

PURCHASING PERFORMANCE: A PUBLIC VERSUS PRIVATE SECTOR COMPARISON OF COMMODITY BUYING

Maj Joseph Besselman, USAF, Ashish Arora, and Patrick Larkey

Hard evidence is needed to provide an accurate gauge of DoD spending efficiency. This study compares DoD and commercial spending on specific items, shows that DoD spends significantly less than its commercial counterparts on similar items. These findings question the widely-held beliefs about the inherent inferiority and inefficiency of DoD purchasing and acquisition. The findings also argue for much more careful research on purchasing and acquisition, so that the likely effects of reforms are known.

Purported failures in purchasing and acquisition are an important basis for the general public's beliefs that the Department of Defense (DoD) makes inefficient use of tax dollars. A widely publicized string of stories over the past several decades has given the public ample material to compare with private sector purchasing, and to conclude that DoD has been reckless with public money.

We set out to test the validity of the public's beliefs about the DoD by comparing the efficiency of defense purchasing with that of the commercial sector. This research compares the purchases of identical commodities drawn from

electrical, engine, and software sectors. The comparisons consider the price of a good, purchase quantity, relevant contextual information, and DoD's direct buying costs.

The main research questions were:

- What are the differences in buying performance between the commercial and DoD sectors?
- What causes the differences?
- Is there systematic evidence to support the public's beliefs?

The samples of purchases consist of more than 831,000 items purchased as part of 693 actual contracts or delivery orders valued at \$99.9 million to DoD. Among the findings, based on samples of purchases of identical commodities vastly larger than any sample in the literature and improved comparison methodologies, are, first, that DoD pays 41.5 percent less than the average commercial sector organization purchasing the commodities included in the samples. In addition, superior DoD buying performance holds even when considering DoD's direct buying and oversight costs.

PUBLIC PERCEPTION AND PAST RESEARCH

Students of defense procurement, as well as the typical citizen who occasionally reads a newspaper or watches the evening news, agree on one thing: The DoD is an inept buyer of goods and services. Thompson (1992–93), for example, observes the conventional wisdom holds that DoD buying is riddled with fraud and abuse, with overcharging, payroll padding, misappropriation of government property, bribery, kickbacks, and conflicts of interest as commonplace occurrences. The media, and to a much lesser extent the academic literature, have provided many examples fostering these beliefs: \$436 hammers (Comeau, 1984), jet engines purchased by DoD without warranty at a price 20 percent higher than the same commercial sector engines under warranty (Rich and Janos, 1994), \$7,000 videotape recorders (Gansler, 1978), \$7,600 coffee pots, and \$9,600 allen wrenches (Comeau, 1984).

So prevalent are these views that DoD's inspector general, Eleanor Hill, said she

would eliminate the buying of \$436 hammers during her August 28, 1995, swearing-in ceremony, more than 10 years after the hammer purchase made newspaper headlines across the country. Although these examples relate to defense procurement, Downs and Larkey (1986) showed more generally that people believe the U.S. government is inefficient, ineffective, wasteful, and venal, and that its employees are overpaid and underworked.

The belief that DoD is an inept or corrupt buyer rests on a fragile bed of anecdotal evidence. No systematic studies have been performed comparing the buying performance between the defense and commercial sectors using a large sample of purchases of identical commodities. It is unclear whether the aforementioned anecdotes are the rule or exceptions, or whether extenuating circumstances exist to explain the differences in price paid for goods.

Typically, the literature has employed anecdotes focusing only on differences in price while ignoring purchase volumes, representativeness of a purchase, comparability, contextual information surrounding a purchase, or allegedly costly DoD oversight and procurement practices (Mandel, 1977; Michelli, 1977; Angier, White, and Horowitz, 1979; Stimson and Barnett, 1980; Gansler, 1982; Comeau, 1984; Stewart, 1986; "DoD's Inadequate Use" [Senate report 101-62], 1989; the Center for Strategic and International Studies (CSIS), 1991; and Coopers & Lybrand/TASC, 1994). A fuller critical review of this literature is given by Besselman (1998).

The Coopers & Lybrand/TASC study (1994), commissioned by former Secretary of Defense William Perry as one basis

for commercialization reforms, is a recent, important example of the sort of anecdotal research in this area. This study focused on the costs to the government in purchasing and oversight. This directed search for possible savings in purchasing and oversight concluded that:

- the average DoD regulatory cost premium of 18 percent of value-added costs;
- electronics and communications firms appear to have the highest exposure, with an average DoD regulatory cost premium of 25 percent; and
- the DoD acquisition environment imposes substantially greater compliance costs on contractors who develop and manufacture products based on unique military designs.

Unfortunately, the study did not examine possible benefits to the government derived from purchasing and oversight costs. The question never asked or addressed was: Are the government's purchasing and oversight costs justified (that is, more than offset) by lower prices paid than would have been paid absent the costs? Also, the study provided no evidence on best purchasing and oversight practices because it did not examine the practices (and costs) of commercial entities or other units of government.

Even with this restricted cost focus, the methodology was unnecessarily weak. The researchers examined only 10 of the hundreds of possible purchasing sites and the rationale for the 10 selected was not strong. And with this small sample of sites, the researchers relied on opinions of

managers of defense products as data rather than other empirical evidence on actual buying behavior that was readily available. The researchers chose to stay with product lines that were either defense or a mix of defense and commercial business, even though all 10 sites had parallel commercial operations either on or off premises. These strictly commercial operations offered a counterfactual basis of comparison, a means of validating the opinions from cost center managers of defense projects.

