# DoD Acquisition–To Compete or Not Compete:

## *The Placebo of Competition*

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Commercial markets abound with examples of competitive forces providing reduced costs and increased innovation. However, the defense market is materially different from commercial markets in many ways, and thus does not respond in the same way to competition. This analysis examines a series of outcomes in both competitive and sole-source acquisition programs, using a statistical model that builds on a game theory framework developed by Todd Harrison, Center for Strategic and Budgetary Assessment. The results show that the Department of Defense may actually incur increased costs from competition. Competition in defense acquisition may not reduce costs, but may—like a placebo—create a powerful perception of cost control.

In the never-ending battle to control the costs of Major Defense Acquisition Programs (MDAPs) in the Department of Defense (DoD), the cry for competition can be heard throughout the U.S. Government like an incantation to conjure the invisible hand of free markets so aptly described by Adam Smith, the father of modern economics. Commercial markets abound with examples of competitive forces providing reduced costs and increased innovation. Deregulation and commercialization of telecommunication services, for example, broke up the AT&T monopoly and restored competition, resulting in the low-cost, innovative products and services now enjoyed on a global scale. Government officials and politicians point to endless examples of the powers of competition in commercial markets, such as the remarkable consumer electronics available today and the influence of Internet commerce that drives down prices. Can the DoD harness these competitive forces to control acquisition costs and provide innovative solutions for U.S. defense needs?

The market for the products and services sought by the DoD differs greatly from the free market of the commercial economy. Commercial markets enjoy a vast universe of customers, while in most cases the unique systems required by the DoD make the U.S. Government the sole customer and regulator. The companies of the military-industrial complex of the 1950s have consolidated and specialized over the past

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two decades, strengthening oligopolies and creating monopolies, thereby limiting opportunities for competition. This article employs a simplified statistical model to examine various characteristics of competition in defense markets and to provide insight for acquisition professionals and policymakers. The results indicate that cost savings, when they occur, often come with adverse side effects on budget planning and industry health. Uncertainties in the competitive bid process can cause large cost variations, overwhelming the savings from competitive pressures on profit margins. Innovation introduced by competition can reduce costs, but innovation can be difficult to distinguish from overly optimistic cost estimates, particularly when sellers have to set prices before product development and production. Contrary to expectations, competition may actually increase costs relative to sole-source procurement.

## Background

The desire for competition has a long history in federal acquisition. In 1809, Congress passed the first law addressing the question, stating the preference for "formal advertising" for procurement contracts. Subsequent legislation periodically relaxed and strengthened requirements for competition in response to various wartime and peacetime demands. The Competition in Contracting Act (CICA) of 1984 laid the foundation for today's regulations, requiring "full and open competition through the use of competitive procedures" (Manuel, 2011, p. 4). Subsequent legislation has amended CICA and allows for many alternatives to competition under specific conditions (Manuel, 2011). Most recently, in response to increased DoD acquisition costs and growing budget pressures, Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall reemphasized competition to control and reduce cost (Kendall, 2012). Belying the recent emphasis on competition to mitigate cost challenges, a recent study implies that competition will often increase the cost of acquisition.

Todd Harrison of the Center for Strategic and Budgetary Assessment performed a game theory analysis of two equal competitors bidding on a hypothetical acquisition program (Harrison, 2012). He assumed each competitor had perfect knowledge of the development and production costs, and each could bid either a 10 percent profit, zero profit, or a 10 percent loss in any given round of competition (the analysis allowed for a loss in a round of bidding as a strategy to win future rounds, but recognized that a competitor would not accept a loss over the entire program).

Harrison's analysis shows that sole-source procurement provides the lowest range of potential costs regardless of the number of rounds or the award split used in a competitive acquisition strategy (Figure 1). Competition produces higher costs in this analysis because each competitor incurs duplicative development costs, and neither competitor can realize the full cost benefits of a typical production learning curve. Harrison's game theory model of competition examines the bidding behavior of two equal competitors, but it does not address characteristics that differentiate competitors or recognize imperfect knowledge about the costs of development and production. A statistical-modeling approach can explore these characteristics.

