Vertical Control (Undergrad Notes)

Chris Conlon

July 3, 2017

Outline

Vertical Control

Manufacturers rarely supply final consumers directly (as we have modeled them so far). Instead, most industries are vertically separated.

We often refer to firms in these markets as upstream and downstream firms. In these settings, downstream firms are the customers of the upstream firms, and many of the standard issues still apply. For example:

1. choice of price is endogenous
2. price discrimination (both the upstream and downstream firms)
3. mergers
4. entry, etc.

Vertical Control

However, things can also get more complicated in vertically separated environments. In particular, downstream firms do not usually consume the good, but typically make further decisions regarding the product.

Examples of activities of downstream firms:

1. determination of final price
2. promotional effort
3. placement of product on store shelves
4. promotion and placement of competing products
5. technological inputs

Vertical Control

Why don't manufacturers simply engage in direct marketing to consumers?

Some reasons:

1. increasing returns to distribution due to shopping needs or travel costs for consumers
2. choice of variety
3. demand for service
4. integration of complementary products
5. different geographical markets, etc.

Vertical Control

Unlike the consumption activities of final consumers, the activities of the downstream firms may affect the profits of the upstream firm.

This is why upstream firms care about the activities of the downstream firms, and why we study vertical control/restraints between firms in these settings.

We focus on the incentives for vertical control when the market for the intermediate good is imperfectly competitive.

Vertical Control

A common benchmark for what firms can achieve through vertical control is the "vertically integrated profit." This is the maximum industry or aggregate (manufacturer plus retailer) profit.

If firms use vertical restraints efficiently, they should achieve the vertically integrated profit.

Vertical Control

There are several types of vertical restraints used by firms in vertically-separated markets:

1. *Exclusive Territories*: a dealer/ distributor/ retailer is assigned a (usually geographic) territory by the manufacturer/ upstream firm and given monopoly rights to sell in that area.

2. *Exclusive Dealing*: a dealer/ distributor/ retailer is not allowed to carry the brands of a competing upstream firm.

3. *Full-line forcing*: a dealer is committed to sell all the varieties of the manufacturer's products rather than a limited selection. (i.e., the upstream firm ties all its products to sell to the downstream firm).

Vertical Control

4. *Resale Price Maintenance*: a dealer commits to a retail price or a range of retail prices for the product. This can take the form of either minimum resale price maintenance or maximum resale price maintenance. Equivalently, firms can engage in quantity forcing or quantity rationing.

5. *Contractual arrangements*: upstream and downstream firms write contracts to provide greater flexibility in the transfer of the product. Profit sharing and revenue sharing are the most common, which we'll see soon. Also, franchising arrangements.

Vertical Control

The typical outline of vertical control is as follows:

1. Basic Framework
2. Externalities between downstream and upstream firms (Maximum Resale Price Maintenance, Quantity Forcing, Contractual Arrangements, or Full-line Forcing)
3. Downstream Moral Hazard, or Externalities from Intrabrand competition (Exclusive Territories, Minimum RPM, or Quantity Rationing)
4. Interbrand competition (Exclusive Dealing or possibly Full-line Forcing)

Basic Framework

- Simple model: homogeneous good with (inverse) demand given by:

$$p = a - Q$$

- Suppose we have a monopolistic manufacturer and we have given exclusive rights to a dealer to sell the product of the manufacturer, so both the upstream and downstream firms are monopolistic.

- The downstream firm has marginal cost of selling the product of d which is equal to the wholesale cost of purchasing the product from the manufacturer.

- The manufacturer has marginal cost of producing the good equal to c.

Basic Framework

Dealer maximizes his profit given by

$$\pi_d = p(Q)Q - dQ = (a - Q)Q - dQ$$

F.O.C.:

$$\frac{\partial \pi_d}{\partial Q} = 0 = a - 2Q - d$$

$$Q^* = \frac{a-d}{2} \qquad p^* = \frac{a+d}{2} \qquad \pi_d = \frac{(a-d)^2}{4}$$

Next solve for the upstream firm's choice of d.

