

Positive and Negative Selection in Bargaining: An Experiment

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Helicopter tour first

Consider two-person bargaining. A buyer has a private value $v \sim F$. A seller makes an offer, then a buyer accepts it, takes an outside option if available, or rejects it to repeat the negotiation.

- Coase conjecture: With no outside option, the uninformed seller doesn't benefit from inter-temporal price discrimination.
- Board and Pycia (2014): When there is a commonly-known outside option, the seller enjoys the largest profit.
- We examine the validity of such a stark difference both theoretically and experimentally.
- Many experimental results go against the theoretical predictions about the difference. They are consistent with the predictions from our model with the buyer's optimism.

Coase Conjecture

- One of the most fundamental ideas in
 - Bargaining theory
 - Durable-good monopoly
 - Dynamic screening problems
(including lemon market and sequential auctions)
- The uninformed seller eventually benefits **not at all** from inter-temporal price discrimination.
- Theoretically examined and confirmed by Fudenberg et al. (1985) and Gul et al. (1986) among others.

Negative Selection in the Demand Pool



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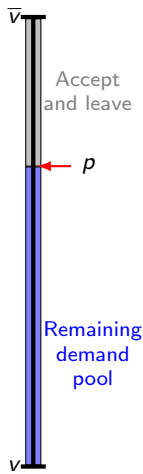
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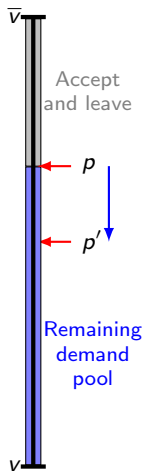
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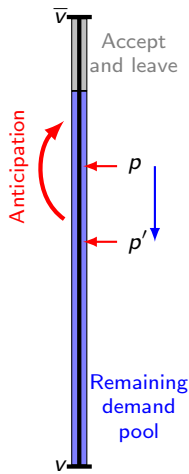
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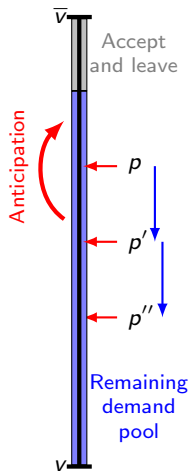
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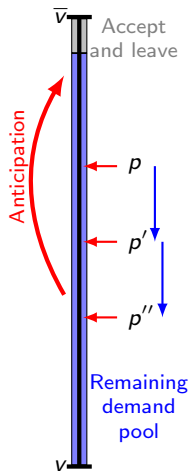
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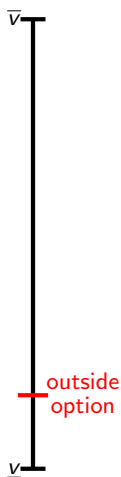


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- 5 Pushing the seller to lower the price in the early stage even further to induce any purchase.
- 6 Pushing the price toward \underline{v} (cf. Coase conjecture) and lead to the lowest seller profit in equilibrium.

Outside Option and Positive Selection

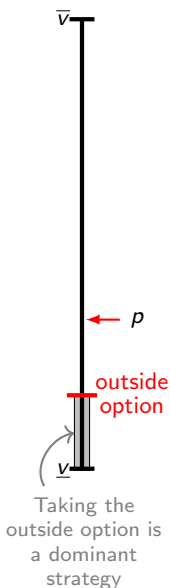
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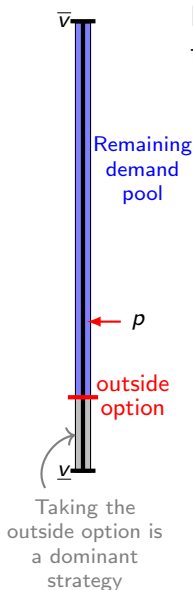
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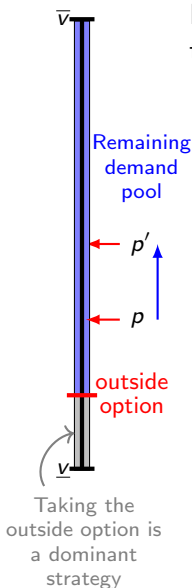
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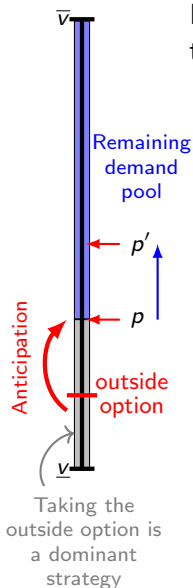
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- ③ The seller responds to increase the price.



