

What's Behind the Resurgence of Auctions

John McMillan*

1. The Resurgence of Auctions

While Tokyo sleeps in the early morning, the Tsukiji fish market is buzzing. Tsukiji has become a tourist attraction for visitors from overseas. Displayed for sale are some 450 different species: sea urchins, blowfish, live eels and shrimp, octopus, squid—all kinds of ocean and freshwater fish, fresh, frozen, dried, and smoked. The highlight, for a visitor, is the tuna auctions. The sleek silver tuna, 3000 or so, are laid out on pallets by the sellers, affiliates of the seven fishery companies that supply Tsukiji with seafood. The buyers examine each tuna through its “window,” a small cut in the tail, to assess its suitability for sashimi and sushi. Then the auctions begin. Bidding silently, using hand gestures, the buyers instantly counter each other’s bids, so it takes just seconds to sell a tuna worth up to \$10,000.

The Tsukiji market facilitates Tokyo’s wholesale fish trade. If it did not exist, each of the buyers and sellers would have to negotiate separate deals—a cumbersome way to transact. It takes a mere hour and a half to auction about \$25 million worth of seafood. For buyers, the marketplace shows the range of seafood available. For sellers, auctioning speedily reveals how much the buyers are willing to pay.

Tsukiji’s auctions run in a time-honored way. A more high-tech type of auction was initiated in July 1994, when the leaders of the US telecommunications industry gathered in the ballroom of Washington, DC’s Omni Shoreham Hotel to bid on licenses offered by the government to use the electromagnetic spectrum for paging services. (Each license represented a sliver of spectrum waveband over a region of the country.) Giant computer screens showed the current status of the bidding. In curtained booths at one end of the ballroom were computer terminals. Unseen by anyone else, bidders keyed in their secret code and then their bids. After each round of bidding, the new bids were

* This article is adapted from my forthcoming book *Reinventing the Bazaar: A Natural History of Markets*, New York, Norton, 2002.

announced, to be greeted by cheers and by groans of disbelief. The auction lasted a week, raising \$617 million for ten licenses covering a tiny sliver of spectrum.

Subsequent auctions offered larger chunks of spectrum, for mobile telephones and wireless computer networks. After the trial run in the Washington hotel, the auctions ran electronically. Spectrum auctions spread around the world, as countries like New Zealand, Mexico, Australia, Canada, Italy, the United Kingdom, Taiwan, Germany, Brazil, and the Netherlands adopted them. Worldwide, they have raised more than \$120 billion. The *Financial Times* called them “the world’s largest concerted transfer of money from the corporate sector to state coffers.”

Shortly after the spectrum auctions began, new methods of auctioning arrived also in the private sector, as electronic commerce grew. Drawing on the internet’s speedy two-way communication, a myriad of mechanisms have been concocted to make buying and selling easier. At the internet auction site eBay, for example, bidders feverishly compete for everything from junk to high art. It all began in 1995, when Pierre Omidyar set up a web site called AuctionWeb for people wanting to exchange information about collectibles and to make trades. The site’s services were initially free of charge, as a service to the public. After six months’ explosive growth in usage, based on word-of-mouth recommendations, Omidyar began charging a fee, a small percentage of the sale price, to cover his costs of running the web site. He left payment to the honesty of the seller, but the checks rolled in. He gave up his day job and was joined in the firm by Jeffrey Skoll. At first they contemplated focusing on a particular market segment such as coins or stamps. “In the early days, our strategy changed by the day,” says Skoll. Eventually they decided not to specialize but to let anyone sell anything.

With the auction system reengineered to handle the massive volume of traffic, they relaunched AuctionWeb as eBay in September 1997. Less than two years later eBay’s stock-market value reached \$22 billion. Now, the eBay web site has over ten million registered users. Millions of auctions are running on any given day, selling everything from cast-offs to fine art. The press proclaimed this reinvention of markets. *Business Week* said, “eBay has single-handedly created a new market.” According to the *Economist*, eBay instigated “a revolutionary leap forward in the efficiency of the price

mechanism.” The internet has lowered the costs of transacting enough that people anywhere wanting to trade low-value items are able to deal directly with each other.