Basic Framework

Manufacturer maximizes profit given by

$$\pi_m = (d - c)Q = (d - c)\frac{a - d}{2}$$

F.O.C.:

$$\frac{\partial \pi_m}{\partial d} = 0 = a - 2d + c$$

$$d^* = \frac{a + c}{2} \qquad \pi_m = \frac{(a - c)^2}{8}$$

Note that we can now substitute into the dealer's solutions (for d) and get:

$$Q^* = \frac{a - c}{4} \qquad p^* = \frac{3a + c}{4} \qquad \pi = \frac{(a - c)^2}{16}$$

Externalities

Results:

1. The manufacturer earns a higher profit than the dealer
2. The manufacturer could earn a higher profit if he did the selling himself.

Total industry profit in this case is lower than the vertically integrated profit. Shown here:

$$\pi_{VI} = \frac{(a-c)^2}{4} > (\pi_d + \pi_m) = \frac{3(a-c)^2}{16}$$

The presence of two markups introduces an inefficiency.

Externalities

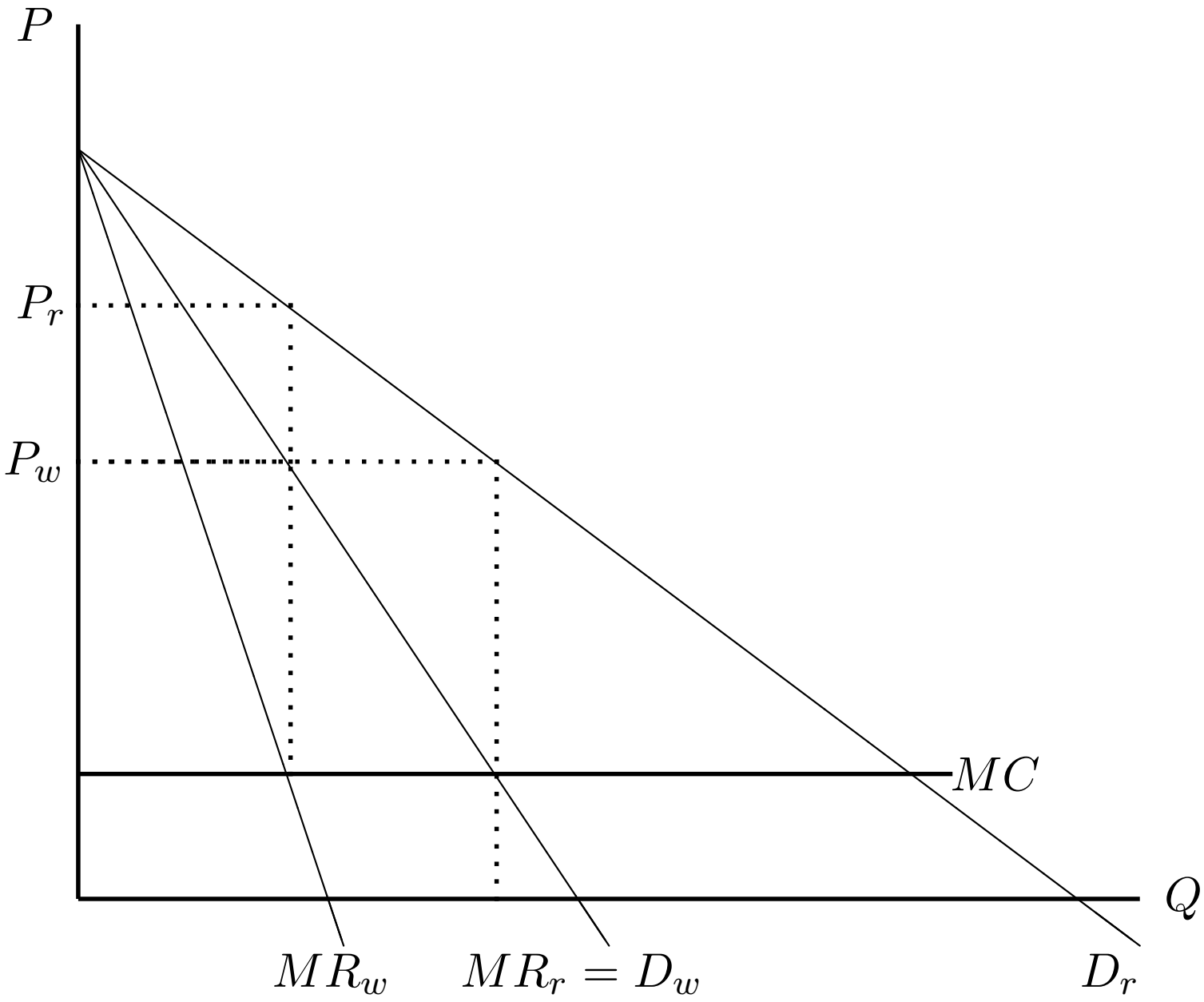
This basic fact is called:

- double-monopoly markup problem,
- successive monopolies problem, or
- double marginalization.

As mentioned earlier, there are many ways around these problems, including RPM, contracts, etc.

There are also other problems that arise, and sometimes firms might choose to create a successive monopoly problem in order to solve other incentive problems in the vertical channel.

Externalities



Externalities

- *Maximum Resale Price Maintenance (Maximum RPM)*, or *Quantity Forcing*:
  Set a maximum resale price below the optimal retail price, in order to mitigate the double marginalization problem.
  Equivalently, use a quantity forcing arrangement.

  Examples include:
  - gasoline
  - newspapers
  - "suggested retail prices"

  Important court cases are:
  - Albrecht v. The Herald Co. (1968) (per se)
  - State Oil Co. v. Khan (1997) (rule of reason)

Externalities

- *Contractual Arrangements*:
  Instead of using Maximum RPM, write other types of contracts. Perhaps lease the good to the downstream firm, perhaps use profit-sharing contracts.

- *Profit-sharing or revenue-sharing contracts*:
  Similar to a two-part tariff. Instead of charging linear prices, the manufacturer requires a lump-sum transfer as well as a per-unit charge.

Externalities

Consider a simple linear demand model in a vertical setting where consumer demand is, for example,

$$Q = V - \eta p$$

Where p is the price charged under simple linear pricing with no cover charge. With two monopolists, we end up with:
Demand facing manufacturer, optimal wholesale price, optimal retail price:

$$Q = V - 2\eta p, \qquad p_w^* = \frac{V}{4\eta} \qquad p_r^* = \frac{5V}{8\eta}$$

Externalities

And firm profits under the case of linear pricing only are:

$$\pi_m = \frac{V}{4}(\frac{V}{\eta} - \frac{V}{4\eta}) = \frac{3V^2}{16\eta}$$

$$\pi_r = \frac{3V}{8}(\frac{V}{\eta} - \frac{5V}{8\eta}) = \frac{9V^2}{64\eta}$$

$$(\pi_r + \pi_m = \frac{21V^2}{64\eta})$$

(This gives us well-behaved profit functions that actually have a maximum so we don't require capacity constraints. Note that p_r^* accounted for the fact that the downstream firm paid a marginal cost of p_w^*.)

Externalities

Now case 2, with a lump-sum payment: (Remember we're assuming that production costs are zero.)

The best the downstream firm can do when he does not have to pay for the incremental units is to maximize profit according to:

$$\max \pi_r = p(V - \eta p)$$

Which yields

$$p_r^* = \frac{V}{2\eta} \qquad \pi_r = \frac{V^2}{2\eta} > \frac{21V^2}{64\eta}$$

Externalities

Let's say the upstream firm charges the downstream firm a lump-sum payment C for quantity Q^* of the good.
The upstream firm's profit function is $\pi_m = C$.

