Vertical Mergers

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Main antitrust issue: Does the merger foreclose the downstream or upstream market to potential rivals?

- When an upstream manufacturer acquires a downstream firm (e.g., retailer), does it reduce rival manufacturers' access to the downstream market?
- When a downstream firm acquires an upstream firm, does it reduce rival downstream firms' access to upstream market?

$\Rightarrow$ Reduced access can mean zero access or access at higher prices.

Motivating Case 1: United States vs AT&T, Time Warner (2018)

- The AT&T-Time Warner merger amounts to a $85 billion vertical merger.
  1. Time Warner major generator of content:
     HBO, CNN, TNT, DC Comics, ...
  2. AT&T major distributor of wireless and cable content.
- This is a big deal b/c the government has been traditionally approving of vertical mergers. Why?

What's changed?

- The DOJ argued that once AT&T owns Time Warner, it could force other cable companies to pay extra for the rights to carry shows such as "Game of Thrones" or channels such as CNN.

  – At that point, those distributors (e.g., Comcast) would face a tough choice: Pay up, or risk having AT&T yank that content and leave consumers with a blackout.

  – If distributors pay-up, some of these costs will be borne on consumers through higher cable bills.

- AT&T's economist says that cable prices would likely decrease because of "economic efficiencies" and even if the government claims were true, the net effect on consumers would be an increase of no more than 45 cents per month per household.

Outcome: The DOJ chose to block the merger. AT&T and Time Warner took the government to court. One June 12, 2018; US District Judge Richard Leon rule in favor of the AT&T-Time Warner merger. On June 15, 2018; AT&T completed the acquisition of Time Warner.

Motivating Case 2- Brown Shoe Company vs United States

Upstream Market: Manufacturing of men's, women's, and children's shoes.

- 24 largest manufacturers produced about 35% of the Nation's shoes.
- Top 4 firms - International, Endicott- Johnson, Brown (including Kinney with 4 plants) and General Shoe account for about 23% of the market.
- Brown had about 4% of the market.
- The market had grown more concentrated from 1947 to 1954.

Downstream Market: Retailers of men's, women's, and children's shoes.

- 70,000 retail outlets, of which 22,000 are shoe stores (at least 50% of revenues from sales of shoes).
- Kinney operated 400 stores in more than 270 cities; sales accounted for 1.2% of the retail market.
- Kinney shoes represented about 20% of the shoes sold at their stores.

- Brown also had retail outlets but no data on number or share.
- After merger with Brown, Brown became largest outside supplier to Kinney stores, accounting for about 7.9% of Kinney's stock.

Note: merger had horizontal as well as a vertical component. Courts ruled that horizontal effects in upstream market were negligible. However, merger would lessen competition in some retail markets.

The Charge: The merger violated Section 7 of the Clayton Act by substantially lessening competition.

Evidence:

- Brown used its ownership of Kinney to force Brown shoes into Kinney stores.
- Effect was to foreclose Kinney stores to other manufacturers of shoes
- Trend in the industry was towards vertical consolidation with manufacturers acquiring retail outlets.

Dynamic Games

An Example of a Dynamic Game (Selten, 1978)

- Firm 1 is a potential entrant; it has to decide whether or not to enter a market.
- Firm 2 is the incumbent firm.
  1. If Firm 1 stays out, Firm 2 has no decision - it is a monopolist and earns monopoly profits.
  2. If Firm 1 enters, Firm 2 has to decide whether to fight entry (F) or accommodate entry (A). For example, Firm 1 could fight entry in a symmetric, homogenous good Cournot game by increasing output to drive price to constant marginal cost (*i.e.*, competitor profits to zero).
- Pay-offs:
  1. If Firm 1 stays out, Firm 2 gets monopoly profits of 5 and Firm 1 gets its outside option equal to one.
  2. If Firm 1 enters and Firm 2 fights, both firms get zero profits.
  3. If Firm 1 enters and Firm 2 accommodates, both firms earn profits of 2.

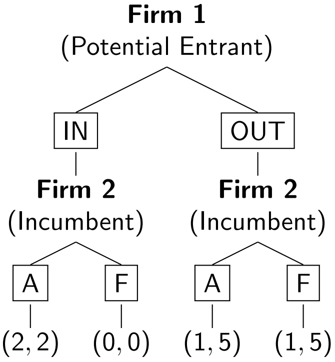
Game in “Normal” Form

Firm 1	*Fight*	*Accommodate*
	Firm 2	
Enter	0, 0	2, 2
Stay out	1, 5	1, 5

⇒ Two Nash Equilibria: (Stay Out, Fight) and (Enter, Accommodate)

Game in "Extensive" Form

- The previous results failed to account for the timing inherent in the game (i.e., Firm 1 enters, Firm 2 observes Firm 1's decision and decides whether to fight or accommodate).
- Let's resolve the game and account for the timing.



⇒ Solving the game backwards leads to a unique equilibrium outcome: (Enter, Accommodate).

Normal vs Extensive Form

Why the difference? The (Stay Out, Fight) Nash equilibrium is supported by the following reasoning:

- Firm 1's best reply to its belief that Firm 2 will fight entry is to Stay Out.
- Firm 2 is indifferent between Accommodate and Fight if Firm 1 stays out. Hence, Fight is a best reply.

Normal vs Extensive Form

But suppose Firm 1 does enter. Will Firm 2 fight?

- If it fights, it gets 0.
- If it accommodates, it gets 2.

Clearly, the optimal decision is to accommodate at this point.

Problem: The Nash equilibrium concept in multi-stage games fails to rule out play based on "incredible" threats: actions which are only best replies if the player is not called upon to play them.

Solution: Refine our equilibrium concept to exclude non-credible threats. Put differently, we want an equilibrium concept where at each point the agents are behaving optimally.

Subgame Perfect Nash Equilibrium

Definition:
A strategy profile is a *Subgame Perfect Nash Equilibrium* (SPNE) if it represents a Nash equilibrium of every subgame of the original game.

To compute the subgame perfect equilibrium to a finite period multi-stage game, you solve the game backwards. The intuition is that by solving the game backwards, you're restricting the set of equilibrium choices to be a Nash equilibrium at every subgame (e.g., period).

Example: Stackelberg Game

Heinrich Freiherr von Stackelberg (1903-1946)

- German economist.
- Best known for publishing:

  "Market Structure and Equilibrium" (1934).

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- Also a Nazi:
  - Joined Nazi party in 1931.
  - Joined SS in 1933.
  - Fled to Spain in 1944.

The Stackelberg Game

- Player Set: $i = 1, 2$
- Strategies: $y_1 \in [0, \infty); y_2 = f(y_1)$.
- **Timing:**
  1. Firm 1 chooses output y_1.
  2. Firm 2 observes y_1 and chooses y_2 (i.e., best responds).
- Payoffs for firm 1 and firm 2:

$$\pi_1(y_1, y_2(y_1)) = P(y_1 + y_2(y_1))y_1 - C(y_1)$$

$$\pi_2(y_1, y_2(y_1)) = P(y_1 + y_2)y_2 - C(y_2)$$

Interpretation: *Firm 1 decides on quantity that it supplies the market; then Firm 2, observing the output that Firm 1 has chosen, decides on the quantity that it supplies the market. Given amounts supplied, price adjusts to clear the market.*

An Example

$$P(Y) = a - bY$$

$$C(y_i) = cy_i, i = 1, 2$$

Solve the game working backwards. Given output y_1, Firm 2 chooses its output to maximize

$$\pi_2(y_1, y_2) = [a - b(y_1 + y_2) - c] \times y_2$$

Differentiating and solving for Firm 2's best reply,

$$y_2 = (a - c - by_1)/2b$$

Note: That is just the usual homogenous good Cournot best response function.