Auctions are very old. They a long, colorful, and sometimes disgraceful history. The ancient Greeks used them to sell slaves and wives. Auctions are also very new. The growth of electronic commerce has reinvigorated them. Recent economic theory has deepened our understanding of how auctions work. This new theory has also helped economists design and implement new and improved auction mechanisms.

2. Auctions Reveal Information

Where and why are auctions used? In many transactions, such as in a supermarket or a department store, the seller fixes the price. An auction, by contrast, is interactive: the seller puts the pricing in the hands of the potential buyers, relying on the competition among them to get an acceptable price.

Why are some items auctioned while others are sold by posted prices? The difference lies in the degree of uncertainty about the value of the item for sale. Posted prices are used for items that are frequently traded and therefore have a well-established market value. Auctions are used for unique items. How would you set the price if you were selling Jane Austen’s handwritten draft of *Pride and Prejudice*, say, or the costumes the Beatles wore on the album cover of “Sergeant Pepper’s Lonely Hearts Club Band”? For goods that are not unique but whose value fluctuates, also, auctions are used at the primary point of sale to set a benchmark price. In the Tsukiji auction, the price of any particular kind of fish varies from day to day, reflecting the demand and supply vagaries of a perishable commodity. The essence of any auction, then, is that the bidders value the item for sale differently, but no one knows how highly anyone else values it. The seller does not set the price because he or she does not know what price to set.

It is not only the seller who suffers from an informational handicap. If the bidders knew their rivals’ exact valuations, their decision on how to bid would be very easy—but they do not.

The uncertainty about the bidders’ valuations can arise in two distinct ways. In one case (which theorists label “private values”), each of bidders attaches a different, subjective value to the item for sale. They all know exactly how much it is worth to

themselves to own it, but not how highly the others value it. An example is the sale of a painting in which the bidders differ in how much they would enjoy owning it.

In the other case (which theorists label “common value”), the buyers’ valuations are objective: they are all trying to assess the same thing, the underlying true value of the item for sale. It is worth the same no matter who wins it, but at the time of bidding no one knows this value; each has an estimate which is subject to error. The right to extract oil beneath a tract of land is an example: the amount of oil available to be extracted is the same for each bidder, but at the time of bidding they have different, imperfect estimates.

Auction houses like Sotheby’s and Christies sell artworks using an open ascending auction, in which the bidders go on raising their bids until only one bidder remains. Imagine bidding for a painting in an open auction, and suppose that you know exactly how much you are prepared to pay for it (so this is the private-values case). Your best strategy is to stay in the bidding until the price reaches your valuation, and then to drop out. If you ceased bidding earlier, you would risk seeing the painting sell for less than you value it; if you stayed in the bidding beyond that level, you would risk winning the bidding but paying more than it is worth to you. If all of the bidders follow this strategy, then you win only if you value the painting more than your rivals. The bidding stops at the price at which the second-last bidder drops out, so the price is the second-highest of the valuations.

The competitive process, therefore, reveals information. After the auction, the seller knows which of the bidders values the item the most. Moreover, the price gives an estimate of value. It is an underestimate, since the price is the second-highest valuation. But if the number of bidders is reasonably large, the competition drives the price up close to the winner’s valuation.

The logic of bidding is less straightforward when the item’s value is not private but common. Because the bidders have inexact estimates of the true, common value, there is an additional twist. They risk falling into the trap of the “winner’s curse:” that is, learning, too late, that the price has been bid higher than the item is worth. If they are all knowledgeable, then the best estimate is something like the average of their valuations. The winning bid, of course, is higher than the average bid. The winner is likely to be the bidder whose estimate is the most optimistic, probably overoptimistic.