Satisfy a zero profit condition for the downstream firm. Then

$$\pi_m = C \text{ s.t. } \frac{V^2}{2\eta} - C = 0$$

Therefore,

$$C = \frac{V^2}{2\eta}$$

The upstream firm makes profits of $\frac{V^2}{2\eta}$ and the downstream firm makes zero profit, but aggregate profits are higher.

Externalities

We'll see that sometimes firms face a menu of such contracts. In that case, the firms will bargain over the extra profit (relative to the baseline profits under linear per-unit pricing).

The upstream firm will have to give at least $\frac{3V^2}{16\eta}$ to the downstream firm in order to induce him to accept the other contract.

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Consider the example of promotions or advertising. Assume (inverse) demand is given by

$$p = \sqrt{A} - Q$$

The manufacturer sells to two dealers who compete in price. Denote the wholesale price as d and advertising expenditures as A_1 and A_2, where $A = A_1 + A_2$.

First result: For any given d, no dealer will engage in advertising and demand would shrink to zero, with no sales. (Firms compete in price, and they sell a homogeneous product.)

Downstream Moral Hazard, or Externalities from Intrabrand Competition

What can Minimum Resale Price Maintenance (or Quantity Rationing) do?

Minimum Resale Price Maintenance: $p = p^f \geq d$

Now demand is:

$$Q = \sqrt{(A_1 + A_2)} - p^f$$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Assume that quantity demanded is split evenly between the two retailers. The only strategic variable for the retailers is A. Thus, writing profits as a function of A and finding the F.O.C. yields:

$$\pi_i = \frac{\sqrt{(A_i + A_j)} - p^f}{2}(p^f - d) - A_i$$

F.O.C.:

$$0 = \frac{\partial \pi_i}{\partial A_i} = \frac{p^f - d}{4\sqrt{(A_i + A_j)}} - 1$$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Note that we can only identify the sum of $A_1 + A_2$ and not A_1 and A_2 individually.

But the idea is that retailers will compete on promotion now. As long as $p^f > d$ then at least one retailer has an incentive to advertise, and the totaldollars spent on ads increases with the markup.

Thus, we can induce dealers or retailers to allocate resources for promoting the product, or exert other forms of effort in distributing the product.

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Examples of minimum RPM, also sometimes called "Telser special services":

- perfume
- cameras
- Coors beer
- Windows 98, Windows XP, Vista
- books
- many, many retail products (toys, electronics, etc.)

Important court cases include:

- Miles Medical v. John Park and Sons (1911) (per se)
- Leegin Creative Leather Products v. PSKS (2007) (rule of reason)

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Note that the problem of downstream moral hazard was that competition between the retailers resulted in too much competition downstream, so that firms could not afford to advertise as a vertically-integrated firm would choose to do.

Another (non-price) way around that: Exclusive Territories or "Territorial Dealerships"

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Simple Model of Exclusive Territories:

- Manufacturer must choose whether to grant dealerships to several or one dealer(s).
- A similar literature looks at these decisions in the context of licensing for inventors. (i.e., when I invent a new product, do I want to sell it myself, license it exclusively to a retailer/distributor, or license it to many competing retailers?)

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Model:

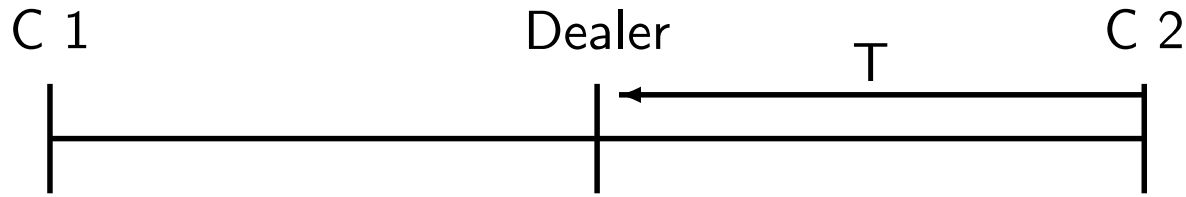
Assume mfg's production cost $c = 0$
The wholesale (linear) price is d (strategy variable of the mfg)
There is a fixed cost to setting up a dealership given by $F > 0$

