

Lectures on Collusion and Bidding Rings:

# A Study of the Internal Organization of a Bidding Cartel

*Asker, American Economic Review 2010*

The reasons for looking at this are:

- a) Example of empirical cartel research
- b) Illustration of how auction-related econometrics can be leveraged for an applied question.

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Structural Analysis

Results

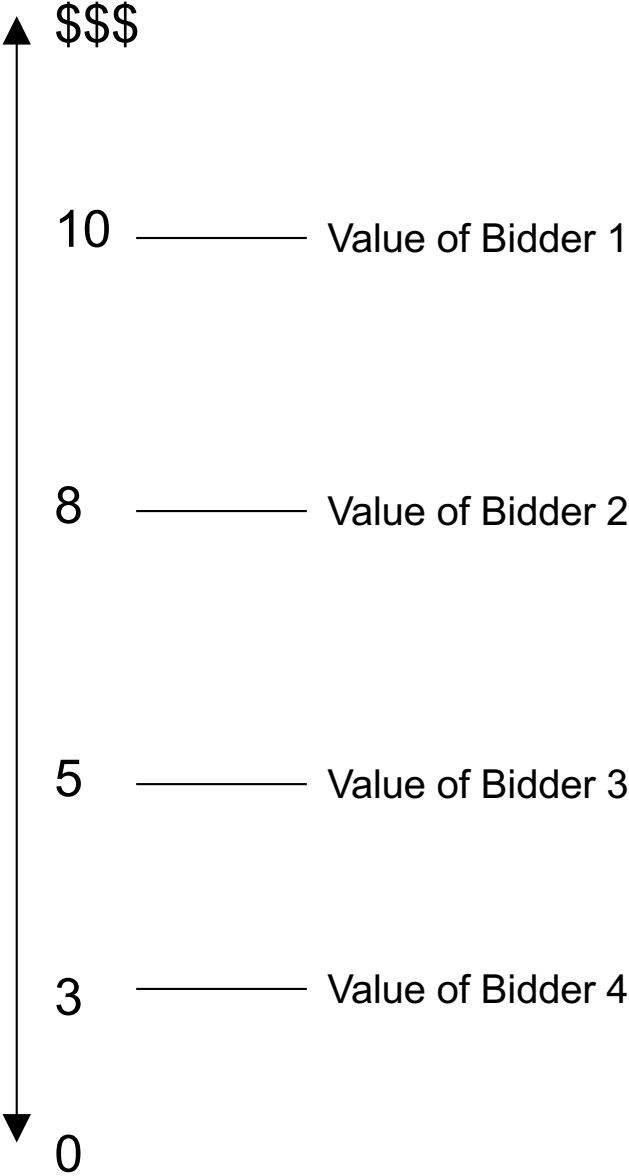
Conclusion

# Place in literature

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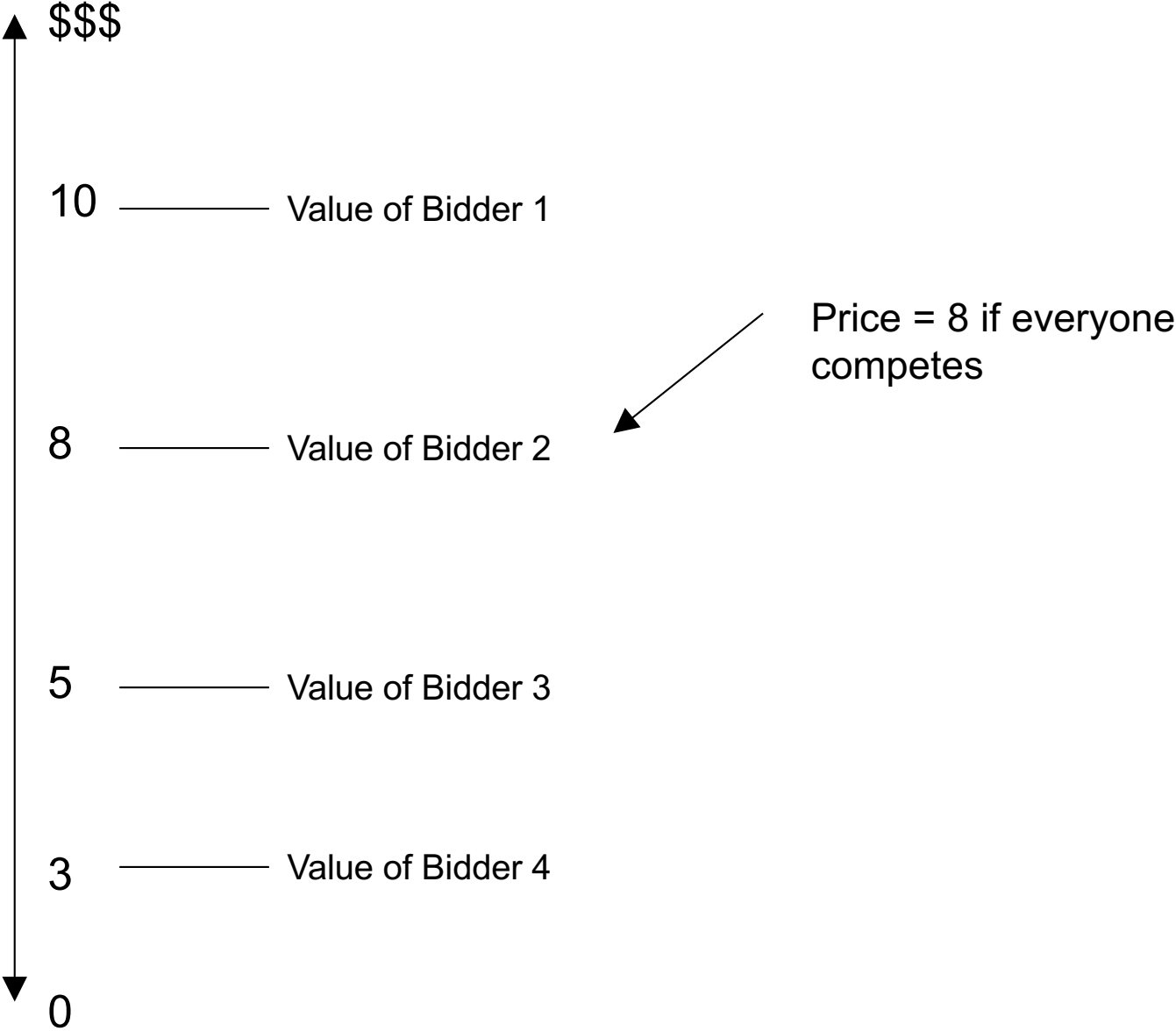
	Measure market Impact	Detection	Evaluating theory	Descriptive work
Enforcing agreement				
Splitting the gains				
Entry deterrence				
Avoiding detection and countermeasures				

