Agenda

- bilateral oligopoly
  - Gowrisankaran Nevo and Town (2013)
  - Crawford and Yurukoglu (2012)
- vertical markets
  - Hasting (2004)

Bilateral Oligopoly

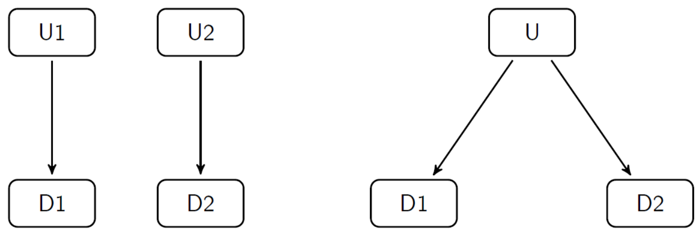
- many interesting markets have a few powerful sellers and a few powerful buyers
  - mobile phone makers (Apple, Samsung, HTC, ...) and service providers (AT&T, Verizon,...)
  - appliance makers (KitchenAid, LG, GE, ...) and department stores (Best Buy, Sears, Home Depot, ...)
  - hospitals (UW, St. Mary's, Meriter) and health insurers (Unity, Dean, Physicians Plus)
- how to model price determination in these markets?

No Workhorse Model

- it would be nice to have a model with
  - N sellers, K buyers
  - clean prediction of prices p_{nk} as function of N and K (and other parameters)
  - intuitive relationship to standard models
    - as $K \to \infty$, prices converge to Cournot or Bertrand prices
    - as $K \to \infty$ and $N \to \infty$, prices converge to marginal costs
- why is this difficult?
  - prices are negotiated
  - not obvious how to specify bargaining sequence
  - not obvious how to model network formation

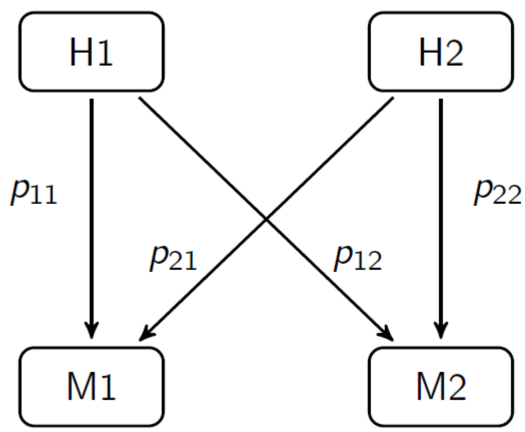
Horn and Wolinsky (1988)

- main results: monopoly more (less) profitable than duopoly if downstream firms' products are substitutes (complements)



- intuition: if downstream products are substitutes, then monopoly's bargaining position is somewhat strengthened ("I cannot lower my price to you, because if I do, you'll produce more and your rival will produce less, lowering my revenue from your rival")

Hospitals and Health Insurers



Gowrisankaran Nevo and Town (2013)

- question: how to predict the price effects of a hospital merger when prices are negotiated?

- approach: estimate a model in which prices result from a bargaining game, then simulate the effects of the merger
  - need data on hospital-insurer specific prices and quantities for different treatments
  - need to simplify the bargaining game to make it tractable

Nash Bargaining

- assume price charged by hospital h to MCO (managed care organization) m solves

$$\max_{p_{hm}} \left[\pi_h\left(p_{hm}\right)\right]^{b_h}\left[\pi_m\left(p_{hm}\right)\right]^{b_m}$$

  - b_h and b_m are bargaining weights
  - $\pi_h\left(p_{hm}\right)$ is hospital h's surplus from the $h-m$ relationship as a function of p_{hm}, holding all other prices fixed
  - $\pi_m\left(p_{hm}\right)$ is MCO m's surplus from the $h-m$ relationship

