Haggle or Hammer? Dual-Mechanism Housing Search

Aaron Barkley
Univ. of Melbourne

David Genesove
Hebrew Univ. of Jerusalem & CEPR

James Hansen
Univ. of Melbourne

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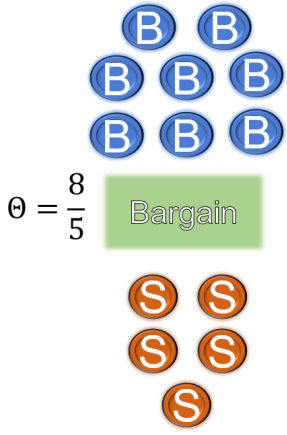
Introduction

- Many assets trade in **decentralized markets:**
  - Buyers and sellers search for a trading partner.
  - Upon meeting a counterparty, they attempt to trade.
- Often assumed that a single trade mechanism (e.g., Nash bargain) governs trade.
- Yet multiple mechanisms operate simultaneously in many markets:
  - Automobile markets (Huang 2020)
  - Financial markets (Hendershott and Madhavan (2015))
  - Ride hailing (Buchholz et al. (2020))
  - **Housing**, the focus of our paper: auctions and negotiations.
- We study how co-existence of mechanisms affects search and trade.

Why dual mechanisms matter



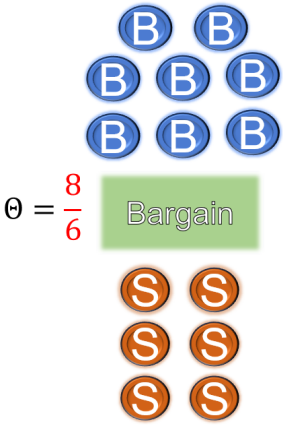
Set of buyers B and sellers S

Randomly meet at rate governed by *market tightness* Θ

Upon meeting, bargain for trade outcome.

If no trade, search again (at some cost).

Why dual mechanisms matter

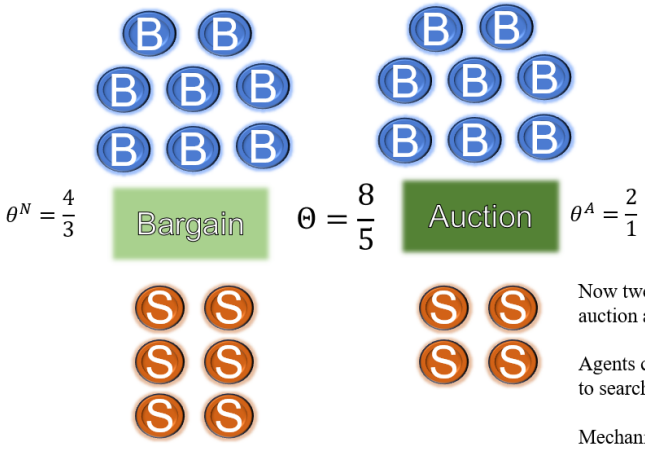


Suppose another seller enters the market.

This means market tightness Θ declines, matching with buyers is harder for sellers, so *prices fall.*

Direct link between overall buyer-to-seller ratio and price.

Why dual mechanisms matter

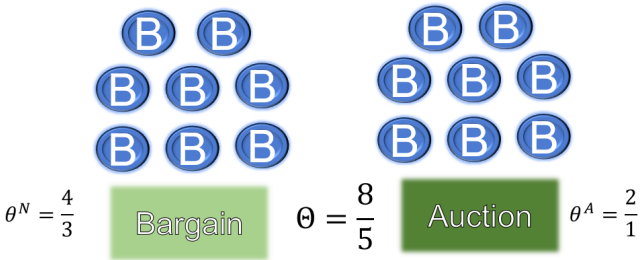


Now two mechanisms: auction and negotiation

Agents choose a mechanism to search in (each period).

Mechanism tightness θ^j at each mechanism j determines prices.