These problems are symptomatic of the more general problem of a lack of scholarly research in the defense policy sector, including defense acquisition (Walt, 1991; Mayer and Khademian, 1994). The problems with the defense

procurement literature can be likened to the more general problem of understanding organizations as identified by March and Simon (1958) 40 years ago:

“ These problems are symptomatic of the more general problem of a lack of scholarly research in the defense policy sector, including defense acquisition.”

“The literature contains many assertions, but little evidence to determine—by the usual scientific standards of public testability and reproducibility—whether these assertions really hold up in the world of fact.”

GAUGING EFFICIENCY

Understanding the relative efficiency of defense procurement and how it might be reformed is an important public policy

issue. The DoD purchases more goods and services than any other organization in the world, with 8.7 million contracts worth more than \$132 billion in goods and services (in 1996). Of the 8.7 million contracts, 8.3 million were for goods and services contracts, primarily standard items worth less than \$25,000, with a total value of \$12.4 billion. Approximately 275,000 of the 8.7 million contracts were large system or commodity contracts worth more than \$25,000 for a total value of \$109 billion. With this high volume of buying, even if DoD could achieve six sigma quality,¹ the holy grail of manufacturing quality, DoD would still face approximately five to eight procurement disasters per year.

But funding for procurement is declining, since the Cold War is no longer a driving force for increased defense spending. As the budget falls, so does the size of the military forces, as well as the number of civilians that support the military in critical

“Reductions in personnel and procurement funding must be accompanied by process changes to enable DoD to function effectively.”

acquisition or purchasing positions. Reductions in personnel and procurement funding must be accompanied by p r o c e s s changes to enable DoD to

function effectively. The Congress and the President have been ambitious in their efforts to reform DoD's buying practices and make it easier to buy commercial items through the passage of the Federal Acquisition Streamlining Act of 1994 (Heberling and Houpt, 1995) and the Federal Acquisition Reform Act of 1996

(FARA). The enormous sums of money coupled with the declining budget highlight the importance of understanding the effectiveness of defense procurement practices before offering further reforms.

WHAT ARE THE DIFFERENCES IN BUYING PERFORMANCE?

Rational procurement reform must be grounded in concrete knowledge of what DoD pays relative to the commercial sector for equivalent goods. Not only is this important from a public policy perspective, but this level of insight would enable DoD's purchasing organizations to measure and then continuously improve their operations. Generalizing as to whether DoD pays more than the commercial sector for an equivalent good is not a trivial task. The DoD is not a monolithic organization with one procurement style purchasing one type of good with a singular cost structure. The goods purchased by DoD range from simple commodities, such as hammers, bolts, or transistors, to highly complex unprecedented systems, such as the Air Force's newest fighter, the F-22. To ensure that identical goods are being compared, this research focuses on commodities. As more complex DoD goods are examined, it becomes increasingly more difficult to find identical commercial counterparts. For example, no commercial counterpart exists for the Air Force's F-22 fighter or B-2 bomber. There are commercially available commodities purchased for or in support of those aircraft, however.

It is not easy to gather a large sample of actual, identical commodity purchases, gain government or commercial sector

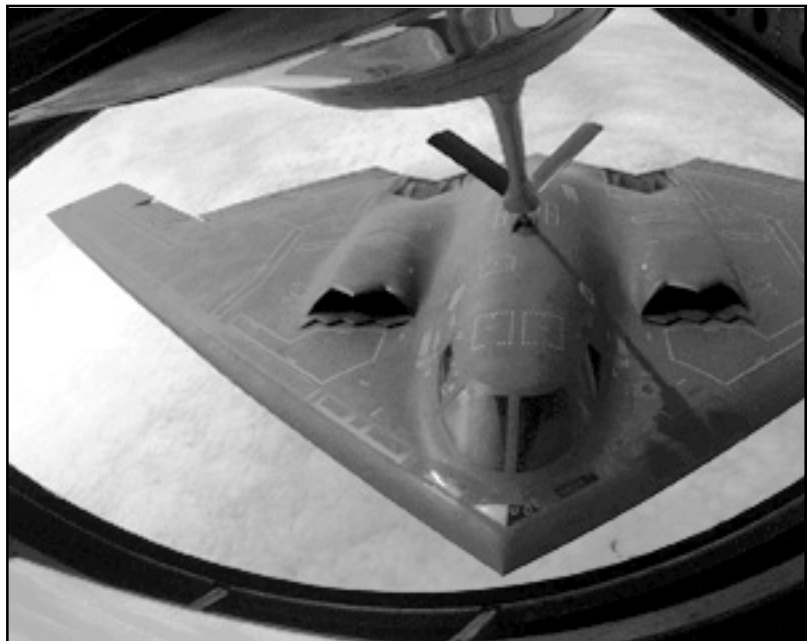


The goods purchased by DoD range from simple commodities, such as hammers, bolts, or transistors, to highly complex unprecedented systems, such as the Air Force's newest fighter, the F-22.

cooperation, and determine a fair basis of comparison. First, government buying personnel have myriad abstruse rules and procedures they must follow to purchase many items. Second, videotape recorders for a military jet aircraft, as an example, are not the same as those a consumer buys at a local discount store. Third, media exploitation of past anecdotes of alleged

incompetent government buying has created an atmosphere of fear that translates into a general unwillingness to take part in this genre of research. Fourth, some commercial entities are reluctant to cooperate because they believe data describing their sales behavior has proprietary value.

No commercial counterpart exists for the Air Force's B-2 bomber.



