

Industrial Organization 08

Vertical relations

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Vertical relations

Definition of vertical relations

Relationships between two firms in the sequence along the value chain (relationships such as client-supplier relations)

Vertical relations \neq “horizontal” relations between firms at the same level of a value chain (competition, horizontal mergers, ...).

Value chain

Set of production activities that brings the raw materials to a finished product.

Vertical relations

Vertical relations \neq Supply-demand relations (choice of consumers, pricing decisions, ...).

Many firms sell to other firms, not (only) to final consumers.

- A cement producer sells its cement to construction firms...
- A TV manufacturer sells its products to retailers...
- A manufacturer of telecom equipments sells its products to telecom operators...

... which in turn sell their products to final consumers (or to other firms).

Vertical relations

Why making a distinction between a B2B and B2C relationship is important?

- A firm that sells to final consumers controls most of the variables that impact the demand (price, quality...), which is not the case of firms selling to other firms.
- Client firms can compete with each other, which cannot be the case for final consumers.
- The number of client firms can be lower than the number of final consumers.

Vertical relations

We make a distinction between:

- Upstream firms: manufacturers of consumer goods, producers of intermediate goods, ...
- Downstream firms: distributors, retailers, ...

The market between upstream firms and downstream firms: the **intermediary market** (or the wholesale market).

The market between downstream firms and final consumers: the **final market** (or the retail market).

Vertical integration

Vertical integration

A firm is vertically integrated when she controls over several or all of the production steps involved in the creation of its product or service.

Example: in the oil industry, the major companies carry out in-house the following steps of oil production:

- Exploration
- Drilling
- Refining
- Distribution

→ In general, does a firm need to vertically integrate or not?

Vertical integration

To integrate or not to integrate an activity? → compare the costs (including the opportunity costs)

- of an internal production (vertical integration)
- of having recourse to external firms ("to the market")

→ Coase (1937) theory of "transaction costs" (transaction costs in the market versus costs of organizing additional transactions within the firm)

Other factors:

- ensuring access to an essential input
- internalizing some externalities
- escaping regulation
- ...

Vertical integration

Why firms remain vertically integrated? → Also because they have invested in some **assets which are specific** to the vertical relation.

- This assets cannot be recycled without incurring costs in another transaction
- Profits from these investments disappear in case of a definitive breakdown of the relation.

Some examples of specific investments:

- Specific to the location (ex: manufacturers of cans close to canning factories, cement works close to cement warehouses)
- Specific to the assets (ex: an aluminium plant invests in a refinery conceived to process a bauxite ore of a precise quality).
- Dedicated assets (investments specific to one client, for ex, special mold for a perfume)
- Specificities of human resource (ex: employees in a medical clinic trained for the use of a specific software, etc.)

The hold-up problem

Notion of quasi-rent

Amount that one of the parties can require to the other during the negotiation, knowing that breaking up the negotiation would not be profitable to the latter.

Example :

- Firm A invests in a specific component for firm B, with a price which is specified beforehand: profit Π_1 for A. If B changes his mind, A makes Π_2 on the market. Quasi-rent $\Pi_1 - \Pi_2 > 0$.
- The hold-up problem: if $\Pi_1 - \Pi_2 > 0$, B can improve her situation by holding-up A and keeping the quasi-rent (A is expropriated of a part of its profit from the investment). If A anticipates, she will not invest in the asset specific to the relation.
- The contract negotiations become complex
- Under-investment in assets specific to the relation
- Renegotiations are frequent and transaction costs are high.

→ Vertical integration can be a solution.

Vertical integration

But vertical integration is a radical solution.

Lots of the benefits from a vertical integration can be achieved by long-term contract between firms:

- Joint ventures
- Outsourcing
- Franchise
- Exclusivity
- ...

→ **Vertical restraints**

Vertical restraints

Vertical restraints

Contractual terms between firms in a client-supplier relationship, which goes beyond simple pricing rules and restrain what the other can do

Vertical restraints **in pricing** :

- Minimum resale price maintenance (RPM)...
- Franchise (two-part tariffs)

Vertical restraints **non-tariff** :

- Exclusive territory
- Selective distribution
- Minimum amount on quantities to be traded
- ...

Vertical restraints

Definition of vertical restraints by the European Commission (Guidelines on vertical restraints):

“Vertical restraints are agreements or concerted practices entered into between two or more companies each of which operates, for the purposes of the agreement, at a different level of the production or distribution chain, and relating to the conditions under which the parties may purchase, sell or resell certain goods or services.”

