**Introduction to Industrial Organization**
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**Lecture Note 17**

Last lecture we examined merger between similar firms (horizontal mergers). Saw that all else equal such mergers increases market power and therefore prices.

Today begin talking about vertical mergers:
We usually think of firms as selling to consumer but in reality most firms sell to other firms.

- Sony sells TVs to Best Buy who sells them to consumers
- Farmers sell produce to restaurants who sell them to consumers
- Etc

When we model these types of markets, we use the following vocabulary:

Upstream➔Downstream(360buy.com)➔consumers

- Relationship b/w US and DS firms fundamentally different than relationship b/w DS firms and consumers because
    1. The value of US firms product no longer fully under the control of US firm: Utility consumer get from Sony TVs depends on price, advertising, customer service, etc. A lot of this is determined by 360buy.com!
    2. DS firms compete with each other. The value of the US firms product to DS firms depends on the prices that all DS firms pay to US firms. Remember that a firm's profits in oligopolistic models depend on all firms' costs in equilibrium.

There are three ways US and DS firms can manage these vertical relationships:

1. DS&US firms can vertically integrate (i.e. merge)
2. DS&US firms can write contracts with each other (called vertical restrictions) that yield outcomes similar to merger.
3. DS&US firms can just rely on market forces, compete with each other.

We will go over a few scenarios under which vertical integration occurs and discuss whether it is welfare improving. Then we will discuss different types of vertical restrictions.

Reason #1 for integration-Elimination of Double marginalization:

- When US and DS firms have market power, prices are marked up twice. If there is vertical integration, prices are marked up above cost once; DWL reduced.

Setup:

- An US monopolist produces a good X at constant marginal cost w
- A DS monopolist purchases X from US firm at price c. He then transforms X into q according to q=F(X)=X.
- Consumer demand q from DS firm according to p=a-bq.

Suppose first that the US and DS firm are integrated. Then one firm produces the input at cost w, turns it into output, and sells it to consumers. Standard monopoly problem:

$$\pi^{VI} = (a - bq - w)q$$

$$\frac{d\pi^{VI}}{dq} = a - w - 2bq = 0$$

$$q^{VI} = \frac{a-w}{2b} \qquad p^{VI} = \frac{a+w}{2} \qquad \pi^{VI} = \left(\frac{a-w}{2}\right)^2 \left(\frac{1}{b}\right)$$

Now let's examine the non-integrated problem.
Given a price c that the US firm sets for the DS firm,

DS solves: $\pi^{DS} = (a - bq - c)q$ $\qquad q^{DS} = \frac{a-c}{2b} \qquad p^{DS} = \frac{a+c}{2}$

DS firm's output given US firm's price. Can use this function to derive the demand curve that US faces.

Given a price c, US will sell (a-c)/2b units of X. US maximizes:
$\pi^{US} = (c(X) - w)X = (a - 2bX - w)X$

$$\frac{d\pi^{US}}{dX} = a - w - 4bX = 0$$

$$X^{US} = \frac{a-w}{4b}$$

$$C^{US} = \frac{a+w}{2}$$

So the final product price is equal to $(a+c^{US})/2=(3a+w)/4=p$
Notice that the vertically integrated price is lower than the non vertically integrated price:

$$p^{VI} = \frac{a+w}{2} < \frac{3a+w}{4} = p^{NONVI}$$

➔w<a  true if maximal WTP>cost.

So consumers are made better off by a merger because US&DS!

What about firm profits? After a merger, $\pi^{VI} = \frac{(a-w)^2}{4b}$

After some algebra, premerger $\pi^{US} = \frac{(a-w)^2}{8b} \qquad \pi^{DS} = \frac{(a-w)^2}{16b}$

So total profits are lower pre-merger than post-merger! Merger causes welfare to go up. The reason this merger makes everyone better off is because of the double markup.