SELECTION OF COMMODITIES

The vast majority of DoD's purchases are for commodities. The data samples collected for this analysis come from two sources: DoD's buying centers and firms that have sold common products to both markets. The comparisons consist not only

"One could argue that government buyers are capable of skewing the data collection process in order to look good to some researcher."

of price differences, but also the total dollar value of each purchase along with the relevant factors identified in the previous section. The selection of com-

modities for comparison is a balancing act between data availability, reliability, comparability, and confidentiality.

To collect data on commodity purchasing, we questioned low-level suppliers and collected random samples from the Defense Logistics Agency (DLA) and various DoD maintenance and buying centers. The DLA does some bulk purchasing, whereas the logistics centers buy parts and equipment specific to their mission. For example, at the time the engine sample was collected, Kelly Air Force Base, in San Antonio, TX, was the logistics center for engine overhaul for the Air Force and some Navy aircraft, and it bought many of the engine-related parts used by DoD.

Three sectors were targeted for data collection: electronics, engine, and commercial-off-the-shelf (COTS) software components. Many goods from the electronics and engine sectors are common to DoD and commercial buyers. The DoD is a minor buyer in the electronics sector and a major buyer in the engine sector. In the

COTS software market, DoD is a large buyer, but its purchases are dwarfed by the much larger overall commercial market.

DATA AVAILABILITY

Despite the existence of a commodity purchased by both sectors, the data may not be available for comparison. There is no master procurement list detailing the population of commodities purchased by both sectors. One must research the variety of commodities purchased by DoD, identify the buying activity for a particular sector, and then receive permission to collect a sample of purchases. We contacted government buying entities and interviewed them to determine how to identify and arrive at a sample of commodities sold in both sectors.

On the commercial side, collecting purchase information is even more of a challenge because rarely is pricing information readily available. For example, thousands of suppliers provision DoD in the electronics sector. To get a picture of their pricing behavior in the commercial sector, one must contact the firms individually and solicit their cooperation in providing this information. On the DoD side it is much easier, because there is typically one or a few buyers within a particular sector. The relationship is one DoD buyer to many commercial suppliers.

DATA RELIABILITY

Another challenge is the reliability of the data gathered, given distrust on the part of government personnel, timeliness, or whether the record of a purchase still exists months after it has transpired. One could argue that government buyers are capable of skewing the data collection

process in order to look good to some researcher. This risk can be mitigated by looking firsthand at the contracts within a sector as part of the data collection process. All of the data in this analysis was collected in this manner except for the electronics sector. The possibility that multiple buying organizations would fabricate contract files to fool a researcher is remote. Furthermore, some of the purchases were corroborated by evidence from the actual firms. In the case of the electronics sector data, the commodity purchases were provided from a pool of commercial buys for which the depot had complete data.

It is also conceivable that depot personnel selected purchases that reflected well on the government compared to the commercial sector, and then claimed that they lacked data on other purchases. But there really is no way the government personnel could have determined what was a good buy and what was a bad buy. How would they have written a computer program to collect only commercial commodity buys in which the government was the best buyer? Commercial pricing data does not exist in their system, and they certainly did not have time to call vendors and add such data in the span of time between the initial contact and the visit to their depot. Furthermore, the low-level contracting and programming personnel that provided the data and background discussions, following introductory meetings with the depot's senior management, were stunned that a researcher was even being allowed to pursue such research. They were stunned because they expected any such study to portray them as poor buyers of commodities, so conditioned were they by the media and DoD leaders to believe it must be so.

The time interval between the time the data was collected from the depot and the commercial organizations were contacted could affect the reliability of the electronics data. This interval was always 3- to 12-months and not all commercial organizations kept pricing material even that old, so some commodity purchases were omitted. Another side of the problem was DoD's very own data. Although the depot's personnel claimed the size of the problem as very small, some of the commercial purchases were missing key pieces of data. The depot's programming representative said this was an attribute of the depot's conversion of historically military items to strictly commercial classification. During 1995, the depot was systematically reclassifying those parts in its inventory of commodities that could be satisfied by a purely commercial part. The data migration process was not perfect and introduced what is commonly referred to in the information technology sector as "dirty data": records with either missing or incorrect data.

"The refusal of some firms and DoD organizations raises the specter of bias."

DATA COMPARABILITY

Another problem with comparing commercial and DoD prices is determining the fair basis of comparison. Should retail or wholesale prices be used? Where possible, both retail and wholesale prices were gathered for a commodity. In the absence of such pricing practices, we used pricing based on lot size. Under those circumstances, the smallest salable lot size is assumed to be the retail price. The wholesale price is then

assumed to be either the price commercial firms pay when buying in lot sizes equivalent to those DoD buys, or the price

“ Treating various facets of the analysis as confidential is a common feature of this kind of research.”

commercial firms pay when buying in their typical lot sizes. The analyses of the commodity data take into consideration the different price bases.

Although some results of comparisons of DoD to retail prices are provided, this research focuses primarily on DoD performance compared to the average commercial sector organization, where the average commercial sector organization is buying at commercial wholesale prices.

CONFIDENTIALITY

Most DoD organizations and commercial firms taking part in this research are not identified. Furthermore, specific products and prices will also not be identified. Confidentiality is essential for gaining access to procurement information, particularly for a buying activity or manufacturer who understands that their practices and outcomes may be embarrassing to their organization or provide a competitor insight into their proprietary pricing practices. With the power of computers, it is trivial for an auditor to identify a manufacturer or DoD buying activity perceived to be overcharging DoD or shirking their responsibilities. DoD agencies and their contracting firms, in general, are extremely sensitive to public disclosure of any information that may embarrass the respective agency. Despite

assurances of confidentiality, many firms and, initially, a few DoD organizations were reluctant to participate in this research.

