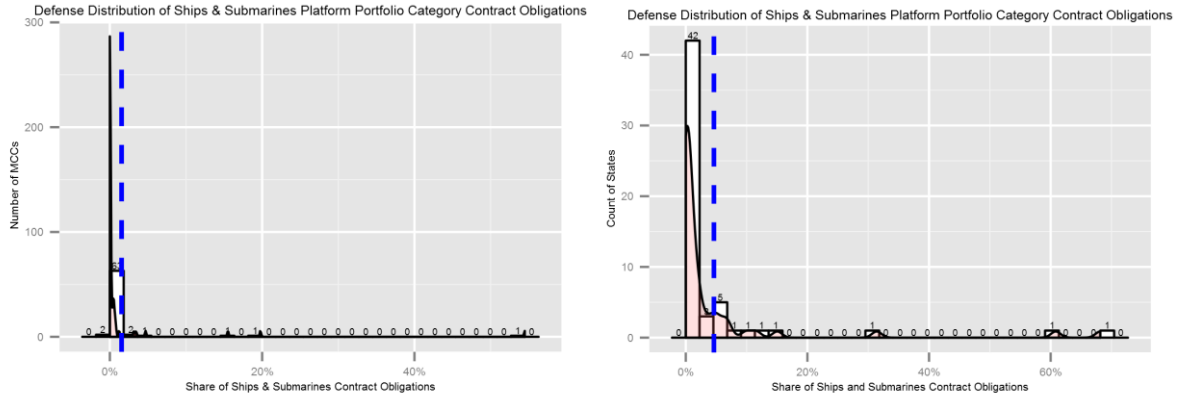
Source: FPDS; CSIS analysis

The predicted relationship between Missiles and Space contract obligations and effective competition at the MCC level is influenced by a few outliers. Otherwise, the relationship is almost nonexistent because there are few MCCs with significant shares of Missiles and Space contract obligations. At the state level, the relationship is also influenced by a few outliers; however, as was seen in the histogram in Figure 2-34, there is a more evenly distributed spread for contract obligations within states than within MCCs, which means there will be a more definitive relationship between Missiles and Space contract obligations and effective competition.

Ships & Submarines

Ships & Submarines, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. Over the 2000–2014 period, an average of 6 percent of overall DoD contract obligations were awarded for Ships & Submarines. Over that same period, 32 percent of contract obligations for Ships & Submarines were awarded after effective competition. Figure 2-36 displays the distribution of Ships & Submarines contract obligations at both the MCC level and state Level.

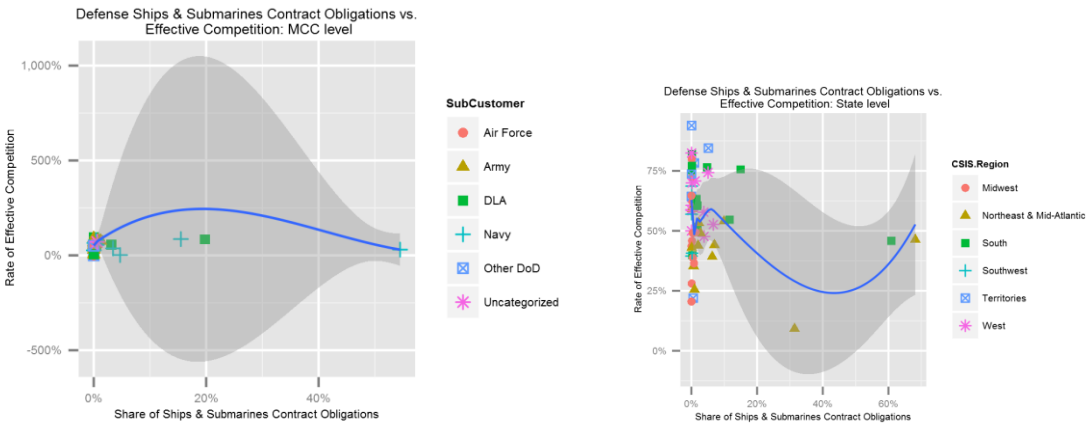
Figure 2-36: Distribution of Ships & Submarines Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Ships & Submarines contracts obligated ranges from 0 percent to 54 percent, with a mean of 2 percent and a median of 0 percent. This distribution is skewed to the right and indicates that Ships & Submarines contract obligations are highly concentrated in a few MCCs. At the state level, the distribution of Ships & Submarines contracts obligated ranges from 0 percent to 68 percent, with a mean of 5 percent and a median of 0.5 percent. The distribution at the state level is also skewed to the right but more evenly distributed. Contract obligations for Ships & Submarines are more evenly distributed among states than MCCs, but there are only a small number for which even a quarter of their total obligations go to Ships & Submarines. The estimated relationship between Ships contract obligations and Effective Competition is displayed in Figure 2-37.

