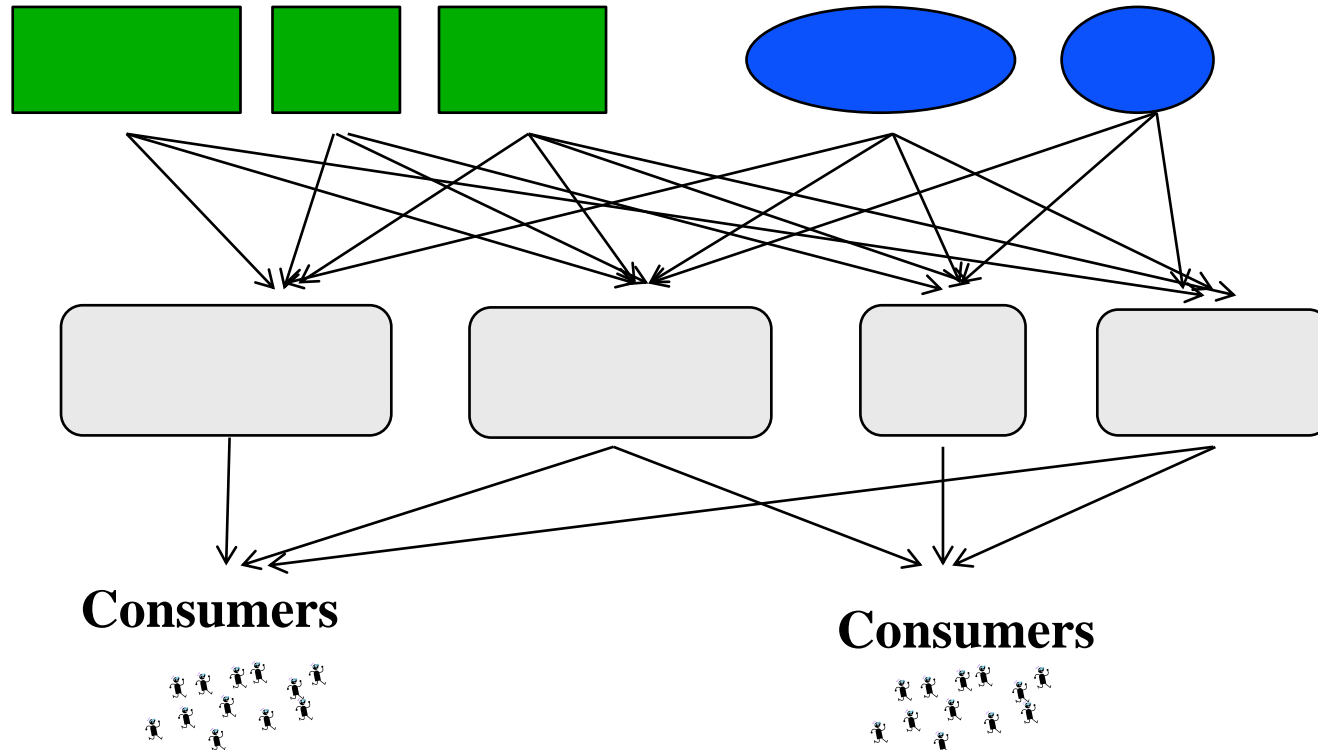# Vertical Market Structure 2
Contractual Terms and Vertical Restraints

IO Fall 2013
Pakes and Yurukoglu

Vertical Markets in IO

Main ingredients: Buyers and sellers with market power, externalities between different groups, contracting

Last Time (Lecture 1)

- Basic Theory

- Double marginalization, Two-part tariffs

- TIOLI offers

- Off-equilibrium belief selection (passive, wary)

- Bargaining (Nash, Rubinstein)

- Horn and Wolinsky

- Bargaining with asymmetric information

Today

- We will look some types of contractual arrangements that firms use to partially control each other.

- Merger (vertical integration) is the extreme form.

- Short of merger, firms can use contractual provisions.

- Wholesale price discrimination, wholesale bundling, penalty clauses, and exclusive dealing.

- A good reference is Whinston's *Lectures on Antitrust Economics*. In some parts, I use exactly his examples and notation.

Today

- **Mostly toy models and examples showing anti-competitive effects can happen**, but I'll mention some empirical work and famous cases.