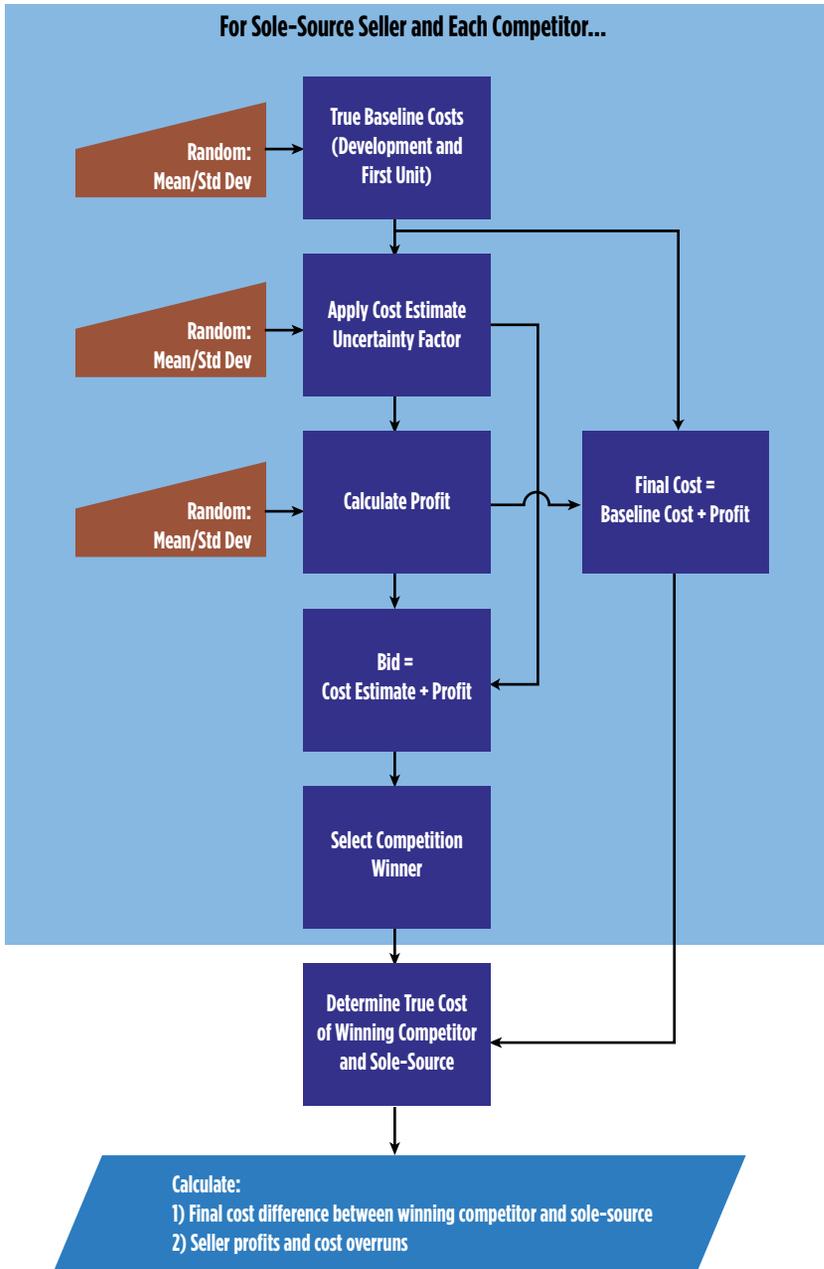**FIGURE 1. MULTIPLE ROUNDS OF COMPETITION**
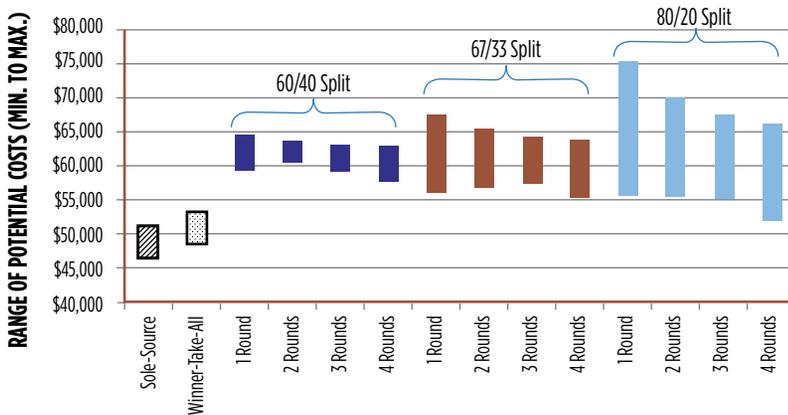


*Source.* (Harrison, 2012, p. 9)

## Statistical Model and Analysis Methodology

To investigate how the outcomes of sole-source procurement compare to competitive procurement would require researchers to execute duplicate acquisition programs as both a competitive and sole-source procurement and compare the results. To gain meaningful data, researchers would have to conduct this experiment many times. Of course, such a real-world trial would be virtually impossible. Instead, this comparison can be made by using a statistical model of bidding and program execution, with comparison of the results of multiple trials in a Monte Carlo analysis (Figure 2).

## FIGURE 2. FLOW CHART OF COMPETITION MODEL



**For Sole-Source Seller and Each Competitor...**

Random: Mean/Std Dev → True Baseline Costs (Development and First Unit)

Random: Mean/Std Dev → Apply Cost Estimate Uncertainty Factor

Random: Mean/Std Dev → Calculate Profit

Final Cost = Baseline Cost + Profit

Bid = Cost Estimate + Profit

Select Competition Winner

Determine True Cost of Winning Competitor and Sole-Source

Calculate:
1) Final cost difference between winning competitor and sole-source
2) Seller profits and cost overruns

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The statistical model attempts to capture several key characteristics that affect the final price of an acquisition program, including profit sought by supplier, the accuracy of estimates used to produce supplier bids, innovations that reduce the true cost for one competitor, and the amount of prior experience each supplier has in developing and producing similar products. Whereas Harrison's analysis assumed the supplier bids reflect the true program cost, this approach evaluates the effects on the final program costs, which often vary substantially from initial proposals.

The analysis methodology starts with the same hypothetical acquisition program used by Harrison, which assumed a $2,000 development phase, a 100-unit production run, and a $1,000 cost for the first unit. The cost of subsequent units benefits from a learning curve defined as $C_n = C_F n^{\log_2 0.85}$, where $C_n$ is the cost of the *nth* unit, and $C_F$ is the cost of the first unit (for a $1,000 first-unit cost and 100-unit purchase, the average cost becomes $435). To evaluate the effects of competition, the model assumes that two competitors bid on the development and production phases, and the lowest bid wins. The final cost of the competition is then compared to that of sole-source procurement. In cases that examine the effects of random variables, the analysis uses random values for both the competitive and the sole-source procurement, compares final buyer cost for each, and repeats the process 1,000 times to obtain statistical data on the cost difference to the buyer, as well as on several other parameters.

## Analysis Results

The following results illustrate the effects of each competition characteristic. Examining each effect independently provides insight that acquisition officials and policymakers can use to assess the competitive environment for a product, consider whether to emphasize competition, evaluate competitors and their proposals, and establish expectations for the results. The analysis begins with the most basic aspect of competition: the pressure on suppliers to trim profit margins to win a competition.