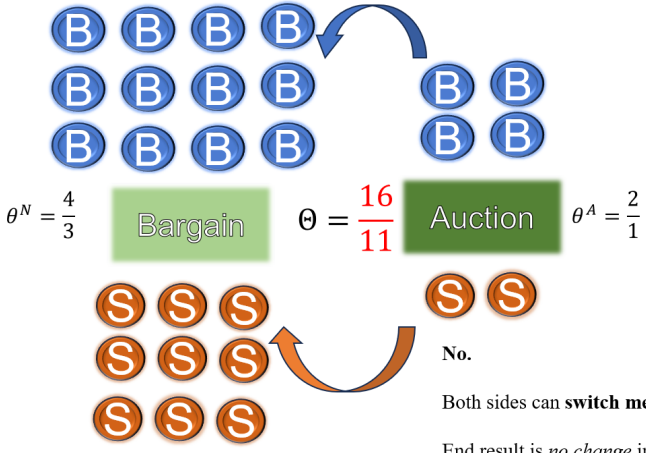
Why dual mechanisms matter



A new seller enters the market.

Will tightness at one mechanism fall?

Why dual mechanisms matter



No.

Both sides can **switch mechanisms** in response.

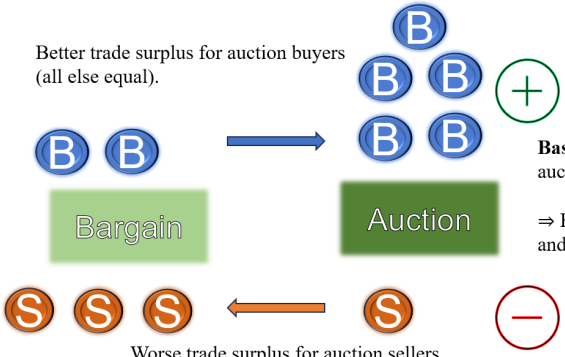
End result is *no change* in mechanism tightness (or prices).

Why dual mechanisms matter

Now suppose there is a policy change affecting auctions (e.g., price ceiling).

This makes auctions more attractive to buyers and less attractive to sellers.

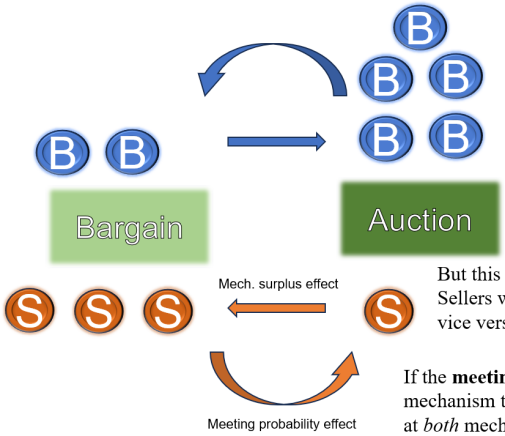
Why dual mechanisms matter



Basic intuition: buyers move to auction and sellers move to bargain.

⇒ Bargaining tightness θ^N decreases, and auction tightness θ^A increases

Why dual mechanisms matter



But this ignores **strategic complementarity**: Sellers want to be where buyers are, and vice versa.

If the **meeting probability** responds strongly to mechanism tightness changes, tightness may increase at *both* mechanisms (possibly benefitting sellers).

Model

DMP with costly search + dual trade mechanisms – auction and negotiation:

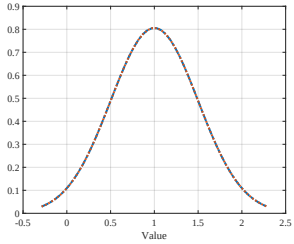
- **States:** homeowner, buyer and seller. Exog. transition from H to S or S+B.
- **Search:** buyers and sellers choose single mechanism to search & transact.
- **Auction:** second-price sealed bid auction with optimal reserve price.
- **Negotiation:** MS mechanism (second-best). Buyer chosen randomly.
- **Meeting function** finite Poisson mixture.
- **Seller heterogeneity:** search cost.
- **Buyer heterogeneity** i.i.d. match quality of buyers to homes (realized after mechanism choice).
- **Equilibrium concept:** buyers and sellers indifferent between mechanisms in all states and time periods - *Competing Mechanisms*.