Bidders sometimes get caught up in the frenzy of an auction and pay too much. But they need not be fooled. Experienced bidders avoid the winner's curse by bidding cautiously. They recognize they will win only if they have relatively high value estimates and bid accordingly lower. Alert winners are not cursed.

Rational bidding, then, involves (in an open ascending auction) remaining in the bidding until the price reaches the bidder's own valuation. The winning bidder earns profit, from the difference between his or her valuation and the next-highest valuation.

3. The Seller's Strategies

Auctions exist in a variety of forms. The most common is an open auction, used to sell art and antiques, in which the bidders go on topping each others' bids until only one wants to stay in. An alternative is the Dutch auction, used to sell flowers in the Netherlands, in which the price starts high and falls until a bidder claims the item. Another is the sealed-bid auction, sometimes used to sell commercial real estate: with a single round of sealed bids, the high bidder wins and pays his or her bid. A variant is the second-price auction, sometimes used for selling stamps: there is a single round of sealed bids and the high bidder wins, but the price is the second-highest bid.

When multiple objects are for sale rather than a single item, there are still further variations in auction design. The objects can be sold in a sequential auction, one after the other, or in a simultaneous auction, in which all the objects offered for bidding at the same time and none closes until bidding ceases on all of them.

Auction theory provides some propositions on how a seller should design an auction. The seller is handicapped, in seeking a high price, by not knowing exactly what the item for sale is worth to any of the bidders. Theory suggests a number of aspects of auction design that, in the face of this informational handicap, enable the seller to earn the best feasible return.

One straightforward result from the theory is that, for the seller, more competition is better. Competition can be stimulated by encouraging extra bidders to enter.

Sellers sometimes impose a minimum (or reserve) price, refusing to sell the item if no bid exceeds it. It is in the seller's interest, the theory says, to do this. A disadvantage of a minimum price is the risk that all bids will come in below the minimum and the item

will fail to sell. Weighed against the risk of no sale, however, is the gain from the minimum price: the possibility that it will force one of the bidders to bid higher than the competition would have induced. This might outweigh the risk of no sale, so it is typically in the seller's interest to impose a minimum price.

It follows from the idea of the winner's curse that, in a common-value setting, the winning bid is typically higher in an open auction (in which bids rise until no bidder wants to bid higher) than in a sealed-bid auction (in which bidders submit a single sealed bid). If the bidders understand the winner's curse, they can bid so as to correct for it. Because the bidders are guessing the item's common value, any information about the others' estimates, direct or indirect, is useful to a bidder. The open auction conveys more information than the sealed-bid auction, because a bidder can see the prices at which his rivals cease bidding. This provides indirect information about the others' estimates, and tends to make each bidder less cautious. Thus the seller should impose an open auction rather than a sealed-bid auction.

There is yet another strategy for the seller in a common-value setting. Sometimes the seller has information about the item's true value. Christies and Sotheby's, for example, publish advance estimates of the value of artwork up for auction. The winner's-curse logic implies that such a policy is in fact in the seller's interest. When extra information is released, the bidders fear the winner's curse less. As a result, they usually bid higher. They do not always bid higher, of course; sometimes the seller's information indicates the value to be unexpectedly low. But publicizing information mostly induces higher bidding, because it makes the bidders less wary of the winner's curse.

Auction theory's advice to sellers, then, is: get as much bidding competition as possible; set a minimum price; use an open auction rather than sealed bids; and publicize any information on the item's value.

4. Auction Research

The theory of auctions is an unusually successful branch of economic theory. As theory for theory's sake it is valuable, for it contains deep and innovative mathematical economics. It goes beyond theory, in yielding practical insights that have been put to use

in innovative auction mechanisms such as in the spectrum auctions. It is a lively field of research, moreover, and exciting new work continues to be produced.

Auction theory forms part of the emerging field of market design. As explained in my book *Reinventing the Bazaar*, market design consists of the range of devices that underpin any market—the underpinnings that are needed before the market can do its job of allocating resources efficiently.