### Case 1: Competitive Pressure on Profit Margin

To remain consistent with Harrison's results, the analysis of reduced profit margins assumes the sole-source supplier requires a profit of 10 percent, resulting in a total cost to the buyer of $50,050. Since a sole-source provider feels no pressure to trim the profit margin, the analysis holds the 10 percent profit constant for this case. The competitors,

however, will feel pressure to lower their profit margin to win the competition. Business conditions for each competitor—such as weighted average cost of capital, manufacturing capacity, and the expectations of shareholders—will influence how much profit each competitor requires. The model will treat the profit margin contained in each competitor's bid as a random variable with a mean and standard deviation. Figure 3 shows the average, 1-sigma (one standard deviation) variation, and the range from 5th percentile to 95th percentile, for the savings the buyer can expect as the mean bid varies from 5 to 10 percent, assuming a bid standard deviation of 2 percent profit. Not surprisingly, sellers' reductions in acceptable profit margins lead directly to savings for the buyer. Note that the average saving exceeds the simple difference in mean profit margin between sole-source and competitive bidding because the competitive process selects the lower of the two bidders. Thus, for example, a mean bid profit margin of 7 percent saves the buyer not only the 3 percent difference between 7 percent and the sole-source bid of 10 percent, but an additional saving occurs by selecting the lowest of two bidders, resulting in an average 3.7 percent saving to the buyer. If more suppliers enter the competition, the saving will marginally improve.

## FIGURE 3. EFFECT OF PROFIT MARGIN PRESSURES
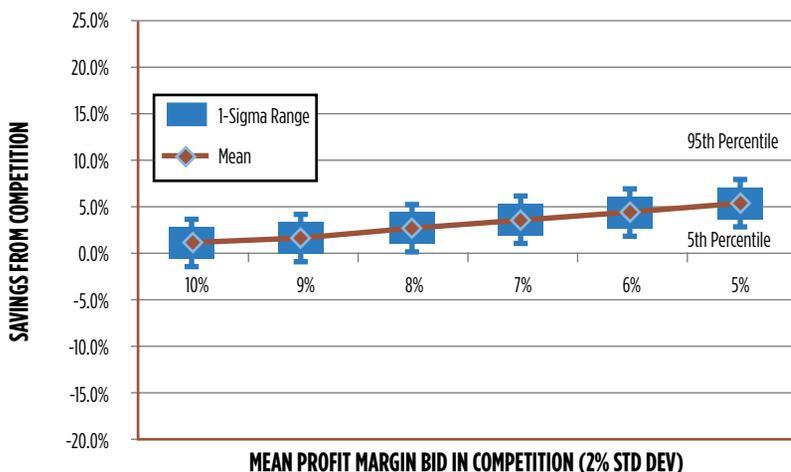


*Note.* Competitive pressures can force sellers to reduce profit margins, resulting directly in buyer savings relative to sole-source procurement.

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This somewhat obvious first case illustrates two characteristics of competition relative to sole-source procurement. First, competitive pressure on profit margins alone provides a relatively modest saving to the buyer. The defense industry generally has the lowest profit margins among its peers in other industries, ranging between 5 percent and 10 percent for the period from 1989 to 2006 (Arnold, Harmon, Tyson, Fasana, & Wait, 2009, p. 50). Starting at these low profit margins provides limited opportunity to shave margins further.

Second, a seller's willingness to reduce its profit margin significantly to win a competition may indicate a struggling business. For example, executives interviewed by the Space Industry Study Group at the Eisenhower School for National Security and Resource Strategy recently noted that each competition seems to have at least one *desperate bidder*, due to declining federal budgets. While these low bids promise savings for the government, acquisition officials should carefully consider whether the low bidder can survive unexpected cost increases and reliably deliver the final product.

Like Harrison's analysis, this first case assumes that the competitors have perfect knowledge of the development and production costs for the proposed product. Most MDAPs, however, do not enjoy perfect knowledge of these future costs.

## Case 2: Bidding Accuracy

In addition to monopsonistic and oligopolistic conditions, the defense acquisition market differs from the commercial markets in another fundamental way. The defense industry faces significant uncertainty in its costs at the time it sets the price for its products. In a typical commercial market, a seller offers a product for sale after completing development and an initial production run. At that point, the seller understands its costs, can evaluate the demand, and can set the price and production rate to maximize profits and effectively compete against other sellers. In most MDAPs, the buyer asks the seller to set the price in advance. This analysis case will examine two effects of imperfect cost knowledge. First, the analysis assumes that both the sole-source provider and the two competitors have the same inaccuracy in assessing the future cost of the program. Then the analysis will evaluate the results if one competitor underestimates the true costs.

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**Case 2a: Equal bidding inaccuracy.** To assess the effects of bidding inaccuracy on the outcomes of competition, the analysis assumes the true costs of development and production remain the same as Case 1, but that each seller has independent inaccuracy in estimating them. A random factor with a Gaussian distribution represented by its standard deviation (1-sigma) value will signify this uncertainty in the model. The bids of the sole-source provider and the two competitors will vary independently based on the same standard deviation.

This Case 2a scenario simulates a condition in which any seller will likely incur the same cost in the end, but be unable to estimate accurately the cost changes that might occur during the development and production learning curve. In this case, the contract type becomes relevant to the outcome. The analysis will evaluate both a Fixed Price (FP) and Cost Reimbursable (Cost-Plus, or CP) contract. For an FP contract, the buyer pays an agreed price regardless of the actual cost incurred by the seller, and therefore the seller could earn a profit higher or lower than the bid contains. For a CP contract, the buyer agrees to pay a fee, representing the seller's profit, based on a percentage of the initially estimated costs, and the buyer also pays the actual costs of development and production.

Figure 4 shows the cost savings that competition provides relative to sole-source procurement for an FP contract. The inaccuracy of the initial bid for an FP contract competition, on average, reduces the buyer's final cost relative to a sole-source award. The result has high variability; however, competition actually results in higher cost relative to sole-source procurement in about one-third of the simulations. In this case as in Case 1, the buyer benefits at the seller's expense, but since, by definition, the seller cannot predict its bid inaccuracies, the potential impact to the seller's profit (or loss) can be much greater. Figure 5 shows how inaccurate bidding affects the competitive seller's profits. While FP contracts place this risk on the seller, two issues could arise for acquisition programs: (a) if the seller incurs too much loss, it could become unable to complete the contract; and (b) if the seller incurs too much gain, it could draw the attention of regulators always on the lookout for excessive industry profits. For the sole-source seller, the average profit does not decline, but it has somewhat more variability. The competitive seller suffers more on average because the competition selects the bidder who underestimates the costs the most.