# Introduction: Collusion in an English Auction



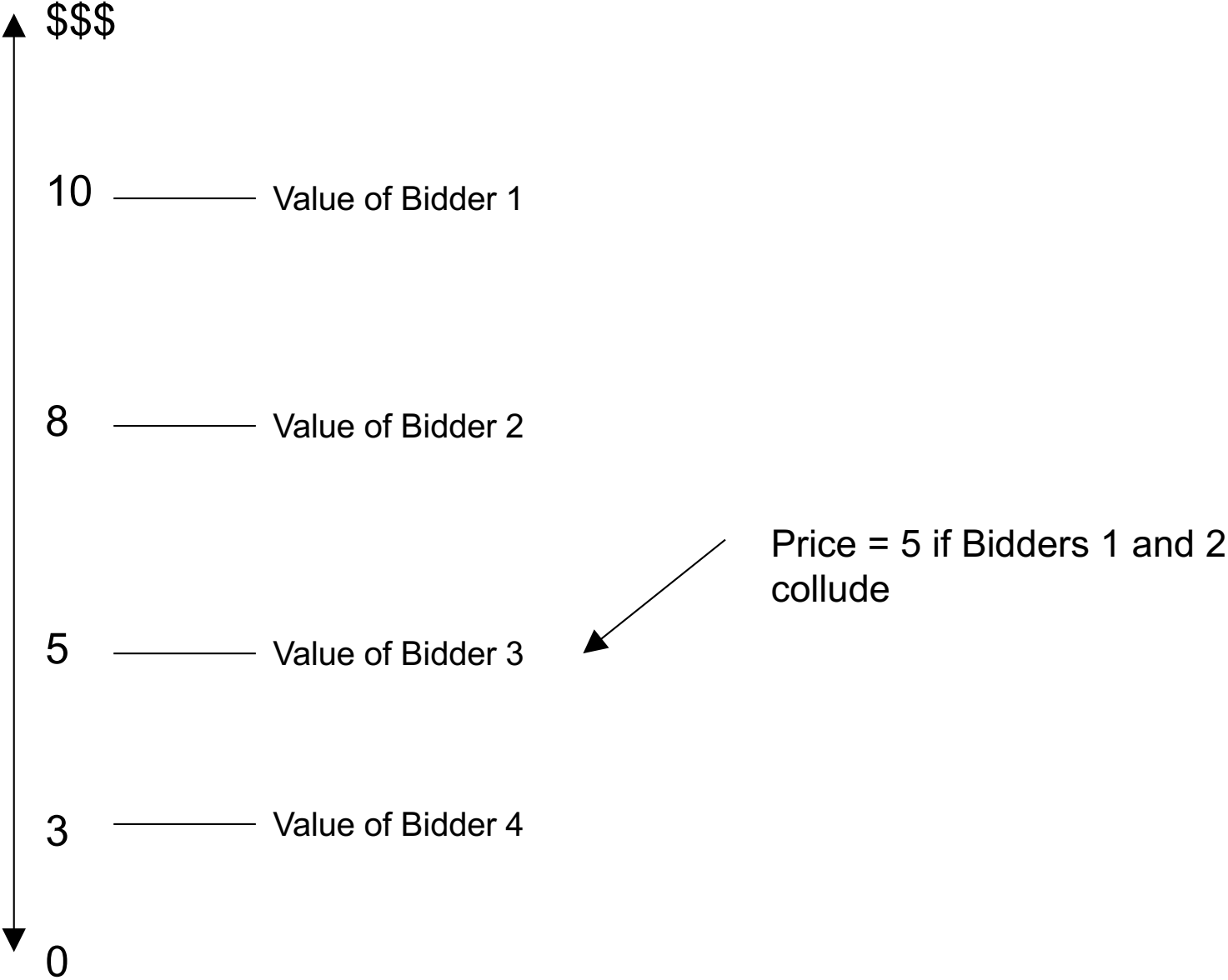
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# Introduction: Collusion in an English Auction



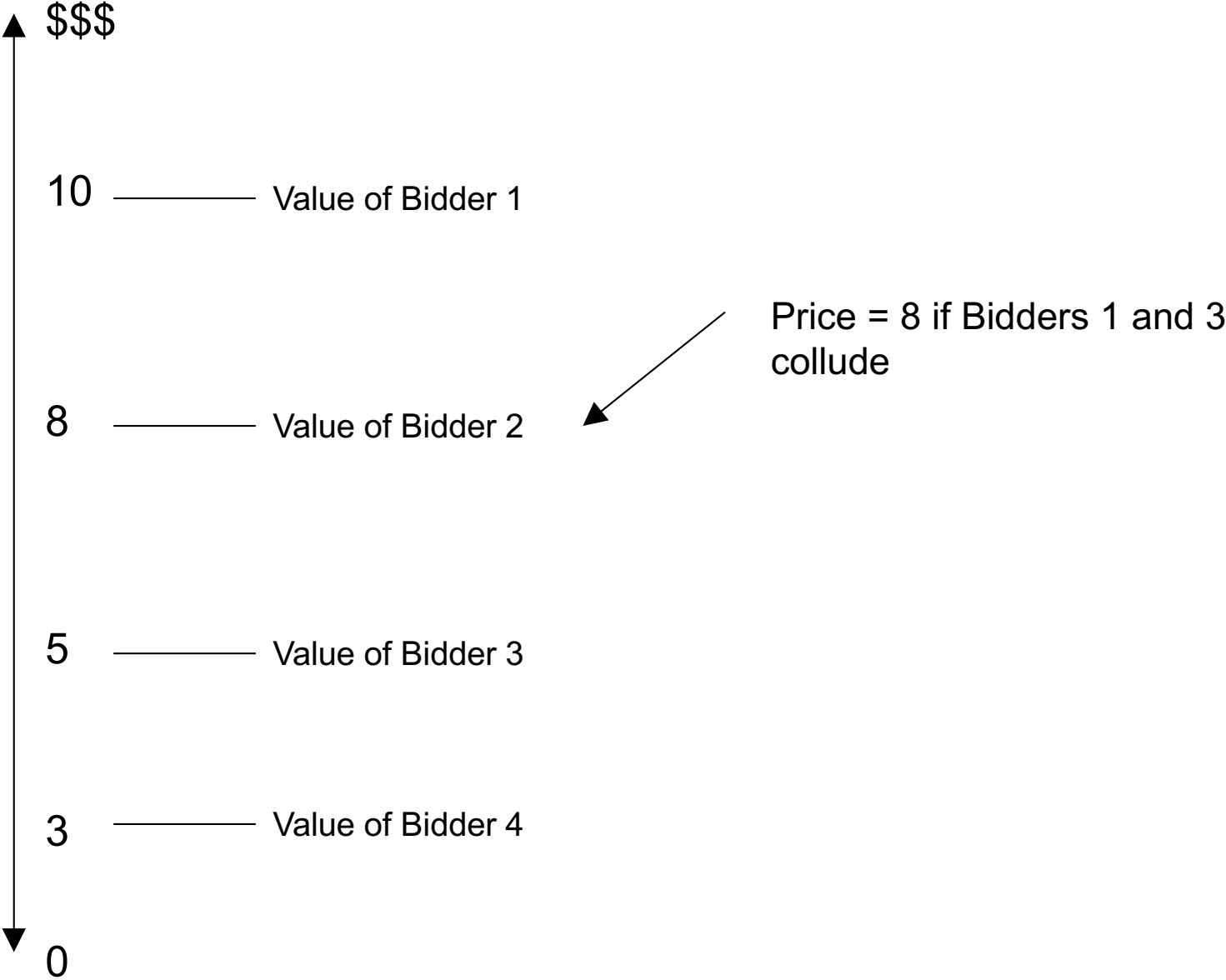
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# Introduction: Collusion in an English Auction



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# Introduction: Collusion in an English Auction



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# Introduction

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- Research Question:
  - “How do bidding rings work in practice ?”
  - “How might rings affect market outcomes ?”
- To do this I analyze the activity of ring of 11 stamp dealers who colluded in North American stamp auctions for around 20 years
- Why is this interesting?
  - Regulatory reasons: Price Fixing and Bid Rigging are Illegal
  - There is very little evidence on how cartels organize themselves
  - We know very little about the magnitude of the impact of cartel design on revenues and efficiency

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# Ring Organization

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## Ring Exists:

- 11 Stamp Dealers
- Subset of all Bidders
- Each ring member decides whether interested in the object for sale

## Knockout Auction:

- First Price Sealed Bid
- Decides : who gets the stamps if the ring wins
- At what price they stop
- The side payments

## Target Auction:

- English – Open Outcry Ascending Bid
- Winner Pays Own Bid
- Cartel bids up to the winning knockout bid.

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# Ring Organization: The Knockout (Data)

Consider the following data:

Data ID	Bidder	House	Date	Lot #	Sidepayments	Rank	Knockout Bid	Target Price
989	K	hrh	5-Dec-1996	954	-250	1	3400	1350
990	C	hrh	5-Dec-1996	954	237.5	2	1850	1350
991	J	hrh	5-Dec-1996	954	12.5	3	1400	1350
992	I	hrh	5-Dec-1996	954	0	4	1200	1350
993	D	hrh	5-Dec-1996	954	0	5	725	1350

The catalog description is:

**ITALY AND AREA**

954 ★○⊠ 19th and 20th Century, coll. of many hundred diff., plus hundreds of dupl., in 2 Minkus albums and loose pages in carton, l.h. to unused and used, mostly Italy with a wide range of issues incl. many compl. sets, some modern n.h., blks and corner blks, Airs, back-of-book, Aegean Is., San Marino, etc., mixed condition to very fine. Est. Cash Value \$750-1,000 .....

Bidding data collected and generously provided by Antitrust Division of NY State AG's Department.

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Computing side payments:

D & I get nothing:  $1350 > 1200 > 725$

J does get a sidepayment:

Take the difference between bid and target price:

$$1400 - 1350 = 50$$

$\frac{1}{2}$  of this goes to the winner (K)

$\frac{1}{2}$  gets split between C & J

Hence, J's sidepayment is \$12.5

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# Structural Analysis: Model

Approach:

- IPV style model
- 2 types of bidder: strong and weak
- Focus on 2 bidder knockouts (tractable + identified + lots of data)

Bid = argmax: (Value of object - Expected payment in target if win) x (Prob of winning)

- (Expected payment to loser if win) x (Prob of winning and having to make a payment)

+ (Expected payment from winner if lose) x (Prob of losing knockout) x (Prob of beating the price in target)

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# Structural Analysis: Model

Approach:

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First Order Condition is:

$$v_{ik} = b_{ik} - \frac{1}{2} \left[ \frac{F_r(b_{ik})(1 - G_{-i}(b_{ik}))}{f_r(b_{ik})G_{-i}(b_{ik}) + F_r(b_{ik})g_{-i}(b_{ik})} \right]$$

This provides a mapping from bids to values, such that  $v(b)$  is a function: for each  $b$  there is a unique  $v$

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# Data

- Complete record of ring's activity from July 1996 – June 1997
- Also depositions from the taxi driver and one of the ring members
- 1967 target auctions.
  - Data Summary:

**Table 2: Bidding by number of bidders in the knockout**

# of Bidders	Target Auction (Winning Bid)		Knockout Auction (Median Bid)		% Of lots won by ring	Total Number of lots
	Mean	Standard Dev.	Mean	Standard Dev.		
1	733	1262	616	1134	19%	623
2	1314	2016	1066	2048	36%	367
3	2014	3246	1750	3029	48%	260
4	2217	3492	2293	4082	69%	196
5	2249	3419	2092	3322	68%	144
6	2098	2628	2163	3014	74%	91
7	2979	3425	3655	4116	86%	74
8	4790	4904	6233	7726	96%	26

Notes: Does not include the Harmer-Schau auctions. All subsequent analysis also excludes these auctions.

# 'Weaker' Bidders

**Table 5: Knockout outcomes, by ring member**

Ring Member	Auctions with at least 2 ring members interested ( $n \geq 2$ )			
	% High KO Bid	receive sidepayme	% pays sidepayments	# of Knockouts
A	33%	22%	12%	607
B	52%	21%	16%	175
C	20%	23%	5%	368
D	10%	20%	3%	686
E	38%	24%	21%	348
F	28%	28%	4%	116
G	10%	34%	5%	184
H	4%	34%	0%	50
I	44%	17%	20%	209
J	30%	22%	9%	686
K	28%	21%	9%	861