Figure 2-37: Rate of Effective Competition for Ships & Submarines Contract Obligations, by MCC and Place of Performance



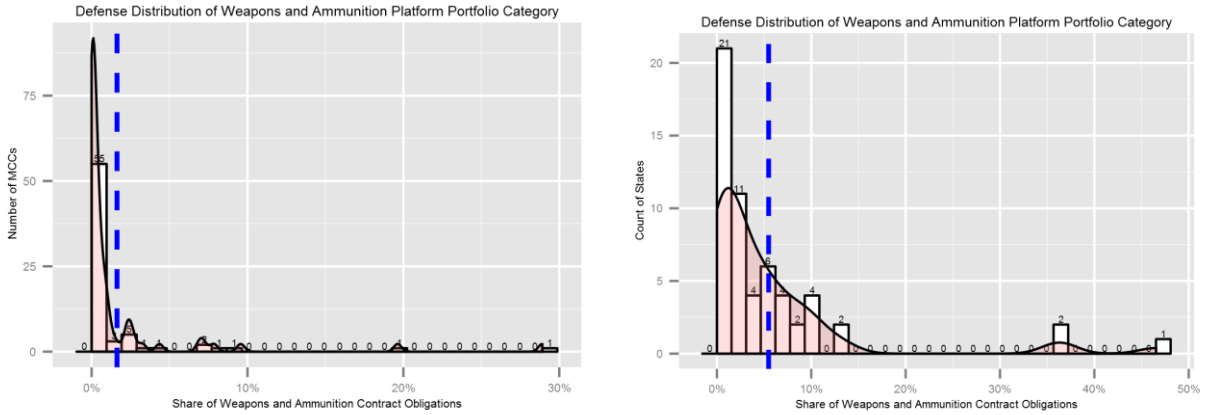
Source: FPDS; CSIS analysis

The predicted relationship between Ships & Submarines and effective competition at the MCC level is almost completely inelastic, save for a few outliers. This indicates that the likelihood of an increase in Ships contract obligations having a statistically significant impact on effective competition within MCCs is close to zero. At the state level, there is a little more variability in the data. In states where Ships & Submarines account for small shares of overall contract obligations, there appears to be a positive relationship between increasing Ships & Submarines contract obligations and increasing effective competition.

Weapons and Ammunition

Weapons and Ammunition, a platform portfolio category that includes all related products, services, and R&D contract obligations, is used as a predictor to estimate rates of effective competition. Contract obligations for Weapons and Ammunition account for a relatively minor share of overall defense contract obligations, averaging 4 percent between 2010 and 2014. Over that same period, only 36 percent of contract obligations were awarded after effective competition. Figure 2-38 displays the distribution of Weapons and Ammunition contracts at both the MCC level and state Level.

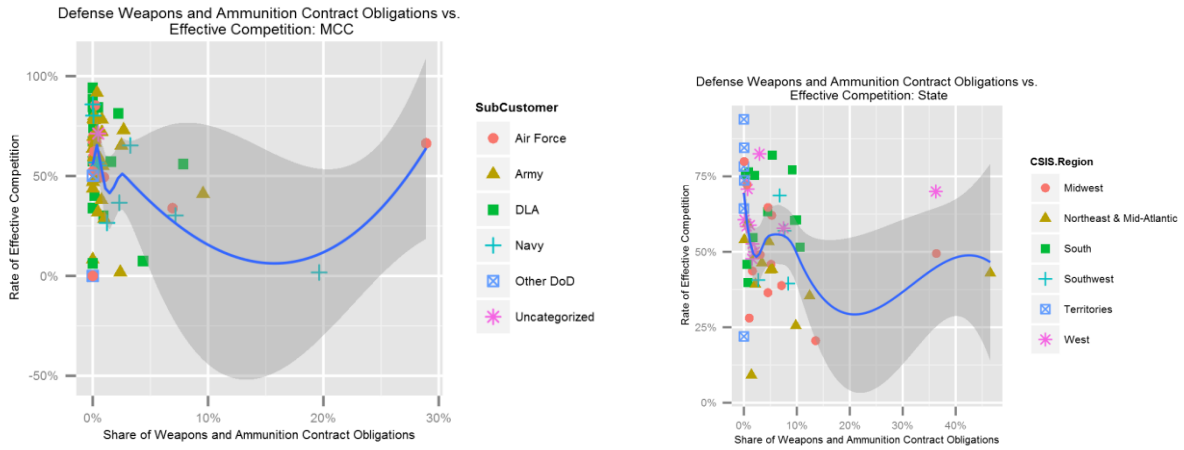
Figure 2-38: Distribution of Weapons and Ammunition Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

At the MCC level, the distribution of Weapons and Ammunition contracts range from 0 percent to 20 percent, with a mean of 1 percent and median of less than 0.2 percent. The distribution is both skewed to the right and unimodal. The lack of normality around the mean and the outlier may affect the magnitude of the predictive power Weapons and Ammunition contracts has on effective competition. At the state level, Weapons and Ammunition is also skewed to the right but to a smaller degree than at the MCC level. The category's distribution ranges from 0 percent to 47 percent, with a mean of 6 percent and median of 3 percent. Weapons and Ammunition seems to have a smaller degree of variability than at the MCC level, but it also is not nearly normal and may not effectively predict effective competition in an unbiased or consistent way. The relationship between Weapons and Ammunition contracts and effective competition is displayed in Figure 2-39.

Figure 2-39: Rate of Effective Competition for Weapons and Ammunition Contract Obligations, by MCC and Place of Performance



Source: FPDS; CSIS analysis

The predicted relationship between Weapons and Ammunition and effective competition at the MCC level has a very large confidence interval (reaching into the impossible negative competition and greater-than-100-percent competition ranges) and is highly variable because of the few outliers. The predicted relationship emulates a cosine function; however, this prediction is likely skewed by the outliers. Thus, when outliers are accounted for, the relationship would likely resemble a negative linear pattern. At the state level, the relationship between Weapons and Ammunition obligations and effective competition is also nonlinear, has large confidence intervals and is skewed by the outliers.