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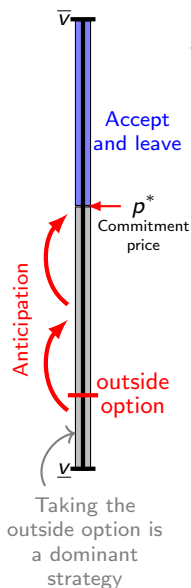
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- ④ Anticipating such a price increase, some intermediate-type buyers tend to exercise the outside option immediately.



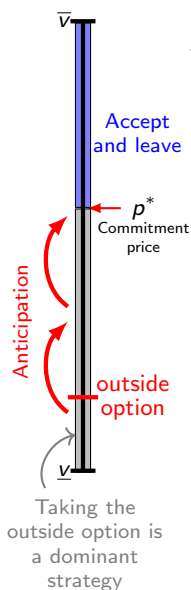
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- 5 Pushing the seller to increase the price further.

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- 4 Anticipating such a price increase, some intermediate-type buyers tend to exercise the outside option immediately.
- 5 Pushing the seller to increase the price further.
- 6 Leading the seller to charge the commitment price p^* and earn the largest profit in equilibrium.

Robust as long as the outside option value > 0 .

Research Questions

The sharp contrast in theoretical predictions inspires our research:

- ① In the **absence** of outside option: Negative selection results in the **minimum** seller profit
- ② In the **presence** of an (arbitrarily small but positive) outside option: Positive selection leads to the **maximum** seller profit

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Would this stark difference be empirically valid, even when some players are not entirely rational?

- We are interested in examining the **treatment effect** of the outside option, but not in confirming or rejecting the Coase conjecture per se.

Remarks on Positive Selection

- The main driving force of the positive selection: the market *unravels* with the low-type buyers leaving earlier.
- Unraveling may not take place perfectly if players lack
 - ① first-order rationality such that some low-type buyers do not leave the market early, or
 - ② higher-order rationality such that the seller is unsure about whether the lower-type buyers leave the market early.
- Any of these scenarios leads the buyer to believe that the seller's price in the subsequent rounds may decrease.
- To capture this intuition parsimoniously, we consider the bargaining game with buyer's *optimism*.

Related Literature

Theory

- Negative Selection: Coase (1972), Fudenberg et al. (1985), Gul et al. (1986), Ausubel and Deneckere (1989)
- Positive Selection: Board and Pycia (2014), Tirole (2016)
- Introducing Behavioral Types
 - Obstinate buyer (Myerson, 1991; Abreu and Gul, 2000)
 - Commitment type (Fanning, 2021)
 - Optimism (Li and Wong, 2009; Yildiz, 2011; Friedenbergl, 2019)

Experiment

- Mixed Evidence for Negative Selection
 - Rejecting: Güth et al. (1995), Rapoport et al.(1995), Reynolds (2000), Srivastava, (2001), Cason and Reynolds (2005)
 - Supporting: Cason and Sharma (2001), Güth et al. (2004), Fanning and Kloosterman (2019)

Summary of Theoretical Predictions

① No Outside Option \Rightarrow Negative Selection

- Price declines over time; inter-temporal pricing.
- Rejection (hence Delay) happens.
- Seller profit is low.

② Outside Option \Rightarrow Positive Selection

- No inter-temporal pricing
- No Rejection, No Delay
- Seller profit is high.

③ Outside Option + Optimism \Rightarrow Quasi-Coasean eq/m

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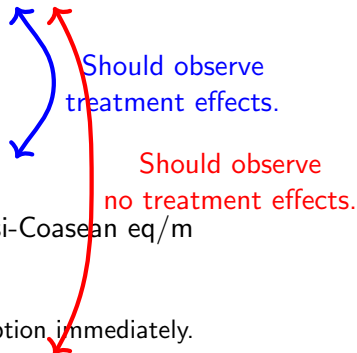
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Experimental Design

Table 1: Experimental Design

<i>Out0 (OutNo)</i>	<i>Out50 (OutYes)</i>	<i>Out60 (OutYes)</i>
No outside option	Outside option 50	Outside option 60

* Each participant has seven newly paired supergames (matches).

* Continuation probability to the next round is 0.8.

* Buyer's value v is drawn from $U[50, 400]$.

- Value distribution: $U[50, 400]$
- The buyer's value of the outside option $\epsilon \in \{\emptyset, 50, 60\}$
- Random termination (Roth and Murnighan, 1978) with fixed continuation probability of $c = 0.8$

Belief Reporting: Positive or Negative Selection?

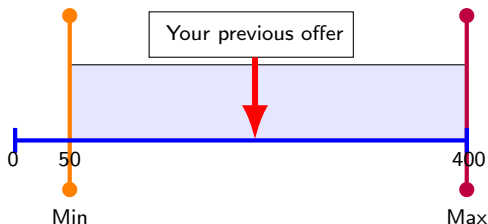


Figure 1: Reporting Beliefs in Round n

- After each rejection, the sellers are asked to report their beliefs about the buyers' value (min and max)

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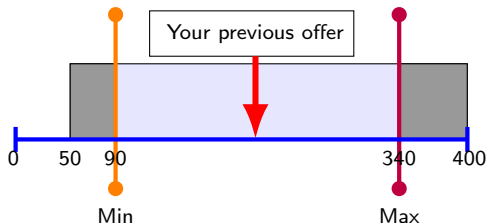


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Experiment: Basic Procedure

- oTree (Chen et al, 2016) + Zoom RTO experiment
- Turning on their video was a strict requirement
- HKUST, English
- 4 sessions each for Out0 and Out50, 5 sessions for Out60
- $58 + 66 + 72 = 196$ participants
- Seven supergames (matches)
- Random matching, between-subject design
- On average, HKD 115 (\approx USD 16) including HKD 40 show-up payment
- Online bank transfer via the autopay system of HKUST

Result 1: Bargaining Length

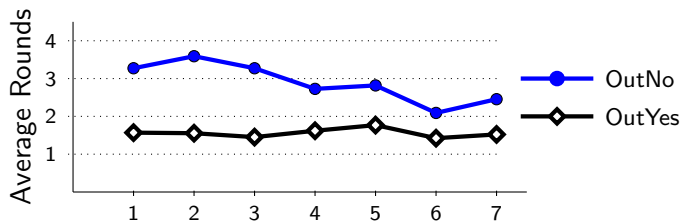


Figure 2: Average Length of Bargaining across Match

- The average # of bargaining rounds: $\text{OutNo} > \text{OutYes}$.
- The average # of bargaining rounds in $\text{OutYes} > 1$.

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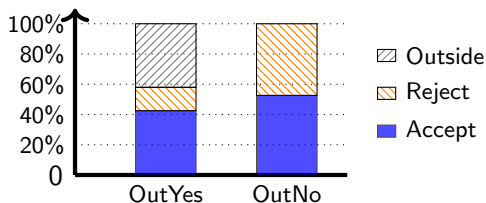


Figure 3: End-of-Bargaining States

- The average # of bargaining rounds in OutYes > 1 .
- In OutYes, some fraction of the (optimistic) buyers remains by rejecting the offer, causing some delay.

Result 2: Seller Profit

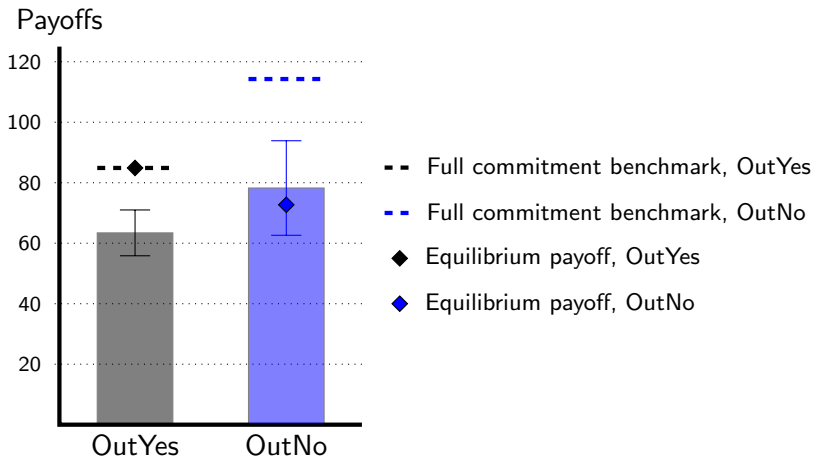


Figure 4: Seller's Earnings

- The seller's average profit: OutYes (63.43) < OutNo (78.25).
- Nearly 50% of bargaining in OutNo ended with termination.

Result 3: Price Offers

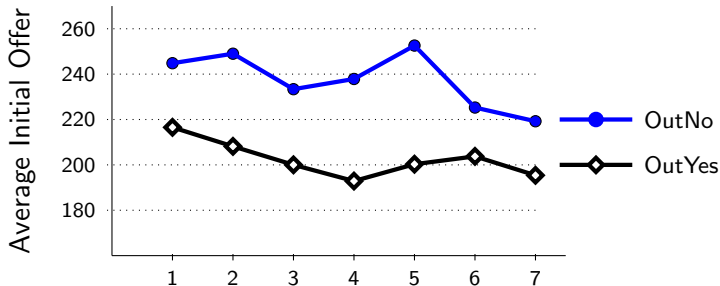


Figure 5: Round 1 Offer across Match

- The seller's initial offer: $\text{OutYes} < \text{OutNo}$.
- The mild negative trends observed in OutNo and OutYes are not significantly different from each other.