Overview of Empirical Model

- patient choice model determines MCO's surplus from an $h-m$ bargain
  - welfare $= \tau\times$(patients' surplus from h) - (payments to h)
  - bargaining surplus $=$ (welfare from h) - (welfare without h)
- for hospital's surplus, assume constant marginal cost

$$q_{mh}\left(p_{mh}-mc_{mh}\right)$$

- estimate patient choice model in first stage, bargaining model in second stage

Data

- note: typically it is very difficult to get price data (the p_{hm}'s) in these kinds of markets
- claims data report payments from MCO to hospital
- separately for each MCO, regress payment on gender, age and hospital dummies, use fitted values as p_{hm}'s
- could also look at contracts, but these specify prices in complicated ways
- data reveal large price variation across hospitals within MCO, and even larger variation across MCOs within hospital

Identification

- patient choice model
  - price coefficient: variation in coinsurance rates
  - distance coefficient: patient-level variation in location
- MCO model
  - MCO weight on patient welfare τ: how MCOs value hospital choice relative to payments to hospitals
  - bargaining weights b_m and b_h V.S. marginal costs γ

Hospital Demand Estimates

Variable	Coefficient	Standard error
Base price × weight × coinsurance	−0.0008**	(0.0001)
Travel time	−0.1150**	(0.0026)
Travel time squared	−0.0002**	(0.0000)
Closest	0.2845**	(0.0114)
Travel time × beds / 100	−0.0118**	(0.0008)
Travel time × age / 100	−0.0441**	(0.0023)
Travel time × FP	0.0157**	(0.0011)
Travel time × teach	0.0280**	(0.0010)
Travel time × residents/beds	0.0006**	(0.0000)
Travel time × income / 1000	0.0002**	(0.0000)
Travel time × male	−0.0151**	(0.0007)
Travel time × age 60+	−0.0017	(0.0013)
Travel time × weight / 1000	11.4723**	(0.4125)
Cardiac MDC × cath lab	0.2036**	(0.0409)
Obstetric MDC × NICU	0.6187**	(0.0170)
Nerv, circ, musc MDC × MRI	−0.1409**	(0.0460)
N	1,710,801	
Pseudo R^2	0.445	

Demand Elasticities

Hospital	(1) PW	(2) Fairfax	(3) Reston	(4) Loudoun	(5) Fauquier
1. Prince William	−0.125	0.052	0.012	0.004	0.012
2. Inova Fairfax	0.011	−0.141	0.018	0.006	0.004
3. HCA Reston	0.008	0.055	−0.149	0.022	0.002
4. Inova Loudoun	0.004	0.032	0.037	−0.098	0.001
5. Fauquier	0.026	0.041	0.006	0.002	−0.153
6. Outside option	0.025	0.090	0.022	0.023	0.050

Note: Elasticity is $\frac{\partial s_j}{\partial p_k}\frac{p_k}{s_j}$ (rows=j, col = k)

Effective Price Sensitivities

- for a single hospital, the pricing equation looks like

$$p_{hm} - mc_{hm} = -q_{hm}\left(\frac{\partial q_{hm}}{\partial p_{hm}} + q_{hm}\frac{b_m A}{b_h B}\right)^{-1}$$

  - with $b_m = 0$, this is the standard equation for markup (Bertrand)
  - with $b_m > 0$, the presence of the extra term reflects the bargaining consequences of an increase in price
  - the effective price sensitivity generally is higher than with Bertrand competition

Conclusions

- paper constructs and estimates a model of a bargaining game between hospital system and MCOs

  - bargaining equilibria differ from Bertrand equilibrium, but similar techniques could be applied

- bargaining leverage results in MCOs being more price sensitive than patients: MCOs could help lower prices
- paper provides structural framework to evaluate bargaining models, which are being used for merger policy

Crawford and Yurukoglu (2012)

- question: what would be the welfare effects of mandating a la carte pricing of television channels?
- approach:
  - use data on viewership, subscription rates, package prices to estimate a structural model of supply and demand for TV channels, explicitly modeling the determination of input prices (channel fees charged by content providers to content distributors)
  - use the estimated model to simulate how a la carte pricing would change consumers' purchase decisions and content providers' fees and compute welfare changes

Industry and Policy Background

- content providers (channel conglomerates): ABC Disney, NBC, Time Warner, ...
- content distributors: Comcast, DirecTV, AT&T, Charter,...
  - historically these were heavily regulated
  - typically sell channels in bundles (basic, expanded basic, ...)
  - policy proposal: force distributors to offer channels a la carte

Basic Economics of Unbundling

- this is a setting where bundling is clearly a good strategy for the sellers!
  - large number of channels, with heterogeneity in preferences across channels
  - bundling homogenizes WTP, facilitates surplus extraction
  - basic analysis suggests unbundling is good for consumers, bad for distributors

Bargaining Effects of Bundling

- we should think of the market for television content as a bilateral oligopoly (a few content providers selling to a few content distributors)
- input costs (channel fees) are negotiated
- distributors' decision to bundle or not affects the bargaining game
- in particular, unbundling may lead to higher input costs

Overview of Model

- demand for channels
  - estimated using viewership data from Nielsen and MRI
- demand for packages (bundles of channels)
  - function of package quality and price
  - estimated using data on package prices and shares (from Cable System Factbook)

Overview of Model (Cont.)

- supply of channel bundles
  - Nash equilibrium in prices
  - Nash equilibrium in bundles
- bargaining game between content providers and content distributors
  - determines input costs (channel fees)
  - only data on input costs is at the aggregate level (average channel cost across all providers)

Utility from TV

- household i utility from bundle j

$$v_{ij}\left(t_{ij}\right) = \sum_{c \in C_j} \gamma_{ic} \log\left(1 + t_{ijc}\right)$$

  - t_{ij} is a vector with components t_{ijc} denoting the number of hours household i watches channel c
  - γ_{ic} is a parameter representing i's tastes for channel c
- household chooses t_{ij} to maximize v_{ij}
- estimation problem: recover the distribution of γ_{ic}'s

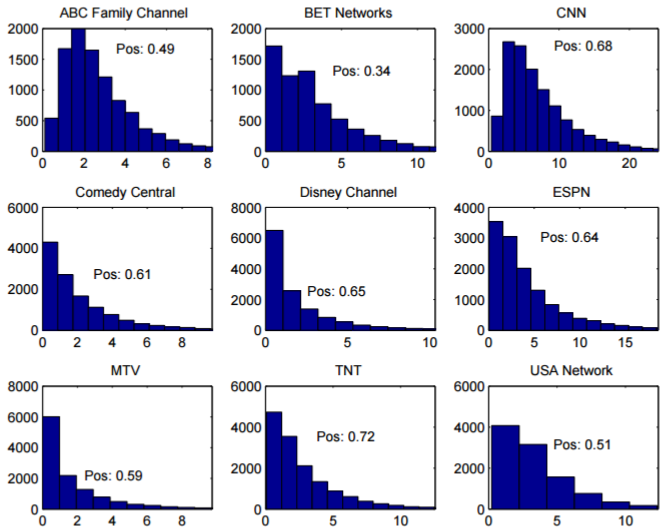
Distribution of Channel Preferences

$$\gamma_{ic} = \begin{cases} 0 & \text{with prob } \rho_{ic} \\ f\left(\text{demographics}\right) + v_{ic} & \text{with prob } 1 - \rho_{ic} \end{cases}$$

- positive probability of zero utility from a given channel
- the probability (ρ_{ic}) allowed to depend on demographics
- correlation in tastes: v_{ic}'s are correlated exponential RV's

WTP

Figure 4: Estimated WTP for a Subset of Channels



Bargaining Game

- Nash equilibrium in Nash bargains: each vector of channel fees is optimal given all other provider/distributor pairs' negotiated fees

Table 7: Conglomerate Bargaining Parameters

Conglomerate	Big Cable	Small Cable	DirecTV	Dish Network
ABC Disney	0.28	0.25	0.18	0.17
Viacom	0.49	0.48	0.54	0.53
NBC Universal	0.50	0.49	0.52	0.51
Comcast (Content Division)	0.69	0.68	0.67	0.66
Scripps	0.55	0.55	0.58	0.58
News Corporation	0.42	0.39	0.34	0.32
Rainbow Media	0.70	0.69	0.68	0.67
Discovery Networks	0.62	0.61	0.63	0.63
Time Warner	0.40	0.38	0.38	0.37
Hallmark	0.69	0.69	0.71	0.71
Lifetime	0.43	0.43	0.43	0.43
Oxygen	0.73	0.72	0.71	0.70
Weather Channel	0.69	0.69	0.69	0.69
TV Guide	0.77	0.77	0.76	0.76

