

Efficiency in Auctions with (Failed) Resale

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- *Should resale be allowed?*
- *What if resale is uncertain?*

Why does resale happen?

- Bidders do not participate in the auction (Milgrom, 1987; Bikhchandani & Huang, 1989)
- Bidders' valuations change after the auction (Haile, 2000, 2003)
- Value uncertainty (in 1st-price auctions) (Gupta & Lebrun, 1999; Hafalir & Krishna, 2007)
- Auction price affects bargaining in resale market (Pagnozzi, 2007)
- Strategic behavior: **demand reduction** and **speculation** (Garratt & Tröger 2006; Pagnozzi, 2009, 2010)

- In **multi-object** auctions, bidders often bid less than value for marginal units to keep the auction price low
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(e.g., FCC auctions, German GSM auction, electricity)

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- **Resale** induces weak (low-value) bidders to **speculate**: bid aggressively to win and sell to strong (high-value) bidders
- **Resale** increases strong bidders' incentive to **reduce demand**, because they can purchase after the auction the units lost

Experimental literature on auctions with resale

- Lange *et al.* (2004), Georganas (2007), Saral (2008), Georganas & Kagel (2011), Jog & Kosmopoulou (2014)
consider single-unit auctions with resale
either "automatic" or through auction
- Pagnozzi & Saral (2013), Filiz-Ozbay *et al.* (2013)
consider multi-object auctions with different resale forms
and valuation structures

First study of auctions when resale may exogenously fail ...

Overview

- **Multi-object** uniform-price auctions with **asymmetric** bidders and resale through **bargaining**:

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 - 1 Resale induces demand reduction and speculation
 - 2 Effects of resale on efficiency and seller's revenue
 - 3 Effects of changing the probability of resale

THEORETICAL BACKGROUND

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- 2 units of an identical good for sale
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- Either S wins both units or S and W win one unit each

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 - Resale takes place through **bargaining**
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 - probability of ex post ban of resale or value shock

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- $q > 0$: W speculates because of the option to resell and bids higher than v_W

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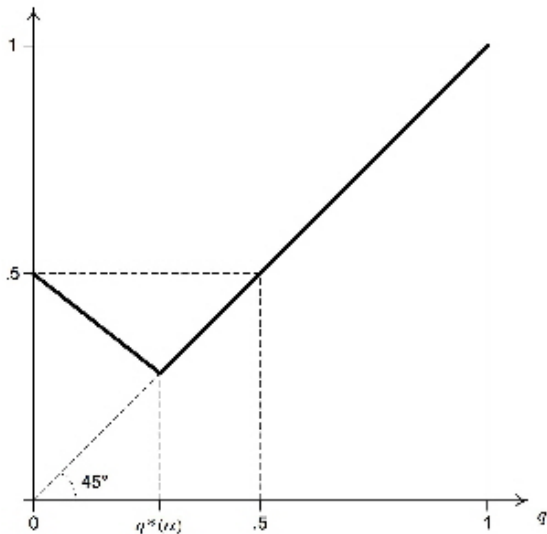
- When $q = 0$, S reduces demand iff $v_S < 40$
- $q \uparrow \Rightarrow$ less costly to lose auction $\Rightarrow v_S^* \uparrow$
- S always reduce demand if $q > q^*(\alpha) \equiv \frac{1}{4 - \alpha}$
 - S prefers to win 1 unit at price 0 and then buys from W with high probability (rather than pay both units)

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 - It increases resale efficiency

Pr[efficient allocation]



EXPERIMENTAL DESIGN

- $v_W \sim U [10; 30]$; $v_S \sim U [30; 50]$
(same values for all treatments)
- Subjects are randomly assigned to S or W
and do not change role
- Each subject participates in only 1 treatment
- Bidders are randomly rematched each period

Uniform-Price Ascending Clock Auction

- Bidders choose when to drop out of the auction as the price increases
- When one bidder drops out, the auction is over (# of units on sale = # of units demanded)
- Winner(s) pay the dropout price for each unit

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Resale Market

- Unstructured bargaining: multiple offers, chat and exit option
- Exogenous probability determines if bidders enter resale when W wins a unit

Treatments - between subjects design

1. **No Resale:** after the auction, there is no resale market
2. **30% Resale:** if W wins the auction, bidders participate in resale with 30% probability
3. **50% Resale:** if W wins the auction, bidders participate in resale with 50% probability
4. **100% Resale:** if W wins the auction, bidders participate in resale with certainty

