MICROECONOMICS AND POLICY ANALYSIS - U8213
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Class Notes - Spring 2001

Auctions

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Reading: Handout, Thaler, Milgram

There are two basic forms of auctions: Sealed bid submissions and open bids. In a sealed bid auction individuals do not know what others are bidding.

Two types of Sealed Bid Auctions:

1st Price sealed bid auction: The highest bid submitted will be the winning bid. The winner pays what he/she bid.

2nd Price sealed bid auction: Everyone submits sealed bids and the winner is the one who submits the highest bid BUT the price paid by the winner is the 2nd highest bid submitted.

Two types of open auctions:

English auction: The bidding starts low and incrementally rises until someone is the highest bidder and no one is willing to outbid the highest bidder.

Dutch auction: The price starts very high and is keeps going down until someone bids. The first person to bid wins.

Why Study Auctions?

1) Auctions can be an efficient method of valuing goods. For example: rights to air waves, signals and bandwidth. The government auctioned off parts of the spectrum in anticipation of new technology. The auctions were appealing because well-structured auctions get people to reveal the true valuation of the good. The company (private entity) actually ends up paying to the government what the good is worth to them. It turned out with these auctions that the willingness to pay for a slice of the spectrum, as revealed by the auction outcome, was much higher than expected.
2) Procurement: Governments and entities want to procure goods and services at the lowest possible price (like an auction in reverse). The lowest bidder wins the contract. In a 1st price sealed bid auction the lowest bidder wins the contract and in a 2nd price sealed bid auction the lowest wins but is paid the second lowest price. Procurement auctions are often an important tool for the government in selecting contracts.

How are these four auctions related?

1) **An English auction and a 2nd price sealed bid auction are strategically equivalent/identical to one another.**

Why?
Everyone in the auction has a maximum price they are willing to pay for a particular good. This is called their **reservation price**. In an English auction as long as the current price is below your reservation price you will keep bidding. When the price is greater than your reservation price you stop bidding. The person with the highest reservation price who pays the second highest reservation price wins the auction. In the 2nd price sealed bid the winner has the highest reservation price, and payment is made at the second highest bid. (Although there is an incremental integer issue with larger numbers it is usually not significant).

The dominant strategy is to bid your reservation price. The bid determines if you win. You will not bid less than your reservation price because it reduces the probability that you will win without lowering the price you will pay. You will not bid more than your reservation price because you would only increase your probability of winning if you pay more than your reservation price.

(William Vickery created the 2nd Price sealed bid auction in order to effectively make the English auction easier to administer).

2) **The Dutch auction and the 1st price sealed bid auction are strategically equivalent/identical**

Why?
With a Dutch auction you want to know the next highest reservation price but it is unknown. Given your reservation price you are trying to figure out the 2nd highest reservation price so that you can effectively pay less. This creates tension. The same situation applies in the 1st Price sealed bid auction - you probably should not bid your reservation price but try to estimate the second highest reservation price. At your reservation price you are actually indifferent between having the good and not having the good.

Winner's Curse (Milgram, Thaler)

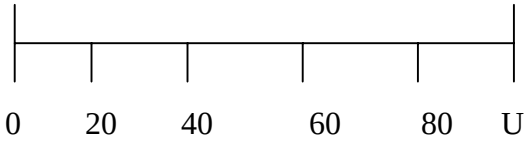
Arose from the bidding for mineral rights. It eventually become clear the winning bidder, on average, lost money on the investment. Why? Every bidder has a signal the indicates the value of the good. The winner is the highest bidder – or the one who has most overestimated the value of the good.

There are two kinds of auctions:

1) **Private values auctions:** Values of the good being auctioned to individuals is subjective and is different between individuals. You can not make comparisons between people (SIPA Mug).
   Common values auction: The good being auctioned has an objective value that may or may not be known ($.05 for every raisin). Therefore, the bids of individuals are somehow related. Everyone has an estimate but if you are the highest bidder you probably over-estimated the value of the object. Thus the winner tends to lose money

(hence the winner's curse). The optimal strategy then is to revise your bid down from the signal you receive.

Assume: Uniform Distribution and uniform random variables



With n being the number of bidders, and V the signal you receive, you estimate the maximum value of the distribution from which signals are drawn. If yours is the highest signal (from n bids) then on average it is n/(n+1) of the maximum. Hence, if U is the maximum then::

$$V = \frac{n}{(n+1)} (U)$$

Then the max, U, would be

$$U = V \frac{(n+1)}{N}$$

What should you do to avoid the winner's curse? If the max value of the distribution is U, and everyone's estimate of the value is unbiased, the true value of the object is U/2, so you bid

$$B = \tfrac{1}{2} \frac{(n+1)}{n} V$$

To avoid the winners curse, you realize your bid is too high and so you need to scale back your bid.

What auction yields the highest revenue?
(see Milgram and Auction and Bidding Notes)

Revenue Equivalence Theorem: All four auctions yield the same expected revenue if bidders are identical, the reservation prices are drawn from the same distribution and there is independence among individuals.
Why?
In an English auction the auction stops at the second highest reservation price and in the Dutch auction you are trying to figure out the second highest reservation price. In principal you are trying to do the same thing.

(In lab experiments the Dutch auction doesn't lead to the same result as the 1st price sealed bid auction. The Dutch leads to a lower price.)

Why would you choose one auction over another?

1) Under different circumstances different auction may lead to different results. With Industrial Procurement and an English auction the lowest price wins. This is because when you are purchasing multiple units the price is first determined and then the government decides how much to buy. In this case English is preferred to Dutch because the companies realize that at a lower price the government will buy more goods. This drives down the price in an English auction.

2) Private vs. Common: With a common auction the context of the auction can change. The English is preferred over the Dutch because it exploits the correlation of information between individuals. In deciding what to bid you are trying to access what others bid. You have some information on the underlying market value of the good. Manipulating information may lead to higher bids.

Linkage Principle: (pg. 16 Milgram)

Bidders are made worse off and sellers better off if the price paid by the buyers can be more effectively linked to exogenous variables correlated with bidders private information. With common values, any information that provides information on those values increases individuals' bids. Auctions that exploit the linkage do better. The expected revenue to sellers increases if the price paid is linked to information.

Examples:

1) If a seller has private information on a good the seller should reveal it to increase expected revenue.
2) Royalties: Book rights/mineral rights. Price will be tied to ex-post factors such as sales. Links revenue to a common piece of information.
3) With common values the English is preferred to the Dutch because it leads to a higher price. However, with risk aversion the revenue equivalence theorem breaks down. The revenue equivalence theorem is based on risk neutrality. If the individuals bidding are risk adverse then you would prefer a Dutch to an English auction. Why? Because if you are the highest bidder and the price fell to your reservation price you would hold out as long as you could before the second reservation price was revealed. Risk aversion means you wait longer before you stop to bid.