Result 4: Minimum Belief

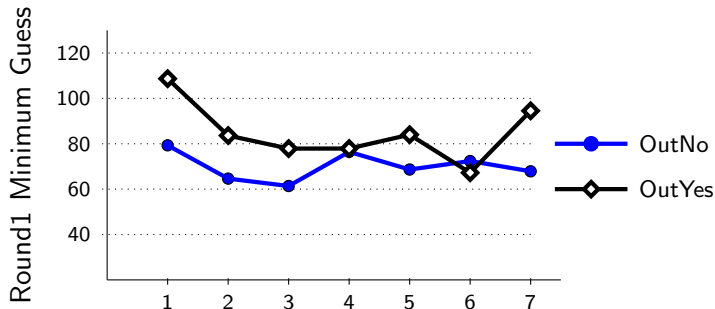
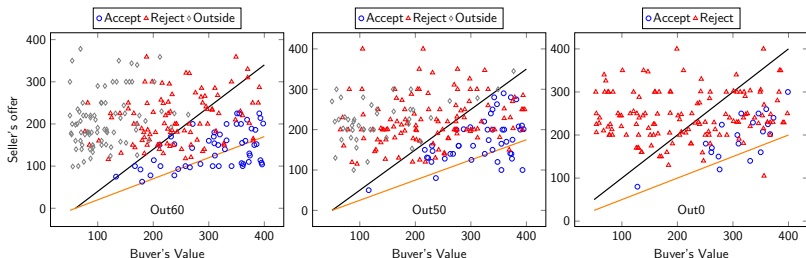


Figure 6: Minimum of the Guess after Round 1 Rejection across Match

- The min of the guess in OutYes is larger than that in OutNo ($p=0.059$), but a substantial fraction of the min guesses are below w/c , the lower bound of the guess under $\phi = 0$.
- The individual-level reports on the min of the guess in OutYes and OutNo are, by and large, **the same** (KS test, $p=0.328$).

Result 5: Outcome

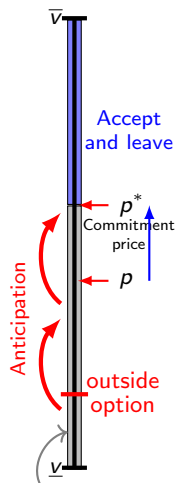


- On the right-hand side of the **black 45-degree line** ($v - w$), accepting the offer is strictly better than taking the outside option.
- The **orange line** ($\frac{v-w}{2}$) equally splits the gains from trade between the buyer and the seller.

Figure 7: Buyer's Action in Round 1

- Rejections are pervasive** in both Out60 and Out50.
- Inequity aversion (Fehr and Schmidt, 1999) does not help explain the pervasive rejections.

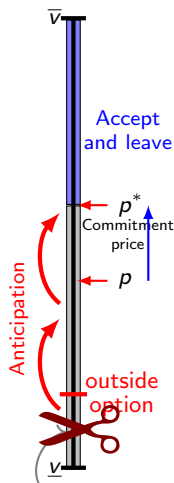
The Main Driver



The belief that **some low-type buyers may remain in the market** \Rightarrow Failure of unraveling. Our setup with optimism as a parsimonious workhorse model visualizing it.

Taking the outside option is a dominant strategy

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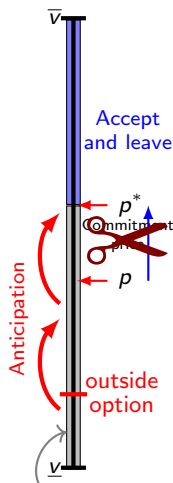


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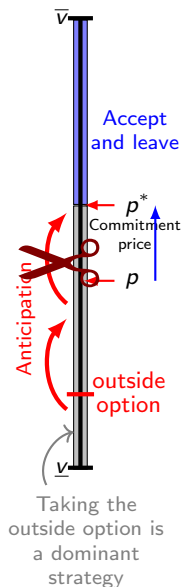


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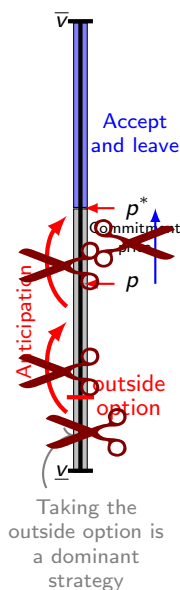
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Any of them results in a failure of the inductive process of unraveling and the positive selection.

Take-away Messages

- The absence/presence of an outside option
⇒ the stark theoretical difference
⇒ our experimental data.
- Most of our experimental results are
 - **inconsistent** with the predictions from the standard model with positive selection.
 - **consistent** with the predictions from the model with buyer's optimism.
- We found **supporting evidence** that
 - some buyers reject the current-round offers,
 - optimistically believing a more favorable next offer.