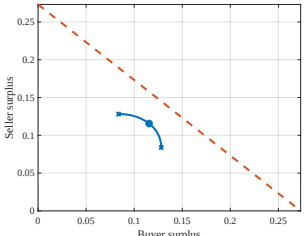
Negotiation: 2nd best of Myerson-Satterthwaite

- First Best: trade when $v > c$. Maximizes sum of buyer and seller surpluses. Impossible with two-sided incomplete information.
- Second Best: maximizes sum of buyer and seller surpluses, subject to incentive compatibility, individual rationality, and budget balance.
- We extend to more than one buyer showing up: nature chooses one randomly.
- **Data:** Transaction census covering all residential real estate sales in Sydney metro area 2010-2019. Includes price, seller time-on-market, and other info.

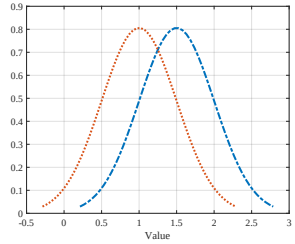
Visualizing MS mechanism

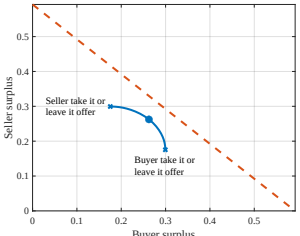
(a) Equal distributions



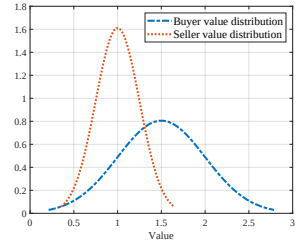


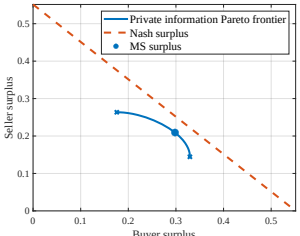
(b) Buyer mean shift





(c) Seller variance decline

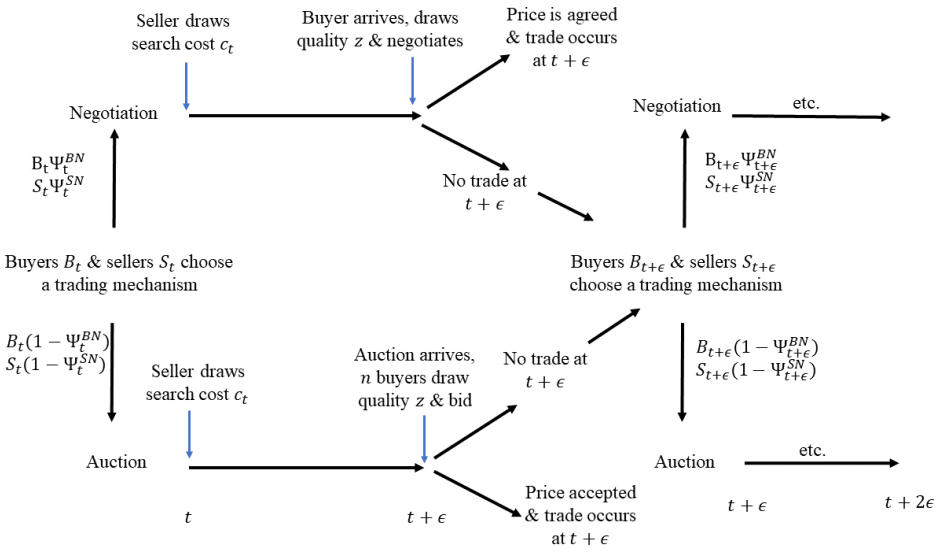




Auction: second-price sealed-bid

- Second price sealed bid auction with optimal seller reserve.
- n buyers each bid their value, i.e., home match value less next period's continuation value of search.
- Seller sets optimal reserve price (motivated by our empirical setting).
- **Data:** Real estate auction firm, $\approx$ 15,000 auctions including price, number of bidders, failed auctions, and other info.