Vertical restraints

Why firms use vertical restraints?

For **efficiency** issues:

- To solve the problem of double marginalization
- To avoid free-rider problem from downstream firms
- To price discriminate

For **anti-competitive** incentives:

- To control competition
- Establish entry barriers

The double marginalization problem

The **double marginalization problem** or the problem of **vertical externality** (Spengler 1950).

We consider an upstream firm (ex: a manufacturer) and a downstream one (ex: a retailer).

General idea

If the manufacturer and the retailer both have market power, each of them will set a price higher than the cost (strictly positive margin), which will lead to a price too high in the value chain

“What is worse than a monopoly? A chain of monopolies!”

A model

- Upstream firm U produces an intermediate good in monopoly
- She sells this good to a retailer D in monopoly which commercializes the good to final consumers
- The final demand function is given by $Q = D(p) = a - p$
- The marginal cost of the manufacturer is c and $c < a$
- The marginal cost of the retailer is c_D
- We note w the wholesale price set by the firm U
- Thus the “perceived marginal cost” of the retailer D is $w + c_D$
- We assume that $c_D = 0$

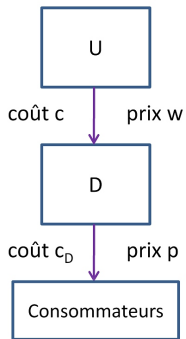
A two-stage game:

- 1 U sets the wholesale price w
- 2 D sets the retail price p

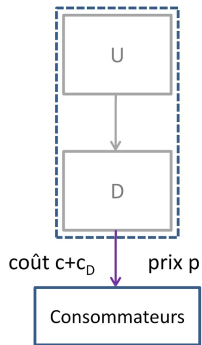
A model

We are going to compare the two situations:

Separate firms



Vertically integrated firms



Case of separate firms

Problem of the downstream firm (the retailer)

$$\max_p \Pi_D = (p - w)(a - p).$$

The first order condition is

$$\frac{\partial \Pi_D}{\partial p} = 0 \iff p = \frac{a + w}{2}.$$

The demand function for the final product, that is, for the intermediate good, is

$$q = a - p = \frac{a - w}{2}$$

Case of separate firms

The manufacturer anticipates the retailer's pricing. We then have:

Producer's problem

$$\max_w \Pi_U = (w - c)q(w) = (w - c) \left(\frac{a - w}{2} \right).$$

The first order condition of the problem is

$$\frac{\partial \Pi_U}{\partial w} = 0 \iff w = \frac{a + c}{2}.$$

Case of separate firms

By replacing w with its value, we find the retail price in equilibrium:

$$p = \frac{3a + c}{4}.$$

The total surplus of the firms are:

$$SP = \Pi_D + \Pi_U = \frac{(a - c)^2}{16} + \frac{(a - c)^2}{8} = \frac{3(a - c)^2}{16}.$$

Vertical integration

We assume that firm U and firm D are **vertically integrated**.

Then it becomes the classical monopoly problem:

$$\max_{p_{IV}} \Pi_{IV} = (p - c)(a - p),$$

We find

$$p_{IV} = \frac{a + c}{2} \text{ et } q_{IV} = \frac{a - c}{2},$$

and

$$SP_{IV} = \Pi_{IV} = \frac{(a - c)^2}{4}.$$

Comparison

We have:

$$p > p_{IV}$$

and

$$SP < SP_{IV},$$

Which means that:

- i. Consumer surplus is higher when there is vertical integration,
- ii. Firms surplus is higher when there is vertical integration.

We call it the **problem of double marginalization**.

Alternative solutions to integration

The problem of double marginalization: an argument for vertical integration?

No, there are other alternative solutions → vertical restraints.

An upstream firm could prefer these alternatives:

- Costs to manage employees of the distribution channel
- Distant geographical market for the producer and the distributor
- ...

Two part tariff

- Let's consider an upstream firm (U) that proposes a two-part pricing to the downstream firm (D)
- The price: a per-unit price (w) and a fixed part (F)
- Firm U sets the unit price (w) at marginal cost: $w = c$
- Then the problem of firm D is:

$$\max_p \Pi_D = (p - c)(a - p) - F$$

- It is the monopoly profit minus the fixed cost F !

Two part tariff

Therefore we have

$$p = \frac{a + c}{2} = p_{IV} \text{ et } q = \frac{a - c}{2} = q_{IV}.$$

The profits of the two firms are

$$\Pi_D = \frac{(a - c)^2}{4} - F \text{ and } \Pi_U = F$$

The total profit of firms is **maximal** and equal to Π_{IV} .

The allocation of the total profit depends on F .

Two-part tariff

Conclusion

If non-linear contracts are possible then the optimal solution under vertical separation is identical to that under vertical integration.

→ Vertical restraint (non linear pricing contract) allows to lower the final price, which is beneficial to consumers.

Limit

- If there is competition between retailers, a fixed tariff is not sufficient to capture the whole monopoly profit

Other alternative: maximum retail price (price ceiling)

The producer can also set a **maximum resale price** (or a sales quota).

If firm U sets a maximum retail price equal to p_{IV} , firm D sets its retail price... at the authorized maximum price.

Then, the share of surplus between the upstream and the downstream firm is defined by the wholesale price w :

- If the upstream firm has all the market power, she sets

$$w = p_{IV} = \frac{a + c}{2}$$

- If the downstream firm has all the market power, the upstream firm (U) sets $w = c$

An example

Blockbuster's solution

- Before 1998, in the US, video distributors were selling videocassette to videostores at a fixed price of from approximately \$65 to 70
- The videostore then decided the quantity of cassettes and the rental price
- If it had a market power: problem of double marginalization
- Blockbuster introduced a new type of contracts: sharing of the income at a rate of 40 to 60% and a fixed price of \$8
- Mortimer estimated this new type of contract (adopted by the others) led to:
 - A decrease of the rental price of \$4.64 to \$4.08 in average
 - An increase of the number of cassettes

The free-riding problem

... or **problem of incentives to increase the sales effort**.

There can be horizontal externalities between distributors and retailers, which can lead to a **free-riding** problem ("passager clandestin" in French).

Externalities on the quality and the level of service proposed by the retailer:

- Advertisement by the retailer
- Presence and training of commercial adviser
- Service quality
- Showrooms

If services are public goods, there is very weak incentives to provide them.

Some examples

The development of Internet as a merchandizing channel raises several problems of free-riding.

Free-riding between retailers

- A consumer can take advantage of some advice at Fnac
- then buy the product at an online discounter

Free-riding between the distributor and the retailer

- Fear of retailers that distributors can also sell their product on the Internet by themselves
- However if free-riding is a problem, the distributor is well-advised to avoid it, so he would rather not lower the price

Some examples

Carlton et Chevalier (2001) analysis on perfume and DVD industries.

Case of perfume

- Perfume brands avoid selling their product on websites that suggest discounts
- or limit online sales on their own website (at high price)

Case of DVD

- Sony and RCA had sold their DVD at a higher price of about 5% than their authorized retailers
- Distributors try to limit the availability of their products on non-authorized retailers

The free-riding problem

- We consider for instance an upstream producer (U)
- Two downstream retailers: D1 and D2
- Each retailer has to choose the level of effort it will make in commercial services: e_i
- Retailers then compete in prices (Bertrand competition)
- Upstream and downstream marginal costs are normalized at 0

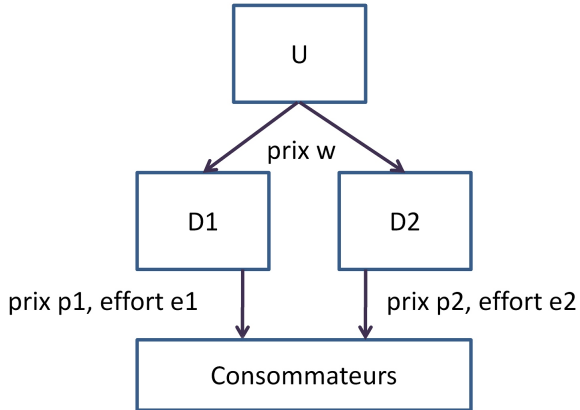
Impact of the commercial efforts on the perceived quality

Commercial efforts increase with the perceived quality:

$$s = \underline{s} + e.$$

with $e = e_1 + e_2$ (commercial effort as a public good).

The free-riding problem



The free-riding problem

For a retailer, making a commercial effort is costly.

Let's assume that the total cost of the retailer i is written:

$$C(q, e_i) = wq + \frac{\mu e_i^2}{2},$$

with $\mu > 1$.

Consumer demand function is:

$$q = (a + s) - p = (a + e) - p,$$

assuming that $\underline{s} = 0$.