- Some key points about the literature:

1. For any given practice, there are a lot of theory papers and a handful of empirical papers.
2. A lot of different practices have similar economics and are partial substitutes for each other.
3. Entry is an important margin here, and we haven't studied entry yet.
4. Almost exclusively TIOLI offers by U's.

Intellectual History and Definitions

- Debate over desirability of allowing vertical restraints centers on showing either:

- Exercise of Market Power, or
- Efficiency

- Laws treat as rule of reason accordinglu

- Chicago School- demonstrated that foreclosure effects are not obvious, and provided examples of efficiency enhancing usage
- Game theory- developed models where foreclosure arises in equilibrium
- Empirical analysis- …

Definition of Foreclosure

- One of the exercises of market power results in a set of outcomes classified as **foreclosure**

- Foreclosure is when access to something- a market, an input- is denied from one firm to another.

- For example, a manufacturer might sign an exclusive deal with a retailer (like in employment contracts). Rival retails are foreclosed access to the manufacturers' goods.

- Or a retailer might sign an exclusive deal with a manufacturer where the retailer won't carry other manufacturers. Access to consumers shopping at store is foreclosed.

Other Types of Market Power Exercise

- Another exercise of market power in a vertical relationship is **leverage**.

- Leverage occurs when a firm with market power in one market extends it to another market.

- Often used interchangeably with foreclosure.

- Another exercise is raising rival's costs.

Wholesale Price Discrimination

- The starting point here is ambiguity.

- Banning price discrimination by a monopolist selling to consumers has ambiguous welfare effects depending on whether it lowers or raises total quantity.

- Perfect price discrimination increases Q, is good for total welfare, but lowers consumer welfare.

- However, results can ambiguous with imperfect discrimination, eg rich vs poor consumers

Wholesale Price Discrimination

- Empirical research

- Villas-Boas on coffee, Hastings on gasoline, Grennan on stents

- All are studies where they estimate an industry model under price discrimination, then simulate out effects of uniform pricing.

- No actual variation in banning wholesale price discrimination.

Wholesale Price Discrimination

- Hastings: Gasoline in Southern California

- Assume Bertrand pricing by refiners to gas stations.

- Estimates BLP model with random coefficients on brands: "brand loyalty"

- Predicts 5 cents per gallon increases from banning wholesale price discrimination.

- Prices rise in poor areas and fall in rich areas, so interesting distributional effects.

Wholesale Price Discrimination

- Grennan looks at hospital purchases of stents (inserted surgically to pry and hold open blocked blood vessels)

- Documents large price variation across hospitals within stent

Table 1: Price variation across hospitals. The table reports summary statistics for the distribution of price ($US) across hospitals for each stent. The sample is restricted to September 2005 (middle of the sample in time) to isolate cross-sectional variation. There are N=54 hospitals sampled, and BMS1-3 have exited the market.

	mean ($)	std. dev. ($)	std.dev./mean	min ($)	max ($)	N
BMS4	1006	175	0.17	775	1500	25
BMS5	926	191	0.21	700	1600	23
BMS6	952	156	0.16	775	1475	26
BMS7	1035	174	0.17	775	1600	39
BMS8	1063	338	0.32	800	1950	11
BMS9	1088	224	0.21	800	1800	47
DES1	2508	317	0.13	2450	3606	54
DES2	2530	206	0.08	2500	2900	54

Wholesale Price Discrimination

- Simulates uniform pricing

	Discrimination	% change with No Discrimination		
		$b_\mathcal{H} = 0$	$b_\mathcal{H} = \bar{b}_h$	$b_\mathcal{H} = \max(b_h)$
mean BMS price (\$/stent)	1023	163	-2.2	-23
		(18)	(1.6)	(3)
mean DES price (\$/stent)	2517	152	9.2	-14
		(17)	(3.4)	(4)
total stentings (stents/hospital/year)	969	-20	-1.7	1.5
		(5)	(0.5)	(0.7)
manufacturer profits (\$M/hospital/year)	1.17	193	20	-19
		(26)	(4)	(8)
hospital surplus (\$M/hospital/year)	14.3	-23	-2.0	1.8
		(5)	(0.6)	(0.9)
total surplus (\$M/hospital/year)	15.5	-5.6	-0.25	0.14
		(1.9)	(0.11)	(0.09)

Standard errors, clustered by hospital, in parentheses.

Wholesale Price Discrimination

- In cable, stylized fact that bigger downstream firms get lower input prices.

- One question is why? Unclear…

- The implications are also interesting. If big firms get lower input prices, then

- 1. There are automatic marginal cost synergies from mergers.
- 2. Entry would be easier under uniform pricing law.

Wholesale Price Discrimination

- Late 2012 and Early 2013, stream of articles in press about Intel's IPTV video service

How Intel Plans To Kill The Cable Industry With Its New 'IPTV'

TECHNOLOGY

The New Cable-TV Guy: Intel

Chip Maker Working on a Web-Based Video Service to Compete With Cable, Satellite Providers

Wholesale Price Discrimination

- Fast forward to Q3, 2013

Intel willing to pay premium for IPTV content

Chipmaker offering as much as 75 percent more than traditional cable rates

Intel's IPTV dreams are hampered by haggling over content

Dates continue to slip

Intel set to axe its OnCue IPTV project and sell leftovers to Verizon

By **Daniel Cooper** posted Oct 30th, 2013 at 9:01 AM

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Wholesale Bundling

- Also called "tying" and "full line forcing"

- Requires that retailer purchase a suite of products

- Theoretical justification is not price discrimination tool (as in bundling to consumers which we talked about before). Not for homogenizing consumer demand.

- Theoretical justification is for entry deterrence.

Wholesale Bundling

- The basic economic logic is simple.

- Suppose a monopolist on good A can also produce good B.

- Suppose there is an efficient entrant in good B, but not good A.

- Tying B to A means consumers who really like A "might as well" buy B from monopolist also.

- Entrant might not have enough residual demand to meet fixed cost, so doesn't enter.

Wholesale Bundling

- Whinston: "Tying, Foreclosure, and Exclusion"

- Introduction summarizes intellectual history.

- There is this choice quote:

[2] Bork (1978) sums up his discussion of tying more emphatically: "[The leverage] theory of tying arrangements is merely another example of the discredited transfer of power theory, and perhaps no other variety of that theory has been so thoroughly and repeatedly demolished in the legal and economic literature."

Wholesale Bundling

- Two goods A and B.

- Consumer valuations uniform on unit square, independent.

- If pricing independently, monopolist of A and B would set $p_a = p_b = .5$

- A potential entrant to B with entry costs F could come in and undercut and take the whole market assuming F<.25

Wholesale Bundling

- The monopolist can engage in limit pricing of B.

- It would charge a price p_b such that entry is not profitable.

- $p_b(1-p_b) < F$

- Example: F=.1, then p_b = .113
- Monopoly profit is .25+.1 = .35

Wholesale Bundling

- What if monopolist bundles A and B?

- p_{bundle} assuming no entry is sqrt(2/3)=.815

- Profit is .545

- If entrant enters, p_{bundle} goes to 0.6, profit to .37.

- Entrant's profit is 0.065.

Wholesale Bundling

- Take away: Monopoly prefers to bundle A and B rather than engage in limit pricing for a range of entry costs.

- Intuition is monopoly shaves demand from entrant by selling B to consumers who value A.

- Incumbent has leveraged monopoly power in market A to market B.

Wholesale Bundling

- Famous examples:

- Loews Block Booking
- GE-Honeywell Merger
- **Microsoft Windows and Internet Explorer**
- Microsoft Office

- The highlighted case was a mix of exclusive dealing and wholesale bundling.

Wholesale Bundling

- Are there efficiency reasons for wholesale bundling?

- Cost complementarities, standardization

- Negotiation and transaction costs
  - Almost every good can be considered a bundle, therefore clear efficiencies for selling together.

Wholesale Bundling

- An empirical paper:

- Ho, Ho, and Mortimer AER 2012: *The Use of Full-Line Forcing Contracts in the Video Rental Industry*

- Setting is VHS/DVD rental 1998-2002 (now extinct)

- Upstream Movie Distributors
- Downstream Rental Stores
- Data for non-Blockbuster rental stores

Wholesale Bundling

- Full Line Forcing contracts offer rental stores discounts (on either linear prices or revenue shares) for taking the full suite of studio movies.

- Observe for each retailer-studio distributor, the contract type chosen, and then sales (rentals) by consumers.

Wholesale Bundling

- Estimate demand system for video rentals.

- Nested logit with nests being genres. Incorporate decay in product utility over time.

- Estimate terms of cost of carrying inventory based off of decision to take FLF contract, or not.

- This discrete firm choice produces a set of inequality conditions that they use for estimation a la PPHI.