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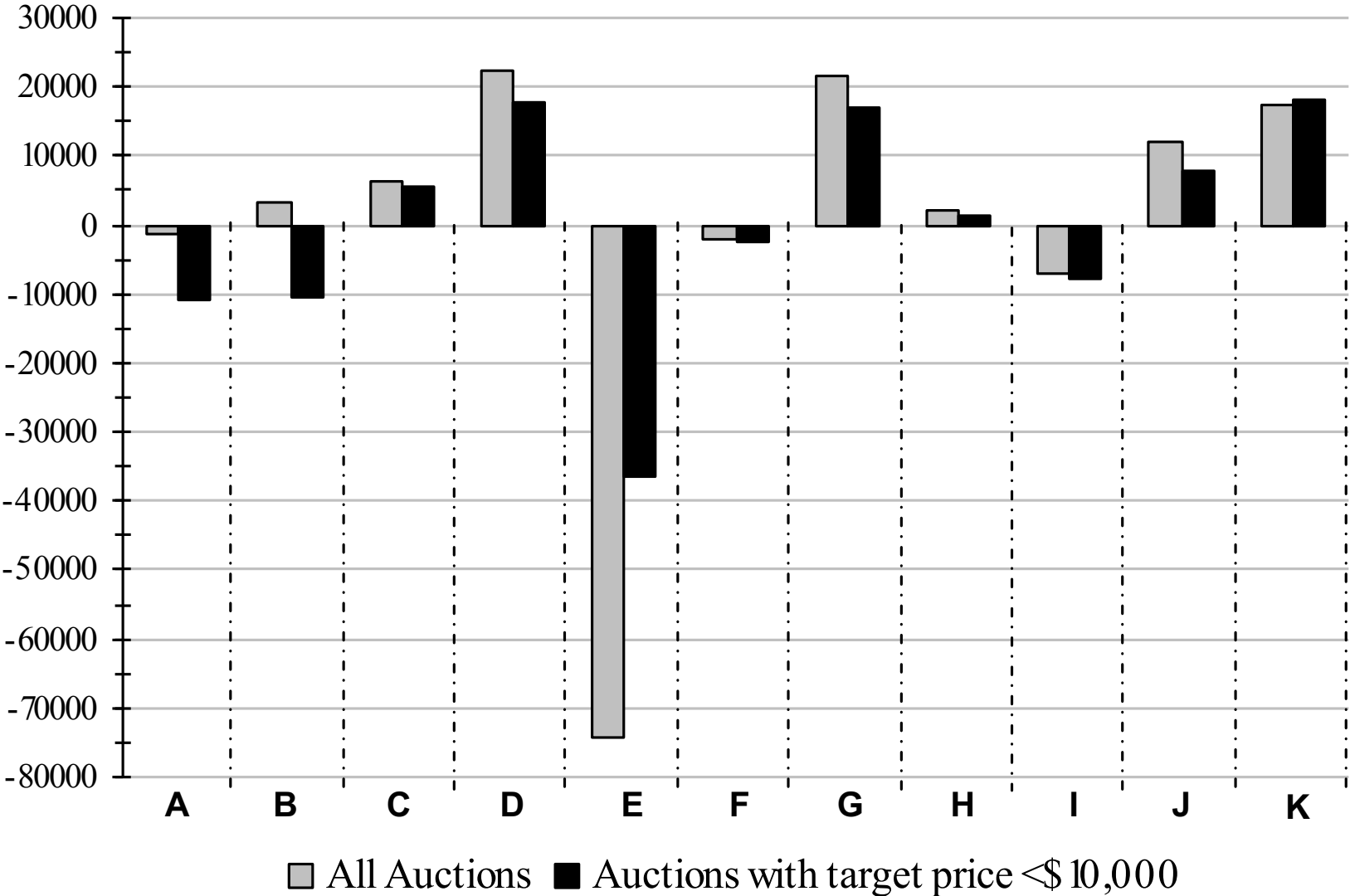
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# 'Weaker' Bidders

Net Payments From the Ring, By Member



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# Reduced Form: Summary

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- Ring participants are heterogeneous
- 'Weaker' bidders are a problem

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# Structural Analysis

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## Objectives:

### A. Measure damages:

- To the seller
- To the other bidders who are not members of the ring

### B. Measure the market inefficiency introduced by this knockout design

### C. Measure the returns to the cartel from colluding

- It all amounts to estimating a version of a markup

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# Structural Analysis: Estimation (Basic Idea)

Observables:  $b_{ik}$ , other Bids in auction  $k$ , Bids in other auctions

Nonparametric estimation (kernels) give densities

Empirical CDF gives distributions

2 Bidders in  
Knockout  
IPV Setting

$$v_{ik} = b_{ik} - \frac{1}{2} \left[ \frac{F_r(b_{ik})(1 - G_{-i}(b_{ik}))}{f_r(b_{ik})G_{-i}(b_{ik}) + F_r(b_{ik})g_{-i}(b_{ik})} \right]$$

Compute valuation, bootstrap standard errors

# Structural Analysis: Estimation (Issues)

1. Getting the distribution of the winning target price (highest non-ring valuation)

There is a selection problem in the data which I explicitly model.

2. Observed auction level heterogeneity

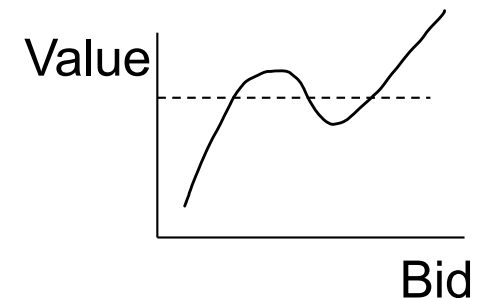
First stage OLS regression approach

3. Unobserved auction level heterogeneity

Adopt the deconvolution technique first adapted to first price auctions to deal with unobserved heterogeneity by Krasnokutskaya (2004).

4. Non-monotonicity of bid function

Need to make sure smoothing parameters do not let this happen



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# Steps in Estimation

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Step 1: Regress Bids on observed auction characteristics

Step 2: Work with residual from step 1

Step 2a: Do the deconvolution

Step 3: Work with a sample drawn from the idiosyncratic bid distribution

Step 3a: Selection correction on distribution of highest non-ring bid

Step 3b: Adapted GPV procedure

Step 4: Add the common element from the deconvolution back in

Step 5: Add the observed auction characteristics back in

Step 6: Counterfactual simulations

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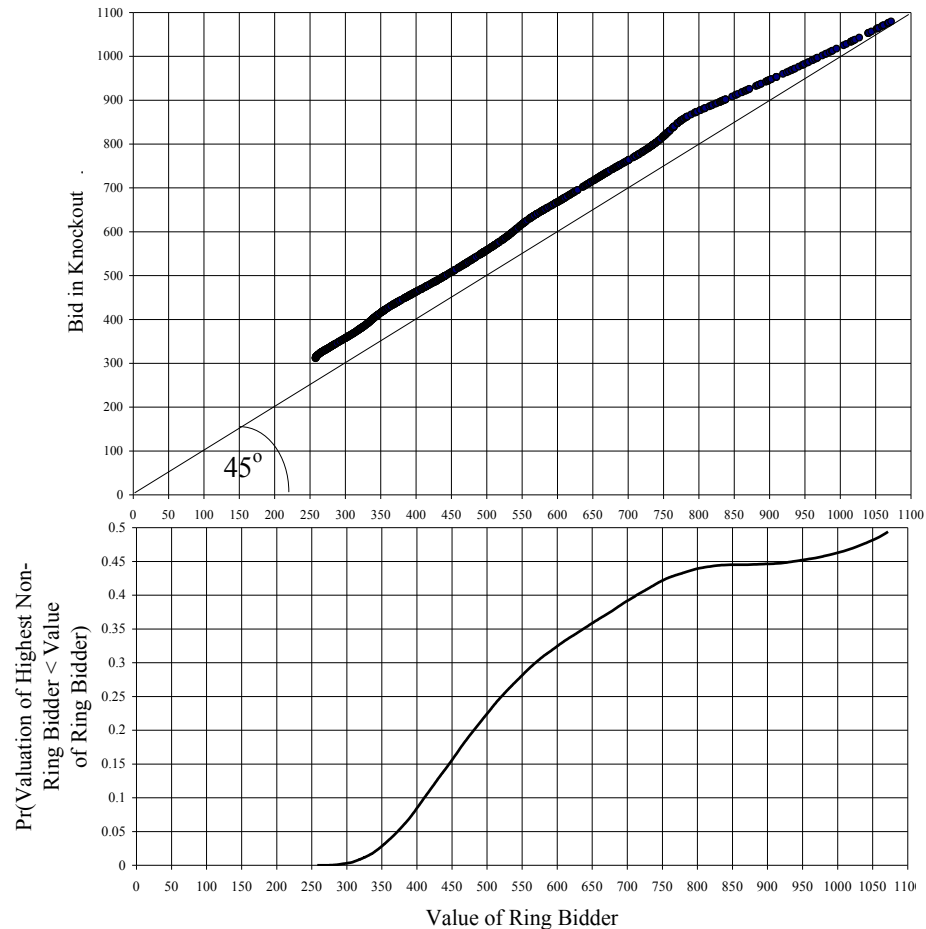
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# Structural Analysis: Results