Firm 1's Optimization Problem

The timing in the game enables Firm 1 to choose its output anticipating how Firm 2 will respond. Thus, it chooses y_1 to maximize

$$\pi_1(y_1, y_2(y_1)) = \left[a - by_1 - b\overbrace{\left((a - c - by_1)/2b\right)}^{\text{Firm 2 BR: } y_2(y_1)} - c\right] \times y_1$$

Note that Firm 1's optimization problem is only a function of y_1. Differentiating and solving for y_1:

$$y_1^\star = \frac{a-c}{2b}$$

Substituting into Firm 2's best reply yields

$$y_2^\star = \frac{a-c}{4b}$$

Total output is then

$$\begin{aligned} Y^\star &= y_1^\star + y_2^\star \\ \Rightarrow Y^\star &= \frac{3}{4} \cdot \frac{(a-c)}{b} \end{aligned}$$

Equilibrium price is

$$p^\star = \frac{1}{4}(a + 3c)$$

Here total output is higher and price is lower in Stackelberg game than in Cournot game (i.e., $Y^C = \frac{2}{3} \cdot \frac{(a-c)}{b}$). Firm 1 has a larger market share and makes more profit; i.e., first-mover advantage.

First Mover Advantage

- Here, the firm which moves first has a "first mover advantage" because it can select its output taking into account the best response of its opponent.
  - Note that Firm 1 could have chosen the simultaneous-move Cournot solution of $y_1 = \frac{a-c}{3b}$ but it did not. Had it made this choice, Firm 2 would have best responded with $y_2 = \frac{a-c}{3b}$.
  - Firm 1 knows this yet it made a different choice. Thus, we know its profits will unambiguously increase when you give it a first-mover advantage.
- Does moving first always make a firm better-off?
- No. Consider the case of Bertrand competition in homogenous goods.

Theory

Vertical Mergers - Theory

Basic Question: Why do firms vertically integrate?

Consider a downstream monopoly that produces product y using a single input x.

- Production: $y = x$. (wholesale/retail markets)
- Costs: $C(y) = cy$, where $c =$ input price.
- Demand: $p(y) = a - by$.
- Profits: $\pi(y) = (a - by)y - cy$.

In the upstream market that supplies x, the input is produced at a cost of w per unit.

Perfect Competition in Upstream Market

Suppose the upstream market is perfectly competitive. Can the downstream gain by merging with an upstream supplier (i.e., vertically integrating backwards)?

- The vertically integrated firm supplies itself at a cost of w per unit.
- But, in a competitive industry, $c = w$.

Hence, its costs are the same whether it supplies itself or purchases the input from other suppliers.

Therefore, it cannot gain from vertically integrating.

- This argument extends to upstream markets that operate under rising marginal cost conditions.

However, this argument does not extend when suppliers in the upstream markets have market power.

Reason 1: Eliminate double markup.

Suppose upstream market is also a monopoly. The game is as follows:

- Upstream monopoly (U) posts a price c.
- Downstream monopoly (D) takes this price as given and then chooses price p (equivalently y since D is a monopoly).

What are the equilibrium wholesale and retail prices?

Solve the game working backwards:

1. First solve D's problem to derive input demand.
2. Then solve U's problem to determine c.

D's problem:

$$\max_{y} \underbrace{(a - by) \times y}_{P(y) \times y} - cy$$

Differentiating with respect to y and solving for y yields:

$$y = (a - c)/2b \tag{1}$$

*Note that this is just the simultaneous-move Cournot BR.

How much input (x) do we need to produce the optimal output $y^\star$?

Since $x = y$, we can use (1) to derive D's inverse demand for x:

$$c(x) = a - 2bx \tag{2}$$

We can use (2) to formulate U's problem:

$$\max_x \underbrace{(a - 2bx)x - wx}_{\pi_U(x)}$$

Differentiating with respect to x and solving for x^*, we obtain the profit-maximizing choice of x (or equivalently c from Equation 2):

$$x^* = (a - w)/4b = y^\star$$

Equilibrium

Thus, equilibrium prices are:

$$c^* = (a + w)/2$$

$$p^* = (3a + w)/4$$

Equilibrium profits of the two monopolies are:

$$\pi_U^\star = (a - w)^2/8b$$

$$\pi_D^\star = (a - w)^2/16b$$

Total industry profit is therefore

$$\pi_U^\star + \pi_D^\star = 3(a - w)^2/16b.$$

A Vertical Merger Between U and D

Now suppose the two firms merge. The vertically integrated firm (VI) transfers input to itself at cost (i.e., $c = w$). Its maximization problem is as follows:

$$\max_y \underbrace{(a - by)y - wy}_{\pi_{VI}(y)}$$

Differentiating and solving for the equilibrium yields

$$\tilde{y}_{VI} = (a - w)/2b$$

$$\tilde{p}_{VI} = (a + w)/2$$

$$\tilde{\pi}_{VI} = (a - w)^2/4b$$

Results

$$\begin{array}{rcl} & \underline{\text{Post-Merger}} & \underline{\text{Pre-Merger}} \\ \tilde{y}_{VI} = & (a-w)/2b > & (a-w)/4b = y^\star \\ \tilde{p}_{VI} = & (a+w)/2 < & (3a+w)/4 = p^\star \\ \tilde{\pi}_{VI} = & (a-w)^2/4b > & 3(a-w)^2/16b = \pi_U^\star + \pi_D^\star \end{array}$$

Result: Vertical merger increases output, decreases price, and increases profits.

Conclusions:

1. Upstream monopoly (market power) creates an incentive for vertical integration to reduce the number of markups leading to an increase in profits. This is sufficient motivation to vertically-integrate.

2. Falling prices imply an increase in consumer surplus so regulators usually do not oppose these kinds of mergers.

Vertical integration is not the only way to eliminate the double markup problem.

1. U could charge w per unit and a franchisee fee of F. Optimal two-part tariff is

$$c = w,\ F = (a - w)^2/4b$$

   The outcome is the same as if the firms had merged. U gets all the profit.

2. U could limit the market power of D by imposing a price ceiling on $D : p \leq \overline{p}$. For any $\overline{p} \in [c, p^\star]$, the price ceiling binds (*i.e.*, D will choose retail price such that $p = \overline{p}$).
   Since the optimal ceiling is the $\pi-$max retail price under VI:

$$\overline{p} = (a + w)/2$$

   in the SPNE,
   - U sets a price ceiling $\overline{p}$ equal to $(a + w)/2$, and
   - U sets upstream price $c = (a + w)/2$, and
   - D chooses retail price $p = \overline{p}$.

   U achieves the same outcome as in the VI case: *i.e.*, **It gets all the profit.**

Reason 2: Eliminate transaction costs.

1. If quality of the input is more difficult to monitor when it is produced outside of the firm than inside of the firm, D may want to vertically integrate.

2. Suppose D needs a special input which can only be supplied by U. The value of the input depends upon U making some specific investment I prior to production.

Payoffs:

If U does not make the investment, then

- Value of the input to D is 3
- Production cost is 2
- Surplus is 3 - 2 = 1.

Suppose they bargain over the surplus and split the difference. U's profit is $1/2$.

If U makes the investment I = 1, then

- Value of the input to D is 4
- Production cost falls to 1.5
- Surplus is 4 - 1.5 = 2.5

Surplus (profit) goes up so it's tempting to conclude that the optimal strategy of U is to undertake the costly investment. But will it do so?

Payoffs:

Once again, parties split the surplus. Then U's profit is

$$1.25 - 1 = 0.25$$

Hence, it will choose not to make the investment even though the social value of the investment is positive since

$$(4 - 3) + (2 - 1.5) = 1.5 > 1$$

What is the problem here?

- Investment is sunk at the time of the transaction occurs so D can “hold up” U.
- U bears the burden the of investment cost.
- Moreover, U knows it cannot recover its investment from D ex post so it is better off not making it.

If U could recover its investment, both firms would benefit. Hence, we have a coordination problem. *This problem is solved if D could commit to paying U.*

Q: How can D commit to paying U?

- Could write a contract conditioning transaction price on investment or value of input. This would require I to be observable and verifiable (contract is enforceable in court).
- If not, then D may want to merge with U.

