EC 326 - Lecture 11&12

Vertical Restraints and Vertical Mergers
What are vertical restraints?

- In most markets producers do not sell directly to consumers but to retailers who then sell to consumers.

- Some producers produce intermediate goods that are assembled into a final product (e.g. cars)

- Vertical restraints: the contracts signed between firms in the supply chain.
Why are special arrangements necessary?

- The profits obtained by the producer depend also on actions taken further down in the supply chain; there are externalities.

Questions:

- positive: what measures can be used to correct for externalities?

- normative: should such measures be prohibited or not?
**Typical vertical restraints:**

- Nonlinear pricing; Franchise fees.

- Quantity discounts

- Resale Price Maintenance

- Quantity Fixing

- Exclusivity clauses

- exclusive territories: a single retailer is given the right to sell

- exclusive dealing: retailers agree to carry only the manufacturer’s brand
• selective distribution clauses: only high-street sellers are allowed to carry the product

Notice: analysis of vertical restraints requires also an analysis of vertical mergers. Otherwise firms can substitute mergers for contracts.
A basic distinction for the analysis of vertical restraints:

- Within the supply chain or between competing supply chains? (Intra-brand versus Inter-brand)

Anticipating our main conclusion:

- Vertical restraints affecting only Intra-brand competition are generally good for welfare; vertical restraints affecting inter-brand competition are welfare reducing. Moreover, vertical restraints are generally welfare reducing only if the amount of market power is sufficiently high.

- Implication for competition policy: investigation necessary only if market power is found sufficiently high; rule of reason for those cases where investigation is necessary.
Intra-brand competition

The basic problem: double marginalization

Suppose a producer relies on a retailer to sell his product.

The producer has constant marginal costs of production.

For simplicity, the retailer has zero marginal costs of production.

Suppose there is only one producer (behaving like a monopolist) and only one retailer (also behaving as a monopolist).

Let $p$ be the retail price set by the retailer.

Let $w$ be the wholesale price set by the manufacturer.

Finally, let $c$ be the marginal cost of the producer.
Analysis

The decentralized structure

At stage 1, the producer sets \( w \) given its cost and the anticipated demand for its product.

At stage 2, the retailer sets \( p \) given its own cost, which is exactly \( w \).

Suppose demand is linear and given by \( q(p) = a - p \)

Analysis by backward induction:
The problem of the retailer at stage 2 is

$$\max_p \Pi_R = (p - w)(a - p)$$

Solution is

$$p^m = \frac{a + w}{2}$$

equivalently, the optimal quantity is

$$q^m = \frac{a - w}{2} \quad (1)$$

Profit at the optimum is

$$\Pi^m_R = \frac{(a - w)^2}{4}$$
When we vary $w$, we can view (1) as a demand function for the manufacturer’s product

$$q(w) = \frac{a - w}{2}$$

This demand function is the relevant demand function for the producer’s problem at stage 1:

$$\max_w \prod P = (w - c) \frac{a - w}{2}$$

The optimal wholesale price is

$$w^m = \frac{a + c}{2}$$

The quantity sold at the optimum to the retailer is

$$q^m (w^m) = \frac{a - \frac{a+c}{2}}{2} = \frac{a - c}{4}$$
Using the optimal values we can calculate the profit obtained by the manufacturer:

\[ \Pi_P^m = \frac{(a - c)^2}{8} \]

Plugging the optimal wholesale price into the retailers profit function, we obtain the retailers profit

\[ \Pi_R^m = \frac{(a - \frac{a + c}{2})^2}{4} = \frac{(a - c)^2}{16} \]

The joint profits of producer and retailer are

\[ \Pi_P^m + \Pi_R^m = \frac{3}{16} (a - c)^2 \]
The integrated structure:

Compare this to what an integrated firm would do:

\[
\max_p \Pi_I = (p - c)(a - p)
\]

Solution is

\[
p^* = \frac{a + c}{2}
\]

which gives rise to a quantity sold of

\[
q^* = \frac{a - c}{2}
\]

and a profit of

\[
\Pi_I^* = \left(\frac{a + c}{2} - c\right) \left(a - \frac{a + c}{2}\right) = \frac{(a - c)^2}{4}
\]
Comparison:

- Welfare is lower when the two firms are separated than when they are integrated. Why?

- Prices paid by consumers are higher: therefore consumer surplus is lower.

- Joint profits of manufacturer and retailer are lower than the profit of the integrated firm.