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## FIGURE 4. BID ACCURACY–FIXED PRICE CONTRACT
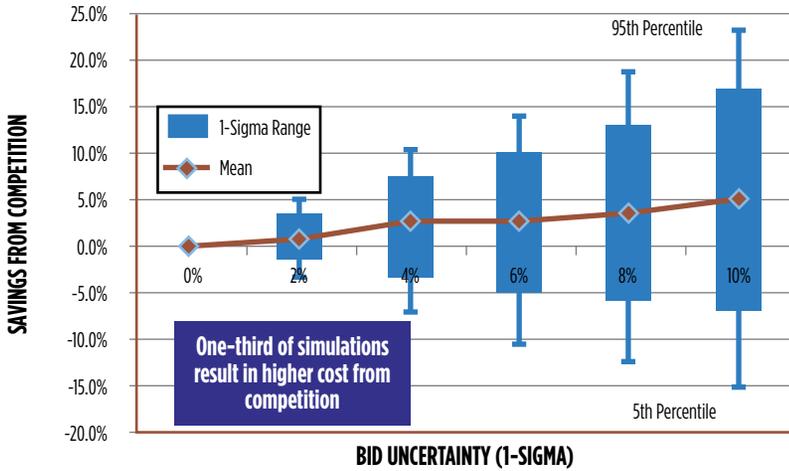


*Note.* As the inaccuracy of the initial bid increases for a Fixed Price contract, competition, on average, reduces the buyer's final cost relative to a sole-source award; however, the result has high variability. Competition actually increases cost relative to sole source in about one-third of the simulations.

## FIGURE 5. BID ACCURACY–FIXED PRICE CONTRACT
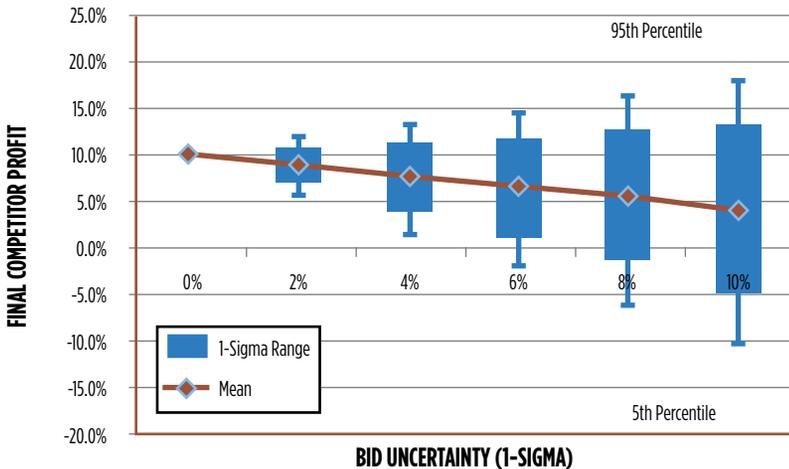


*Note.* Bid inaccuracy can severely impact seller profits on a Fixed Price contract.

**FIGURE 6. BID ACCURACY–COST REIMBURSABLE CONTRACT**
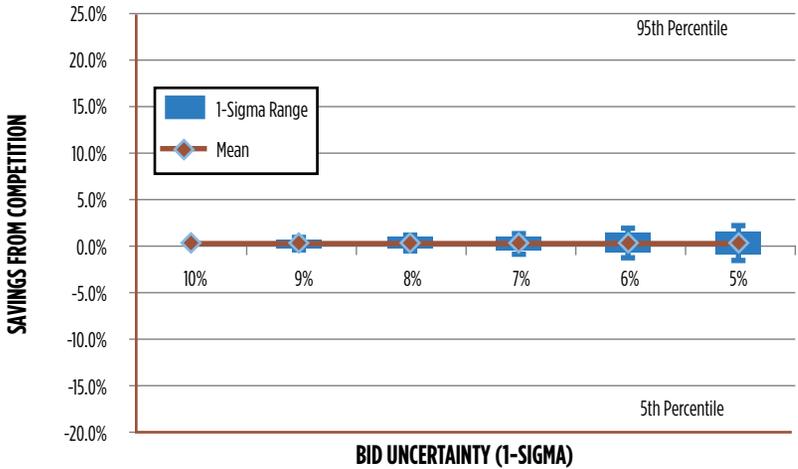


*Note.* Minimal savings from competition for a Cost Reimbursable contract: the initial bid only affects the fee paid to the seller as profit, so bidding accuracy influences the final cost only slightly.

**FIGURE 7. BID ACCURACY–COST REIMBURSABLE CONTRACT**
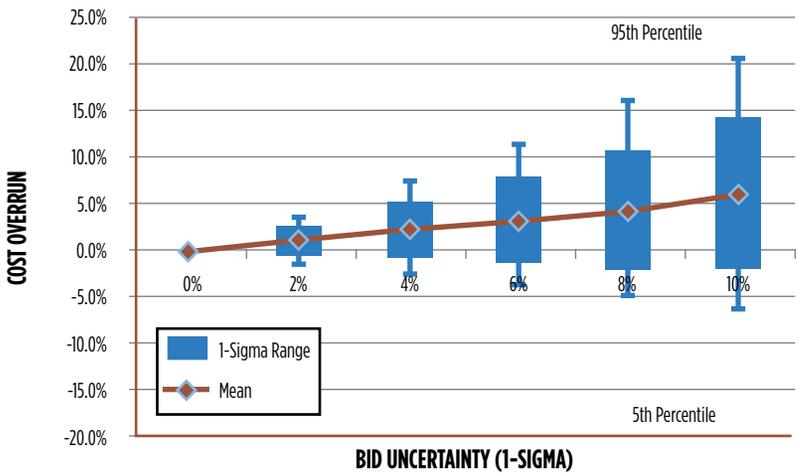


*Note.* Bid uncertainty leads to cost overruns on Cost Reimbursable contracts.