Vertical Restraints

Vertical Restraints

Manufacturers frequently impose on retailers restrictions in an attempt to capture downstream rents.

- Retail price maintenance (RPM): set price floor, price ceiling or simply set the price.
- Exclusive territories: retailer has a monopoly right to sell in a specific area, preventing intra- brand competition. (e.g., McDonalds).
- Exclusive dealing: retailer sells only the manufacturer's product and is not allowed to sell competing products (e.g., Microsoft restricted ISPs to offer only IE; Coke and Pepsi enter such agreements with schools, hospitals; A.C. Nielson has such agreements with supermarket chains).

Main point: these agreements are not necessarily harmful to consumers.

Motivating Case - Dr. Miles Medical Co. vs John D. Park & Sons

- Dr. Miles is a manufacturer of drugs produced by secret formulas.
- John D. Park is a wholesaler of drugs.

Dr. Miles sold its drugs to wholesalers and retailers under contract which stipulated the minimum prices at which they could resell the drugs.

John D. Park refused to go along with the RPM agreement and sold at lower prices, causing other resellers to violate their contracts.

Main Question: Are these agreements valid?

Arguments

Plantiff argument:

- Manufacturers have the right to set the terms of sale for their products. For example, if they do not want to sell to someone, they are free to do so.
- Standardized retail prices are needed to avoid confusion and damage from undercutting.

Defendant Argument:

- Manufacturers are free to set the terms of their sale of products but not the terms of the resale of their products.
- The effect of the agreement is the same as if all retailers and wholesalers of the drug had formed a cartel and fixed the retail price.

Ruling: For the defendant.

Vertical Restraints - Theory

Consider the following situation.

- Upstream supplier is a monopolist who produces a product at zero cost and chooses price "c" it charges per unit to a downstream market.
- Downstream market is a duopoly. Firms buy the product from U at "c" and compete in (retail) price.
- Demand is inelastic at quantity M up to price 1. Note that both downstream firms sell U's product so the products they offer are homogenous.

Question: What is the equilibrium?

There is timing in the model so we are looking for a subgame perfect Nash equilibrium. Find it (them) by solving backwards:

- Downstream: Bertrand competition implies $p = c$. Each downstream firm earns zero profit.
- Upstream: U maximizes profits by setting $c = 1$ and earns M.

Advertising

Now suppose each duopolist can "advertise" to increase demand.

- Advertising costs to retailer i are A_i^2.
- Consumers buy from the firm that offers the lowest price.

$$D_i(p_i, p_j, A_i, A_j) = \begin{cases} M + A_1 + A_2, & \text{if } p_i < p_j \text{ and } p_i \leq 1 \\ (M + A_1 + A_2)/2, & \text{if } p_i = p_j \leq 1 \\ 0, & \text{otherwise.} \end{cases}$$

- Downstream Firm i then solves

$$\max_{p_i, A_i} (p_i - c) \times D_i(p_i, p_j, A_i, A_j) - A_i^2$$

What is the Equilibrium?

- Undercutting logic drives prices to c for any $A_i \geq 0$ which means profits not accounting for A_i are zero.
- Firm i understands this and therefore chooses not to advertise ($A_i = 0$).
- Thus, U sets $c = 1$ and earns M (i.e., same solution as before).

The ability to advertise had no effect on the equilibrium allocation.

But this is might be bad for the firms since advertising could grow the market but competition among D_1, D_2 drives prices to marginal cost. How can they cooperate?

Retail Price Maintenance

- Suppose U makes an agreement with its retailers to restrict retail prices to be no less than 1.
  1. Why $\underline{p} = 1$?
  2. Undercutting in downstream market means price floor binds.
  3. The price floor therefore sets downstream price so setting it equal to one extracts all CS from consumers.
- Downstream firm i solves

$$\max_{A_i} (1 - c) \times (M + A_i + A_j)/2 - A_i^2$$

- Differentiating and solving for optimal A_i

$$A_i(c) = (1 - c)/4$$

- U's profit with RPM is

$$\pi(c) = c[M + \underbrace{(1 - c)/2}_{A_1(c)+A_2(c)}]$$

- Profit-maximizing upstream solution is

$$c = \begin{cases} M + 1/2, & \text{if } M + 1/2 < 1 \\ 1, & \text{otherwise.} \end{cases}$$

Results

Big Idea: The price floor (i.e., RPM) enables U to constrain the competition between the two downstream retailers so that they have an incentive to advertise and increase demand.