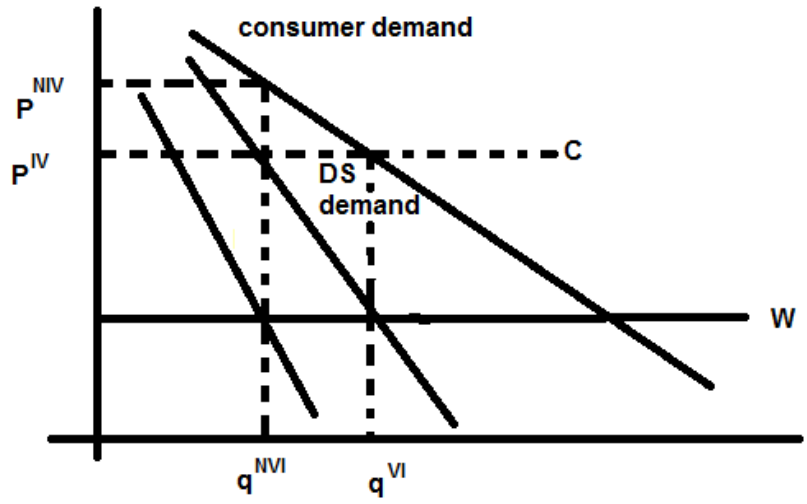


**Figure 11.e1 Vertical relationship**

DS demand for input lies beneath consumer demand since DS firm would never be willing to pay more than consumers. DS demand from US=marginal revenue of consumer demand since given any c chosen by US, DS firm will choose q based on consumer demand.

- In the above graph, consumer demand given by p=a-bq. Thus marginal revenue for the VI monopolist is equal to p=a-2bq. This marginal revenue is equal to the DS firms demand from the US firm before VI. The US firm choose $q^{NVI}$, which is chosen based on the intersection of a-4bq=w. This is where the term "double marginalization" comes from. Prior to integration, the DS firm charges a mark up on the US firm's markup.
- Prior to integration, these double markups cause output to fall below monopoly profits. The only way that monopoly profits can be obtained is if the US firm changes a price c=w to the DS monopolist. But US would never do that b/c it leaves US firm with zero profits.

Thus the only way that the US firm can profitably get DS firm o behave as if c=w is to merge with the DS firm. If US firm offers to purchase DS firm for $(a-w)^2/16b$, then DS firm will accept. Then merged firm can obtain the maximized monopoly profits.

-Note: US firm could also use more sophisticated pricing policies. Can earn monopoly profits by changing a two part tariff with $F=(a-w)^2/4b$ and c=w.

How does the economic rationale for vertical integration change as DS competition intensifies?

Suppose the DS is perfectly competitive… If US firm charges a price c, then this will be the perfectly competitive price that consumers pay. To maximize profits, the US firm should charge $c=p^{VI}=(a+w)/2$. US will then earn $(a-w)^2/4b$.

Result: As DS competition goes up, the price set by the US firm increases, the double marginalization problem becomes less severe and there is less incentive for vertical integration.

Other reasons for vertical integration:

- Price discrimination
  a. Suppose the US firm is selling its input to two separate DS markets. Suppose it is optimal for US to charge c1 to the DS firm in market 1 and c2<c1 to DS firm in market 2. US firm has an incentive to charge a higher price in market 1 b/c of higher demand.
  b. If resale between markets 1 and 2 is possible, this price discrimination is not possible.
  c. The US firm can vertically integrate with one of the two firms. If US firm purchases DS firm in market 2, it doesn't have to worry about resale to DS firm in market 1.
- Externalities and transaction costs
  a. Many market relationships involve transaction costs and uninternalized externalities
  b. Vertical integration can reduce these transaction costs or cause these externalities to be internalized.
  c. For example, consider a manufacturer distribute its product through a DS firm. The manufacturer benefits from DS firm's attempts to improve product quality(through advertising, customer service, improving store quality, etc.) Since the DS firm doesn't internalize this positive externality, it has incentive to under-provide these things. By vertically integrating, the US firm obtains direct control.
  d. The market failure can also work in the opposite direction. Suppose a DS firm purchases an input from a US firm. The quality of this input is difficult to monitor and depends on investments made by the US firm. Can see that the US firm doesn't always have strong incentives to invest in the quality of the input it produces b/c it can't internalize the returns from its investment.
  e. Assume US firm can make costly investment ($1) in improving quality of input. This investment cost is a sunk cost.
  f. After US firm makes its investment decision, US&DS firm negotiate a price of the input as follows:
     1. Input has value to DS of v
     2. Input has marginal cost to US of mc
     3. US and DS negotiate a price that splits the surplus: c=mc+1/2(v-mc)
  g. Because quality investment is sunk, it is hard for the US firm to reap any gains from it. Specification below shows that even though it is efficient for US firm to make investment, it doesn't:

| Quality Investment | V | mc | US revenue | US cost | US profit | Surplus |
|---|---|---|---|---|---|---|
| NO | 3 | 2 | 2.5 | 2 | 0.5 | 1 |
| YES | 4 | 1.5 | 2.75 | 1+1.5 | 0.25 | 1.5 |

h. US firm has weak incentives incur fixed cost b/c it might be hard to set DS firm to pay it a higher price. US firm can't take back its quality investment.
i. To set US firm to make investment, DS firm might purchase it. B/c note that DS firm is better off if US firm makes investment.