The refusal of some firms and DoD organizations raises the specter of bias. Is it possible that DoD will appear better in this analysis because the poorly performing organizations refused to participate? Yes, the possibility exists, but experience with the data collected as part of this research points in the opposite direction. First, eventually all DoD firms asked to participate ended up participating to some degree, some more reluctantly than others.

Second, for the aforementioned question to be true, one would expect that all of the participating buying activities would consider themselves as good organizations outperforming the commercial sector. Although in nearly every case there was enormous pride on the part of DoD buyers and genuine belief that they were doing their best for the taxpayer, despite any direct contrary evidence bearing on their efforts, they felt sure the commercial sector was doing a better job. The phenomenon is a lot like the child who, after being repeatedly told by his parents and teachers that he is stupid, begins to believe it even though he is faced with a wealth of contrary evidence. The buyers had no specific evidence they were doing poorly, but they had been conditioned by the media, national leaders, and DoD's own leadership to believe the worst.

Third, of the firms that did not participate, the vast majority of the affected dollars from the discarded contracts point to DoD being the better buyer. For example, approximately \$350,000 over seven contracts in the electronics sample was excluded because a broker that sells

these particular products as a retailer is prevented legally from providing the price it pays to the manufacturer. The manufacturer explained that it was legally bound to its brokers not to provide their prices. One broker finally provided a “ballpark” markdown from the list price for the range of products, which was significantly above the price charged DoD by the manufacturer. Since the broker did not provide the individual markdowns, those purchases were discarded entirely. Collectively, they constituted about 10 percent of the total value of the electronics sample and would have enhanced DoD’s purchasing position relative to the commercial sector.

Treating various facets of the analysis as confidential is a common feature of this kind of research. The jobs and careers of DoD buying and selling personnel could be adversely affected if unfavorable information is brought to the public’s or a competitor’s attention. Past research produced by Peck and Scherer (1962), the seminal work on defense procurement, Gansler (1982), the CSIS (1991), and the Coopers & Lybrand/TASC (1994) study all contained aspects of confidentiality in order for the researchers to secure, analyze, and publish vital information regarding the DoD procurement sector.

Even good news or a success story can sometimes bring unintended consequences to a program or its management. Burton provided an incident from 1980 in which the program manager for the Air Force’s A-10 ammunition procurement, Col Bob Dilger, was allegedly fired within hours of briefing much of the Pentagon’s Air Force leadership on how he had introduced competition in his procurement and drove down the price of a cannon shell (essentially a commodity) from \$83 to \$13 (Burton, 1993).²

ANALYSIS APPROACH

A new method of analysis was used to compare the prices paid by DoD and commercial sectors: weighted price difference analysis. In the past, mere price comparisons or unweighted price difference analysis was the method used by researchers and the media. One never had any conception of whether a showcased part or commodity purchase was representative of DoD buying or an outlier. Unweighted price difference analysis involves subtracting the commercial price from the DoD price and then dividing the result by the commercial price. This method constrains purchases in DoD’s favor between –

“A new method of analysis was used to compare the prices paid by DoD and commercial sectors: weighted price difference analysis.”

100 percent and 0, and purchases in the commercial sector’s favor between 0 and infinity; thus, DoD’s buying performance is adversely biased relative to the commercial sector.

The weighted price difference methodology weights each purchase price by the proportion of expenditures in the entire sample accounted for by this purchase. This has the effect of making high-dollar-value purchases of greater importance in the analysis. Interestingly, this research uncovered many egregious purchases by DoD, but in nearly every case they were for low-dollar-value items purchased in small quantities. Once those low-dollar-value purchases were weighted, their importance in the overall analysis waned. As the product of purchase quantity and purchase price increased, the relative efficiency of DoD’s purchasing also increased.

A third analysis approach, percent difference, aggregates all purchases at DoD and commercial prices to arrive at the dollar totals. The calculation is to first compute the ratio of total commercial to DoD buying cost and then subtract one to arrive at the relative efficiency. This method, equivalent to a price index using DoD quantities as weights, compares the DoD cost to purchase all of the goods in a sample to the commercial wholesale cost to purchase the same goods.

ANALYSIS

Weighted price difference analysis between the commercial wholesale and DoD sectors reveals DoD’s buying is 5.9, 47.4, and 34.2 percent more effective within the electronic, engine, and software commodity samples, respectively. A *t*-test revealed that each mean was statistically different from zero ($p < .001$). The electronic, engine, and software commodity samples comprised 329, 132, and 232 purchases or delivery orders valued at \$2.7, \$60.9, and \$36.3 million using

DoD’s actual unit prices. The largest sample presently found in the literature consists of 40 purchases (Angier, White, and Horowitz, 1979). Even at the macro-level of the sample, this research shows that as the average dollar value of an electronic, engine, or software purchase increased, so did DoD’s relative buying efficiency. Engine buying significantly outperformed software buying and software buying significantly outperformed electronic buying.

Aggregate analysis of DoD’s purchasing performance was no different. Overall, weighted price difference analysis reveals that DoD outperformed the average commercial sector organization using commercial wholesale prices by 41.5 percent. Table 1 summarizes these findings with the findings from each sector. In every case, DoD’s total sample cost was less than if commercial wholesale prices had been used (see the “percent difference” column of Table 1). When those same price differences are not weighted (see the “unweighted” column of Table 1), where each purchase is of equal value in the analysis, DoD pays 20.7 percent more than

Table 1.
Summary of DoD Purchasing Performance and Costs by Sector

	Price Analysis Summary ^a			Value of Purchases ^b		
	% Difference	Unweighted	Weighted	DoD Cost	Wholesale	Retail
Electronic	-14.4	70.2	-5.9	2.7	3.1	4
Software	-66.5	-19.7	-34.2	36.3	60.5	88.4
Engine	-105.5	-31.7	-47.4	60.9	125.1	178.1
Total	-89	20.7	-41.5	99.9	188.7	270.5

^a Percentages using the three price analysis methods. ^b In millions of dollars.