Main Findings

Table 8: Baseline Counterfactual Results: Full À La Carte

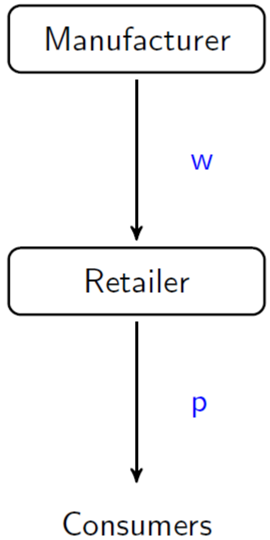
	Bundling	ALC No Reneg	% Change	ALC With Reneg	% Change
Non-welfare Outcomes					
Cable & Sat Penetration	0.880	0.998	13.3%	0.993	12.8%
Total Affiliate Fees	$18.22	$18.22	0.0%	$36.98	103.0%
Mean Consumer Expn	$27.63	$21.07	-23.8%	$28.24	2.2%
Number Channels Received	42.8	22.0	-48.5%	19.3	-54.9%
Number Channels Watched	22.2	22.0	-0.5%	19.3	-12.8%
Welfare Outcomes					
Channel Profits					
Total License Fee Rev	$16.03	$7.95	-50.4%	$15.44	-3.7%
Total Advertising Rev	$13.38	$14.71	10.0%	$14.73	10.1%
Total Channel Revenue	$29.41	$22.67	-22.9%	$30.16	2.6%
Distributor Profits	$11.59	$13.11	13.1%	$12.81	10.4%
Total Industry Profits	$41.00	$35.78	-12.7%	$42.97	4.8%
Mean Consumers Surplus	$45.82	$54.59	19.2%	$45.91	0.2%
Total Surplus	$86.82	$90.37	4.1%	$88.88	2.4%

- without renegotiated input costs, ALC looks great for consumers (+19.2%) and good overall (+4.1%)
- with renegotiated input costs, no change in CS because input costs (and prices) go up

Vertical Markets

- many firms exclusively produce intermediate goods
- some ideas can be applied equally to final-good and intermediate-good producers (e.g., price discrimination)
- but transactions between upstream and downstream firms are more complicated than transactions between firms and final consumers
  - upstream firm's profit is affected by downstream firm's decisions (e.g., pricing, product promotion)
  - so upstream firm may want to exercise control over those decisions

Example: Two Successive Monopolies



Profit Maximization without Integration

- retailer
$$\max_{p}\left(p-w\right)D_{R}\left(p\right)\Rightarrow p^{*}\left(w\right)$$
- manufacturer
$$\max_{w}\left(w-c\right)D_{M}\left(p^{*}\left(w\right)\right)\Rightarrow w^{*}\left(c\right)$$

Double Marginalization

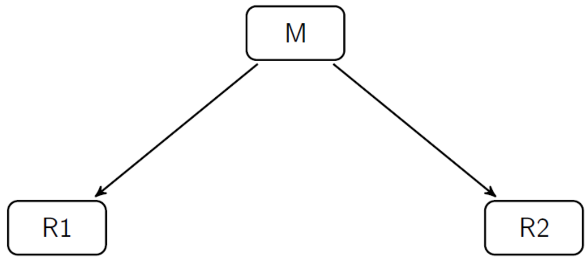
- when setting its price, the retailer doesn't internalize the impact of a price increase on the wholesaler's profits
- the two successive markups (double marginalization) lead to $p^{*}\left(w\right)$ being greater than the price that maximizes the two firms' joint profits
- how can the firms resolve this problem?
  - two-part tariffs: set $w=c$ and charge a fixed fee to extract a share of the profits
  - vertical integration

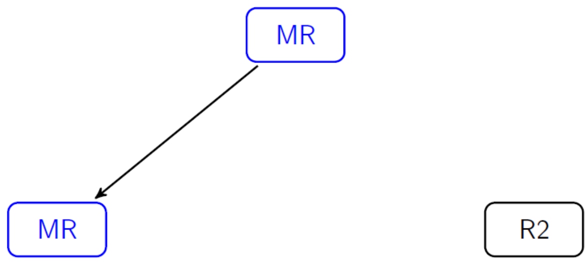
Are Vertical Mergers Anti-Competitive?