- Upstream and downstream profits increase. We know $\pi^{U\star}\uparrow$ b/c U could choose $c = 1$ but it does not (when $M < 1/2$). Of course, we could also compare the SPNE.
- Consumer Surplus is unchanged since retail price is always one and each consumer has WTP equal to one so each consumer gets no surplus (i.e., $\text{CS}_k = 0 \; \forall k = 1, ..., M + A^\star$).
  - If we had heterogenous consumers, CS could increase because advertising lead to more consumers in the market.
- Total welfare increases since $\pi^{U\star}\uparrow, \pi_1^{D\star}\uparrow, \pi_2^{D\star}\uparrow, \Delta\text{CS} = 0$.

Remarks:

1. If U were vertically integrated, then it could do even better by choosing higher advertising levels: $A^\star = 1/2$.

2. A_i can be interpreted as media advertising, customer service, etc. Customers consider such things alongside price when making purchase decisions – a similar idea as Hotelling with transportation costs.

Exclusive Territories

Consider a Hotelling model with two towns located one mile apart. Town R is located at the right end point and Town L is located at the left end point.

- Buyers live in Town R or in Town L
- Towns are the same size. Each town has a retailer.
- Travel costs are zero.
- Demand is the same as above: in each town, $M/2$ buyers are willing to pay up to $1 for the product.
- Retailers can increase demand by offering service but buyers purchase from the retailer with the lowest price.
- Manufacturing costs are zero.

The SPNE

In the absence of any constraints, the equilibrium is as above: each retailer sets its price equal to c and provides no service; manufacturer sets $c = 1$ and earns profits of M.

The SPNE under "Exclusive Territories"

Constraint: Now suppose the manufacturer does not allow the retailers to sell to buyers in the other town.

- I know this seems like a silly constraint. At this point, this stark assumption is to simplify the model. We'll talk about how to generalize the underlying idea at the end.

Given the constraint, each retailer i sets price p_i to extract all CS ($p_i = 1$) and chooses A_i to solve

$$\max_{A_i} (1-c)(M+A_i)/2 - A_i^2$$

Differentiation yields the solution

$$A_i = (1-c)/4$$

The manufacturer chooses c to solve

$$\max_{c} \left\{ c \times \left[M + \frac{1-c}{4} \right] \right\}$$

Results

- The solution is similar to before in the price floor example (*i.e.*, U gives profits to D firms encourage them to invest in A).
  - Note that I rigged the model to deliver this result to illustrate how RPM and Exclusive Territories operate on the same underlying mechanism: Downstream competition shrinks the pie for the upstream firm.
- As in the case of RPM, Exclusive Territories can lead to a fall in the upstream price and an increase in industry profits.
- Upstream manufacturer gains, retailers gain, more consumers participate. (though CS unchanged in this example).
- More generally, RPM and Exclusive Territories may enable coordination between Upstream and Downstream firms to the benefit of not just firms but also society.

Bottom Line

1. One could easily change the model to a more standard Hotelling model as we studied in class.
    - Moving the firms farther apart shifts the downstream market from duopoly to local monopoly due to the presence of the transportation cost.
    - This amounts to the upstream firm mandating its downstream retailers have "Exclusive Territories" where the upstream firm does not allow its product to be sold by vendors too close to each other (e.g., McDonald's).
    - Equivalently, take the Hotelling model from class, fix s, and increase the transportation cost t to shift the downstream equilibrium from duopoly to local monopoly. See problem set.
2. Vertical integration or restraints may restrict competition but may not be detrimental to welfare.
3. Vertical integration and restraints need to be evaluated on a *rule of reason* criterion.