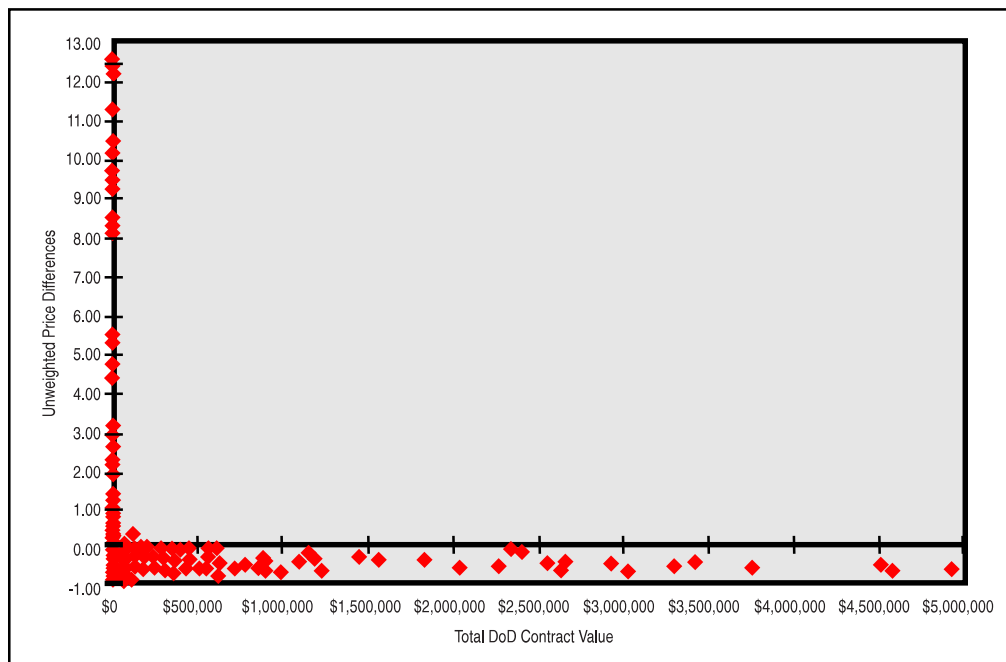


Figure 1. Scatterplot of All Purchases by Total DoD Contract Value Versus Unweighted Price Differences

the average commercial sector organization. Collectively, DoD paid \$99.9 million for the more than 831,000 items that constituted these samples. Using commercial wholesale prices, the average commercial sector firm would have paid \$188.7 million for the very same commodities.

These findings cogently capture the flaw in comparing unweighted price differences. Examining only price differences distorts DoD's actual buying behavior because it does not consider the total dollar value of a purchase. Furthermore, many of the individual purchases contributing to the perceived poor DoD buying performance would make good anecdotes for the evening news or a tabloid article. A more realistic assessment of DoD's buying performance is found by weighting the purchases according to purchase volume,

revealing that (within the samples gathered as part of this research) DoD outperforms the average commercial sector organization when purchasing commodities.

The DoD's aggregate buying behavior is captured graphically by plotting all of the purchases based upon the unweighted price difference and total DoD contract value of each purchase. In terms of total DoD cost, the purchases range from less than a dollar all the way up to approximately \$5 million. The range of unweighted price differences begin at just more than -100 percent and climb to more than 1200 percent. All of the purchases are plotted in Figure 1. The scatterplot reveals that the vast majority of purchases are in DoD's favor, falling in the 0- to -100-percent range in terms of unweighted price difference. The scatterplot also highlights the

distortion in the unweighted price difference method. The scatterplot reveals more than a dozen purchases in which DoD paid more than 500 percent above commercial sector prices, yet those purchases were for trivial amounts. The figure shows that as the total value of a purchase increases, the buying performance of DoD is better than the average commercial sector organization buying at wholesale prices.

This research was also innovative in factoring DoD's oversight costs into the total cost equation in order to more accurately evaluate DoD's relative efficiency.

"As the total dollar value of a purchase increases, so does DoD's attention and effort for getting a fair price."

All of the personnel associated with the purchase of the engine parts and software commodities were identified and their labor

costs computed. In nearly every case these individuals either supported other engine purchases or other activities beside software purchasing.

Two case studies from the engine and software commodity sectors considered all DoD purchasing costs and assumed the commercial sector's buying costs were zero. Despite this handicap, DoD outperformed the average commercial sector firm buying at commercial wholesale prices. For example, DoD paid \$59.3 million for 71 engine part contracts while accruing an estimated \$8.3 million in labor costs. The total cost to DoD is \$67.6 million. However, if the manufacturer's best commercial customer purchased those same parts and purchased them while accruing no labor costs, they would have paid \$123 million. For the software

sample, DoD paid \$36.4 million for the purchases constituting the sample and incurred an estimated \$3.9 million in labor and contract costs to research and purchase the software commodities. The average commercial sector firm receiving wholesale prices, however, would have spent \$60.5 million for the very same software products. Even when DoD's purchasing costs are considered, DoD outperforms the average commercial sector organization buying at wholesale prices.

WHAT CAUSES THE DIFFERENCES IN BUYING PERFORMANCE?

DoD's buying behavior can be compared to that of the typical American consumer: As the total dollar value of a purchase increases, so does DoD's attention and effort for getting a fair price. If the typical consumer needs only a loaf of bread or gallon of milk, he or she will more often than not purchase it at the nearest convenience store even though a grocery store offers a lower price. But if the consumer has a long list of items to buy or it is the weekly shopping trip, he or she will undoubtedly go to the local grocery store or discount warehouse for its better prices. On high-cost purchases such as automobiles, houses, and appliances, the typical consumer is more likely to thoroughly research sources and comparison shop. The DoD buyer is no different in allocating attention and effort in purchasing.

Like a typical consumer, a variety of practices are employed by DoD in order to achieve superior performance relative to the average commercial sector firm. First, DoD acts according to legislation

passed to ensure that it pays no more for an item than any other commercial sector firm buying under similar circumstances, although this statute is rarely enforced. Second, for high-dollar-value purchases, most DoD buyers appear to study their suppliers, aggregate their buys, watch for sales, forecast, and negotiate aggressively with suppliers. In the software sector, studying suppliers, aggregating requirements, and waiting for sales provided deep savings; the deepest discounts were often offered by a commercial supplier at the close of a financial reporting period. Aggregating buys is one method DoD uses to exploit its buying power.

Forecasting is important if DoD expects to derive the benefits of “just in time” delivery and aggregating buys to get the greatest quantity-based price breaks. With effective forecasting, DoD can then enter into long-term contracts with a supplier to provide incremental quantities on a monthly basis over several years. This provides a win-win situation for DoD and suppliers. This is precisely how information distortion in a supply chain can be eliminated, and thus lead to the greatest efficiencies for both the supplier and customer (Lee, Padmanabhan, and Whang; 1997). With good forecasting information for the DoD buyer and his supplier complemented by long-term contracts with incremental deliveries, the supplier-customer team is managing throughput rather than speed; it is effective throughput management that minimizes cost (Fuller, O’Conor, and Rawlinson, 1993). The DoD is able to glean the benefits of a high-quantity buy while accruing savings from reduced inventory. The supplier is able to more effectively plan its production and minimize its inventory

of raw materials. This is, however, an area ripe for process improvement across DoD, since all product lines are not effectively forecasting demands or future requirements.

Third, DoD has the option of collecting cost and pricing data on purchases for which no real commercial market exists, if the purchase is over \$500,000, or to support a sole source purchase of some kind (where competition is not used even though alternative suppliers may exist).

Collecting cost and pricing data is another example of DoD exercising its buying power. Cost and pricing data provides visibility

“ It costs DoD money in terms of buying personnel and on-site labor to collect cost and pricing data.”

into a manufacturer’s production costs. It costs DoD money in terms of buying personnel and on-site labor to collect cost and pricing data. Ironically, the acquisition reform movement succeeded in making it more difficult for DoD to collect cost and pricing data with FARA of 1996. The irony lies in the DoD leadership’s perception of what is and what will continue to be a commercial practice: collecting cost and pricing data (Vander Schaaf testimony, 1995).

Large firms with substantial buying power in a market have collected cost and pricing data long before DoD ever entertained the idea. Perrow (1970) has shown that large organizations that possess power over subordinate suppliers regularly audit their records (and cites Ford Motor Company as one example). Pfeffer (1978) reinforces this observation of powerful commercial organizations that derive greater profitability from asymmetrical

exchanges with suppliers, using General Motors as one example of a firm that gains visibility into its supplier's operations and

"We need to pay attention to the big picture: big purchases."

uses that knowledge to control the price at which it buys. More contemporary research highlights how

firms with market power exercise that power through meticulous understanding of their supplier's costs, with some delving deeply into the supplier's engineering and quality activities (Hardy and Magrath, 1987; Burt, 1989; Myer, 1989; Cross, 1995; and Taylor and Wiggins, 1997). In the food service and retail sectors, McDonald's and Wal-Mart, respectively, as examples, can be seen exercising this kind of leverage over a supplier.

Fourth, DoD will seek secondary sources of supply when they own a set of engineering drawings or when items are available from more than one manufacturer. This drives competition into the purchasing process for parts that are generally not sold in the commercial marketplace. Lastly, for items that are bought and sold in large volumes in the commercial sector and are found on a commercial price list, DoD will often negotiate price breaks off of the commercial list price.

Once the reasons for DoD's superior buying performance are distilled, it is clear the organizational framework first presented by Simon (1947), March and Simon (1958), and then Cyert and March (1963) offers one interpretation of DoD's performance. In terms of purchasing, DoD has several goals it tries to meet across its contracts. For example, DoD undoubtedly wants a good price that pays a fair profit

to its suppliers, but other goals such as support to small businesses and minority-owned firms also enter into the decision process. In order to meet these sometimes conflicting goals, DoD has searched over time and arrived at a set of procedures or heuristics used to ensure all goals are satisfied to the greatest extent possible. The use of cost and pricing data, aggregating buys to leverage market power, or studying one's suppliers are standard operating procedures or heuristics used when buying commodities. Also, DoD has a system of authority and influence in place for purchasing: Most notable is the practice of having contracting officers (rather than program or item managers) awarding contracts. Similarly, only certain contracting officers are allowed to award contracts above certain dollar thresholds. A system of training is in place to cultivate increasing levels of expertise and experience.

IS THERE SYSTEMATIC EVIDENCE TO SUPPORT PUBLIC BELIEFS?

