

Statement of Charles R. Plott, Professor of Economics and Political  
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Committee on Small Business  
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My name is Charles Plott and I am the Edward S. Harkness Professor of Economics and Political Science at the California Institute of Technology. My research specialties are in the theory and behavior of auction systems including the design and testing of new forms of auctions. I am a member of the National Academy of Science, the American Academy of Arts and Sciences, a Distinguished Member of the American Economic Association, a Fellow of the Econometric Society, and I have served as president of the Economic Science Association, the Society for the Advancement of Economic Theory, the Public Choice Society, the Western Economics Association, and the Southern Economics Association. I have consulted with many governments and businesses and I have published over 160 scientific papers.

My testimony is in response to the questions as posed to me by the Committee.

1. I was asked to summarize my paper "The CMS Auction: Experimental Studies of a Median-Bid Procurement Auction with Nonbinding Bids", written with Brian Merlob and June Zhang and published in *The Quarterly Journal of Economics*, vol. 127, no. 2, 2012, pp. 793-828. I was also asked to comment further on the fundamental issues I see with the Competitive Bidding program as it pertains to the DMEPOS established by CMS.

I became aware of the properties of the CMS auction through a letter that called attention to the rules. The letter was addressed to auction experts and was sent by Professor Peter Cramton of the University of Maryland. I independently initiated a study of the auction rules. I found that some of the CMS auction rules reflect standard procedures but two rules protruded as features that would necessarily lead to an unsuccessful auction. The possible incongruence between the CMS auction rules and the intuition drawn from a substantial body of well tested auction theory led to the research reported in the paper. The

experimental economics methods I applied were a natural tool to illustrate the potential tension between the purpose of the rules and their consequences if put into place.

My focus is on the major architectural features of the auction, several of which are standard in the world of auction procedures. The auction proceeds as a sealed bid auction using a “one price” structure in the sense that if identical items are purchased, then suppliers are paid the same price independent of the terms of the tendered bid. Bids are arranged from low to high. The fixed procurement goal is applied to determine the winners to be those with the lowest bids. These features are well known and function well within standard frameworks. Several other features are natural and dictated by the scale and scope of the auction.

The issues of concern stem from two central features of the CMS auction that are not part of traditional auctions: (1) The price is set at the median of the winning bids, and (2) winning bids may be withdrawn after the price is announced should the winners find the price unacceptable. These two features make the CMS auction substantially different from traditional procurement auctions.

My study is structured around comparisons between the performance of auctions based on the CMS auction rules and auctions based on other auctions rules. The comparisons are based on four natural policy goals: (i) The auction should be successful in procuring the units demanded; (ii) The auction should be efficient from a social point of view in the sense that units are purchased from the lowest cost producers; (iii) The auction should not be wasteful from the government’s point of view; and (iv) The auction should produce a competitive price that is capable of creating a healthy supply industry.

Different auction tests were created and studied through the use of experimental economics methods frequently used to compare the basic principles of auction behavior and performance. Auction architectures performing poorly in simple cases studied experimentally provide a realistic warning about problems that can surface in complex cases. Furthermore, if the behavior observed in the simple case is understandable in terms of theory, or even partial theory, then there is reason to take that theory seriously when applied to more complex cases. Theories that are less successful in the laboratory can be analyzed to determine why they lack reliability.

The major test results can be summarized as follows:

- Reliable procurement auction architectures exist. Our study focused on the “excluded bid” pricing process, which met all of the four natural policy goals. Procurement policies were met. The auction was efficient. Prices approximated competitive so a healthy industry could be maintained and the cost was as low as possible given that goal.
- The CMS auction architecture failed the tests on all dimensions. The theory that motivated the concerns of the CMS auction critics is supported by the tests and that theory explains the poor performance. To be a winner in the auction, a supplier needs to bid lower than other suppliers. But unlike other auctions the bids are not constrained from below by the cost of supply because the bid can be withdrawn if the supplier does not like the resulting price determined by the auction. A winning low bid provides the bidder with an option to sell at the market price if the bidder likes the price and refuse otherwise. Excessively low bids are part of strategic bidding. A pattern of excessively low bids emerged from the test auctions and that resulted in an announced price below the cost of many bidders. Since the winning bids were consistently below cost, prices, based on the median of already excessively low prices, were certainly below cost. The procurement failed dramatically in the tests.

