



RECITATION NOTES #9

Auctions and Common Property

Friday - November 19, 2004

OUTLINE OF TODAY'S RECITATION

1. **Auctions:** types of auctions and definition of optimal strategies
2. **Common property resources:** theory and example

1. AUCTIONS

- 1.1 Types of auctions and characteristics
- 1.2 Definitions and terminology
- 1.3 Optimal bidding strategies in auctions

1.1 Types of auctions and characteristics

There are many different types of auctions. The main differences affect the:

- Format of the auction process
- Information available about the good bought

1.1.1 Different types of Auction Formats

There are two main types of auctions, each of which then includes many possible variants. We will analyze the most important ones.

- **Open outcry auction:** The price has to be openly declared by the buyers; auction proceeds until the final price has been reached. Two main types:
 - *Ascending (English auction):* Auctioneer announces ever increasing prices to solicit bids. Continues until one person offers the highest price and no-one else offers more.
 - *Descending (Dutch auction):* Auctioneer announces decreasing prices until someone signals the intention to buy.
- **Sealed bid auction:** Every buyer puts a bid into an envelope and gives it to the seller at the same time.
 - *First price:* The buyer with the highest offer wins the auction and has to buy the product at the price he/she offered
 - *Second price:* The buyer with the highest offer wins the auction and has to buy the product at the SECOND highest price offered for the good

1.1.2 Different kinds of information availability in auctions

There are two main cases we have to analyze:

- **Private Valuation Auction:** each bidder has private information about his/her own personal individual valuation of the good auctioned.

Different people have different valuation.

Example: Artwork that is bought for personal enjoyment.

- **Common Value Auctions:** each bidder has private information about the value of the object auctioned. But at the end of the day the object will be worth the same to all.

Example: A group of friends bid to buy a jar full of quarters or companies that bid for an oil field

NOTE 1: In most real world situations auctions have often a private as well as common value component. For example a profitable division of company will most probably also be profitable if it belonged to another company (common value component) but potential buyers might add different value as a result of the existence of economies of scale and/or scope (private component).

1.2 Definitions and terminology

There are two important definitions we have to remember in auctions:

- **Winner's curse:** When bidders have common values, they tend to overbid since the bidder with the highest (over)estimate wins. If bidders correctly account for the Winner's Curse, of course, they will not overbid. Also, the Winner's Curse is not relevant when bidders have private values since, then, bidders know how much the object is worth to them.
- **Bid Rigging:** If in a sealed bid auction two or more bidders agree to submit a bid (which is the result of a prior agreement), with the objective of lowering the maximum price or signaling future bidding intentions, we are assisting to a case of bid rigging. This is illegal in most sealed bid auctions, in the auctioneer is not properly informed about the agreement.

1.3 Optimal bidding strategies in auctions

Different auctions require different strategies. In general, there are two main rules that apply to certain auctions formats, regardless of the situation.

- In a **second price private value auction**, the dominant strategy is to **bid the real valuation** for the good
- In **common value** auctions, **beware of the winner's curse**.

2. COMMON PROPERTY RESOURCES

2.1 Description

2.2 Example of independent use of common resources

2.3 Example of coordinated use of common resources

2.1 Typical common property problems

Common properties are defined as resources that can be used without payment by a large number of players who have access to them. The problem with common goods relies on the fact that the use by one player affects the others (creating an externality: see later). The failure to price these common resources results in the overuse and - eventually - exhaustion of these resources.

Example: imagine an oil field. The more oil platforms that will be built on the oil field, the less pressure each platform will obtain, hence the less oil.

2.2 Example of independent use of common resources

Let's consider again the example of the oil rigs seen in class.

Let's define the following variables:

N = total wells drilled

q = average output per well

Q = total production = Nq

Furthermore, let's assume that:

P = oil price = \$15 per barrel

Drilling cost = \$1500 per well

Finally, let's consider the following production function:

$$Q = 1000N - N^2$$

NOTE: when the number of wells increases, the pressure of the oil fields will drop, thereby affecting negatively total production!

Each developer works independently. If there are many independent developers working on the oil field and trying to maximize profits, the problem becomes the following. To the Firm i , the profit from one more well – according to the data above - is given by the equation:

$$\begin{aligned}\Pi_i &= P * Q - 1500 \\ &= P * 1000N - P * N^2 - 1500\end{aligned}$$

Each developer will add more wells up to their own break-even point, which is defined as

$$P * q - 1500 = \frac{15 (1000 N - N^2)}{N} - 1500 = 0$$

This equation is solved for

$N = 900$ wells

And the optimal quantity of oil produced amounts to:

$$Q = 90,000 \text{ barrels}$$

The average output per well will be

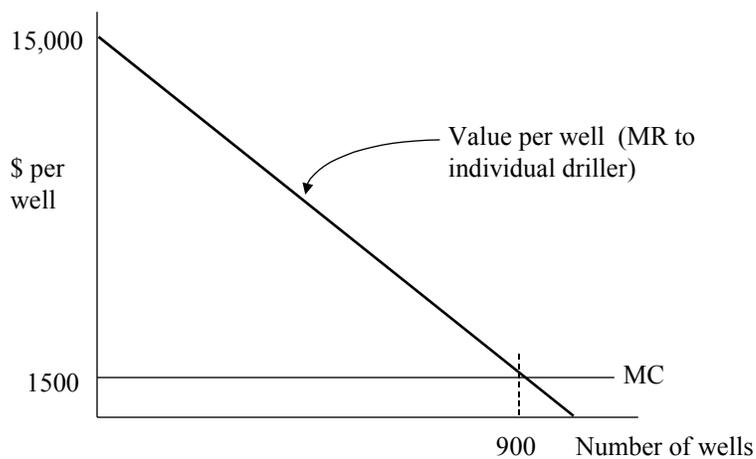
$$q = 100 \text{ barrels.}$$

Profits in this case will be:

$$\Pi_i = \$15 * 100 - \$1500 = \$0$$

Graphically:

Many independent developers



2.3 Example of coordinated use of common resources

Let's now assume that all developers decide to form a joint venture for the usage of the oil field.

This time, the optimization problem involves the whole community. The profit for the community of developers as a whole from the creation of drilling wells is given by the function:

$$\begin{aligned} \Pi_c &= PQ - 1500N \\ &= 15(1000N - N^2) - 1500N \end{aligned}$$

If all developers behave as a single firm (a joint venture) and they ask a single manager to find the optimal amount of wells, the manager will decide to add up oil wells until the point where:

$$d\Pi_c / dN = 15(1000 - 2N) - 1500 = 0$$

Solving for N determines the point that maximizes the community's profit function.

This equation is solved for:

$$N = 450 \text{ wells}$$

And the optimal amount of oil produced is:

$$Q = 247,500 \text{ barrels.}$$

The average production per well becomes:

$$q = 550 \text{ barrels}$$

Finally, the profits for each developer become:

$$\Pi_i = \$3.04 \text{ million}$$

Graphically:

