

Experimental Economics

Slides 6

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Based in part on course materials by Sandra Maximiano



Outline for today

- ▶ Double auction vs posted offer markets
- ▶ The impact of communication between sellers

Market Institutions and Competitive Outcomes

- ▶ Laboratory markets often converge to competitive equilibrium, even with relatively few traders.
- ▶ However, this result depends importantly on how trade is organized
- ▶ Two common market institutions:
 1. **Double auction:** buyers and sellers continuously submit bids and asks.
 2. **Posted-offer market:** sellers announce prices before buyers make purchasing decisions.
- ▶ These institutions can generate different prices and efficiency levels, even with identical supply and demand conditions.

Double Auction vs. Posted-Offer Markets

Double Auction

- ▶ Both buyers and sellers actively submit bids and asks.
- ▶ Prices can adjust continuously during the trading period.
- ▶ Traders observe information about market conditions through bidding.
- ▶ Sellers can lower prices to sell additional units.

Posted-Offer Market

- ▶ Sellers independently post prices at the beginning of each period.
- ▶ Buyers decide whether and from whom to purchase.
- ▶ Prices generally cannot be revised within the period.
- ▶ Sellers learn about demand mainly through realized sales.

Experimental Evidence: Price Convergence

- ▶ Experiments compare double auctions and posted-offer markets with similar supply and demand conditions.
- ▶ **Double auctions:**
 - ▶ Prices converge rapidly toward competitive levels.
 - ▶ Trading efficiency is typically very high (around 95–98%).
- ▶ **Posted-offer markets:**
 - ▶ Prices often remain above competitive levels.
 - ▶ Convergence is slower and less complete.
 - ▶ Traders may forgo around 10% of the potential gains from trade.
- ▶ Key result: the trading institution affects both prices and realized surplus.

How Do Markets Respond to Demand Shocks?

- ▶ Consider an unexpected downward shift in demand.
- ▶ **Double auction:**
 - ▶ Buyers adjust their bids immediately.
 - ▶ Sellers observe weaker demand during trading.
 - ▶ Transaction prices fall relatively quickly toward the new competitive equilibrium.
- ▶ **Posted-offer market:**
 - ▶ Prices were set before the demand shock becomes apparent.
 - ▶ Sellers infer weaker demand from lower sales.
 - ▶ Price adjustments occur gradually across periods.
- ▶ Posted prices may remain too high, reducing transactions and efficiency.

Trading Institutions and Market Power

- ▶ Trading institutions also affect sellers' ability to sustain prices above competitive levels.
- ▶ **Double auctions:**
 - ▶ Sellers can reduce prices during trading to sell marginal units.
 - ▶ This creates pressure toward competitive prices.
 - ▶ Even monopolists may struggle to sustain monopoly prices.
- ▶ **Posted-offer markets:**
 - ▶ Sellers commit to a take-it-or-leave-it price for the trading period.
 - ▶ Within-period price cutting is restricted.
 - ▶ Market power is more likely to translate into higher transaction prices.

Experimental Results: A Demand Shift

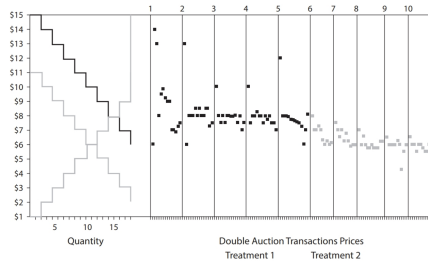


Figure 21.1. Price Sequence for a Double Auction with a Downward Shift in Demand after Round 5

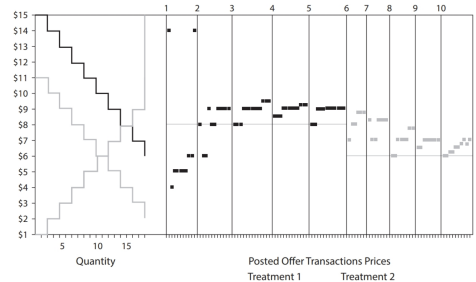


Figure 21.2. Price Sequence for a Posted-Off-Auction with a Downward Shift in Demand after Round 5

Experimental Results: A Demand Shift

- ▶ In both markets, demand shifts downward after period 5:

$$P^{CE} : \$8 \longrightarrow \$6.$$

- ▶ **Double auction:**

- ▶ Prices approach the new equilibrium within the first period after the shock.
- ▶ Efficiency remains around 96% in the final five periods.