Vertical relationship

- US firms can impose restrictions on DS firms ("you do this, or we will stop selling our inputs to you") with the same effect as integration.
- These vertical restriction are just sophisticated pricing policies. We already saw how US firm can use a two part tariff to eliminate the double marginalization problem.
- First restriction – Resale Price Maintenance (RPM) is a practice whereby US firms impose minimum or maximum prices on DS firms. i.e., US firm tells DS firms they can not charge consumers a price below $\underline{p}$ for the final product.
- Easy for US firm to use RPM to eliminate the double marginalization problem. US firm can restrict DS firm from charging a price greater than $p^{VI}$ and then set $c=p^{VI}-e$. The DS firm will then be forced to charge $p^{VI}$ which maximizes industry profits. US firm able to extract most of those profits from DS.
- In previous section, noted that vertical integration eliminates externalities due to customers service and advertising incentives. This works very well when DS firm is a monopolist and his customers service investments only impose a positive externality on the US firm. But what happens when DS firm is not a monopolist?
  If the DS firm is not a monopolist, then his investments in quality impose positive externalities on his DS competitors. For example, if 360buy.com invests a lot of resources in their customer service, Wal-Mart can free-ride on 360buy.com investments. Customers learn about products at 360buy.com. Then Wal-Mart can undercut 360buy.com and steal 360buy.com customers. Knowing this, 360buy.com won't invest in improved customer service.
- To deal with this type of externality the US firm (Sony) would have to vertically integrate with all DS firms (360buy.com and Wal-Mart). Instead US firm can rely on RPM arrangements. By setting a $\underline{p}$, US firm can make it harder for DS firms to undercut each other. This reduces the disincentive to under-invest in customer service.

The model below illustrates this point.

Two DS firms compete in Bertrand fashion. They have marginal costs c, which is the price paid to US for its inputs. Assume that demand is inelastic. $Q(p)=M+cs1+cs2$ if $p<=1$ and $Q(p)=0$ if $p>1$ where cs1 and cs2 are the two DS firms investments in customer service, which increases demand but costs the firms $cs^2$.

In the absence of RPM:

- Bertrand competition drives profits to zero.
- No incentive to invest in cs. If cs1>0 and cs2=0, firm 2 can undercut firm 1 leaving firm 1 with negative profits.
- Thus, the DS equilibrium is p1=p2=c and cs1=cs2=0
- Anticipating this, US firm sets c=1 and earns profits equal to m(1-w)
- Consumers surplus equal to

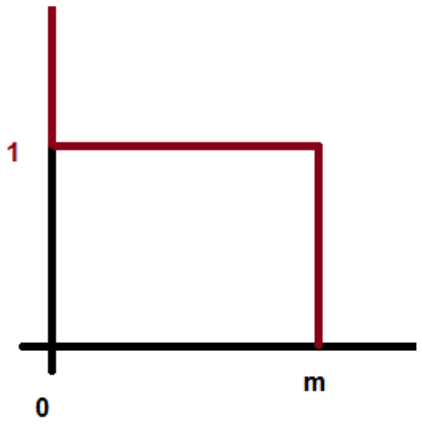


**Figure 11.e2: demand**

Now suppose that the US firm engages in RPM. Specifically it requires that both DS firms set p=1. Now the downstream firms profits are equal to

$$\pi_{DS1} = (1-c)\frac{m + cs1 + cs2}{2} - cs1^2$$
$$\pi_{DS2} = (1-c)\frac{m + cs1 + cs2}{2} - cs2^2$$

Both firms charge p=1 so they split the market given their CS decisions. Note that they now have incentives to invest in CS since they won't be undercut. Now they get to benefit from their CS investments.