Final Thoughts

A number of variables that the study team hypothesized as correlating with differing rates of effective competition for either or both of MCCs and states were not judged to have significant predictive power. In many cases, this is the result of the fact that product/service categories and platform portfolios have the vast majority of their contract obligations concentrated in a relatively few MCCs and states, meaning that there are not enough useful observations to provide evidence of significant correlation. Nonetheless, the study team has identified variables that, taken together, do provide sufficient correlative power to provide meaningful predictions of effective competition rates.

III. Modeling DoD Effective Competition Rates

For both states and MCCs, the study team built an ordinary least-squares (OLS) model in order to calculate an estimated rate of effective competition for each state and MCC, along with the descriptive statistics that measure the strength of the model. Then a predictive model uses these least-squares models and the data from FY2000–2013 as the basis to generate a prediction of 2014 effective competition rates, based on the variables previously described. In the final models, each of the variables has been tested and validated as having a statistically significant correlation with, or a meaningful impact on, the model estimating rates of effective competition.

Next, the study team used the predictive model based on the final model explained above to compare the estimated rate of effective competition to the actual rate of effective competition for FY2014 for each observation. The study team calculated the actual rate of effective competition by dividing contract obligations awarded after competition with two or more offers by total contract obligations. The predictive model estimates the rates of effective competition for each MCC and state using the final model described above and data from FY2014. The results of the predictive model estimate the effective competition for each MCC and give the confidence interval for each estimate.

The first iteration of this predictive model for MCCs focused on the MCC level of analysis. In order to try and improve the predictive power of the model, the study team revised the predictive model to examine obligations at the contracting office level. The model built at the contracting office level was used to predict the estimated rate of effective competition to the actual rate of effective competition for FY2014. These contracting office-level predictions were then aggregated back to the MCC level by summing all the contracting offices under each MCC. Finally, these sums represented the predictions for effective competition at the MCC level and were compared to the actual values of effective competition for FY2014. Though this change did provide a more granular view into contracting data at the MCC level, it did not significantly improve the predictive power of the model, and thus was not incorporated into the final model.

At this point, this predictive model is not intended to evaluate performance in promoting effective competition—the MCC model is only capable of explaining about half of the variance in effective competition rates, though the model for states explains nearly three-quarters of the variance. The 95 percent confidence intervals for both the MCC and state models remain higher than would be ideal, but have narrowed notably since the initial iterations of the predictive models.

Because variables used to evaluate states versus those used for MCCs are different, the following discussion will be divided into two sections, highlighting a selection of variables for states/MCCs that the model suggests are worthy of further study.

Major Command Regression

Table 3-1 displays the results from the study team's OLS model predicting rates of effective competition at the MCC level.

Table 3-1: Effective Competition at the MCC Level	
Variable	*Coefficient and Standard Error*
Intercept	0.38*** (0.07)
Services	0.74*** (0.24)
Services^2	-0.81** (0.12)
Weapons and Ammunition	1.94** (0.69)
IDV	-0.01 (0.12)
Single-Award Indefinite Delivery Contract	-0.26 (0.13)
R^2 Adjusted R^2 Observations	0.53 0.49 63
*** p < 0.001, ** p < 0.01, * p < 0.05	

Variables that correlate with a lower rate of effective competition:

- Share of contract obligations awarded under single-award IDCs
- Share of contract obligations awarded under IDV contract types—weak effect
- Mix of Products/Services (Services^2)—as the contracting portfolio of a MCC becomes more mixed between Products and Services, the rate of effective competition declines.

Variables that correlate with a higher rate of effective competition:

- Share of contract obligations awarded for Services
- Share of contract obligations awarded for Weapons and Ammunition (platform portfolio category)

U.S. State Regression

Table 3-2 displays the results from the study team's OLS model predicting rates of effective competition at the state Level.

Table 3-2: Effective Competition at the State Level	
Variable	*Coefficient and Standard Error*
Intercept	0.83** (0.28)
Services	0.52*** (0.08)
Aircraft and Drones	-0.19` (0.10)
Indefinite Delivery Vehicle	0.13 (0.10)
Fixed Price	-1.48` (0.82)
Fixed Price^2	1.04` (0.59)
Engines & Power Plants	-0.69` (0.36)
PAMS	-0.39* (0.18)
"Other Products"	0.06 (0.41)
R^2 Adjusted R^2 Observations	0.77 0.73 53
*** p < 0.001, ** p < 0.01, * p < 0.05, `p<.10	

Variables that correlate with a lower rate of effective competition:

- Share of contract obligations awarded for Aircraft and Drones (platform portfolio category)
- Share of contract obligations awarded under fixed-price contract types
- Share of contract obligations awarded for Engines & Power Plants (products category) and PAMS (services category)

Variables that correlate with a greater rate of effective competition:

- Share of contract obligations awarded for Services
- Share of contract obligations awarded under IDV contract types
- Mix of contract pricing mechanisms (Fixed Price^2)—as the usage of different contract pricing mechanisms within a state becomes more diverse, the rate of effective competition increases.
- Share of contract obligations awarded for “Other Products”

IV. Examination of Outlier Major Commands and U.S. States

After creating the predictive model and analyzing the causal roots of the variables that drive the model, the study team analyzed FY2014 contracting. By applying the ordinary least-squares (OLS) model derived from FY2000 to FY2013 data to the FY2014 inputs, the study team estimated effective competition rates for each of the states and major commands in the sample for FY2014, and then compared the predicted value to the actual effective competition rate for each state or major command in FY2014. The intent of this process was to identify the MCCs and states that exemplify or defy DoD-wide patterns.

The limits of the predictive strength of the model, most notably the large 95 percent confidence intervals for the "estimated" 2014 effective competition rates, mean that the following analysis is not intended to grade MCCs and states on their competition performance. Rather, the following sections are intended as a proof of concept for the study methodology, demonstrating the ability of the CSIS model to identify "outliers" among the MCCs and states. The drivers of the differences between actual and "estimated" effective competition rates for the identified states and MCCs will be used to improve future iterations of the CSIS predictive model.

Complete results from the MCC and state predictive models are presented in Appendices 1 and 2.

Major Contracting Commands[39]

This section describes five MCCs: four with significant levels of contract obligations that show notable differences between "estimated" effective competition rates and actual rates in 2014, and one MCC where "estimated" and actual rates are nearly identical.

Air Force Space Command (AFSPC)

Total 2014 Contract Obligations: $8.4 billion

"Estimated" 2014 Effective Competition Rate: 63 percent

Actual 2014 Effective Competition Rate: 36 percent *(Lower limit of 95 percent confidence interval: 33 percent)*

AFSPC notably underperformed its "estimated" competition rate in 2014, despite higher-than-average rates of effective competition for the Electronics & Communications platform portfolios and the PAMS services category, due to lower-than-average rates of effective competition for the Facilities & Construction platform portfolio and overall R&D.

As would be expected, the majority of contract obligations by AFSPC are for products or services related to Missiles & Space Systems. At first glance, the Missiles & Space Systems platform portfolio, which accounted for nearly half of AFSPC contract obligations in 2014, appears to have a higher-than-average rate of effective competition within AFSPC (45 percent in 2014, compared to 26 percent for overall

[39] Because the 95 percent confidence intervals for the MCC model are so wide, no MCCs with significant levels of contract obligations fell outside of their intervals. Where the selected examples are at the fringes of the 95% confidence interval, it will be noted in the descriptions below.

DoD). This is primarily an artifact of categorization, however—almost all of AFSPC contract obligations for the "Other Services" platform portfolio, which account for 29 percent of AFSPC contract obligations in 2014, are for space launch services, and all of those obligations were awarded without competition. CSIS has traditionally categorized transportation of physical goods as a service, rather than based on what platform was used for the transport. If those space launch services were folded into the Missiles & Space Systems platform portfolio, however, the rate of effective competition within AFSPC would fall to 28 percent, nearly in line with the rate for overall DoD. Going forward, the study team will reclassify space launch services to be included under the Missiles & Space Systems platform portfolio.

AFSPC did see higher-than-average levels of effective competition for the Electronics & Communications platform portfolio (71 percent in 2014, compared to 44 percent for overall DoD) and the PAMS services category (84 percent in 2014, compared to 58 percent for DoD overall); those two categories account for 6 percent and 11 percent of 2014 AFSPC contract obligations, respectively. By contrast, R&D, which accounted for 25 percent of AFSPC contract obligations in 2014, saw only 37 percent of those contract obligations awarded after effective competition, compared to 46 percent for DoD R&D overall. Similarly, the Facilities and Construction platform portfolio, which accounted for 9 percent of AFSPC contract obligations in 2014, saw only 50 percent of contract obligations awarded after effective competition, compared to 76 percent for DoD overall.

U.S Army Corps of Engineers (USACE)

Total 2014 Contract Obligations: $17.2 billion

"Estimated" 2014 Effective Competition Rate: 67 percent

Actual 2014 Effective Competition Rate: 81 percent

USACE notably overperformed its "estimated" rate of effective competition in 2014. This is somewhat surprising, as USACE's contracting portfolio has characteristics that would suggest that the model would, if anything, overestimate effective competition: USACE contracts almost entirely for services, which correlates with higher rates of effective competition in the MCC model, and low shares of obligations awarded under single-award IDCs, which correlates with higher levels of effective competition. The gap between the actual rate and the "estimated" rate is primarily the result of a higher-than-average rate of effective competition for the Facilities and Construction platform portfolio, which accounted for 87 percent of USACE contract obligations in 2014. Eighty-three percent of USACE contract obligations for Facilities and Construction were awarded after effective competition in 2014, compared to 76 percent for DoD overall.

Army Materiel Command (AMC)

Total 2014 Contract Obligations: $49.6 billion

"Estimated" 2014 Effective Competition Rate: 34 percent

Actual 2014 Effective Competition Rate: 46 percent

The main driver of AMC's higher-than-"estimated" rate of effective competition in 2014 is the unusually high rate of effective competition for one category of its services contracts portfolio.

Based solely on the correlative variables for AMC, AMC effective competition rates being higher than "estimated" in 2014 seems unusual: a nearly even mix of products and services, as well as higher-than-average shares of obligations awarded under IDVs in general, and single-award IDCs specifically, correlate with lower rates of competition. The main driver of the higher-than-estimated rate of effective competition for AMC seems to be in the rate of effective competition for professional, administrative, and management support services (PAMS): PAMS account for nearly a quarter of AMC's contract portfolio, and 66 percent were awarded after effective competition, compared to 36 percent for DoD overall.