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Figure 6 shows that bidding inaccuracy for a CP contract does not favor either sole-source or competitive procurement. In either case, the initial bid affects only the fee paid to the seller as profit, so bidding accuracy influences the final cost to the buyer only slightly. The effect for a CP contract reveals itself in the potential cost overruns relative to initial bids. Figure 7 shows the cost overrun statistics for the competitive seller in a CP contract. The average cost overrun increases for a competitive seller, but stays near zero for the sole-source seller because, like the effect on profit under an FP contract, the competition selects the seller that underestimates the cost the most. Therefore, competition for a CP contract will tend to increase the likelihood of cost overruns, but not significantly reduce the final cost to the buyer. In addition to random bidding inaccuracy, sellers may also have a bias toward underestimating development and production costs, which Case 2b examines.

**Case 2b: One competitor underestimates costs.** In Case 2a, the sole-source seller and both competitive sellers have uncertainty about the final costs, but on average their bids reflect the true cost. Often when forecasting cost, sellers will not only have inaccuracy, but a bias toward underestimation. Especially in the face of competition, a seller will tend to estimate costs optimistically. To represent this effect, the model can add a bias to the bids, while keeping the true costs of development and production the same as previous cases. Adding identical bias to the sole-source seller and both competitive sellers would merely shift the results of Case 2a. Instead, Case 2b assumes that one competitive bidder has less experience developing and producing the product than either the other competitor or the sole-source seller. For the less experienced seller, the analysis assumes a bidding inaccuracy of 10 percent (representing 1-sigma) and a bias toward underestimating the true cost. Meanwhile, both the sole-source seller and the other competitor will have a somewhat lower bidding inaccuracy of 5 percent without a bias.

Figures 8 and 9 show the results for an FP contract as the bias varies from 0 to 10 percent. As with Case 2a, the buyer benefits from a lower cost at the expense of the seller's profit. An inexperienced competitor underestimating the final cost amplifies both effects. The competitive selection favors the inexperienced seller with the lower bid, creating more buyer savings relative to a sole-source seller, but increasing the concern that the seller will incur intolerably low profit, or even losses.

## FIGURE 8. UNDERBID–FIXED PRICE CONTRACT
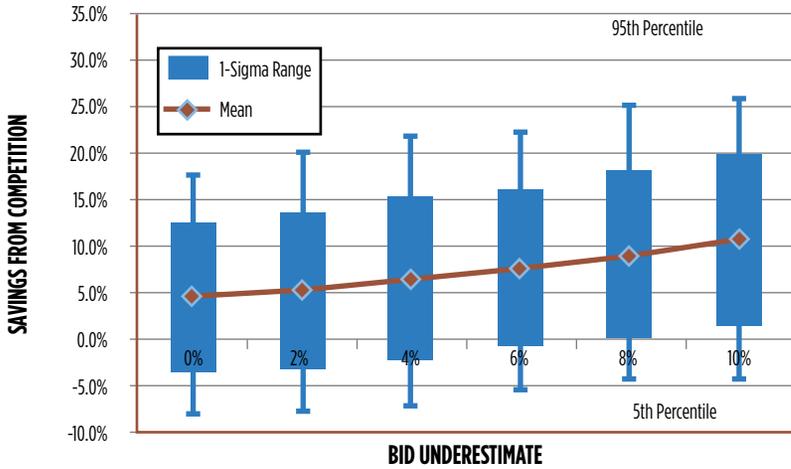


*Note.* A less experienced competitor will tend to have less accurate estimates and may underestimate final costs. As a competitor's underestimate increases for a Fixed Price contract, the buyer enjoys a more favorable price than a more accurate bid from a sole-source seller.

## FIGURE 9. UNDERBID–FIXED PRICE CONTRACT
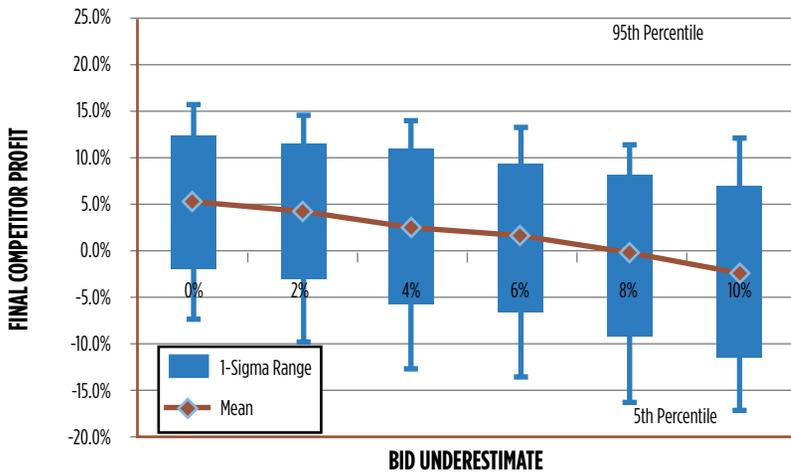


*Note.* A less experienced competitor will suffer reduced profits, or even losses, due to underestimated costs. Since competition will favor the lower bidder, competitive procurements will make seller losses more likely than sole-source procurements.

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## FIGURE 10. UNDERBID–COST REIMBURSABLE CONTRACT
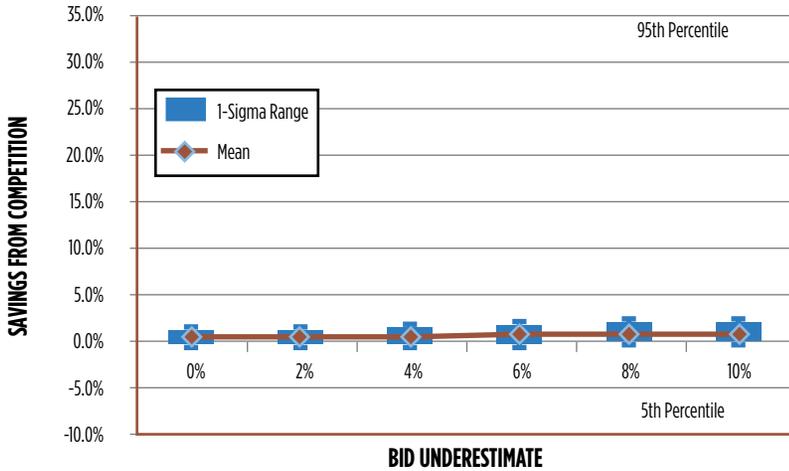


*Note.* For a Cost Reimbursable contract, bid inaccuracy and bid underestimation provide little advantage for competition relative to sole-source procurement because the final price to the buyer includes any cost variation from the bids. Only the fee, or profit, paid to the seller varies—and only slightly.