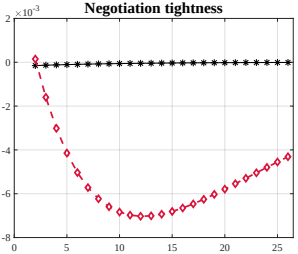
Integrating the Mechanisms in a DMP environment

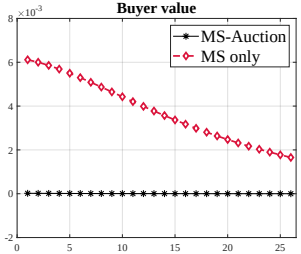


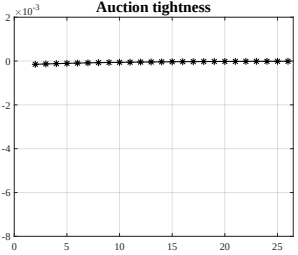
Empirical implementation

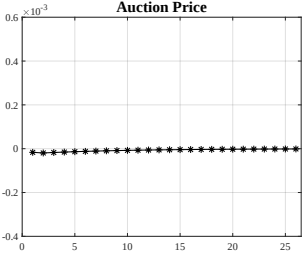
1. Structural estimation to flexibly estimate distributions of buyer and seller values and buyer arrival rates
2. Simulated-based approach to generate tractable functional approximations to endogenous variables used in solving the dynamic equilibrium search model.
3. Dynamic shock parameters are estimated using transaction data.

Effect of two mechanisms: moving shock (lowers overall market tightness)