Naval Supply Systems Command (NAVSUP)

Total 2014 Contract Obligations: $7.7 billion

"Estimated" 2014 Effective Competition Rate: 51 percent

Actual 2014 Effective Competition Rate: 33 percent

The main drivers of the lower-than-predicted rate of effective competition are twofold. First, only 3 percent of NAVSUP contract obligations for the Aircraft & Drones platform portfolio in 2014 were awarded after effective competition, compared to 21 percent for DoD overall. Second, only 23 percent of NAVSUP contract obligations for the Electronics & Communications platform portfolio were awarded after effective competition, compared to 45 percent for DoD overall.

Air Force Materiel Command (AFMC)

Total 2014 Contract Obligations: $37.4 billion

"Estimated" 2014 Effective Competition Rate: 33 percent

Actual 2014 Effective Competition Rate: 30 percent

Unlike the previous four examples, where particular categories of contracts have significantly higher/lower rates of effective competition than DoD overall in one direction, there are notable differences in both directions for AFMC, which is likely a significant factor in how the model was able to so closely predict the 2014 effective competition rate.

AFMC has a relatively even mix of products and services in its contracting portfolio, which correlates with lower competition rates. Only 26 percent of AFMC contract obligations for PAMS in 2014 were awarded after effective competition, compared to 36 percent overall. By contrast, for AFMC ERS contract obligations, 33 percent of contract obligations were awarded after effective competition, compared to 26 percent overall. This lack of unidirectional deviations from "estimated" rates of competition is likely a significant factor enabling the predictive model to accurately estimate 2014 effective competition rates.

Place of Performance—States

This section describes four states with significant levels of contract obligations that show notable differences between "estimated" effective competition rates and actual rates in 2014, along with one state where "estimated" and actual rates are nearly identical.

Massachusetts

Total 2014 Contract Obligations: $9.4 billion

"Estimated" 2014 Effective Competition Rate: 38 percent

Actual 2014 Effective Competition Rate: 19 percent *(Lower limit of 95 percent confidence interval: 14 percent)*

DoD contract obligations performed in Massachusetts have a lower-than-"estimated" rate of effective competition due to lower-than-average rates of competition in virtually every category with significant obligations: the Electronics & Communications, Engines & Power Plants, Launchers & Munitions, and Missiles & Space product categories; the PAMS services category; and R&D.

For the Electronics & Communications product category, which accounted for 18 percent of Massachusetts contract obligations, 30 percent were awarded after effective competition in 2014, compared to 39 percent for DoD overall. Meanwhile, 30 percent of Electronics & Communications contract obligations in Massachusetts were awarded after competition with a single offer, over four times the rate for DoD overall. The Engines & Power Plants product category, which accounted for 11 percent of Massachusetts contract obligations in 2014, saw less than 1 percent of contract obligations awarded after effective competition, compared to 39 percent for DoD overall. Launchers & Munitions, which accounted for 9 percent of 2014 defense contract obligations in Massachusetts, saw a 5 percent rate of effective competition, compared to 42 percent for DoD overall. And Missiles & Space, which also accounted for 9 percent of contract obligations in Massachusetts, saw 0 percent of contract obligations awarded after effective competition, compared to 14 percent for overall DoD.

The PAMS services category, which accounted for 12 percent of contract obligations in Massachusetts in 2014, saw only 18 percent of obligations awarded after effective competition, compared to 58 percent in 2014. And similarly, R&D, which accounted for 30 percent of contract obligations in Massachusetts, saw only 20 percent of contract obligations awarded with effective competition in 2014, compared to 46 percent for DoD overall.

The degree to which nearly every major aspect of the contracting portfolio performed in Massachusetts underperformed overall DoD competition rates is something that the study team did not observe in any other state or MCC with such a diversified contracting portfolio. Further research will be required to determine why defense contract obligations awarded for performance in Massachusetts receive such unusually low levels of effective competition.

Mississippi

Total 2014 Contract Obligations: $2.3 billion

"Estimated" 2014 Effective Competition Rate: 53 percent

Actual 2014 Effective Competition Rate: 71 percent *(Upper limit of 95 percent confidence interval: 76 percent)*

DoD contract obligations performed in Mississippi significantly outperformed their "estimated" effective competition rates. A disproportionately large share (42 percent) of contract obligations performed in Mississippi in 2014 were related to Ships platforms, primarily related to construction of DDG-51 destroyers at Ingalls Shipbuilding in Pascagoula, Mississippi, owned by Huntington Ingalls Industries. Nearly three-quarters of Ships obligations was awarded after effective competition (almost entirely with only 2 offers,) compared to 28 percent for DoD overall. Approximately 30 percent of contract obligations performed in Mississippi were related to Aircraft programs, which generally have low levels of effective competition, due to the limited industrial base for aircraft platforms, the long-term nature of aircraft programs, and the tendency for maintenance contracts to be performed by the development/production vendor. But the contract obligations in Mississippi, mainly for "maintenance–repair of aircraft,"[40] were highly competitive, with nearly three-quarters awarded after effective competition, compared to 11 percent for DoD overall.

