Vertical Restraints and Inter-Brand Competition
Vertical Restraints and Inter-brand competition

The result of the previous lecture are valid within an isolated vertical chain.

What if there is competition between vertical chains?

Vertical restraints will change the strategic interaction among competing downstream firms.

Purpose of today’s lecture:

positive: understand the functioning of inter-brand competition

normative: develop policy implications: is there a need to intervene?
Questions for the analysis:

Positive:

Impact of different types of restraints on competition for different forms of competition

Normative

Welfare effects of vertical restraints: should they be prohibited or are they welfare enhancing?

Main results:

The effects depend on the form of competition (strategic substitutes versus strategic complements)

Effects tend to be diminished with the competitiveness of the industry (as measured by the number of competitors)
A model of the strategic use of vertical restraints

There are two upstream firms $U_1$ and $U_2$;

and two downstream firms $D_1$ and $D_2$.

We analyze two basic forms of organization: integration and decentralization

Integration: $U_1$ and $D_1$ are integrated into one firm; $U_2$ and $D_2$ are integrated into another firm.

Decentralization: Firm $U_1$ sells to firm $D_1$ only and firm $U_2$ sells to $D_2$ only.
Demand and form of competition

We initially model the strategic interaction as price competition.

The firms $U_1$ and $U_2$ sell differentiated products; competition is in prices.

Demand for good $i$ is

$$q_i(p_i, p_j) = \frac{v - p_i \left(1 + \frac{\gamma}{2}\right) + \frac{\gamma}{2}p_j}{2}$$

The parameter $\gamma \geq 0$ measures the degree of substitution between the goods.
Integration

Under vertical integration, we face a standard model of price competition with differentiated goods.

Manufacturers have zero marginal costs of production.

One can compute the equilibrium in prices:

\[ p^I = \frac{2v}{4 + \gamma} \]

and the associated profits

\[ \pi^I = \frac{(2 + \gamma) v^2}{(4 + \gamma)^2} \]
Decentralization and Two part tariffs

Upstream firms offer two part tariffs of the form

$$F_i + w_i q_i$$

to their downstream firm.

Assume a large number of potential retailers compete for the right to sell the good.

Then, $F_i$ can be set so as to extract all the rent from firm $D_i$. 
We analyze the game under the following assumptions:

In the first stage of the game (once retailers have been chosen), firms $U_1$ and $U_2$ simultaneously offer contracts $\{F_i, w_i\}$ to the downstream firms.

Contracts are observed and cannot be renegotiated.

Then, retailers compete and set simultaneously $p_i$ and $p_j$. 
In the second stage, downstream firms compete, given their marginal costs.

The marginal costs are $w_i$ and $w_j$.

In the first stage, upstream firms set strategically the marginal costs of the downstream firms.

Upstream firms take into account that a change in $w_i$ ($w_j$) shifts the reaction function of their downstream firm.
Formal analysis of the second stage:

Retailers set prices so as to

\[
\max_{p_i} \pi_{D_i} = (p_i - w_i) q_i (p_i, p_j)
\]

The first-order conditions are given by

\[
\frac{\partial \pi_{D_i}}{\partial p_i} = \frac{-2 (2 + \gamma) p_i + \gamma p_j + 2v + (2 + \gamma) w_i}{4} = 0
\]

From these first-order conditions, we can solve for the reaction functions of firms.

The function \( R_2 (p_1) \) denotes firm \( D_2 \)'s best reply. The function \( r_1 \equiv R_1^{-1} (p_1) \) denotes the inverse of firm \( D_1 \)'s best reply.
These functions are

\[ R_2(p_1) = \frac{\gamma p_1 + 2v + (2 + \gamma) w_2}{2(2 + \gamma)} \]

and

\[ r_2(p_1) = \frac{2(2 + \gamma) p_1 - 2v - (2 + \gamma) w_1}{\gamma} \]

An increase of \( w_i \) shifts the best reply outwards.
We can compute the equilibrium prices for given $w_1$ and $w_2$:

$$p_i^* = \frac{2 (4 + \gamma) v + (2 + \gamma) \left(2w_i (2 + \gamma) + \gamma w_j\right)}{16 + 16\gamma + 3\gamma^2}$$

Substituting the equilibrium prices into the demand system, one has the derived demand, $q_i^*(w_i, w_j)$.

The upstream firm’s profit is

$$F_i + w_i q_i^* = (p_i^* - w_i) q_i^*(w_i, w_j) + w_i q_i^*$$

$$= p_i^*(w_i, w_j) q_i^*(w_i, w_j)$$
The upstream firms simultaneously choose $w_i$ to solve

$$\max_{w_i} p_i^* (w_i, w_j) q_i^* (w_i, w_j)$$
The solution has the following features:

\[ w_i^* = w_j^* > c = 0 \]

\[ p_i^* = p_j^* > p^I \]

Welfare is lower.

What is going on:

Upstream producers commit to higher prices (being less aggressive) in the downstream markets.

Higher prices increase overall profits

Consumers pay higher prices and receive less surplus.

Contracts serve as a commitment device

Compare: the general effects of investment choices prior to strategic interactions. (Fudenberg and Tirole AER (1986)).
Similar effects:

Exclusive Territories (Rey and Stiglitz (1988, 1995))

Competition (in the sense of many competing vertical chains) lessens these effects.

Hence, there are substantial (and negative) effects on welfare only if there is significant market power.
Robustness of these results with respect to the form of competition

Interestingly, these results are not robust with respect to allowing for quantity competition at the second stage.

Manufacturer sets prices below marginal costs in order to make retailers more aggressive in the downstream market.

Let the demand be given by

\[ p_i = v - \frac{1}{1 + \gamma} \left( 2q_i + \gamma q_i + \gamma q_j \right) \]
Vertical Integration

Suppose both firms are integrated; then we face a standard Cournot game.

The equilibrium is

$$q_{vi} = \frac{(v - c)(1 + \gamma)}{4 + 3\gamma}$$

with associated per firm profits

$$\pi_{vi} = \frac{(v - c)^2 (1 + \gamma)(2 + \gamma)}{(4 + 3\gamma)^2}$$
Delegation

Each retailer first gives a nonlinear contract, $F_i + w_i q_i$ to its retailer; then, retailers observe contracts and compete.

Second stage:

Each retailer solves the problem

$$\max_{q_i} \pi_i^r = \left(p_i \left(q_i, q_j \right) - w_i \right) q_i$$
Best replies (obtained from solving first-order conditions)

\[ q_1 = R_1 (q_2) = \frac{-2 (2 + \gamma) q_1 + v (1 - \gamma) - w_1 (1 - \gamma)}{\gamma} \]

and

\[ q_1 = R_2^{-1} (q_2) = \frac{-\gamma q_1 + v (1 + \gamma) - w_2 (1 + \gamma)}{2 (2 + \gamma)} \]
Exercise: solve for the equilibrium and the equilibrium profits.

Stage 1: manufacturers set $F_i = (p_i^* - w_i) q_i^*$, where $q_i^*$ is the equilibrium quantity and $p_i^*$ is equilibrium price.

The manufacturers’ problems are

$$\max_{w_i} \{ (p_i^* - w_i) q_i^* + (w_i - c) q_i^* \}$$

One can show that the optimum entails

$$w_i^* < c$$
Economics: each manufacturer wants to render his retailer more aggressive in order to “steal” some of the residual demand from the other retailer.

As a result, equilibrium quantities are higher, equilibrium prices lower, and consumers benefit from vertical restraints.

From the producers’ points of view, the situation is similar to a prisoner’s dilemma. They would be better off if they could not contract with the retailers.
Conclusions from the analysis of Inter-brand competition

Welfare effects of vertical restraints depend crucially on the form of competition.

Is there a need to intervene?