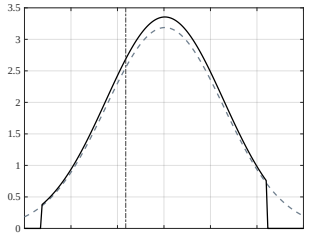




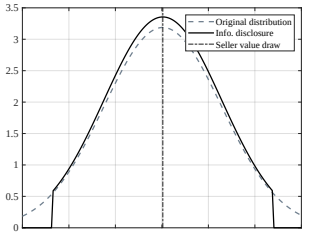


Information disclosure policy: Implementation

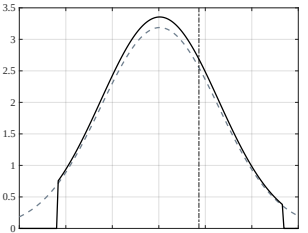
(a) 25th percentile seller value



(b) Median seller value



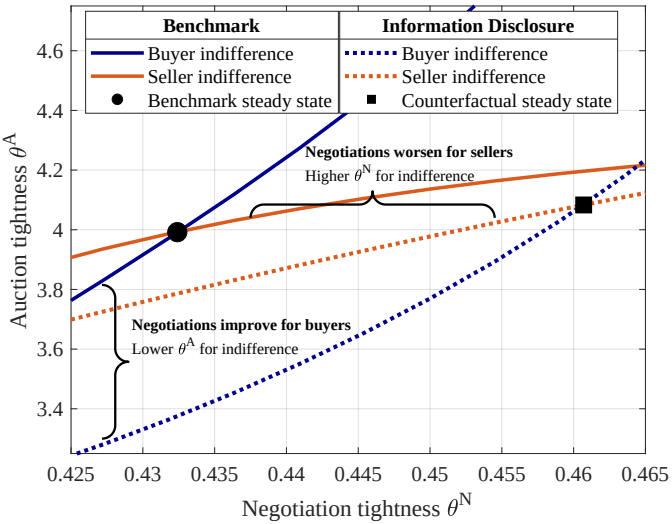
(c) 75th percentile seller value



Effects of information disclosure before and after mechanism substitution

		5% Information Disclosure	
	Benchmark Steady State	Fixed Mech. Tightness	After Re-sorting
Neg. tightness	0.43	0.43	0.46
Auc. tightness	3.99	3.99	4.08
Neg. buyer value	0.07	0.26	0.04
Auc. buyer value	0.07	0.07	0.04
Neg. seller value	1.10	0.87	1.14
Auc. seller value	1.10	1.06	1.14
Homeowner value	1.27	1.23	1.28

Counterfactual steady state visualization



Conclusion

- We study the effect of multiple mechanisms and incomplete information on search and price formation.
- Three main findings:

1. Inferred search costs and mechanism tightness underestimated if negotiated trade assumed more efficient than it truly is.
2. A second mechanism of trade dampens dynamic responses to market tightness (mobility) shocks as agents are reallocated across mechanisms. (These are important shocks.)
3. Seller information disclosure policies benefit buyers only if participants cannot move across mechanisms. Once this occurs, sellers benefit at buyers' expense.

APPENDIX SLIDES

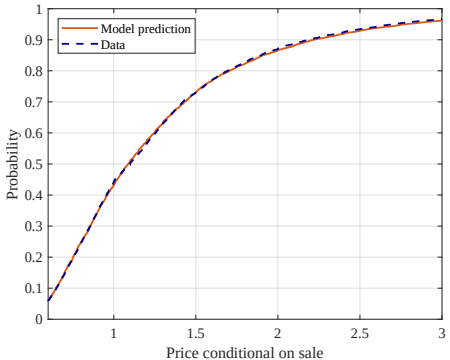
Implications for overall volatility

Table: **Volatility with Incomplete Information and Auctions**

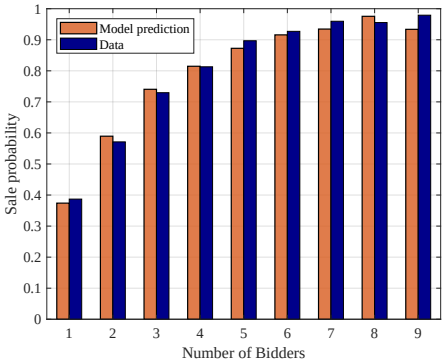
Endogenous	Weekly standard deviation in levels		
	Incomplete information & auctions	Incomplete information	Full-information bargaining
Net surplus from buying	0.060	0.086	0.103
Buyer search value	0.005	0.008	0.004
Seller search value	0.055	0.084	0.102
Ownership values	0.065	0.094	0.099
Negotiation price	0.056	0.084	0.102
Average price	0.056	0.084	0.102
Negotiation tightness	0.011	0.016	0.015
Seller trade probability	0.009	0.009	0.010
Buyer trade probability	0.021	0.021	0.025
Auction price	0.058	-	-
Auction tightness	0.100	-	-