Alabama

Total 2014 Contract Obligations: $8.8 billion

"Estimated" 2014 Effective Competition Rate: 56 percent

Actual 2014 Effective Competition Rate: 82 percent *(Upper limit of 95 percent confidence interval: 80 percent)*

DoD contract obligations performed in Alabama greatly exceeded their "estimated" effective competition rate in 2014, surpassing the upper limit of the 95 percent confidence interval for the prediction. This is primarily a result of the fact that, for nearly every major category in the portfolio of contracts performed in Alabama, the rate of effective competition is notably higher than for overall DoD. The ERS and PAMS services categories, the Ships products category, and R&D all saw rates of effective competition at least 25 percentage points higher than the overall DoD rate.

For ERS, which accounted for 12 percent of contract obligations awarded in Alabama, 98 percent were awarded after effective competition, compared to 56 percent for DoD overall. For PAMS, which accounted for 33 percent of contract obligations performed in Alabama, 83 percent were awarded after effective competition, compared to 58 percent for DoD overall. R&D contract obligations, which made up 21 percent of contract obligations performed in Alabama, saw 87 percent awarded after effective competition, compared to 46 percent for DoD overall. And the effective competition rate for Ships, which accounted for 9 percent of contract obligations performed in Alabama, saw a 100 percent effective competition rate, compared to 28 percent for DoD overall.

[40] These obligations are likely related to Columbus Air Force Base, a major Air Force pilot training installation.

As with Massachusetts, the degree to which nearly every major category across the spectrum of contracts performed in Alabama saw higher-than-average rates of effective competition account for the difficulty the model had in generating an accurate prediction.

Washington

Total 2014 Contract Obligations: $7.5 billion

"Estimated" 2014 Effective Competition Rate: 27 percent

Actual 2014 Effective Competition Rate: 45 percent *(Upper limit of 95 percent confidence interval: 52 percent)*

DoD contract obligations performed in Washington state significantly over-performed their "estimated" effective competition rates in 2014, primarily due to higher-than-average rates of effective competition for contracts related to Aircraft programs and contracts for facilities-related services & construction.

As would be expected from the home state of Boeing, a high share (66 percent) of obligations for contracts performed in Washington go to Aircraft & Drones programs. The source of the higher-than-"estimated" rate of competition for contracts performed in Washington appears to be a higher-than-average rate of competition for Aircraft-related products: while only 10 percent of contract obligations for DoD overall were awarded after effective competition in 2014, 35 percent of those contracts performed in Washington were awarded after effective competition.[41]

FRS&C also makes up a significant share of contracts performed in Washington, and the data show a highly competitive market: 88 percent of Washington FRS&C contract obligations were awarded after effective competition in 2014, compared to 70 percent for DoD overall. And nearly 90 percent of the effectively competed FRS&C contracts performed in Washington received three or more offers.

Virginia

Total 2014 Contract Obligations: $33.6 billion

"Estimated" 2014 Effective Competition Rate: 59 percent

Actual 2014 Effective Competition Rate: 55 percent

Despite a higher-than-average rate of effective competition for a category of services that makes up a significant share of contract obligations performed in Virginia, the predictive model was able to almost exactly predict Virginia's effective competition rate for 2014.

A key reason why the model was able to accurately predict the 2014 effective competition rate for contract obligations performed in Virginia was that the characteristics of those contracts line up notably

[41] Due to poor data labeling, the competed portion of Washington's Aircraft contract obligations are labeled as being associated with the Shillelagh Missile, a 1970s Army anti-tank missile program. CSIS is engaging with experts to try to determine what program these contract obligations are actually associated with.

with those characteristics that have significant explanatory power under the state predictive model. Contact obligations performed in Virginia are disproportionately awarded for services and under IDV contract types, which correlate with higher rates of effective competition, and are disproportionally awarded for PAMS and the Aircraft and Drones platform portfolio, which correlate with lower levels of effective competition.

As might be expected given the volume of available vendors, the market for PAMS in Virginia is significantly more competitive than it is nationwide: 61 percent of PAMS contract obligations performed in Virginia were awarded after effective competition, compared to 36 percent nationwide.

It is also notable that, for R&D contract obligations performed in Virginia, 36 percent awarded after competitions received only a single offer—over twice the rate for R&D nationwide. As a result, the rate of effective competition for R&D contracts performed in Virginia was only 32 percent in 2014, compared to 46 percent nationwide. Given the heavy concentration of major R&D vendors in Virginia, this high rate of single-offer competition is likely masking contracts that would be more properly classified as noncompetitive.

V. Results and Final Thoughts

Due to the previously mentioned limitations inherent in this iteration of the model, it bears repeating that the results from the predictive model are not intended to be used to "grade" states and MCCs on their performance in promoting effective competition. For MCCs, the "estimated" effective competition rates for 2014 were off by an average of 15 percentage points, with a median of 10 percentage points; when only MCCs with over $1 billion are looked at, however, the mean difference was 9 percentage points, with a median of 6 percentage points. For states, the predictive model was notably more accurate—the mean differential between actual and "estimated" 2014 effective competition rates for states was 8 percentage points, with a median of 7 percentage points. Interestingly, the mean and median differentials for states with over $1 billion in obligations are slightly higher (9 percent mean, 8 percent median), indicating that the model for states has less of an issue with low levels of obligations than does the MCC model.