Economics: each firm in the chain increases its price above its marginal cost in order to extract some rents from its buyer(s). As a result there are two markups over marginal costs rather than one. This is called double marginalization.
Vertical Restraints as a solution to the double marginalization problem

Various measures can be used to implement the centralized solution in a decentralized structure:

**Resale price maintenance (RPM):** Producer fixes the resale price at $p = p^* = \frac{a+c}{2}$.

- Notice that this fixes also the quantity that final consumers want to buy: $q = q^* = \frac{a-c}{2}$.

- The wholesale price merely distributes rents between producer and retailer, but has no effect on efficiency.

- An alternative is to set a price ceiling $p \leq p^*$. Since the retailer always sets the highest price within this range, this amounts to the same thing.
Quantity fixing: producer fixes the quantity the retailer has to buy from the producer at $q = q^* = \frac{a-c}{2}$.

- Notice that this also fixes the price at $p = p^* = \frac{a+c}{2}$.

- Again, the wholesale price merely distributes rents between producer and retailer, but has no effect on efficiency.

- An alternative is to set a quantity floor, $q \geq q^*$. Since the retailer always sets the lowest quantity within this range, this amounts to the same thing.
Franchise Fee (FF). The producer sets a two part tariff $F + wq$.

- The optimal way to sell is to set $w = c$ and extract rents from the retailer through $F$.

- Under this contract, the retailer’s profit function takes the form

$$ (p - c)(a - p) - F $$

- Observe that $F$ does not influence the choice of $p$ because at that stage $F$ is sunk.

- Joint profits are exactly as high as under an integrated structure.
Horizontal Externalities between Retailers

- Some products require special efforts by the retailers;

- consumers appreciation of the manufacturer’s product is increased when retailers spend a lot of effort, e.g., because they learn their exact demand.

- Problem: consumers can obtain information from one retailer but then buy the product from another retailer.

- The second retailer can save on the costs of providing services. The first retailer would make a loss.

- As a result no service at all is provided in equilibrium.

- Profits of the manufacturer are inefficiently low because consumers buy too little.
A simple model

To illustrate these issues, suppose market demand is of the form

\[ q(e, p) = (v + e) - p \]

where

\[ e = e_1 + e_2 \]

Retailers costs are

\[ C(q_i, e_i) = wq_i + \mu \frac{e_i^2}{2} \]

where \( \mu > 1 \).

We consider three cases in turn: separation (s), integration (i), and vertical restraints (v).
Separation

In case firms are separated, there can only be one equilibrium: \( e_1 = e_2 = 0 \). Why?

Bertrand competition between two retailing firms drives retail prices down the wholesale price \( w \).

Since effort \( e_i \) is sunk at that stage, firms do not capture benefits in return to their investments. Hence, no investment is undertaken in equilibrium.

Reason: effort is a pure public good.
Anticipating the equilibrium between downstream firms, the manufacturer calculates that the market demand is

\[ q(w) = v - w \]

The optimal wholesale price is

\[ w^* = \frac{v + c}{2} \]

Profits, consumer surplus, and total welfare are equal to, respectively

\[ \Pi_P = \frac{(v - c)^2}{4}; \quad CS = \frac{(v - c)^2}{8}; \quad WS = \frac{3}{8} (v - c)^2 \]
Integration

Suppose the three firms are integrated. Then, the externalities between firms can be internalized.

The problem of the integrated firm is

$$\max_{p, e_1, e_2} \Pi^i = (p - c)(v + e_1 + e_2 - p) - \mu \frac{e_1^2}{2} - \mu \frac{e_2^2}{2}$$

The first-order conditions for the optimal choices $p^i$, and $e_i^i$ are

$$(v + e_1 + e_2 - p^i) - (p^i - c) = 0$$

and

$$(p - c) - \mu e_i^i = 0$$
Solving this system for a symmetric solution:

\[
(v + 2e^i - 2p^i + c) = 0
\]

\[
e^i = \frac{(p^i - c)}{\mu}
\]

Substituting back the solution for \(e^i(p^i)\) into the first condition for \(p^i\), we have

\[
v\mu + 2\left(p^i - c\right) - 2p^i\mu + c\mu = 0
\]

which gives the equilibrium price

\[
p^i = \frac{\mu(v + c) - 2c}{2(\mu - 1)}
\]

Substituting back into the effort condition, gives us

\[
e^i = \frac{\mu(v+c) - 2c - c2(\mu-1)}{2(\mu-1)} = \frac{(v - c)}{2(\mu - 1)}
\]
Substituting back into the demand function, the total demand will be

\[ v + 2e^i - p^i = \frac{\mu (v - c)}{2 (\mu - 1)} \]

and each retailer will sell half of the quantity demanded by the market, that is

\[ q^i = \frac{\mu (v - c)}{4 (\mu - 1)} \]

With this information, we can compute profits and consumer surplus:

\[ \Pi^i = \frac{\mu (v - c)^2}{4 [\mu - 1]}, \quad CS^i = \frac{\mu^2 (v - c)^2}{8 [\mu - 1]^2}, \quad W^i = \frac{\mu (3 \mu - 2) (v - c)^2}{8 [\mu - 1]^2} \]

Vertical integration is obviously more efficient (it is not possible to do better than an integrated firm!)
Vertical restraints

Can vertical restraints replicate the integrated solution?

Are vertical restraints good or bad for welfare?

Exclusive Territories and Franchise Fee

Suppose the market is split with each supplier receiving half the number of consumers.

In addition, downstream retailers face a two-part tariff of the type $T = wq + F$, with $w = c$.

The objective of the downstream firms becomes

$$\max_{p_i, e_i} \Pi_{et} = (p_i - c) \left( \frac{v + e_i + e_j - p_i}{2} \right) - \mu \frac{e_i}{2} - F$$

where $et$ is short for exclusive territories.
The upstream firm can implement the right downstream prices this way (given the level of effort), but not the right level of effort downstream.

To see this, look at the first-order conditions

\[(v + e_1 + e_2 - p_i^{et}) - (p_i^{et} - c) = 0 \quad \text{(f.o.c. price)}\]

and

\[\frac{(p_i - c)}{2} - \mu e_i^{et} = 0 \quad \text{(f.o.c. effort)}\]

Due to the externalities between the downstream firms, the first-best cannot be implemented.
Notice that we cannot implement the optimal level of effort by having one exclusive retailer either, due to diseconomies of scale in effort provision.

If there is only one retailer, the effort level is too low.

The solution to the retailer’s problem is characterized by the system

\[(v + e_1 - p_i^{et}) - (p_i^{et} - c) = 0 \quad \text{ (f.o.c. price)}\]

and

\[(p_i - c) - \mu e_1^{et} = 0 \quad \text{ (f.o.c. effort)}\]
Resale Price Maintenance and Franchise Fee

The upstream supplier can implement the desired choices of effort by imposing the downstream prices at the retailers and offering a nonlinear price $T = wq + F$ with $w < c$.

The objective of the downstream firms becomes

$$\max_{e_i} \Pi_{rpm} = (prpm - w) \frac{(v + e_i + e_j - prpm)}{2} - \mu \frac{e_i^2}{2} - F$$

where $rpm$ is short for resale price maintenance. The first-order condition for effort becomes

$$\frac{(prpm - w)}{2} - \mu e_i^{rpm} = 0 \quad \text{(f.o.c. effort)}$$
Solving for the equilibrium effort we obtain

\[ e_{rpm} = \frac{(prpm - w)}{2\mu} \]

Obviously the retailers prices must be set at the vertically integrated solution, so

\[ prpm = p^i = \frac{\mu(v + c) - 2c}{2[\mu - 1]} \tag{2} \]

Moreover, we also need equality of the effort levels, so

\[ e_{rpm} = \frac{(prpm - w)}{2\mu} = e^i = \frac{v - c}{2[\mu - 1]} \tag{3} \]

Using (2) and (3) we can solve for the wholesale price: we find

\[ w_{rpm} = \left( \frac{\mu(-v + 3c) - 2c}{2[\mu - 1]} \right) \]
Given our assumptions, we have

\[ w = \frac{\mu (-v + 3c) - 2c}{2[\mu - 1]} < c \]

\[ \Leftrightarrow \mu (-v + 3c) - 2c < 2[\mu - 1]c \]

\[ \Leftrightarrow c < v \]

**Economics:** The retailers have insufficient incentives to supply effort due to the externalities between them. Therefore the margin of profit on each unit of effort must be increased. The manufacturer achieves this goal by reducing his margin on each unit sold to them. Since he can extract any profit the retailers make by increasing \( F \), increasing their incentives at the margin does not reduce the manufacturer’s profit.
Resale Price Maintenance plus Quantity Fixing

Under some conditions, the manufacturer can implement the solution that would arise under integration through RPM combined with quantity fixing.

The manufacturer sets the resale price at $p_i$, the price that would be set by the integrated structure. The retailers are required to buy at least $q_i$, but are allowed to buy any quantity in excess of that at price $w$. 
Other Efficiency Reasons for Vertical Restraints and Vertical Mergers

- Quality Certification
- Free Riding among Producers
- Restraints which remove Opportunistic Behaviour and Promote Specific Investments
Conclusions from the analysis of Intra-brand competition

Vertical Restraints are mostly welfare improving (although one can give counterexamples)

Certainly, investigation is only required if there is sufficient market power.