$$\frac{d\pi_{DS1}}{dcs1} = \frac{1-c}{2} - 2cs1 = 0$$
$$cs1 = \frac{1-c}{4}$$
$$cs2 = \frac{1-c}{4}$$

So total demand equal to m+(1-c)/2. Given DS firms' anticipated behavior, US firm choose c to maximize profits.

$$\pi_{US} = (c-w)[m + \frac{1-c}{2}]$$

$$\frac{d\pi_{US}}{dc} = \left[m + \frac{1-c}{2}\right] - \frac{1}{2}(c-w) = 0$$

$$c^* = \begin{cases} m + \frac{1}{2} + \frac{1}{2}w & if\ m + \frac{1}{2} + \frac{1}{2}w < 1 \\ 1 & otherwhise \end{cases}$$

- Assume that w=0 and m<1/2 so that c<1 and the DS firms are incentivized to set cs=0.
- Then $\pi_{US} = (c-w)\left(m + \frac{1-c}{2}\right) = \frac{(m+\frac{1}{2})^2}{2}$
- Easy to verify that they US firm's profits are greater under RPM are greater than in the absence of RPM.
- The DS firms are now earning positive profits since p=1 and c<1.
- Consumers still earning zero surplus, but that is only because of our simplifying assumption that demand=0 if p>1. Made model easier to solve. If we relaxed it consumer would be made better off too.

⇨ RPM allows DS firms to benefit from quality investments. Everyone made better off!

Last type of vertical restriction: Exclusive territory agreements

- Suppose that DS firms are geographically differentiated.
- Firm 1 located in town 1, firm 2 located in town 2.
- Same incentive problems with quality investments exist as before. If 1 invests in customer service, 2 will free ride on 1. Undercut firm 1 and steal all those customers who live in town 1 but are willing to travel to town 2.
- The US firm can use exclusive territory agreements to create local monopolies. Firm 1 can only sell to town 1 residents. 2 can only sell to town 2 residents. Now, the DS firms can reap the benefits of their quality investments.

Thus far, vertical integration and vertical restrictions have been shown to improve welfare. Are there scenarios under which they are not?

Foreclosure

- Vertical restriction can be used by US firms to gain market share from their US rivals.
- Firms can force DS firms to sign "exclusive dealing" agreements:"you sell only our products or we won't supply you."

  Example: Cola markets. Restaurants usually sell Coke or Pepsi but not both. This is the result of an exclusive dealing agreement. If Coke signs an exclusive deal with McDonalds, Pepsi is foreclosed out of the fast food market.

  Is this type of deal anticompetitive? Coke says no. "You can't serve two masters; we pay the distributors a fee to supply our customers and, as such, they are out agents and

an extension of Coke Cola. In other words, if McDonalds supplies Coke and Pepsi they don't have incentives to efficiently promote Coke.

On the other hand, there is Microsoft. In 1990, Microsoft's MS-Dos had a 70% market share. Rivals IBM and DRI had the other 30%. To increase market share, Microsoft imposed vertical restrictions on DS computer manufacturers. Microsoft signed contracts with DS manufacturers requiring they pay a fee F to Microsoft for every computer built regardless of whether the computer had MS-DOS installed. As a result, the effective marginal cost of MS-DOS was zero.

- Strategy foreclosed other US manufacturer out of the market. By 1990, their market share increased to 81%.
- In 1994 the DOJ brought a case against Microsoft and they agree to end these types of vertical restrictions.

Vertical restrictions can also be used to facilitate collusion.

- Assume the DS firms compete in Bertrand fashion.
- US firm sells input to DS firms at cost c. So equilibrium price will be p=c.
- Let $p^M$ be the collusive price that maximizes DS profits. The US firm can generate the collusive outcome by employing retail price management and setting $\underline{p}=p^M$

So vertical restrictions can increase or decrease welfare. Are they legal?

- In 1967 Supreme Court made vertical restraints illegal. In 1977 they reversed this decision and decided they should be evaluated case by case.
- During the Bush-Reagan years (1980-1992), deregulation led to new rules on restraints.
- In 1993, Clinton years, DOJ withdrew Reagan's 1985 vertical restraints Guidelines. But Supreme Court decisions in 1990s made it harder to make price restraints (RPM) illegal. In 1997 Supreme Court ruled that maximum prices set by US firms were legal.