There are other statistical techniques that could be used to try and generate more accurate predictions, but some of the significant challenges that the study team had to deal with in this research effort would also apply to those other approaches. Most notably, there is an issue of causality when using variables based on what is being contracted for delivery: the specific mix of product, services, and R&D within a state or MCC is a decision made at a much higher level than decisions on contract pricing mechanism or contract vehicle. Any future attempts to develop a predictive model for defense competition will have to account for that potential limiting factor.

Regardless of the limitations of the predictive models, the results validate the ability of the models to identify states and MCCs where rates of effective competition for a segment of the contracting portfolio differ significantly from the rates for overall DoD. For states in particular, this method of analysis can serve as a complement to, and potential cueing system for, the highly detailed S2T2 industrial base assessment. While that analysis took a micro-level approach to the industrial base, this analysis is more of a macro-level view, allowing an assessment of whether particular states have lower-than-average rates of effective competition for particular portions of their defense contract portfolios. For instance, as discussed earlier in the "Examination of Outlier Major Commands and U.S. States" section, contracts performed in Massachusetts see rates of effective competition well below average in most significant categories. One explanation for this could be that the particular types of, for example, PAMS performed in Massachusetts historically had lower rates of effective competition than did overall PAMS. This explanation, however, seems unlikely to account for how broadly contracts performed in states like Massachusetts under- (or over-) perform typical rates of effective competition.

The main conclusion that can be drawn from the MCC data in this analysis is that, if DoD has any hope of promoting effective competition in contracting, policymakers will have to look beyond policies that focus on competition as a DoD-wide phenomenon, or even as an issue at the major component level. Rather, the data indicate that the major discrepancies in rates of effective competition are at the MCC level, or even further down at the contracting office level. As with states, there may be legitimate factors relating to the exact composition of what an MCC contracts for that influence their rates of effective competition in particular product or service categories. However, it seems likely that at least

some of those differences between MCCs are the result of certain MCCs being better or worse at getting competition for their contracting portfolios. Identifying which MCCs are getting higher- or lower-than-average rates of effective competition for particular categories of contracts can be the first step to identifying best practices and areas for potential improvement.

The CSIS study team will continue to track and investigate trends in competition for defense contracts as part of an ongoing effort to inform the public debate with hard data. As part of this ongoing effort, CSIS is making key elements of the methodology of both this research effort and the broader contracting analysis available to other researchers at http://github.com/CSiSdefense. The study team is happy to collaborate with other researchers and interested parties, whether in government or outside, in order to help further the understanding of key issues affecting defense contracting.

Appendix 1: Complete Results from States Predictive Model

Place of Performance (State/Territory)	2014 Contract Obligations (2014 $ Billions)	Actual 2014 Effective Competition Rate	"Estimated" 2014 Effective Competition Rate	Difference between Actual and "Estimated"
AK	1.49	72%	81%	-8%
AL	8.81	82%	56%	26%
AR	0.60	78%	79%	-1%
AS	0.00	89%	96%	-7%
AZ	9.57	18%	25%	-6%
CA	30.59	50%	48%	2%
CO	5.76	38%	62%	-23%
CT	13.21	6%	24%	-19%
DC	4.19	58%	61%	-3%
DE	0.40	80%	87%	-7%
FL	9.73	52%	52%	0%
GA	6.32	34%	33%	1%
GU	0.73	92%	87%	5%
HI	2.13	72%	83%	-11%
IA	1.10	33%	29%	4%
ID	0.16	77%	75%	2%
IL	4.29	61%	51%	9%
IN	2.46	41%	50%	-9%
KS	1.55	46%	54%	-8%
KY	5.97	88%	83%	5%
LA	2.08	80%	75%	5%
Place of Performance (State/Territory)	**2014 Contract Obligations (2014 $ Billions)**	**Actual 2014 Effective Competition Rate**	**"Estimated" 2014 Effective Competition Rate**	**Difference between Actual and "Estimated"**
MA	9.43	19%	38%	-19%
MD	12.94	56%	56%	0%
ME	1.42	63%	54%	10%
MI	2.43	32%	42%	-9%
MN	3.85	89%	93%	-3%
MO	7.02	29%	34%	-5%
MP	0.00	49%	39%	10%
MS	2.27	71%	53%	18%
MT	0.20	57%	63%	-6%
NC	2.49	79%	75%	4%
ND	0.22	88%	88%	0%
NE	0.65	75%	68%	7%

NH	1.13	35%	45%	-11%
NJ	5.53	52%	41%	11%
NM	1.26	69%	59%	10%
NV	1.27	41%	58%	-17%
NY	6.22	32%	35%	-3%
OH	4.49	67%	53%	14%
OK	1.83	59%	69%	-9%
OR	0.57	54%	60%	-7%
PA	10.15	59%	46%	13%
PR	0.33	83%	68%	15%
Place of Performance (State/Territory)	**2014 Contract Obligations (2014 $ Billions)**	**Actual 2014 Effective Competition Rate**	**"Estimated" 2014 Effective Competition Rate**	**Difference between Actual and "Estimated"**
RI	0.82	52%	54%	-2%
SC	2.74	66%	68%	-2%
SD	0.12	51%	58%	-7%
TN	1.17	75%	56%	18%
TX	23.56	39%	38%	2%
UT	1.53	52%	54%	-2%
VA	33.59	55%	59%	-4%
VI	0.00	44%	73%	-29%
VT	0.15	29%	32%	-3%
WA	7.52	45%	27%	18%
WI	1.28	65%	65%	-1%
WV	0.24	73%	62%	12%
WY	0.09	75%	80%	-5%