Session Information

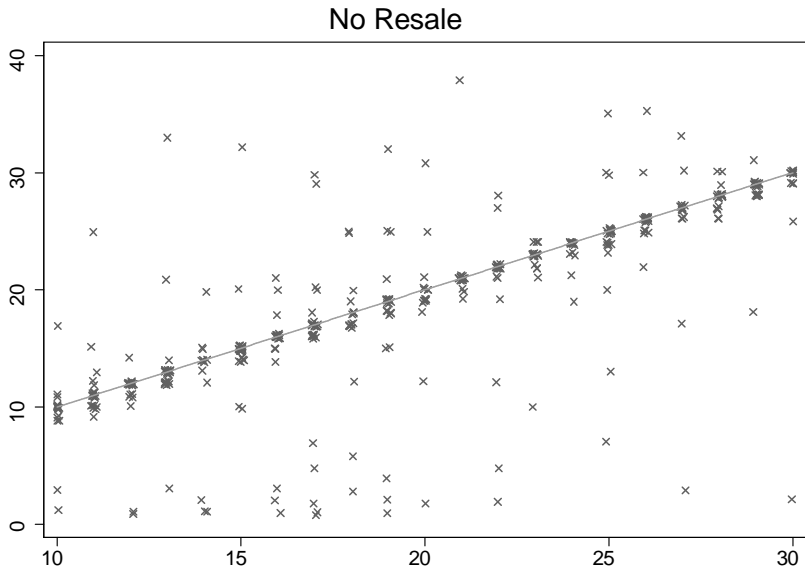
- 3 sessions of 16 subjects per treatment (48 subjects per treatment)
- All sessions had at least 20 periods, maximum 30 (# periods differ because of bargaining & 2 hour limit)
- All 12 sessions were run in the xs/fs laboratory at FSU Spring 2011-Fall 2012; Fall 2013-Spring 2014
- Mostly undergraduate subjects

RESULTS

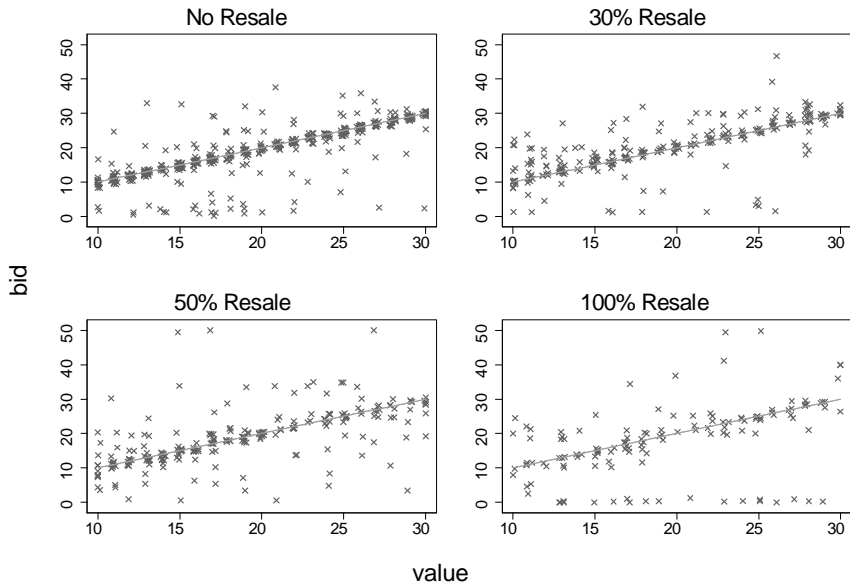
Weak Bidding Hypotheses

- **No Resale:** W bids value
- **Resale ($q > 0$):** W bids above value

- Without resale, W tends to bid value



- Does W speculate more with resale?*



* Fewer observations with resale because of W winning more and fewer periods

Bidding by W – Random Effects Tobit (unobserved bids censored at the auction price)

W's Bid	Coefficient
Constant	1.20
v_w	0.99***
30% Resale	3.89**
50% Resale	4.77**
100% Resale	6.20**
$v_w \times 30\%$ Resale	-0.07
$v_w \times 50\%$ Resale	-0.16**
$v_w \times 100\%$ Resale	-0.23**
Period	-0.03

*** and ** indicate statistical significance at 1% and 5%, bootstrapped standard errors

Bidding by W – Random Effects Tobit

(unobserved bids censored at the auction price)

W's Bid	Coefficient	
Constant	1.20	
v_w	0.99***	
30% Resale	3.89**	- Bids are higher with resale
50% Resale	4.77**	and increasing in prob. resale
100% Resale	6.20**	
$v_w \times 30\%$ Resale	-0.07	
$v_w \times 50\%$ Resale	-0.16**	
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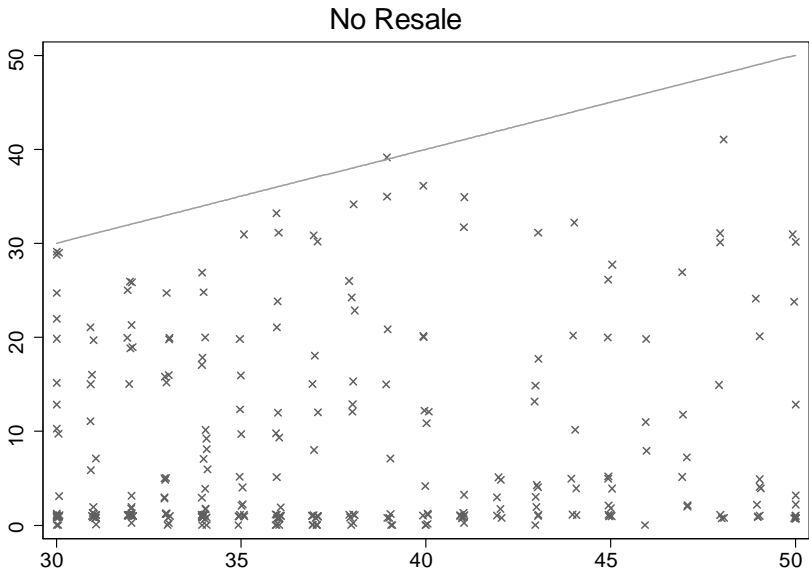
Strong Bidding Hypotheses

- **No resale:** S reduces demand (bidding zero) if $v_S < 40$,
 S does not reduce demand if $v_S > 40$
- **Resale** ($q \gg 0$): S always reduces demand

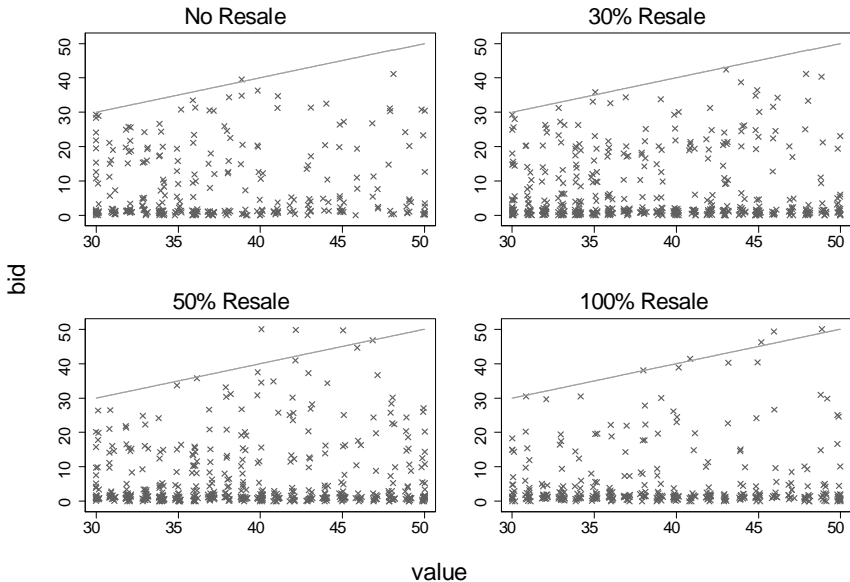
Demand Reduction by S :

	% S 's bids ≤ 2		% W Wins	
	$v_S < 40$	$v_S > 40$	$v_S < 40$	$v_S > 40$
No Resale	29.9	12.4	51.9	25.1
30% Resale	43.2	34.8	74.2	55.7
50% Resale	44.8	37.5	73.7	61.8
100% Resale	48.1	49.5	74.0	70.5

- Without resale, S reduces demand more when $v_s < 40$



- With resale, S reduces demand more, for all values but uncertainty reduces demand reduction



Bidding by S – Random Effects Tobit (unobserved bids censored at the auction price)

Strong Bid	Coefficient
Constant	5.26
v_s	0.58***
$v_s > 40$	4.99*
30% Resale	-6.71**
50% Resale	-7.31**
100% Resale	-10.34***
$v_s > 40 \times 30\%$ Resale	-4.59
$v_s > 40 \times 50\%$ Resale	-5.75*
$v_s > 40 \times 100\%$ Resale	-9.71***
Period	-0.41***

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v_s	0.58***	
$v_s > 40$	4.99*	- Without resale, S bids higher when he has a high value
30% Resale	-6.71**	
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- Lower bids at high values
with high prob. resale

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Efficiency and Revenue Hypotheses

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Efficiency and Revenue Hypotheses