- 2 Bidders, IPV, known number of bidders, unknown identities
- Bidding function in Knockout, Strong Bidder



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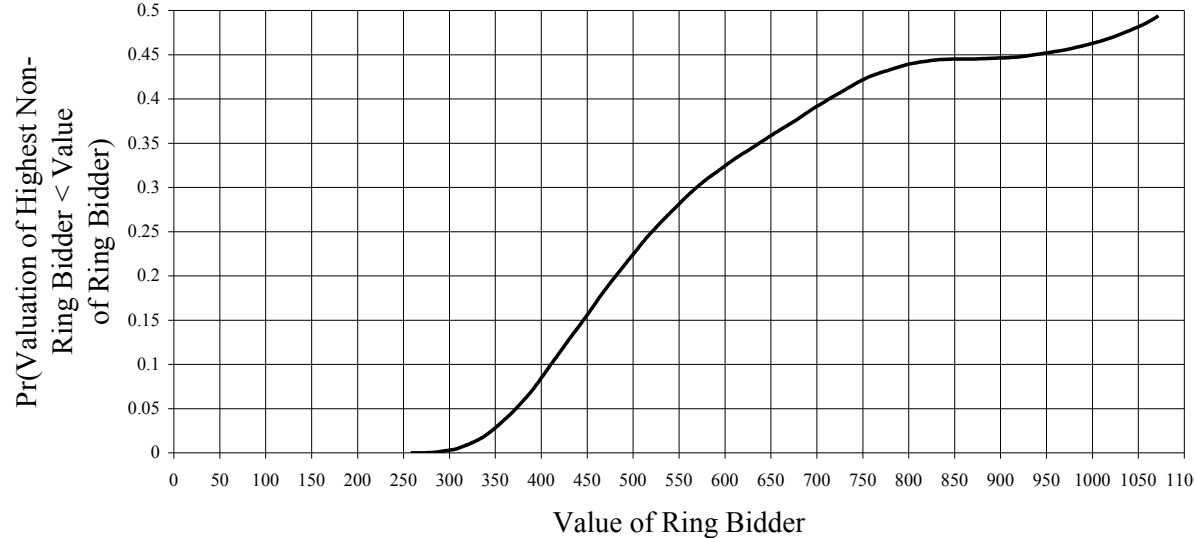
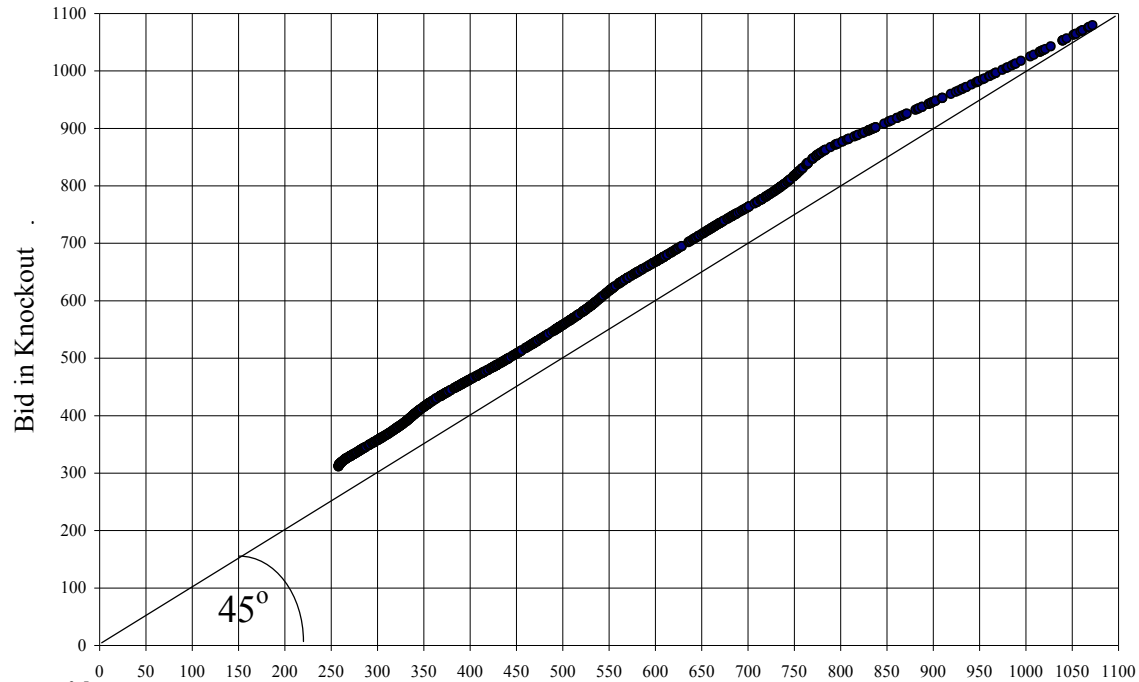
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# Structural Analysis: Results



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# Assessing Damages

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- An estimated model allows us to run the counterfactual experiment: What would have happened if the cartel did not exist?
- Note that the estimated model allows standard errors to be computed and thus we can engage in statistical inference (i.e. hypothesis testing etc).
- What we learn:
  - Sellers suffer to the tune of \$30 each time the ring wins
  - But when the ring loses they get somewhere between \$0 and \$20 more
  - Competing bidders get hurt by about \$10 when the ring wins and \$0 to \$20 when the ring loses
  - The ring made about \$25 each time they won
  - Economic efficiency was not affected in any meaningful way, unless participation was deterred by the ring.

