

Lecture 17

Game Theory V: Auctions



15.011/0111 Economic Analysis for Business Decisions
Oz Shy

Auction in the news

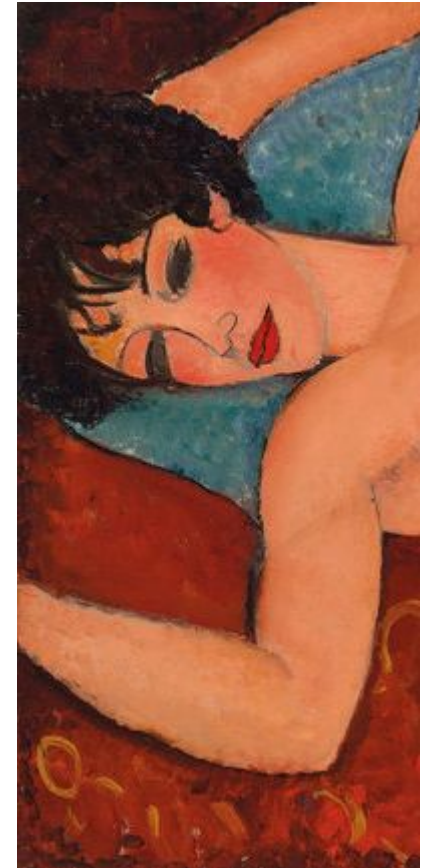
ART & DESIGN

The New York Times

With \$170.4 Million Sale at Auction, Modigliani Work Joins Rarefied Nine-Figure Club

By ROBIN POGREBIN and SCOTT REYBURN NOV. 9, 2015

- ... a painting of an outstretched nude woman by the early-20th-century artist Amedeo Modigliani sold on Monday night for \$170.4 million...in a packed sales room at Christie's
- It was the second-highest price paid for an artwork at auction
- The seller of the Modigliani...was guaranteed at least a \$100 million **minimum** price




What is an auction?



An auction is a procedure and a market in which products are sold through a formal bidding process

Examples:

- Art, antiques, flowers, fish
- Internet (ebay, AdWords) 
- Government (treasury bills, mineral rights, assets, electromagnetic spectrum, procurement)
- Sports: Broadcasting rights (superbowl ads)
- Production/service outsourcing



Advantages:

1. **Low cost trading method**. Participants need not even be present at the same location (online auctions)
2. **Saves time** relative to long price negotiations (next class)
3. Seller can (potentially) extract higher surplus (**higher price**)