Case of separate firms

Equilibrium in the end market

We have $p_1 = p_2 = w$ et $e_1 = e_2 = 0$.

→ retailers cannot set a price above w (Bertrand), thus cannot recover the cost of commercial effort $e_i > 0$

The problem of the producer

- The producer anticipates the equilibrium in the end market
- He maximizes its profit

$$\max_w \Pi_U = (w - c)(a - w),$$

- Thus we have

$$w = \frac{a + c}{2}.$$

Case of separate firms

In equilibrium, the producer surplus, the consumer surplus and the welfare are:

$$SP = \frac{(a - c)^2}{4},$$

$$SC = \int_w^a (a - x) dx = \frac{(a - c)^2}{8},$$

$$W = \frac{3(a - c)^2}{8}.$$

Vertical integration

Problem of a vertically integrated structure

If U and D are vertically integrated, the integration problem is:

$$\max_{p, e_1, e_2} \Pi_{IV} = (p - c)(a + e_1 + e_2 - p) - \frac{\mu e_1^2}{2} - \frac{\mu e_2^2}{2}$$

We have three first order conditions:

$$\frac{\partial \Pi_{IV}}{\partial p} = 0 \Rightarrow a + e_1 + e_2 - 2p + c = 0,$$

$$\frac{\partial \Pi_{IV}}{\partial e_1} = 0 \Rightarrow p - c - \mu e_1 = 0,$$

$$\frac{\partial \Pi_{IV}}{\partial e_2} = 0 \Rightarrow p - c - \mu e_2 = 0.$$

Vertical integration

Solving the three first order conditions give the equilibrium price and the optimal effort:

$$p_{IV} = \frac{\mu(a+c) - 2c}{2(\mu-1)}$$

$$e_1 = e_2 = e_{IV} = \frac{(a-c)}{2(\mu-1)}$$

We have:

$$SP_{IV} = \Pi_{IV} = \frac{\mu(a-c)^2}{4(\mu-1)}, \quad SC_{IV} = \frac{\mu^2(a-c)^2}{8(\mu-1)^2}, \quad \text{et } W = \frac{\mu(3\mu-2)(a-c)^2}{8(\mu-1)^2}.$$

Vertical integration

Firms surplus are higher with vertical integration,

$$SP_{IV} > SP$$

and the global welfare also

$$W_{IV} > W$$

even if prices are higher with vertical integration

$$p_{IV} > p$$

Alternatives to vertical integration

Without vertical integration, can we fix this “horizontal externality” problem between retailers (problem of incentives to commercial effort)?

The upstream firm should take some measures to reduce competition in the downstream market.

- Exclusive territories
- Resale price maintenance

Exclusive geographical area

Each retailer serves an exclusive geographical area.

However, such vertical restraint is not enough. We add a fixed franchising fee F .

Let's solve the equilibrium

- Perceived quality depends on the sum of efforts of the two retailers
- Exclusive territory agreement = each retailer serves **half** of the demand
- The problem of the retailer (on an exclusive territory) is

$$\max_{p_i, e_i} \Pi_D = (p_i - c) \frac{(a + e_1 + e_2 - p_i)}{2} - \frac{\mu e_i^2}{2} - F.$$

Exclusive geographical area

First order conditions

First order conditions are:

$$\frac{\partial \Pi}{\partial e_i} = 0 \Rightarrow \frac{p_i - c}{2} - \mu e_i = 0$$

$$\frac{\partial \Pi}{\partial p_i} = 0 \Rightarrow a + e_i + e_j - 2p_i + c = 0 \Rightarrow p_i = \frac{a + e + c}{2}$$

Conclusions

- For the same level of effort, same price as in the case of vertical integration
- But the commercial efforts are lower
- Thus exclusive geographical agreement improves the incentives to provide services, but does not bring to a situation as efficient as vertical integration.

Resale price maintenance

Let's assume that the producer sets the resale price of the retailer: it is a vertical restraint called “resale price maintenance” (RPM).

This way, the producer can limit the competition intensity between retailers.