Consider an 'address' model of differentiated products with consumers located along a line:

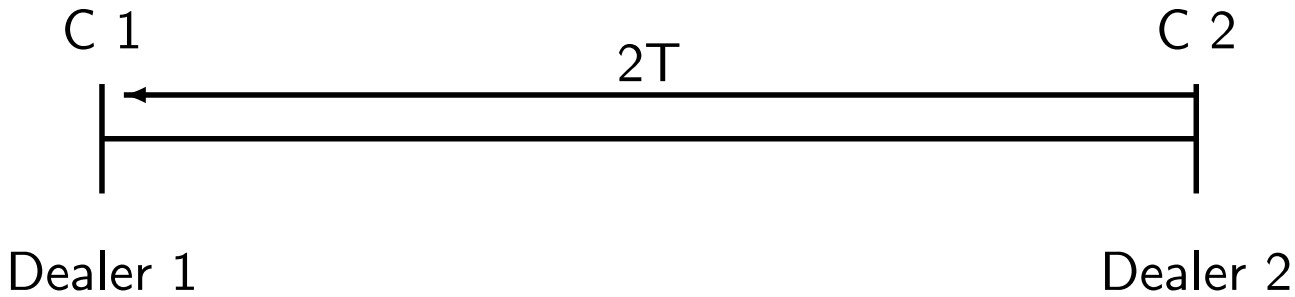
Here, consider 2 consumers located at the edge of town.

Downstream Moral Hazard, or Externalities from Intrabrand Competition

The manufacturer must decide whether to license a single dealer in the center of town:



Or two dealerships at the edges of town:



Downstream Moral Hazard, or Externalities from Intrabrand Competition

Assume the travel costs for a consumer of travelling from either edge of town to the center are T.

Also assume that consumers have the same basic value for the product, = B.

Thus, the utility functions of the consumers are:

$$u^i = \begin{cases} B - T - p & \text{buy from a center dealer} \\ B - p_i & \text{buy from local (edge) dealer} \\ B - 2T - p_j & \text{buy from other side of town} \\ 0 & o.w. \end{cases}$$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Let's work out profits in each case.

Dealer(s) choose p (retail price to consumers)
Manufacturer chooses d (wholesale price to dealers)

<u>Exclusive 'Town-center' Dealer</u>
Dealer's task is easy: extract all consumer surplus

$\Rightarrow$ p = B - T
Q = 2
π_d = 2(p - d) = 2(B - T - d) - F
(don't forget fixed cost)

Mfg's problem – $*$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Two Edge–of–Town Dealerships

2 cases: large town, and small town
(Really these are towns with high or low transportation costs, or possibly high/low search costs for consumers. . .)

Case I: Large Town

Define a large town as one in which T $> \frac{F}{4}$

Define a small town as one in which T $< \frac{F}{4}$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

* Manufacturer's problem in the case of 'Town Center' Dealer:

max d π_m = d· Q

Subject to π_d = 2(B - T - d) - F $\geq$ 0 (1)

(Zero-profit condition for the dealer).
Suppose this constraint is satisfied exactly. Then:

d* = B - T - $\frac{F}{2}$ (rearranging (1))

$\Rightarrow$ π_m = (B - T - $\frac{F}{2}$)· 2

$\boxed{\pi_m = 2(B - T) - F}$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

We want to find an equilibrium in which the two dealers do not undercut each others' prices. Thus, we want to find an equilibrium s.t.

$\pi_1 = p_1$ -d - F $\geq$ 2((p_2 - 2T) -d) - F
(Profit to firm 1 is higher if they don't undercut firm 2 and take all of firm 2's customers), and (vice versa).

$\pi_2 = p_2$ - d - F $\geq$ 2(p_1 - 2T - d) - F
(same requirement for firm 2)

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Large town ($T > \frac{F}{4}$)

In this case, subsidizing the consumers' transportation cost is too expensive (you have to reduce your price by a lot). So we can support the equilibrium above.