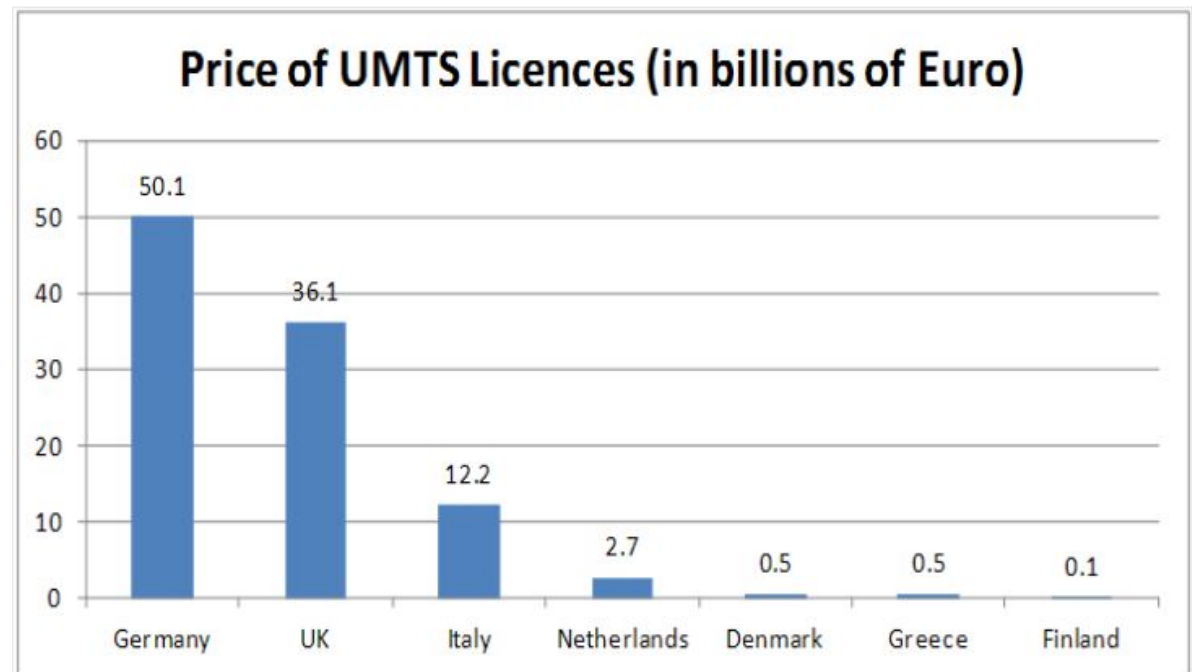
Goals

1. Raise **maximum revenue** for the seller (highest price)
2. **Proper match (efficiency)**: The item is auctioned to the "right" buyer (with the highest valuation of this item)
3. Avoid the possibility of **collusion among bidders** (potential buyers) that may lower the bids and hence revenue generated
4. Allow entry of new competitors (for example, new providers of telecom services that would compete with the incumbents)

Auction design

- Optimal auction design varies with market conditions, type of bidders, and goals of the auction
- **There is no single optimal design that fits all**
- Example: European auctions of 3G licenses in the 1990s yielded different prices (even when adjusted on a per capita basis)

"Success" in Germany and the UK, "failure" to generate revenue in Italy and the Netherlands



Classifying bidder types according to their valuation and information

Private value auction

- Each bidder knows her own valuation
- Bidders **do not know** valuations of other bidders
- Bidders may have a different valuation

Common value auction

- Each bidder has the **same valuation**, but different information
- Bidders don't know true valuation with certainty, therefore,
- Bidders may have different estimates of the true value

Each Bidder's objective is to **Maximize** (valuation – price paid)

Widely-used auction formats

Open outcry auction (auctioneer)

- Ascending auction (English): auctioneer announces increasing prices until one person left
- Descending auction (Dutch): auctioneer announces decreasing prices until someone bids



Sealed bid auction

- First price: highest bidder wins & pays highest price
- Second price: highest bidder wins & pays second-highest price



In-class auction experiments: Private values Open outcry (auctioneer)



- Ascending auction (English): auctioneer announces increasing prices until one person left [Auction A]
- Descending auction (Dutch): auctioneer announces decreasing prices until someone bids [Auction D]

5 bidders participate in Auction A & 5 bidders in Auction D

Bidders: Use the valuations (maximum willingness to pay) printed on the piece of paper you have been given



Fire, 7" Display, Wi-Fi, 8 GB -
Black

by Amazon



12,194 customer reviews

Tablet sold as "new in a box" at a reduced price w/ warranty

Private value open outcry (auctioneer): Frequently-observed outcomes



	Open Outcry		Sealed Bid	
	Ascending (English)	Descending (Dutch)	First Price	Second Price
Private Values	Bid Your Value	Shade your Bid		
Common Values				



Private value open outcry (auctioneer): Two commonly-observed problems

- Collusion among bidders (bid rigging): Open outcry facilitates collusion because bidders can easily monitor other bidders' bids [see next slide]

Hence, monitoring enforces collusion as "defectors" will be punished by having to face higher bids from bidders who initially maintained the collusive agreement

- Entry deterrence: Large established firms will place significantly-high bids to deter small competitors from entering the market

Hence, small more-efficient firms may not enter as they cannot see any profit from matching these bids



Private value: Collusion via market division (10/1999)

Simultaneous Ascending Auction; minimum raises of 10%

Round 1: Mannesman

Bids **DM 18.18m**/MHz for lots 1,2,3,4,5

Bids **DM 20.00m**/MHz for lots 6,7,8,9,10

Round 2: T-Mobil

Bids **DM 20m**/MHz for lots 1,2,3,4,5

Doesn't bid again for lots 6,7,8,9,10

Round 3: No more bids; Auction closes

T-Mobile's manager later says "There were no agreements with Mannesman. But Mannesman's first bid was a clear offer."