This research has provided evidence that calls into question generally held beliefs about government purchasing. The evidence shows that at least in the sectors examined by this research, DoD is clearly doing an effective job purchasing and that its effectiveness increases as the total dollar value of a purchase increases. This finding should cause DoD policy makers to carefully consider how they allocate their valuable labor dollars to ensure effective purchasing. Contrary to claims by DoD Inspector General Eleanor Hill, it may not be in the best interest of the taxpayer that we get the best price on a

few dozen hammers. It is far more important that we ensure, for example, that the several million dollars in turbine blades and vanes for certain engines are bought effectively. We need to pay attention to the big picture: big purchases. Other emerging evidence indicates this is not an institutionalized practice.

The spare parts “scandals” that emerged in congressional testimony on March 18, 1998, provide further support to this research’s findings. The data embodied in this research was gathered before the implementation of policy changes associated with FARA. Today, DoD buyers and contracting officers are prevented from collecting certified cost and pricing data on purchases below \$500,000 or on commercial items. The conditions surrounding the purchase of commercial items have changed.

Many in industry have responded to FARA by listing traditionally military or noncompetitive parts in a commercial catalog, calling them commercial items, and offering them for sale to the public—daring government procurement officers to ask for cost information, even if that part has little or no commercial customer base and is found only in militarized systems. These changes have produced many embarrassing purchases by DoD: For example, 108 electrical bells that used to cost \$46.68 are now \$714 (1,430 percent increase); 187 set screws that used to cost \$0.57 are now \$75.60 (a 13,163 percent increase). The fairness and reasonableness of the prices were determined using the cost and pricing data DoD collected only two years ago for those very same parts.

The latest parts scandal highlights the need for careful measurement and the

exercising of judgment in the collection of cost and pricing data. Furthermore, the definition of a commercial item should revert back to its former incarnation, where a commercial item was a product that was sold in significant quantity in the commercial sector. In the past, a contracting officer was also allowed to exercise judgment in the determination of whether an item was truly commercial. The most important irony of this latest pricing flap is that today’s operational commanders are paying more for many spare parts than they were two years ago; thus, they will have less to spend tomorrow on the modernization of their weapon systems. It is no surprise that we are now seeing spare parts shortages as budgets fail to procure required numbers. The movement to price-based purchasing of militarized, noncompetitive parts has exacerbated the current spare parts crisis facing our operational units.

“Exploiting market power is a classic strategy for saving money in both public and private sectors.”

CONCLUSIONS

Our findings contrast sharply with conventional wisdom and the themes permeating much of the literature on defense procurement. This should cause DoD’s leadership to more carefully consider how it intends to make DoD a more efficient buying organization. Leadership needs to more realistically evaluate its push toward a one-size-fits-all public policy as it tries to commercialize its operations to a greater degree. This

research suggests that buying commercial items off commercial price lists will cost the taxpayer more money. Uniformly eliminating in-plant oversight personnel that collect cost and pricing data will adversely affect DoD's purchasing power, for cost and pricing data is a valuable commercial sector tool the DoD buyer should exploit under the appropriate circumstances. The DoD must continue to examine where it has market buying power and then exercise that market power to get the fairest price for the taxpayer. Exploiting market power is a classic strategy for saving money in both public and private sectors (Thompson and Jones, 1994). Certainly within the engine and software commodity sectors DoD carries important buying power ripe for exploitation.

This research provides important measures of efficiency DoD should but does not consistently measure across its buying organizations. For the past 40 years multiple pieces of legislation have been passed with the aim of making

government, including DoD, measure and improve its operations. The DoD should exploit weighted price difference analysis by collecting samples of its purchases annually at each of its buying activities and compare performance to the average commercial sector organization.

If DoD is truly to improve the efficiency of its processes, it needs to analyze how well it is doing today. These analyses need to consider all costs and benefits that feasibly can be gathered. Real cost-benefit analyses will help DoD to identify where it is buying well and determine the right mix of on-site support to help buyers and contracting officers. Then DoD can formulate the kind of strong measurement program needed to truly improve its purchasing processes. Despite numerous calls for reform and commercialization of its activities over the past three decades, DoD's leadership has little understanding of how effective its buying processes are compared to the commercial sector.

DISCLAIMER

The views expressed in this paper are those of the authors and not the official views of the U.S. Air Force or Carnegie Mellon University.



Major Joe Besselman, U.S. Air Force, is presently an action officer with Installations and Logistics, Headquarters, U.S. Air Force, Washington, DC. He has served in a variety of Weapon and Combat Support System software program management positions. He is a graduate of DSMC's APMC 99-3 class. He has a Ph.D. in Public Policy Analysis and Management from Carnegie Mellon University and an M.S. in Electrical and Computer Engineering from Louisiana State University. (E-mail address: joe.besselman@pentagon.af.mil)



Ashish Arora is Associate Professor of Economics and Public Policy at Carnegie Mellon University, Pittsburgh. Professor Arora's research focuses on the economics of technological change, the management of technology, intellectual property rights, and technology licensing. He has in the past worked on questions of the productivity of university research, and the growth and development of biotechnology and the chemical industry. An enduring research interest is in understanding the rise and their consequences. He has a Ph.D. in Economics from Stanford University. (E-mail address: ashish@andrew.cmu.edu)



Patrick Larkey is a Professor of Decision Making and Public Policy at Carnegie Mellon University. His administrative assignments have included Head of the Department of Social and Decision Sciences, Associate Dean for Academic Affairs at the H.J. Heinz School of Public Policy and Management, and Chair of the Faculty Senate. He earned B.A. at Stanford University and an M.P.P. and Ph.D. at the University of Michigan. He is the author of numerous books and articles. His work has been recognized with the 1976 Outstanding Doctoral Dissertation in Public Finance—Award of the National Tax Association – Tax Institute of America, the 1988 Louis Brownlow Book Award from the National Academy of Public Administration, and the 1999 Invited Paper Award – Applications, Journal of the American Statistical Association (with Scott Berry and C. Shane Reese). His current research centers on the foundations of performance measurement. (E-mail address: pl15@cyrus.andrew.cmu.edu)

ENDNOTES

1. Six sigma quality implies that the product is of such high quality that the defect rate can be measured using a single digit per one million items manufactured.
2. The A-10 Warthog is the tank-killing aircraft that was the big success story of the Gulf War. Colonel Dilger's success was a source of embarrassment.