Thus, consumers have w.t.p. = B (i.e., utility = B - p)

Dealer charges p = B, extracting all consumer surplus.

Dealer profits are p - d - F = π

Therefore $\boxed{\pi = B - d - F}$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

What is the optimal wholesale price (d) for the manufacturer to charge?

Dealer will stay in business as long as $\pi \geq 0$. So, if mfg. changes d = B - F, dealer makes:

π = B - d - F
= B - (B - F) - F
= 0

Manufacturer extracts all rents by setting d = B - F
(i.e., mfg extracts all the consumer's w.t.p. from the dealer, but allows the dealer to cover fixed costs)

Downstream Moral Hazard, or Externalities from Intrabrand Competition

By the way, check that this is an undercut-proof equilibrium!
p_1 - d - F $\geq$ 2(p_2 - 2T - d) - F, and
p_2 - d -F $\geq$ 2(p_1 - 2T - d) - F

Notice that
p_1 - d - F $\geq$ 2(p_2 - 2T - d) - F
$\Rightarrow$ B - B + F - F $\geq$ 2(B - 2T - B + F) - F

which holds if

0 $\geq$ 2B - 4T - 2B + 2F - F

$\Rightarrow$ 4T $\geq$ F, or T $\geq \frac{F}{4}$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Finally, profits of the mfg. are:
π_m = 2d
= 2(B - F)

What should the mfg. do? Set up 1 dealership or two?
π_m of 1 dealership = 2(B - T) - F
π_m of 2 dealerships = 2(B - F)

Therefore, a single dealership is more profitable if
2B - 2T - F $>$ 2B - 2F
$\Rightarrow$ $\boxed{\text{F} > 2\text{T}}$
And we're in a large town, so that
$\boxed{\text{F} < 4\text{T}}$

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Large Town: Result

- If F ϵ [2T, 4T] we set up a single dealership in a large town.
- If F $<$ 2T, we set up 2 dealerships at the edges of a large town.
- Intuition: If the sunk costs of establishing a dealership are high, we will only set up 1.

Downstream Moral Hazard, or Externalities from Intrabrand Competition

Now in a small town, it is too hard to commit to not undercutting price, since the consumers on the other side of town don't have far to go to get to your dealership.

In the small town case, we almost always chose a single dealership.

Recall $F > 4T$ for the small town, so

$\Rightarrow$ if $F < 2T$: two dealerships
if $F > 2T$: single dealership

Downstream Moral Hazard, or Externalities from Intrabrand Competition

One contractual way to get around this problem is to set up exclusive territories so that two dealerships are simply not allowed to compete with each other. (i.e., we contract around the problem of intrabrand competition)

In the previous example, each dealer becomes a monopolist on his half of the linear market, so the profit condition now becomes:

$$\pi_{d,i} = \text{B - d - F} \geq 0$$

He is contractually prohibited from stealing consumers from dealer j.

Interbrand Competition, and the use of Exclusive Dealing and Full-line Forcing

Interbrand competition is what we have in mind in exercises that ignore retail markets: competition between different brands of cereal at the grocery store, for example.

There are two ways in which vertical restraints may be used.

1. Efficiency
2. Anti-competitive foreclosure incentives upstream

The Asker paper on beer examines these issues.

Legal Issues

- There are many ambiguities in the legal treatment of vertical contracts.
- Until 1970s, RPM and E. Territories were per se illegal under Sherman Act.
- But many states passed fair trade laws that were interpreted to cover some of these cases.
- Furthermore, the Khan case in 1997 switched Maximum RPM to a "rule of reason" status, as did the Leegin Leather Products case in 2007 for Minimum RPM.

Legal Issues

Thus, although price fixing remains per se illegal, it's not always applied in vertical settings because it conflicts with free-trade notions between mfgs and their distributors.

Non-price issues have been generally accepted to be ok by the courts. Decisions turn on arguments about efficiency vs. anti-competitive effects.

- Exclusive territories
- Refusal to deal
- Foreclosure, etc.