- ▶ **Posted-offer market:**

- ▶ Prices decline more slowly.
- ▶ Prices do not fully reach the new competitive prediction.
- ▶ Efficiency averages around 86% in the final five periods.

- ▶ Interpretation: continuous price discovery facilitates adjustment to changing market conditions.

Early Evidence: Smith (1962)

Vernon Smith (1962): *An Experimental Study of Competitive Market Behavior*

- ▶ One of the foundational experiments in experimental economics.
- ▶ Buyers and sellers were assigned private values and costs and traded through a double auction.
- ▶ Despite limited information and a small number of traders, prices tended to converge toward the competitive equilibrium.
- ▶ Repeated trading helped the market discover competitive prices.

Competitive outcomes can emerge without perfect information or a large number of traders.

Does the Trading Institution Matter?

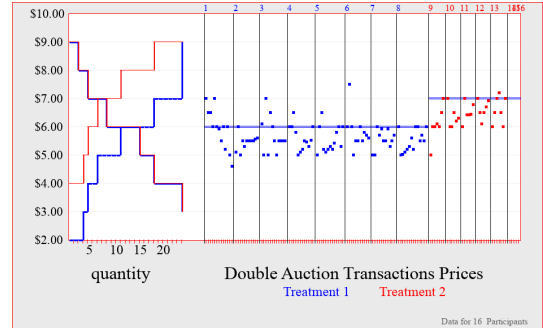
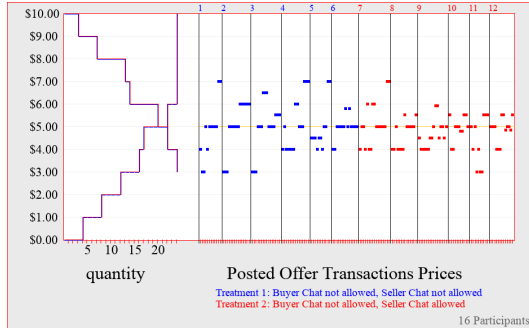
Evidence from comparative market experiments

- ▶ Double auctions typically exhibit:
 - ▶ Rapid convergence toward competitive prices.
 - ▶ High allocative efficiency.
- ▶ Posted-offer markets typically exhibit:
 - ▶ Slower price convergence.
 - ▶ Prices above competitive predictions.
 - ▶ Lower allocative efficiency.
- ▶ Experiments with changing supply and demand show that posted-offer markets have particular difficulties adjusting to demand shocks.

The same economic fundamentals can produce different outcomes under different trading rules.

Ketcham, Smith and Williams (1984); Davis and Holt (1993).

Experimental Results: our experiments



Market Institutions and Collusion

Isaac and Plott (1981)

- ▶ Investigated whether allowing sellers to communicate could facilitate collusion in double-auction markets.
- ▶ Sellers were allowed to discuss prices between trading periods.
- ▶ Despite these opportunities, competitive forces substantially limited their ability to sustain high prices.
- ▶ The competitive model predicted market performance better than cartel models, although attempted collusion had detectable effects.

Communication alone does not guarantee successful collusion.

Posted Prices, Collusion and Discounts

Davis and Holt (1998)

- ▶ Studied price-fixing agreements in laboratory posted-offer markets.
- ▶ Compared markets where sellers could only post prices with markets where secret discounts were permitted.
- ▶ **Without discounts:** colluding sellers generally maintained prices close to monopoly levels.
- ▶ **With secret discounts:** collusive agreements became more difficult to sustain and transaction prices tended toward competitive levels.

The possibility of price cutting can undermine collusion.

Main Takeaways

1. **Market institutions matter.**

The same supply and demand conditions can generate different market outcomes.

2. **Double auctions promote competition.**

Continuous bidding and price adjustments tend to produce competitive prices and high efficiency.

3. **Posted-offer markets exhibit price rigidity.**

Prices adjust more slowly to demand shocks and may remain above competitive levels.

4. **Market power depends on trading rules.**

The ability to sustain high prices depends partly on whether sellers can revise prices during trading.

Motivation I: What We Learned from Posted-Offer Markets

- ▶ Sellers post prices first; buyers then decide where and whether to purchase.
- ▶ Buyers face take-it-or-leave-it offers: there is no bargaining over the posted price.
- ▶ In earlier experiments, posted-offer trading often gave sellers substantial control over transaction prices.
- ▶ But competitive outcomes depend on how sellers interact and on the trading rules.
- ▶ Today: look at impact of communication – Davis and Holt (1998)

Motivation II: Communication Changes the Experiment

- ▶ Earlier laboratory evidence: sellers in double auctions struggled to sustain price-fixing agreements.
- ▶ In posted-offer markets, seller communication could instead sustain high prices.
- ▶ The posted-price institution makes agreements easier to observe: everyone sees the list prices.
- ▶ Yet a cartel still faces a problem: each seller can gain by attracting extra buyers.