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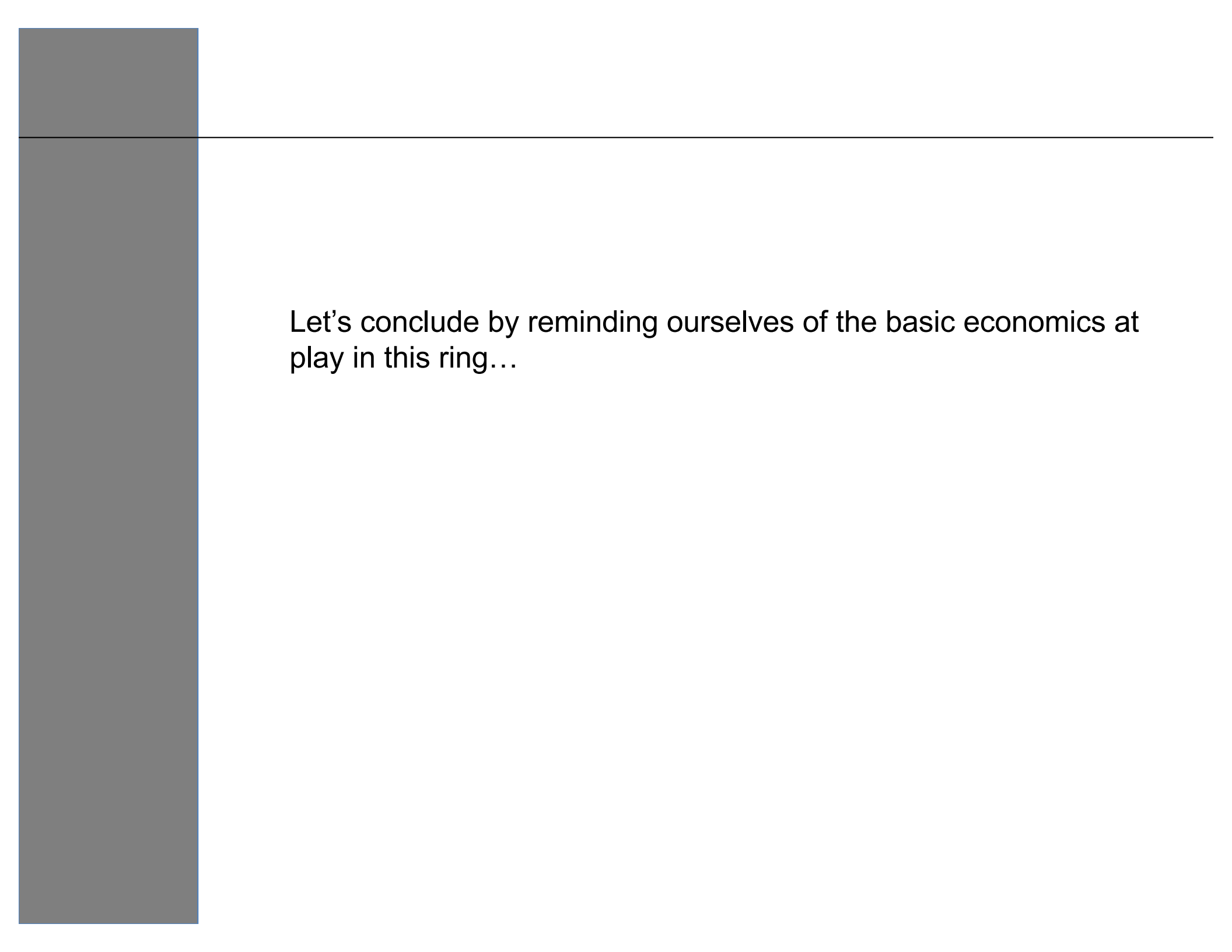
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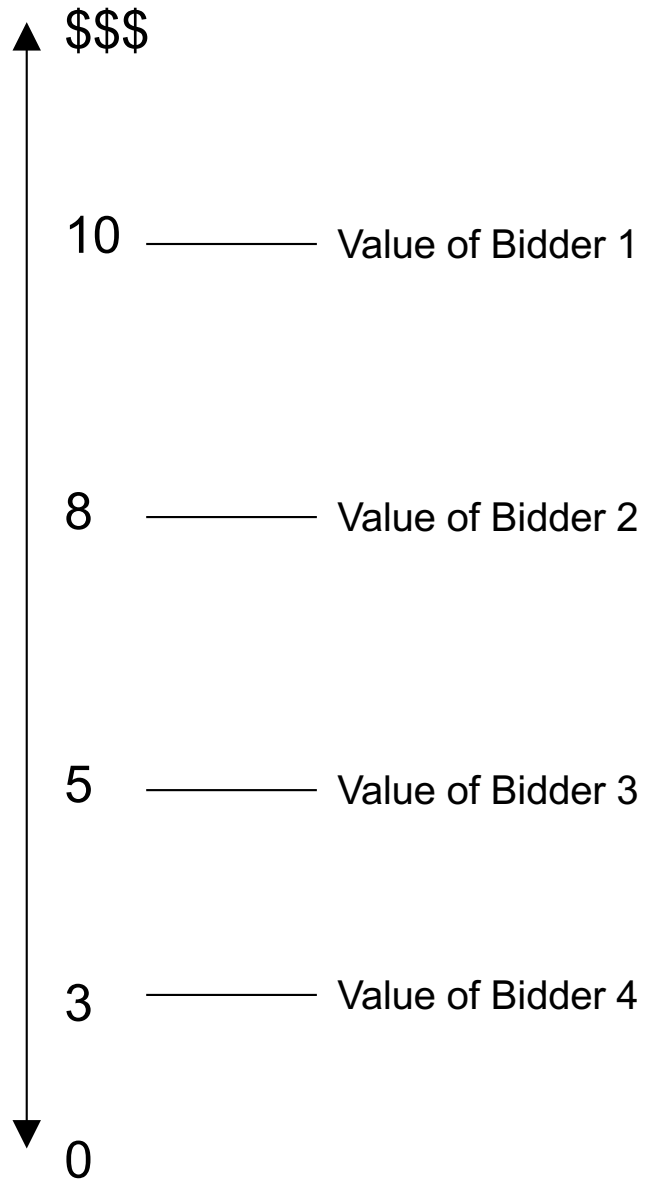
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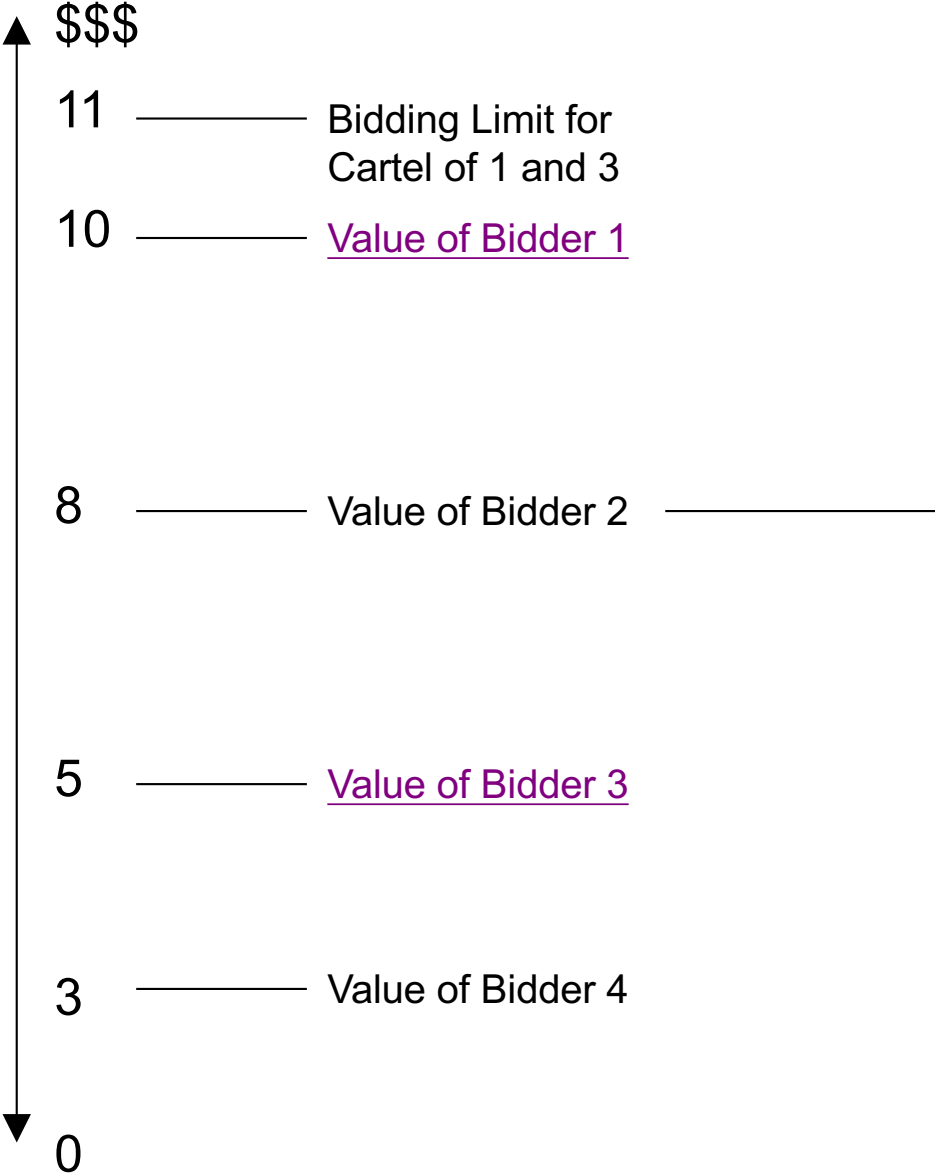
Let's conclude by reminding ourselves of the basic economics at play in this ring...