- if vertically integrating eliminates inefficiencies like double marginalization, it could lead to lower prices
- but vertical integration may raise the risk of foreclosure, which could raise prices

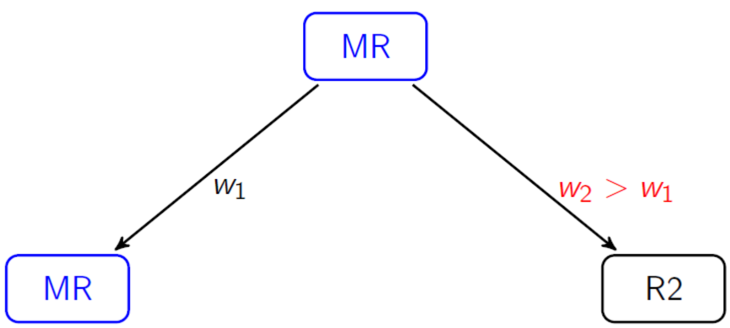
– not always the case, Hortacsu and Syverson (2007 JPE) reviewed plant and market data in the US cement and concrete industries over a 34-year span; they found that vertical integration lead to lower prices and higher quantities for consumers

Foreclosure





Foreclosure (Cont.)



- theory of foreclosure and exclusion
  – Whinston (1990 AER), Rey and Tirole (2007 Handbook of IO)

Hasting (2004)

- question: does vertical integration in the gasoline industry lead to higher retail prices for gas?
- approach: Diff-in-Diff style regression analysis exploiting an ownership shock in Southern CA: Arco purchased 260 independent gas stations in 1997, converting 2/3 of them to "company-op" (vertically integrated) stations

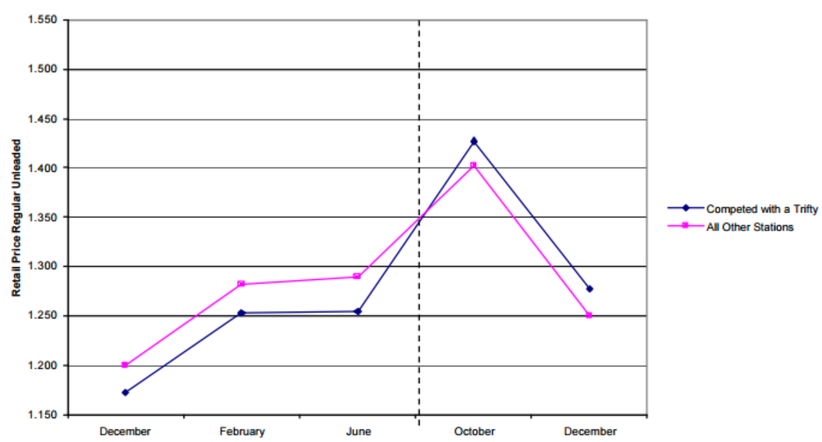
Types of Gas Stations

Branded (Chevron, Shell, ARCO, ...)	Unbranded (Thrifty, Rotten Robbie, ...)
company-op	independent
lessee dealer	
dealer-owned	

- ARCO acquisition: large reduction in the number of independent stations, and relatively large increase in the number of company-op stations