The CMS rules violate two basic principles. One is often termed “no cheap talk” meaning that the incentives assure that participants must deliver on offers that are accepted. The principle is observed operating around us in daily commerce. A bid on a home is often accompanied with a payment to prevent frivolous offers. Offers tendered in stock and bond exchanges are enforced rigorously. Except in special circumstances offers cannot be conveniently cancelled after acceptance. Common sense suggests that cheap talk, if allowed, can undermine a competitive negotiation process. The second principle is related to a concept of “revelation”. Successful auctions rely on forces of competition to guide competitors toward revealing the best terms they can offer. This “revelation” property can take many forms but it must be designed into the process. The CMS architecture is an example of the absence of the principle and, as a consequence, the offers in the test auctions had little resemblance to costs.

- For the CMS auction there is no simple “fix” in the sense that some slight change in the rules might correct the problems. The removal of one of the rules does not produce a well-functioning auction process. One can imagine an auction in which the price is determined by the median of the lowest bidders but bidders cannot withdraw bids. Testing such an auction reveals a perversity of such rules as bidders place very high bids in an attempt to avoid winning and being forced to sell at a low auction price. That is, a price determined by the median of the low bidders can still be unacceptable and the way to avoid being forced to sell below cost is to place a bid far above cost knowing that you can only win if others bid high and so the price will be high. With such rules the cost of the procurement goes up dramatically but efficiency does not because the least cost bidders need not be winners.

An alternative modification of the CMS auction might be to replace the median price rule with the excluded bid price determination, while keeping the withdrawal rule. That change does not improve the auction performance. Competition drives prices to levels lower than bidders are willing to accept and the auction does not succeed.

- The problems with the CMS auction become exacerbated with scale. Additional suppliers, relative to procurement goals, simply add to the excessively low prices, bid withdrawals and procurement failure.

The best form of auction in tests conducted in this study was the excluded price auction. It was implemented as a sealed bid auction but the auction exists in many forms. Those include descending price auctions, clock auctions, and other forms of continuous auctions. Simultaneous auctions and combinatorial auctions have both been successful.

2. The auction tests were conducted using standard methodology of experimental economics. The methods are widely used for testing new forms of auctions and also testing other competitive processes. Examples include the FCC auctions of the electromagnetic spectrum, pollution permit markets, auctions of public properties, regulation, and other competitive systems. Rules that seem desirable when viewed in isolation, in abstraction or from the view of a single bidder can have completely different properties when placed in the context of a system. Competitive processes are systems and the rules must be considered in terms of unforeseen consequences that result from the interactions of

competitors operating within the rules. Experimental economics evolved to meet the challenge of the required tests. Many economics laboratories exist in the United States as well as most other countries.

Experimental methods are used to focus on very simple cases created and studied under laboratory environmental conditions. As is the case with any economics or engineering example, field trials can be so complex that at the end of the trial it is impossible to determine exactly what happened and why. Simple experiments are used to test for the most basic proof of principle prior to going to a field trial. Experiments are used to expose and test the basic principles at work. Once principles are understood, they become tools to assess what will take place in more complex environments. The questions posed in the tests we performed are whether or not the auction works as anticipated or desired and whether or not it is working for understandable reasons.

The tests we conducted were in the form of auctions in which subjects were given financial incentives to win. The structures of the incentives were such that the experimenter could compute both the theoretically efficient allocation and the theoretical competitive price. At the conclusion of the test, we could study the outcome of the auction to determine the degree to which the auction approximated these measures. The subjects were recruited from subject pools at Caltech and the University of Maryland. These subject pools have been successfully used in many important auction systems tests, including the FCC auctions, among others.

The auctions were first tested at Caltech's Laboratory for Experimental Economics and Political Science. The data for all auction forms were tested and analyzed. The study then moved to the Experimental Economics Laboratory at the University of Maryland. Instructions and the conduct of the experiment were handled from Caltech with Maryland personnel observing and watching for any technical problems. The tests at the University of Maryland replicated the findings in the Caltech laboratory. In addition, a set of new parameters were also employed at the Maryland facility to test the robustness of previous results. All results replicated and scaled as predicted by theory. Embedded in the procedures were special conditions that could be compared to results from auctions produced by many laboratories over many years. All results compared favorably to those produced elsewhere in the research community.

3. My knowledge of what transpired in the CMS field trials is limited to conversations, newspaper reports, and a report of the data produced by Professor Peter Cramton. However, I can say what one would expect to find based on the performance of the auctions we studied.

(i) Auction bids would be low relative to expectations. That would include patterns of bids below costs.

(ii) Winning bidders would be hesitant to deliver at the at the announced auction price. The response of the auctioneer would be to attempt to force delivery by whatever means available, including threats of exclusion from future auctions. This activity follows the realization that the bids reflected “cheap talk”.

(iii) To the extent that bidders could not be forced to supply at stated prices the procurement would fall short of needs.

(iv) Without a profitable market, firms would begin leaving the market in search of alternative products to produce and support their enterprise.