Appendix 2: Complete Major Contracting Command Model Results

Major Contracting Command	2014 Contract Obligations (2014 $ Billions)	Actual 2014 Effective Competition Rate	"Estimated" 2014 Effective Competition Rate	Difference between Actual and "Estimated"
ACC	1.81	77%	64%	14%
AETC	1.49	69%	66%	3%
AF INSTALLATION CONTRACTING AGENCY	2.97	70%	77%	-7%
AFDW	0.38	42%	64%	-21%
AFGSC	0.27	70%	69%	2%
AFISRA	0.20	35%	69%	-34%
AFMC	37.43	30%	33%	-3%
AFOTEC	0.02	34%	78%	-44%
AFRC	0.23	73%	63%	9%
AFSOC	0.19	72%	59%	13%
AFSPC	8.43	36%	63%	-26%
AIR MOBILITY COMMAND	1.03	68%	64%	4%
ARMY MATERIEL COMMAND	49.58	46%	34%	12%
ATEC	(0.00)	1%	41%	-40%
CONSTRUCTION & EQUIPMENT	2.46	90%	76%	14%
DCMA, HQ, PROCUREMENT CENTER	0.11	44%	52%	-8%
DCSO	0.94	62%	51%	11%
DLA AVIATION	4.44	20%	25%	-5%
DLA DISPOSITION SERVICES	0.10	84%	90%	-7%
DLA DISTRIBUTION	0.19	89%	71%	18%
Major Contracting Command	**2014 Contract Obligations (2014 $ Billions)**	**Actual 2014 Effective Competition Rate**	**"Estimated" 2014 Effective Competition Rate**	**Difference between Actual and "Estimated"**
DLA DOCUMENT SERVICES	0.09	71%	59%	13%
DLA ENERGY	12.48	94%	88%	6%
DLA LAND	1.27	46%	25%	21%
DLA LOGISTICS INFORMATION SERVICE	0.06	8%	91%	-83%
DLA MARITIME	1.89	53%	52%	1%
DLA STRATEGIC MATERIALS	0.00	-35%	79%	-114%

DLA TROOP SUPT C&T	1.19	62%	88%	-26%
DLA TROOP SUPT MED	4.70	96%	91%	5%
DLA TROOP SUPT SUB	2.10	89%	90%	-1%
INSCOM	0.72	67%	62%	5%
MEDCOM	1.34	58%	75%	-17%
MSC	1.76	83%	69%	14%
NAVAIR	24.84	17%	15%	2%
NAVFAC	8.24	79%	67%	12%
NAVSEA	29.86	35%	35%	-1%
NAVSUP	7.67	33%	51%	-18%
NGB	2.18	66%	60%	6%
ONR	1.29	59%	65%	-6%
PACAF	0.76	54%	64%	-10%
PEO STRI ORLANDO	1.92	85%	83%	1%
SMDC	1.01	68%	58%	9%
Major Contracting Command	**2014 Contract Obligations (2014 $ Billions)**	**Actual 2014 Effective Competition Rate**	**"Estimated" 2014 Effective Competition Rate**	**Difference between Actual and "Estimated"**
SPAWAR	5.20	57%	61%	-4%
SSP	2.39	4%	20%	-17%
Uncategorized	35.46	71%	67%	4%
USACE	17.24	81%	67%	14%
USAFA	0.15	80%	66%	14%
USAFE	0.44	89%	58%	31%
USAMRAA	1.24	55%	59%	-5%
USMC	2.97	64%	68%	-4%

Biographies

Andrew Hunter is a senior fellow in the International Security Program and director of the Defense-Industrial Initiatives Group at CSIS. From 2011 to 2014, he served as a senior executive in the Department of Defense, serving first as chief of staff to undersecretaries of defense (AT&L) Ashton B. Carter and Frank Kendall, before directing the Joint Rapid Acquisition Cell. From 2005 to 2011, Mr. Hunter served as a professional staff member of the House Armed Services Committee. Mr. Hunter holds an M.A. degree in applied economics from the Johns Hopkins University and a B.A. in social studies from Harvard University.

Gregory Sanders is a fellow with the Defense-Industrial Initiatives Group at CSIS, where he manages a team that analyzes U.S. defense acquisition issues. Utilizing data visualization and other methods, his research focuses on extrapolating trends within government contracting. This requires innovative management of millions of unique data from a variety of databases—most notably the Federal Procurement Database System, and extensive cross-referencing of multiple budget data sources. Mr. Sanders holds an M.A. in International Studies from the University of Denver and a B.A. in Government and Politics, as well as a B.S. in Computer Science, from the University of Maryland.

Jesse Ellman is a research associate with the Defense-Industrial Initiatives Group (DIIG) at CSIS. He specializes in U.S. defense acquisition policy, with a particular focus on Department of Defense, Department of Homeland Security, and government-wide services contracting trends; sourcing policy and cost-estimation methodologies; and recent U.S. Army modernization efforts. Mr. Ellman holds a B.A. in political science from Stony Brook University and an M.A. with honors in security studies, with a concentration in military operations, from Georgetown University.