# Implications: Collusion in an English Auction

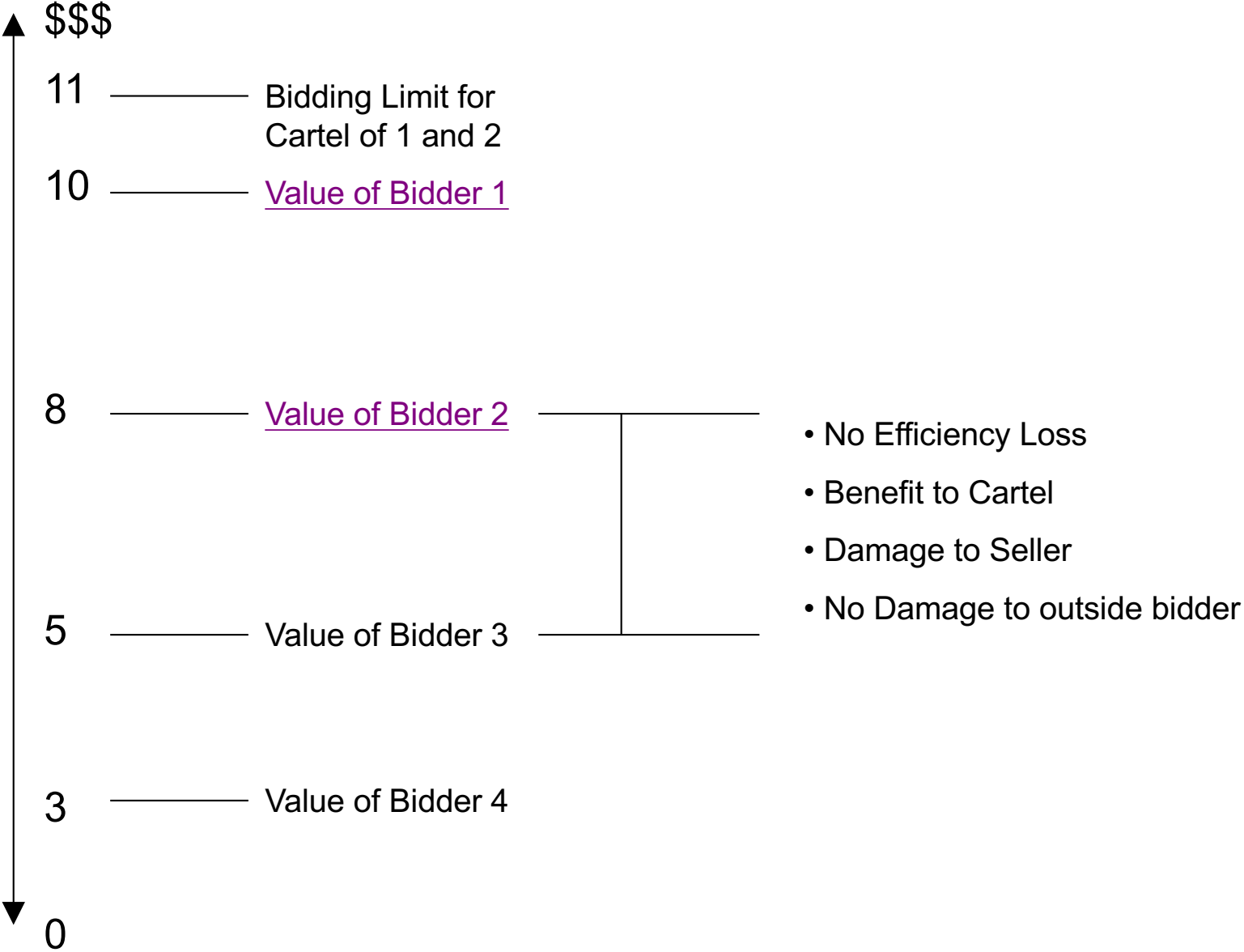


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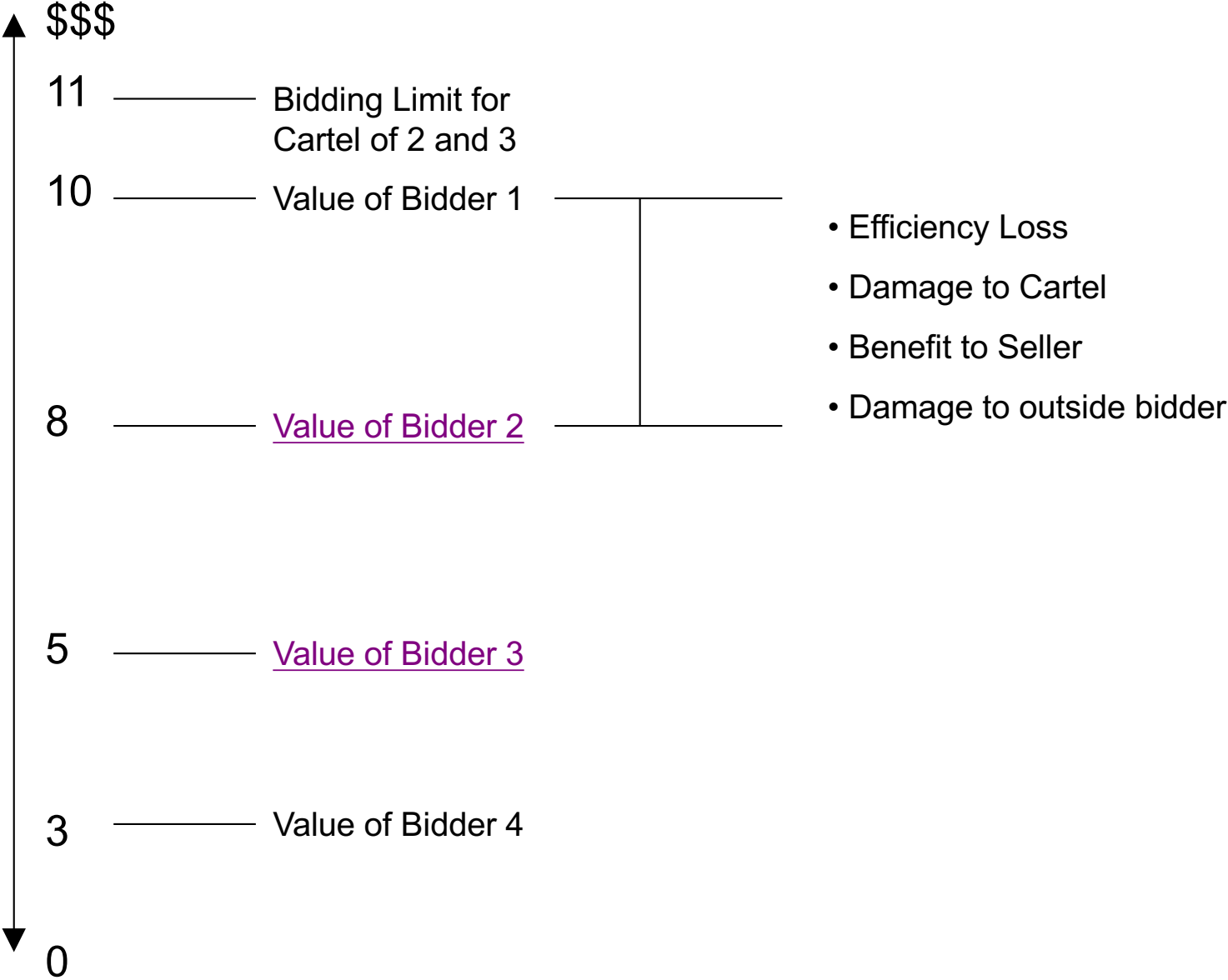


- No Efficiency Loss
- No Benefit to Cartel
- No Damage to Seller