Model fit - mechanism estimation

(a): CDF of price conditional on sale

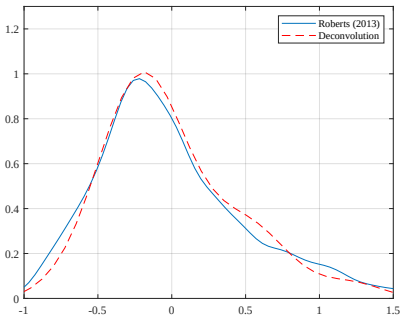


(b): Sale probability by number of bidders

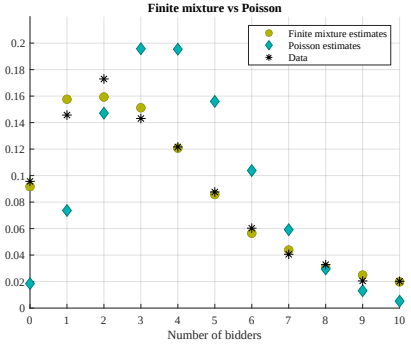


Model fit - mechanism estimation

(a) Unobserved heterogeneity



(b) Auction bidders



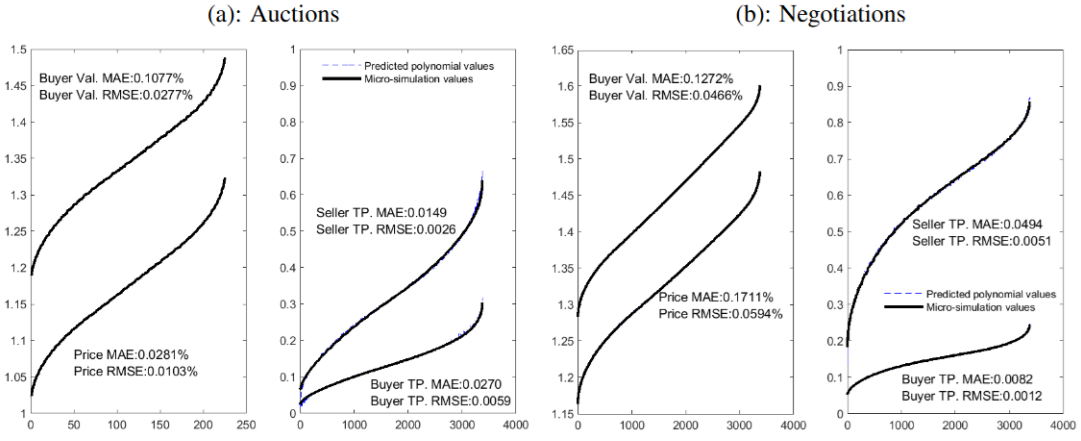
Shock Parameter Estimates

Table: **Estimated Dynamic Shocks**

Parameter	Value	Parameter	Value
Persistence		*Standard Deviation*	
Flow utility shock	0.018	Flow utility shock	0.021
ρ_{r^H}	(3.835e-04)	σ_{r^H}	(6.232e-04)
Intracity moving shock	0.890	Intracity moving shock	2.543e-05
ρ_{α^b}	(0.054)	σ_{α^b}	(8.621e-06)
Discount factor shock	0.998	Discount factor shock	8.620e-06
ρ_β	(0.001)	σ_β	(4.383e-06)
		NP meas. error	0.007
		σ_N	(3.518e-04)
		AP meas. error	0.021
		σ_A	(5.082e-04)
		J-test statistic of over-identifying restrictions:	64.530
		p-value of J-test statistic:	0.563

Model fit - polynomial approximation

Figure E.1: Polynomial Approximations



Comparing Steady States

Table: **Comparing Simulation & Approximation Moments**

	Simulation Mean	Approximation Mean	Steady State
Auction Price	1.331	1.331	1.327
Negotiation Price	1.174	1.174	1.174
Buyer Trade Prob. Auc.	0.153	0.153	0.154
Seller Trade Prob. Auc.	0.610	0.609	0.614
Buyer Trade Prob. Neg.	0.314	0.314	0.314
Seller Trade Prob. Neg.	0.133	0.133	0.136
Buyer Value Cond. Trade Auc.	1.447	1.447	1.444
Buyer Value Cond. Trade Neg.	1.344	1.344	1.339
Targeted Moments:			
Auction Tightness	3.992	3.992	3.992
Negotiation Tightness	0.432	0.432	0.432
Mean Uncond. Buyer Value	1.196	1.196	1.196
Mean Uncond. Seller Value	1.102	1.102	1.102

Notes: Moments not listed under *Target moment* are non-targeted. *Simulation mean* is the micro-simulation computed mean. *Approximation mean* is the mean approximated using 2nd-order polynomials. *Steady state* is the steady state mean for the dynamic MS-auction model with idiosyncratic shocks only.