## FIGURE 11. UNDERBID–COST REIMBURSABLE CONTRACT
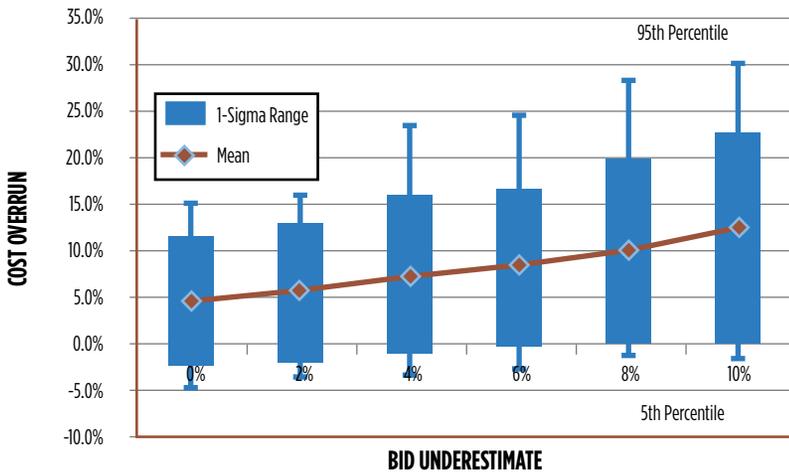


*Note.* Bid inaccuracy and bias toward underestimation can amplify cost overruns in Cost Reimbursable when comparing sole-source procurement to competitive procurement because competitive selection will favor the underestimated bid.

Figures 10 and 11 show the results for a CP contract. As with Case 2a, the effects of bid inaccuracy and bias in competitive procurement provide little savings to the buyer relative to sole-source procurement. Bid underestimation, however, has significant effects on cost overruns, which can threaten the program and disrupt future planning if not taken into account. Competitive procurement increases the effect relative to sole-source procurement because the competitive selection process favors the underestimated bid.

Cases 2a and 2b demonstrate that bid inaccuracy and bias can indeed lower the final cost to the buyer, but at the expense of the seller's profit on FP contracts, or of more likely cost overruns on CP contracts, both of which can put the entire program at risk. The Navy's A-12 acquisition program, which was cancelled in 1991, provides an example.

In 1984, a partnership between McDonnell Douglas and General Dynamics won the FP contract for the A-12 bomber with a bid of $4.8 billion, substantially beating the $5.9 billion bid of the partnership of Northrop and Grumman (Wilson & Carlson, 1995). Northrop and Grumman had prior experience with the key stealth technology required for the contract, while the winning bidder did not. Cost overruns and schedule delays began almost immediately after the contract was signed. Although it was an FP contract, the sellers could not absorb the cost increases and filed a Request for Equitable Adjustment for a price increase of $1.47 billion, implying the losing bid of Northrop and Grumman more closely estimated the true costs. The DoD cancelled the program in 1991 due to these cost increases, spawning a lawsuit from the sellers alleging, in part, that the DoD had knowledge that the requirements were "unattainable" (Wilson & Carlson, 1995, p. W.10). The use of an FP contract with an underinformed competitor produced a contract price that seemed like a good deal at the time, but ultimately resulted in the cancellation of the program and spawned a lawsuit that continues today, two decades later.

Thus far, the analysis has evaluated differences in competitor bidding characteristics while keeping the actual cost of development and production fixed. The next case examines the effects of competition where the sellers have differing design solutions or production processes that change the actual cost.

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## Case 3: Innovation

Innovation in design or production can create differences among sellers, resulting in true cost savings in the final product. Utilizing proven technology in a design, for example, might produce a less expensive product than a design that requires new technology development. Advanced manufacturing techniques or automated assembly could lower the production costs compared to existing manufacturing methods or manual assembly.

In Case 3, the analysis assumes that all of the sellers have a 5 percent standard deviation in the actual cost of their product and that one competitive seller has reduced the cost of production by up to 10 percent. Because innovation likely implies higher development costs, the analysis assumes that the seller with the lower production cost will also incur a 20 percent higher development cost, which as it turns out does not significantly affect the conclusions.

### FIGURE 12. SAVINGS FROM COMPETITION AND INNOVATION
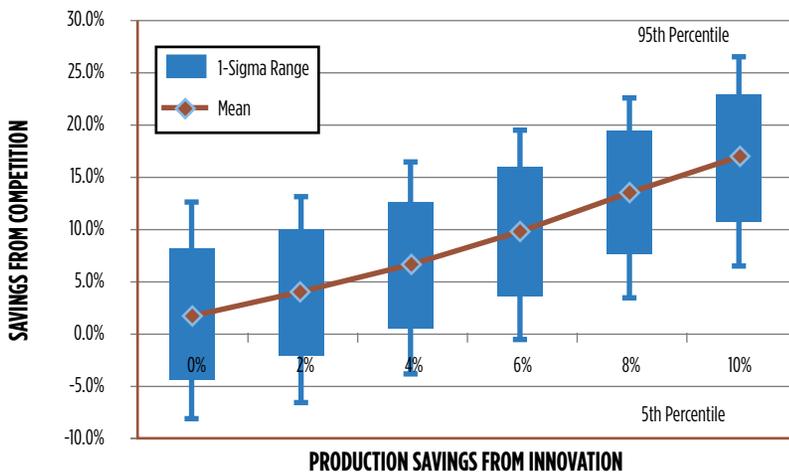


*Note.* Innovation in design or manufacturing can change the true cost. As the production savings of one competitive seller improve, the buyer benefits from competition relative to a sole-source seller without innovation.