Colonel Dilger was a fighter pilot and not a graduate of any of the Air Force's procurement schools, yet he managed to drive down costs and return unneeded production funding back to the Air Force. In the sometimes perverse world of DoD procurement, the "inability" to use all of one's allocated funding is taken as a sign of poor management rather than efficiency.

REFERENCES

- Angier, B. N., White, T. B., & Horowitz, S. A. (1979, December). *An analysis of commercial commodity acquisition*. Alexandria, VA: Center For Naval Analyses.
- Besselman, J. J. (1998). *Purchasing performance: A public versus private sector comparison of commodity buying*. Ph.D. dissertation, Carnegie Mellon University, Pittsburgh, PA.
- Burt, D. N. (1989, July-August). Managing suppliers up to speed. *Harvard Business Review*, 127–135.
- Burton, J. G. (1993). *The Pentagon wars*. Annapolis, MD: Naval Institute Press.
- Center for Strategic and International Studies (CSIS). (1991). Integrating commercial and military technologies for national strength: An agenda for change (prepared by Debra von Opstal). Washington, DC: Author.
- Comeau, L. (1984, August). *Nuts and bolts at the Pentagon: A spare parts catalog* (Defense Budget Project). Washington, DC: Center on Budget and Policy Priorities.
- Coopers & Lybrand/TASC (The Analytical Sciences Corporation). (1994, December). *The DoD regulatory cost premium: A quantitative assessment*. Washington, DC: Office of the Secretary of Defense.
- Cross, J. (1995, May-June). IT outsourcing: British Petroleum's competitive approach. *Harvard Business Review*, 94–102.
- Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Downs, G. W., & Larkey, P. D. (1986). *The search for government efficiency: From hubris to helplessness*. New York: McGraw-Hill.
- Fuller, J. B., O'Connor, J., & Rawlinson, R. (1993, May-June). Tailored logistics: The next advantage. *Harvard Business Review*, 87–98.
- Gansler, J. S. (1982). *The defense industry*. Cambridge, MA: MIT Press.
- Hardy, K. G., & Magrath, A. J. (1987, September-October). Buying groups: Clout for small businesses. *Harvard Business Review*, 16–24.
- Heberling, M. E., & Houpt, T. J. (1995, August). What is and what is not a commercial item. *Contract Management*, 11–15.
- Hill, E. (1998, March 18). Testimony before Subcommittee on Acquisition and Technology, Committee on Armed Service, U.S. Senate.

- Lee, H. L., Padmanabhan, V., & Whang, S. (1997, April). Information distortion in a supply chain: The bullwhip effect. *Management Science*, 43(4), 546–558.
- Mandel, C. E. (1977, July). Going commercial with the commercial commodity acquisition program. *Defense Management Journal*, 33–43.
- March, J. G., & Simon, H. A. (1958). *Organizations*. New York: Wiley.
- Mayer, K. R., & Khademian, A. M. (1996, March-April). Bringing politics back in: Defense policy and the theoretical study of institutions and processes. *Public Administration Review*, 56(2), 180–190.
- Michelli, T. J. (1977, November). Commercial equipment: Stretching the defense dollar (study project report). Fort Belvoir, VA: Defense Systems Management College.
- Myer, R. (1989, November-December). Suppliers—Manage your customers. *Harvard Business Review*, 160–168.
- Peck, M. J., & Scherer, F. M. (1962). *The weapons acquisition process: An economic analysis*. Boston: Harvard Business School Division of Research.
- Perrow, C. (1970). *Organizational analysis: A sociological view*. Belmont, CA: Wadsworth.
- Pfeffer, J. (1978). *The external control of organizations*. New York: Harper and Row.
- Rich, B. R., & Janos, L. (1994). *Skunk works*. Boston: Little, Brown.
- Simon, H. A. (1947). *Administrative behavior* (4th ed.). New York: The Free Press.
- Stewart, W. G. II. (1986, January). *Defense acquisition of commercial products* (draft report, Defense Acquisition Process Project). Washington, DC: Georgetown Center For Strategic and International Studies.
- Stimson, R. A., & Barnett, M. S. (1980, Spring). Buying commercial: What works and what doesn't. *Defense Systems Management Review*, 56–68.
- Taylor, C. R., & Wiggins, S. N. (1997, September). Competition or compensation: Supplier incentives under the American and Japanese subcontracting systems. *American Economic Review*, 87(4), 598–618.
- Thompson, F. (1992–93). Deregulating defense acquisition. *Political Science Quarterly*, 107(4), 727–750.
- Thompson, F., & Jones, L. R. (1994). *Reinventing the Pentagon*. San Francisco: Jossey-Bass.
- DoD's inadequate use of off-the-shelf items, 101st Cong., 1st Sess., S. Part 101–62, (October 30, 1989) (report by the Senate Subcommittee on Oversight of Government Management).

Vander Schaaf, D. (1995, August 3). Testimony before House Small Business Committee, U.S. House of Representatives.

Walt, Stephen M. (1991, June). The renaissance of security studies. *International Studies Quarterly*, 35, 211–239.