In-class auction experiments:

Private values

Sealed bid

Sealed bid auction (Snickers, 30pcs)



- First price: highest bidder wins and pays highest price [Auction F]
- Second price: highest bidder wins and pays second-highest price [Auction S]

3 bidders participate in Auction F & 3 bidders in Auction S

- Bidders: Use the valuations (maximum willingness to pay) printed on the piece of paper you have been given.
- Write down your bid, and submit to the judge in an envelope

Private value sealed bid auctions: Frequently-observed outcomes



	Open Outcry		Sealed Bid	
	Ascending (English)	Descending (Dutch)	First Price	Second Price
Private Values	Bid Your Value	Shade your Bid	\approx Dutch	Bid Your Value \approx English
Common Values				

Conclusion: First-price outcry auctions generate similar revenue as second-price sealed bid auctions

Common value sealed bid auctions:



How much would you bid for this coin jar?



- Nature 'knows' the true value of this jar. However,
- Bidders can only **estimate** the value of the coins
- All bidders share a **common value** of this jar (which is the amount of money in dollar terms)
- Remark: In reality, bidders may have different valuations because they may differ in their value of time needed to deposit the coins in a bank account

Common value sealed bid auctions:



- You bid on exclusive rights for offshore oil excavation
- There is some uncertainty as to how much oil will be found
- Each bidder has a consultant that gives different estimation
- Once excavated, oil value is realized (common value)
- Examples of estimations:

$$V_1 = \begin{cases} \$120 & \text{Prob. } 2/3 \\ \$90 & \text{Prob. } 1/3 \end{cases}$$

$$V_2 = \begin{cases} \$120 & \text{Prob. } 1/3 \\ \$110 & \text{Prob. } 1/3 \\ \$100 & \text{Prob. } 1/3 \end{cases}$$



In-class experiment: Common value sealed bid first-price auction



Two bidders, with estimations given below.

Two separate auctions (called C1 and C2)

1. Bidders of auction C1, please submit your bids (envelope)
2. Highest bid wins and pays the highest bid
3. Nature: Toss the coin and tell us Face or Tail
4. Bidders of auction C2, please submit your bids (envelope)
5. Nature: Toss the coin and tell us Face or Tail

$$V_1 = \begin{cases} \$x_1 & \text{Coin Face up, Prob.0.5} \\ \$y_1 & \text{Coin Tail up, Prob.0.5} \end{cases}$$
$$V_2 = \begin{cases} \$x_2 & \text{Coin Face up, Prob.0.5} \\ \$y_2 & \text{Coin Tail up, Prob.0.5} \end{cases}$$



Common value auctions

The winner's curse:

Three characteristics:



THE WINNERS CURSE

1. The bidder that "wins" and pays b finds out that realized value is w where $b > w$
2. This happens because the bidder that tends to over-estimate generally wins the auction by placing the highest bid
3. Occasionally, if bidders are aware of the winner's curse, they may underbid relative to their expected value





THE WINNERS CURSE

Common value auctions

The winner's curse: Examples

- Acquisitions may be viewed as bidding for other firms
- In 2012, HP acquires Autonomy for \$11.1 billion and lost \$8.8 billion after realizing the true value
- In 2014, Microsoft acquired Nokia's phone division for \$7.2 b



Autonomy®

Common value auctions

Frequently-observed bids



	Open Outcry		Sealed Bid	
	Ascending (English)	Descending (Dutch)	First Price	Second Price
Private Values	Bid Your Value	Shade your Bid	\approx Dutch	Bid Your Value \approx English
Common Values			Shade Adjusted Value	Bid Adjusted Value