Wholesale Bundling

- Not bad execution of paper, but

- A priori unlikely for leverage theory to be at play here.

- The leverage theory would say the FLF contract takes away demand from other titles so much so that the other titles don't enter the market, and therefore prices are higher.

- But very little price variation overall.

Penalty Clauses (Aghion and Bolton)

- This is an early paper showing that contracts can be used to construct a barrier to entry.
- Next slides follow exposition from Whinston's antitrust book.

- Suppose there is a retailer B, an incumbent supplier I, and a potential entrant E.

- B needs one unit and values at v.

- Entrant is more efficient $c_E < c_I$
- And entry would be profitable absent any friction
- $(c_I - c_E) > f$

Penalty Clauses (Aghion and Bolton)

- Consider a penalty clauses between I and B.

- Contract stipulates price and penalty (p,d).
- B pays penalty if it doesn't buy from I.

- **B and I can sign a contract that gives them all the possible surplus in the market (which is $v-c_E-f$).**

- Set $p=v$ and $d=v-c_E-f$.
- Then if E enters, it will price at p-d, and just cover its costs.

Penalty Clauses (Aghion and Bolton)

- Contract transfers surplus from E to B and I.

- Socially efficient.

- However, if c_E is uncertain, then optimal penalty contract will result in sub-optimal entry by E.

Penalty Clauses (Aghion and Bolton)

- Also, as a model of harmful exclusion, there is a problem.

- **The incumbent wants the entrant to enter, so it can collect the penalty clause**.

- But it makes the point that contracts can be socially harmful.

Exclusive Dealing

- A model where an upstream monopolist uses exclusives to prevent entry.

- Efficiency rationales and protection of investments

- Exclusive can also be used to get around the commitment problem under secret contracts that we studied last time.

Exclusive Dealing: Naked Exclusion

- Suppose there is an incumbent and an efficient potential entrant as before.

- c_I, c_E, and F as before

- Now, multiple buyers, let's say 3.
- Buyers are in separate markets and have demand for input D.

- Demand conditions are such that entry is worthwhile if there are two free buyers:
- $2(c_I - c_E)D(c_I) > f > (c_I - c_E)D(c_I)$

Exclusive Dealing: Naked Exclusion

- Numerical example parameters such that if incumbent is a monopoly, it makes Π^M from each buyer.

- And if the entrant enters, buyers enjoy CS*.

- Note: CS here refers to downstream profits as buyers are not end users but retailers (though the distinction is not material in this case).

Exclusive Dealing: Naked Exclusion

- Before entrant comes along, I can make contract offers to each buyer B.

- Suppose it makes simultaneous and public contract offers to all three.

- Offers stipulate a payment t from I to B if B agrees to purchase exclusively from I.

- Suppose no price discrimination (same t offer to all buyers)

Exclusive Dealing: Naked Exclusion

- Coordination game

- One equilibrium: I offers t<CS*, all buyers reject and entrant enters

- Another equilibrium: I offers t<CS*, all buyers accept

- The latter is an equilibrium because if the other two buyers are rejecting, the entrant won't enter, so might as well take t.

Exclusive Dealing: Naked Exclusion

- One equilibrium is Pareto-dominated (for the coordinators) by the other, so might expect buyers find a way to coordinate.

- Now, what if I can price discriminate?

- Then it can offer CS*+ϵ to two out of three buyers and nothing to the other, and get them to sign exclusives as a dominant strategy.

Exclusive Dealing: Naked Exclusion

- If I can approach buyers sequentially, exclusion is even more robust.

- The first buyer signs the exclusive for ϵ, knowing that either way, I will pay for exclusives from the next two.

- But now that 1 is signed up, I only needs one other one. So 2 is in the same position as 1, and thus signs up for ϵ.
- Then E doesn't enter, so I excludes E for free.

Exclusive Dealing: Naked Exclusion

- Interaction of wholesale price discrimination and exclusive dealing.

- Microsoft case was an interaction of wholesale bundling and exclusive dealing.

- Most papers focus on one practice. But we should keep in mind that contracts are high dimensional objects.

- Banning one practice might increase or decrease another practice.

Exclusive Dealing: Efficiency Gains

- The defense for exclusive dealing goes along the following lines:

- Downstream firm makes a relationship specific investment, such as marketing or consumer education.

- If consumers can shop around, then there is underinvestment.