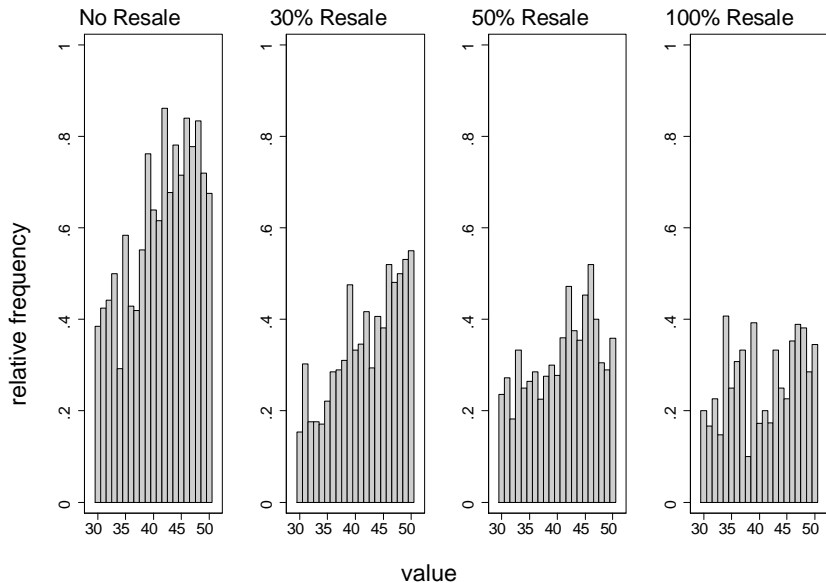
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Efficiency and Revenue Hypotheses

- **Auction efficiency** is lower with resale than without
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- **Final efficiency** depends on the probability of resale
- **Seller's revenue** is lower with resale than without
(because of demand reduction)

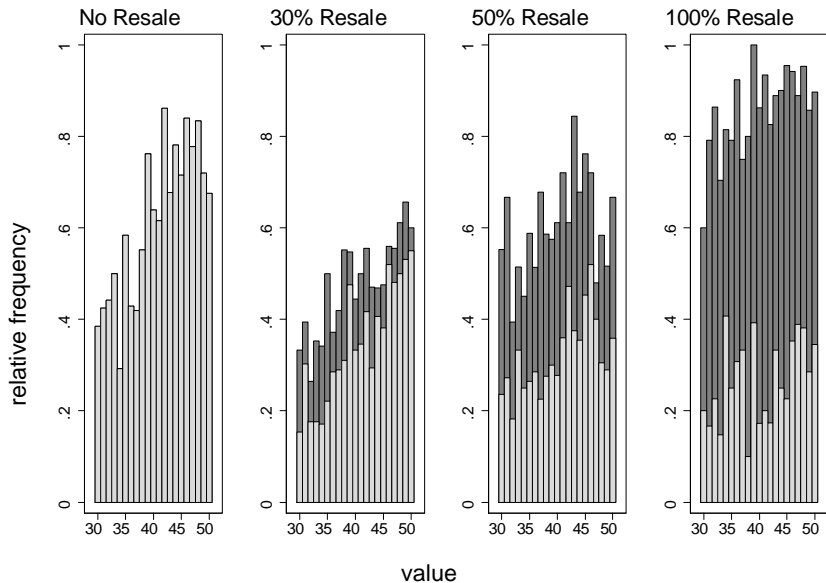
Auction Efficiency: Frequency of S winning 2 units

→ resale reduces efficiency because of demand reduction and speculation



Final Efficiency: Resale increases efficiency after the auction

→ ambiguous effect on final efficiency



Auction Efficiency: winner's value/S's value

Resale Prob.	0%	30%	50%	100%
Auction Efficiency (average)	.82	.69	.68	.65
Final Efficiency (average)	.82	.75	.82	.95
Theoretical Efficiency	.79	.65	.75	1
Random Efficiency	.75	.75	.75	.75

Final Efficiency: final owner's value/S's value

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Final Efficiency (average)	.82	.75	.82	.95
Theoretical Efficiency	.79	.65	.75	1
Random Efficiency	.75	.75	.75	.75

100% Resale \succ 0% Resale \approx 50% Resale \succ 30% Resale

Seller's Revenue:

Resale Prob.	0%	30%	50%	100%
Average Revenue	14.6	11.2	10.0	8.4
Revenue (W wins)	8.0	6.6	6.0	5.2
Revenue (S wins)	18.8	17.2	18.6	17.2

- Resale reduces revenue because it induces S to reduce demand (when S wins revenue is higher because of speculation by W)

Conclusions

- Experiments of **multi-object** auction with resale and
 - **asymmetric** bidders
 - **uncertain** resale through **bargaining**
- With resale (even when uncertain), weak bidders speculate and strong bidders reduce demand more frequently
- Resale reduces auction efficiency and seller's revenue
- Probability of resale has non-monotonic effect on final efficiency
- Very uncertain resale reduces final efficiency (compared to an auction without resale)