Since all of the sellers in this case have accurate bid estimates (perfect knowledge of future costs), FP and CP contracts give the same results when comparing the cost of the competitive procurement to the sole-source procurement. Figure 12 shows the benefits that competitive

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procurement provides over sole-source procurement when one competitor includes cost-saving innovations. Although the analysis assumes higher development costs, the savings during production and the competitive selection of the lowest cost seller overcome that disadvantage. Therefore, a buyer should favor competitive procurement over a sole-source procurement if any seller appears to offer innovative solutions that lower costs. The Evolved Expendable Launch Vehicle (EELV) program may provide an example.

Recently, the Air Force reinvigorated competition for space launch contracts under the EELV program (Leone, 2012). New entrants into this market, such as Space Technologies, Inc. (SpaceX), claim that they can provide launch services at lower costs than the current provider, United Launch Alliance, LLC. SpaceX expects its vertically integrated supply chain and a more efficient design will provide cost savings (Chaikin, 2012). Case 3 of this analysis indicates that the Air Force may reap true cost savings from this innovation-based competition. It remains unclear, however, whether this innovation can actually provide cost savings, or whether SpaceX has underestimated its cost as in Case 2b. While innovation may offer cost improvements, incumbent sellers in a defense market may have cost advantages over their competition due to their experience developing and producing similar products.

## Case 4: Incumbent Advantages

In many defense markets, corporate consolidation has created oligopolies and monopolies, with a few companies competing for a limited number of defense programs. Corporate consolidation in many markets has also created strong incumbents who have much greater capabilities and experience producing their products than potential competitors. Two factors complicate the introduction of competition into a market with a strong incumbent. First, an incumbent's existing expertise and infrastructure provide a cost advantage over a new competitor. A new competitor may have to invest more in infrastructure and development to catch up.

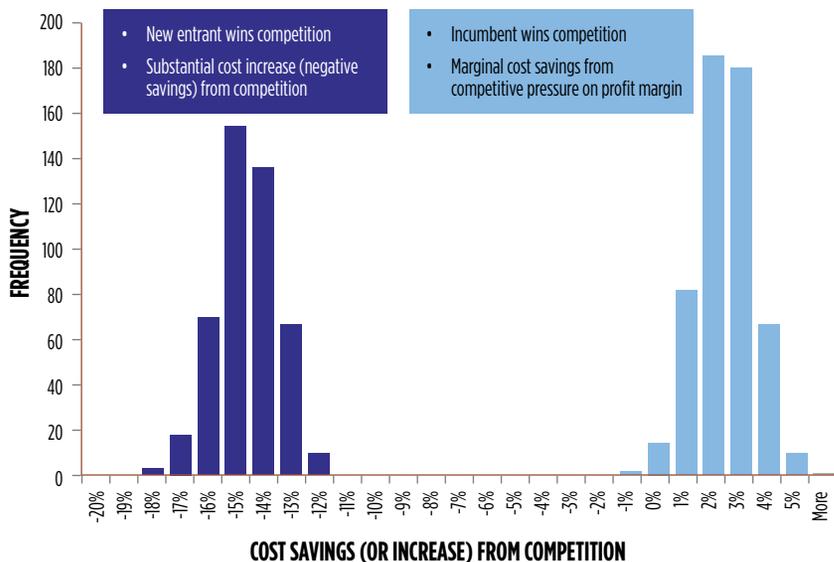Second, incumbents will have a better ability to forecast the costs of a new product in their area of expertise. A new entrant, with less understanding of the challenges and complexities of a particular product, could easily underestimate the cost of development. In competitive procurement, these two factors can conspire to create the illusion of equal competitors. The incumbent will provide an accurate bid that

reflects its actual cost advantage, while the new entrant will likely have higher development costs and start higher on the production learning curve, but will underestimate the costs in its bid either out of ignorance or from competitive pressures. Both may decide to trim profit margins to better compete.

To represent this situation, the analysis for Case 4 assumes the following:

- The incumbent has a random bid inaccuracy of 5 percent (1-sigma) without a bias.

- The new entrant has a random bid inaccuracy of 10 percent (1-sigma) with an average underestimate of 15 percent.

- The incumbent starts lower on the production learning curve, making its production costs 15 percent lower than the new entrant.

- The new entrant has 20 percent higher development costs.

- The incumbent represents the sole-source seller, with no pressure to reduce profit margins from 10 percent.

- The incumbent and the new entrant compete and bid an 8 percent mean profit with a standard deviation of 1 percent profit.

Within these parameters, the model produces two families of potential outcomes for a CP contract, as shown in Figure 13. In cases where the incumbent wins the competition, the results reflect a slight (approximately 2 percent) cost savings relative to sole-source procurement, primarily due to the modeled competitive pressure to reduce profit margins. When the new entrant wins the competition, however, its cost disadvantages manifest themselves with substantially higher costs to the buyer relative to sole-source procurement from the incumbent. This illustrates the danger of forcing competition between a strong incumbent and a relatively inexperienced new entrant.

**FIGURE 13. COST SAVINGS (OR INCREASE) FROM COMPETITION**



- New entrant wins competition
- Substantial cost increase (negative savings) from competition
- Incumbent wins competition
- Marginal cost savings from competitive pressure on profit margin

*Note.* Histogram of outcomes from a competition for a Cost Reimbursable contract between an incumbent and a new entrant as compared to a sole-source procurement from the incumbent. When the incumbent wins the competition, competitive pressures on profit margin result in the slight cost savings relative to sole-source procurement. When the new entrant wins, its higher cost of development and production results in a substantial cost increase relative to a sole-source procurement.