- Shop at the store, buy from Amazon

Exclusive Dealing: Empirical Work

- Empirical evidence

- Asker on Beer
- Lee on Xbox and Halo
- Sinkinson on iPhone and AT&T

Exclusive Dealing: Empirical Work

- The Beer industry has had the most empirical work regarding vertical restraints.

- Asker estimates demand for beer in Chicago and backs out marginal costs via optimal pricing conditions.

- Shows that exclusive distributors operate in higher demand markets (cause or simultaneous?) and marginal costs are lower with exclusive distributors.

- Suggestive of efficiency motivations

Exclusive Dealing: Empirical Work

- Robin Lee examined the exclusive deal between Xbox and the Halo game (actually was an integration).

- Estimates two sided dynamic model of industry.

- Quantifies that Halo may have been key to Xbox launch, suggesting pro-competitive effect of exclusive, even though Playstation users had no access to popular game.

Exclusive Dealing: Empirical Work

Table 8: Counterfactual: Eliminating Vertical Integration and Exclusivity

		Obs. Data	Predicted Outcome	(i) No PS2 Exclusives	(ii) No Exc. For Any Console	(iii) Forced Compatibility
Consoles Sold (M)	PS2	30.07	29.6	28.8	36.4	36.6
			(29.2,29.8)	(28.0,29.2)	(35.4,38.4)	(35.5,39.2)
	XB	13.32	14.1	14.7	12.0	11.2
			(13.7,15.0)	(14.1,16.0)	(11.6,13.1)	(10.6,11.8)
	GC	9.83	10.0	10.5	8.8	9.0
			(9.8,10.2)	(10.3,10.8)	(8.4,9.2)	(8.7,9.3)
Titles Sold (M)	PS2	305.09	271.5	235.1	671.6	772.8
			(252.6,274.8)	(214.6,244.9)	(621.7,720.8)	(713.8,843.5)
	XB	118.05	143.4	196.0	78.2	58.4
			(133.4,169.1)	(179.5,231.3)	(67.4,111.4)	(50.3,75.5)
	GC	79.17	81.3	118.3	36.1	53.2
			(70.6,97.4)	(102.3,135.9)	(31.3,46.0)	(45.3,64.5)
# of Titles	PS2	1161	700	637	770	1569
			(624,711)	(553,657)	(628,847)	(1569,1569)
	XB	749	924	1033	1066	1420
			(873,1105)	(974,1235)	(989,1316)	(1420,1420)
	GC	487	415	496	495	1424
			(301,503)	(362,588)	(382,640)	(1424,1424)
# of "Hit" Titles	PS2	67	66	53	183	188
(Sales > 1M)			(63,68)	(51,54)	(169,195)	(175,203)
	XB	9	10	23	7	5
			(10,14)	(15,29)	(6,8)	(3,7)
	GC	8	12	18	5	5
			(10,13)	(16,19)	(3,8)	(3,8)
Δ Cons. Welfare			-	94.1	1512.2	1766.6
				(60.6,312.3)	(1512.2,3911.8)	(1733.3,4358.6)

Exclusive Dealing: Empirical Work

- Sinkinson quantifies the effect of AT&T's exclusive iPhone deal.

- Ignoring effects on entry (which is where the theoretical literature focuses), let us consider two forces at play with exclusive deals.

- **Exclusive deals increase differentiation between downstream firms, but decrease market coverage.**

Exclusive Dealing: Empirical Work

- In this example, AT&T having iPhone exclusive allows AT&T to charge a high markup.

- However, there are some consumers who would really prefer Verizon because of network coverage.

- Question of why Apple has to make the trade-off… commitment problem?

Exclusive Dealing: Empirical Work

- Sinkinson paper does a detailed job on joint demand for network and handset. Good data and rich model.

- Makes calculation of how much Apple loses out by not serving Verizon.
- Back of the envelope calculation that AT&T could compensate Apple and then some.

- However, contracting details are unclear.

Other Practices and Considerations

- Resale Price Maintenance
- Quality Contracting
- Non-linear Price Schedules
- Most favored nation clauses
- Coordinated effects
- Procurement by auction

Conclusion

- Contracting between large firms with externalities is complicated:
    - Many possible contractual terms
    - Entry margin

- Theory provides many examples of when behavior can be good or bad.
- Empirical work proceeds by examining individual industries.

- Still in process of aggregating these results across industries and times. Some cells are empty.

- Next class: Estimation of a model of vertical bargaining