- No Damage to outside bidder

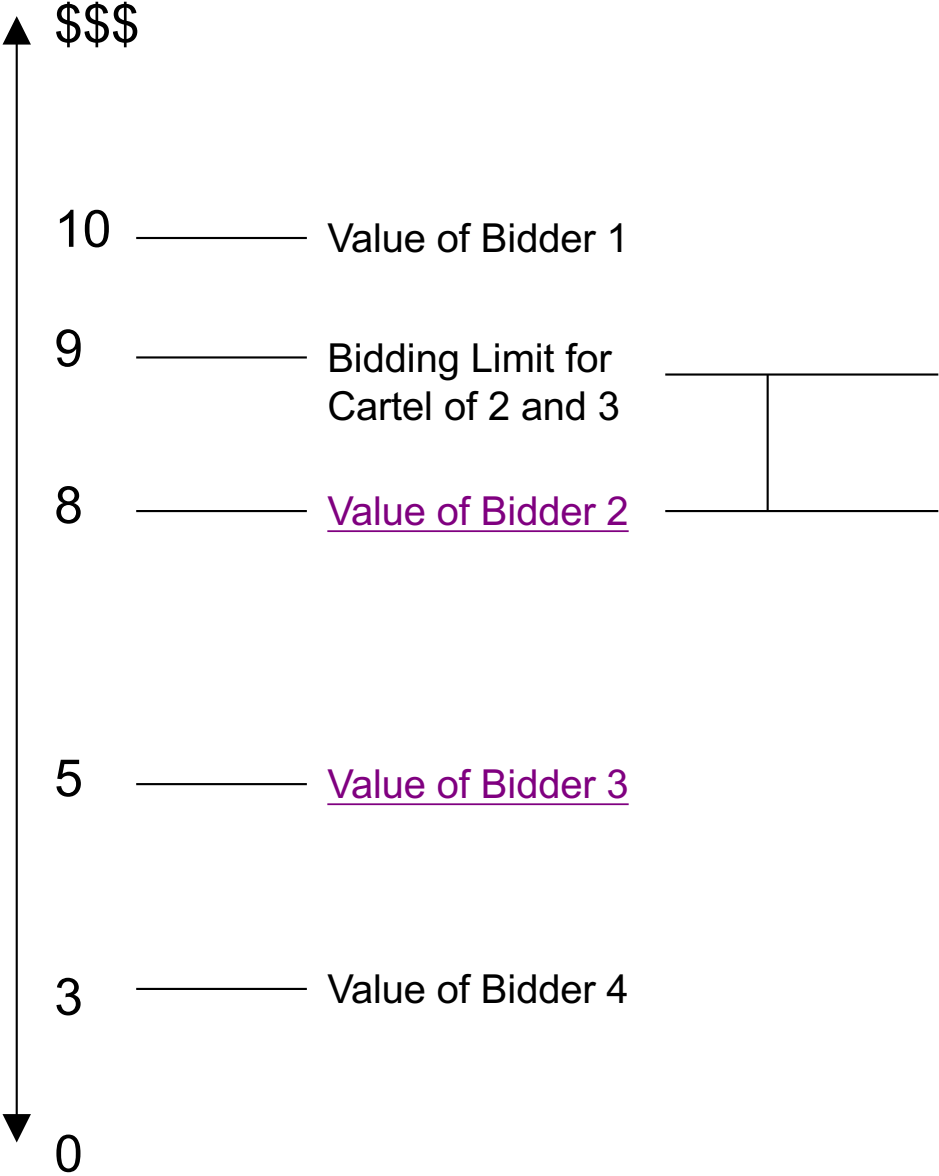
# Implications: Collusion in an English Auction



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- No Efficiency Loss
- No Damage or Benefit to Cartel
- Benefit to Seller
- Damage to outside bidder