The competition for the Future Imaging Architecture contract in 1998–99 provides an example of these Case 4 characteristics. To the surprise of many, the National Reconnaissance Office decided to open its next-generation imaging satellites to new competition, despite Lockheed Martin's four-decade heritage as the sole provider of this technology. Boeing, looking to diversify its business, entered the competition and won, beating Lockheed Martin with a proposal determined to be cheaper and more innovative (Taubman, 2007).

Lockheed had a strong incumbent position, with more than $30 billion invested by the government into its capabilities to produce imaging satellites. Boeing had little experience and vastly underestimated the cost, likely from a combination of ignorance and a desire to meet the government's price targets. As Boeing realized development challenges, the subsequent cost growth ultimately caused the cancellation of the program at a loss of more than $4 billion (Taubman, 2007).

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# Summary

This study analyzed four aspects of competition relevant to the DoD's effort to control and reduce the cost of MDAPs: Case 1, Competitive Pressure on Profit Margin; Case 2, Bidding Accuracy; Case 3, Innovation; and Case 4, Incumbent Advantages. The results call into question the justification of promoting competition on the basis of cost, and offer acquisition officials and policymakers insights into the outcomes they can expect from competition:

- Competition may pressure sellers to trim profit margins, but the defense industry already operates with low margins relative to its peers. Cost variation from other characteristics of competitive procurement, such as bidding uncertainty, overwhelms the modest cost reduction available from profit margins. When weighing competitive procurement against sole-source procurement, DoD acquisition officials should look beyond mere pricing pressures for benefits and risks.

- Unlike commercial markets, markets for MDAPs usually require sellers to set prices before they know the development and production costs. DoD acquisition officials should consider the potential inaccuracy of cost estimates when selecting contract type and recognize that competition increases the likelihood and severity of seller losses or cost overruns that could threaten program completion.

  ◦ For FP contracts, inaccuracies in cost predictions have a more powerful and unpredictable influence on cost outcomes than the competitive pressures on profit margins, resulting in more cost than sole-source procurement in one-third of the cases. Savings to the buyer come at the expense of seller profits, which could threaten the ability of the seller to complete the program as profits diminish or losses increase.

  ◦ Inaccuracies in cost predictions for CP contracts have little effect on final cost to the buyer, but can significantly increase cost overruns, threatening completion of the program and complicating future planning.

- Innovation in design or production offers the best rationale to promote competition over sole-source procurement to reduce costs to the buyer. Competitors that offer cost savings through more efficient design or advanced production processes can directly influence the final cost to the buyer. DoD acquisition officials face the challenge, however, of distinguishing between truly innovative solutions and the seller's overly optimistic cost estimates.

- Incumbent sellers may enjoy a significant advantage over new competitors entering the market. A new entrant's optimistic cost estimates, however, can win a competition against the accurate estimates of a lower cost incumbent, resulting in dramatically higher final costs to the buyer relative to sole-source procurement from the incumbent. When promoting competition against a strong incumbent, DoD acquisition officials must consider whether a new entrant offers innovation that can realistically overcome the cost advantage enjoyed by the incumbent.

## Conclusions

Kendall (2012), in his memorandum entitled "Better Buying Power 2.0," reemphasized competition to control and reduce costs. This study and a prior analysis of competition cast doubt on cost as a rationale for promoting competition in defense acquisition.

Harrison (2012) concluded that maintaining competition during a DoD acquisition will likely increase the total cost to the government. The higher costs in Harrison's study result from redundant development and infrastructure costs and the inability of multiple competitors to benefit fully from the cost savings of production learning curves.

This study expanded on Harrison's work by evaluating the effects of competitor differences and imperfect knowledge of development and production costs. While competition can pressure sellers to win business by trimming their profit margins, the already low profit margins in the defense industry limit this cost improvement to just a few percent relative to the cost of sole-source procurement.

Unlike commercial markets, where sellers typically set prices after completing product development and initial production, sellers in the defense acquisition market usually set their prices in advance of development and production. The inaccuracies and underestimation of these costs in a competition may appear to provide an initial cost benefit for an FP contract, but competitive selection of the lowest cost seller increases the chances of unsustainably low profits (or even losses) for the seller, threatening program completion and supplier health. Bid inaccuracy in a competition for a CP contract does not significantly affect the final cost to the government, but does amplify the chances of cost overruns relative to sole-source procurement, increasing planning challenges and threatening program viability.

Only when one or more competitors offer innovations that truly reduce the costs of development and production does the government substantially benefit from competition over sole-source procurement without the adverse side effects of cost overruns. Distinguishing between true innovation and optimistic cost estimating, however, can pose a challenge for DoD acquisition officials.

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In defense markets with a strong incumbent that enjoys advantages of experience and expertise, forcing competition from less experienced new entrants can produce costly final outcomes. Incumbents will likely produce more accurate estimates reflecting their true cost advantages, while a new entrant out of ignorance or competitive pressure could significantly underestimate the effort required and produce a bid that appears to beat the incumbent. Unless the new entrant offers innovation that overcomes the incumbent's advantage, the cost of the competition could greatly exceed sole-source procurement from the incumbent.

Certainly, justification for promoting competition in DoD acquisition goes well beyond cost control. Competition promotes fairness and impedes collusion by treating all sellers equally. It reassures the citizenry that the government spends public funds effectively and fairly. Competition in DoD acquisition maintains consistency with the fundamentals of capitalism that drive the U.S. economy, and it can incentivize innovation in the defense industry to provide improved capabilities and lower costs to the DoD.

These and many other reasons can justify promoting competition, but the analysis herein and by Harrison make cost savings from competition an uncertain claim. The DoD may actually incur increased costs from competition, which—like a placebo—creates a powerful perception of cost control.

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## Author Biography



**Mr. William J. Levenson** serves as the chief engineer of the Delta Launch Vehicle Product Line for United Launch Alliance, LLC (ULA). Mr. Levenson has over 30 years' experience in the aerospace industry. He holds a BS in Aerospace Engineering from the University of Maryland, and an MS in Management and Engineering from the Daniels College of Business at the University of Denver.

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