Why Would Sellers Communicate?

Potential reasons to use the chat window

- ▶ **Coordinate:** propose a common list price rather than compete for buyers.
- ▶ **Divide sales:** agree on quantity limits or rotate which seller attracts buyers.
- ▶ **Maintain trust:** discuss future conduct after disappointing outcomes.

Why might sellers choose not to chat? (*Hypotheses, not tested in this paper*)

- ▶ They expect rivals to undercut any agreement, or prefer independent decisions.
- ▶ They do not recognize the gains from coordination, or communication feels costly/risky.

Motivation III: Real Markets Are Not Always Pure Posted Offer

- ▶ In car, appliance and business-to-business markets, a list price may not be the price actually paid.
- ▶ Buyers can request a **private, buyer-specific discount**.
- ▶ Other sellers may observe the list price but not the transaction price.
- ▶ Sales reports may nevertheless reveal suspicious changes in market shares.

The Experimental Market: Controlled Incentives

- ▶ Three buyers and three sellers; homogeneous product, repeated trading.
- ▶ Sellers choose list prices; buyers shop and purchase when profitable.
- ▶ A buyer pays \$0.05 each time they approach a seller.
- ▶ Sellers have private unit costs; buyers have private valuations.
- ▶ 15 periods per market; sellers can discuss prices in the conspiracy treatments.

Benchmarks (prices normalized)

Competitive price: $P_c = \$0.00$; joint-monopoly price: $P_m = \$0.55$.

Davis and Holt (1998), Fig. 1 and pp. 738–742.

Three Treatments

Condition	Sellers can talk?	What buyers and rivals observe
NPO: baseline	No	Public posted prices; no private discounts
CPO: conspiracy	Yes	Public posted prices; no private discounts
CD: discounts	Yes	Buyers may request <i>secret</i> discounts; rivals do not see them
CDQ: discounts + reports	Yes	Secret discounts, plus ex post sales-quantity information to sellers

What Happens Without Discounts?

- ▶ **No seller discussions (NPO)**: transaction prices generally converge near the competitive benchmark.
- ▶ **Seller discussions (CPO)**: five of six sessions sustain near-monopoly prices late in the experiment.
- ▶ Sellers invent coordination devices, including rotating the lowest-price seller or restricting quantities.
- ▶ But high prices do not necessarily mean efficient or even highly profitable collusion: allocation can be wasteful.

Secret Discounts: A Cartel's Monitoring Problem

- ▶ Buyers ask individual sellers for discounts from their posted list prices.
- ▶ A seller can secretly undercut the agreement and capture additional sales.
- ▶ Rivals see the posted price but cannot verify the actual concessions.
- ▶ Five of six discount sessions end with prices falling toward competitive levels.

The Results in Numbers

Treatment	Mean price above P_c (cents)	Mean efficiency (%)
No conspiracy, posted offer (NPO)	-1.4	95.5
Conspiracy, posted offer (CPO)	39.4	76.2
Conspiracy + secret discounts (CD)	14.9	82.9
Conspiracy + discounts + sales reports (CDQ)	24.8	82.3

- ▶ Secret discounts lower transaction prices substantially relative to collusive posted offers.
- ▶ Yet lower prices do not restore baseline efficiency: shopping costs and misallocated trades remain.

Treatment means for final five periods; Davis and Holt (1998), Tables 1–3.

Can Sales Reports Help Sellers Collude?

- ▶ In CDQ, sellers receive ex post sales-quantity information before the next discussion.
- ▶ Quantities may signal that someone secretly offered discounts, even when prices are unobservable.
- ▶ Three of six CDQ markets exhibit near-monopoly prices.
- ▶ Average prices are higher than with secret discounts alone, but the difference is not strongly statistically established.

Institutional insight

Information disclosure can make a cartel easier to monitor, even without revealing transaction prices.

What Do We Learn from This Lab Experiment?

1. **Market rules matter:** the same buyers, sellers and incentives produce different outcomes under different trading institutions.
2. **Communication matters:** collusion can be effective in posted-offer markets.
3. **Observability matters:** secret discounts destabilize agreements by making cheating difficult to detect.
4. **Information matters:** sales reports can partly restore the ability to coordinate.
5. **Prices are not the whole story:** low prices need not imply high allocative efficiency.