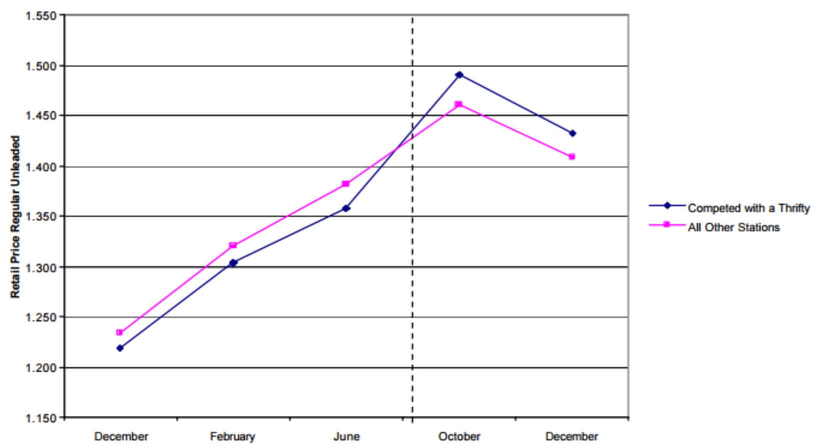
Average Price Graphs

Graph I.a: Los Angeles Treatment and Control Graph



Average Price Graphs (Cont.)

Graph I.b: San Diego Treatment and Control Graph

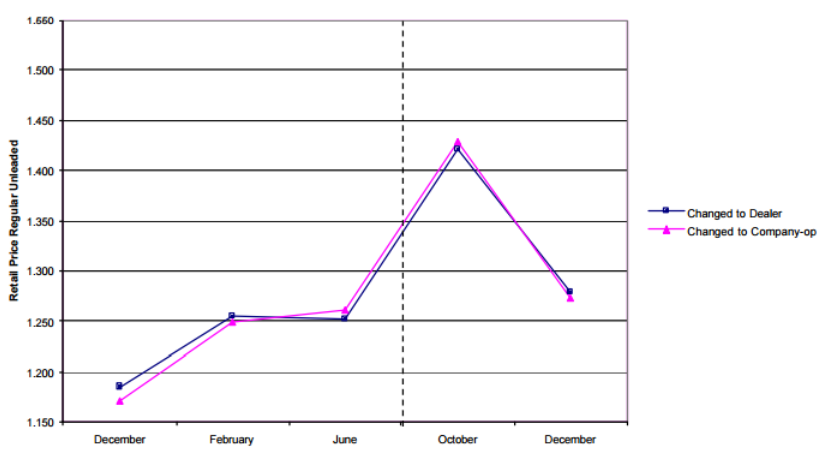


Observations

- before the conversion, the stations that were competing with a Thrifty station (the treatment group) had lower prices than the market averages for stations that never competed with a Thrifty in any time period (the control group)
- after the conversion, the stations in the treatment group had a higher price than the average price of stations in the control group

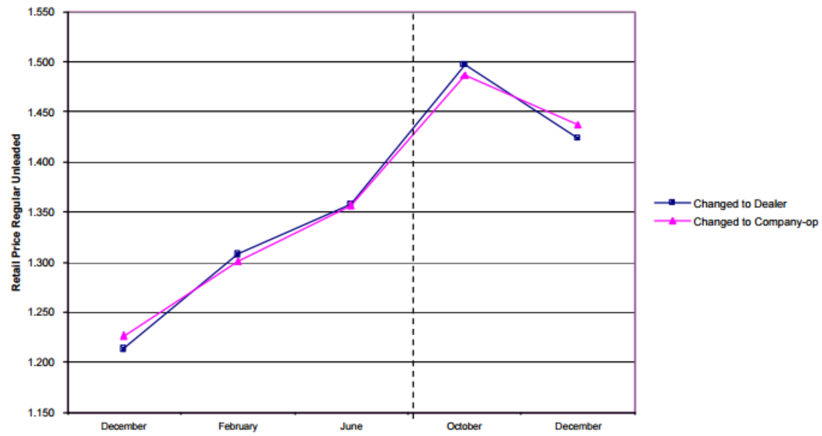
Average Price Graphs (Cont.)

Graph II.a: Los Angeles Change to Company-op vs. Change to Dealer-run



Average Price Graphs

Graph II.b: San Diego Change to Company-op vs. Change to Dealer-run



Observations

- no apparent difference in the price behavior between stations in markets with an increase in the share of company-op ARCO's and those with an increase in the share of dealer-run ARCO's
- evidence to support the hypothesis: local price increases can be attributed to the loss of independent competitors