Assumptions

- Retailers are forced to set a retail price of p_{IV}
- The wholesale price is $T(q) = wq + F$, with $w < c$

Problem of the retailer i

$$\max_{e_i} \Pi_D = (p_{IV} - w) \frac{(a + e_1 + e_2 - p_{IV})}{2} - \frac{\mu e_i^2}{2} - F.$$

Resale price maintenance

First order condition for the retailer i

$$\frac{\partial \Pi}{\partial e_i} = 0 \Rightarrow \frac{p_{IV} - w}{2} - \mu e_i = 0 \Rightarrow e_i = \frac{p_{IV} - w}{2\mu}$$

For an optimal level of effort, the producer should set w such as that

$$e_i = \frac{p_{IV} - w}{2\mu} = \frac{(a - c)}{2(\mu - 1)}$$

By replacing p_{IV} with its expression, we find the wholesale price

$$w = \frac{3\mu - 2c - \mu a}{2(\mu - 1)} < c.$$

Resale price maintenance

The producer sets a unit price below its cost ($w < c$)

- Setting the price at marginal cost ($w = c$) is not enough to encourage the retailers to make optimal efforts
- This is because they only take account the result of the effort on their own profit and not on the rival firm (horizontal externality)
- Setting a lower wholesale price increases the incentives to make an effort in service quality
- The fixed part of the wholesale price, F , may be used to redistribute the profits

Resale price maintenance

In practice, resale price maintenance (RPM) is forbidden in many countries:

- In Canada since 1951.
- In the United Kingdom, since 1965.
- In the United States, since 1976.

Nevertheless, it had been widely used by firms before it became illegal.

For instance, in UK, 44% of consumer expenses concerned goods sold by a RPM type contract.

Today, it is legal to set a “suggested” price.

Competition between producers

Definition

It is about competition between producers (or intra-brand competition) when producers selling products to retailers (or to distributors) compete with each other.

Competition between producers

Market power of retailers

- Let's assume that retailers have market power.
- Then upstream firms should set a high wholesale unit price and a low fixed part.
- But the opportunity cost to sell a brand or another is different.
- So the fixed part of the price can be a negative: "slotting allowances".

Externalities

- There can be also externalities between producers.
- For instance, an automobile manufacturer can train its sellers: with a specific training and generic training.
- Externality problem / free-riding: exclusive distribution?

Competition between producers

Foreclosure

- An exclusive distribution agreement can increase efficiency.
- It can also increase market power (ex: agreement between Coca-Cola and PepsiCo)

Do vertical restraints stimulate collusion?

- Vertical restraints can make collusion between producers easier.
- Indeed, wholesale price may be difficult to observe.
- Therefore, deviations are detected through the variation of retail price.
- But other factors can also explain the price variation.
- Vertical restraints on price can eliminate these variations.

Public policy

Analysis of vertical restraints in terms of public policy is complex due to the fact that some clauses can both have positive and negative effects on efficiency.

There are significant variations in public policy over time and between different jurisdictions.

In the United States:

- In 1967, the Supreme Court declares that vertical restraints is unlawful per se.
- In 1977, she ruled that non-tariff vertical restraints must be judged under the Rule of Reason.
- Since then, the rules tend to be softened. For instance, in 1997, maximum price maintenance is judged legal.

Public policy

In Europe:

- The article 85(1) forbids vertical restraints
- However, the article 85(3) grants certain exemptions when it is justified by a valid technical or economic reasons or if consumers receives a fair part of the benefice.
- In 1967, exemption for exclusive territories and exclusive distribution.
- In 1988, exemption for franchise agreements.
- RPM is illegal but "suggested" minimum or maximum price are accepted.

The example of Microsoft

Microsoft MS-DOS 1994 case

- During the 80s, Microsoft develops MS-DOS at the request of IBM for its PCs.
- IBM has not required any exclusivity clause to MS and MS started proposing licenses to other computer manufacturers.
- Competition began to be developed. At the end of the 90s,
 - MS DOS 70%
 - PC DOS (IBM) : 18%
 - DR-DOS (DRI) : 12%
- MS reacted by imposing a vertical restraint: price maintenance for any computer, whether it has OS MS DOS or other OS.
- In 1992, MS DOS increased its market share to 81%

Take-Aways (1)

- Vertical relations is about two firms that succeed in the value chain.
- Vertical restraints are clauses in sale contracts that limit the behavior of the buyer.
- If a producer and a retailer have both market power, they will both set prices above the costs, which leads to a price too high in the value chain (problem of double marginalization, two monopolies in a value chain are worse than one monopoly).
- The upstream firm does not necessarily resort to a vertical integration to solve the double marginalization problem.
- If non-linear contracts are possible then two-part tariff under vertical separation is identical to the result of a vertical integration, which solves the double marginalization problem.

Take-Aways (2)

- Horizontal externalities between producers and retailers may exist, which may cause a "free-riding" problem (For instance, if the retailer decides by itself the effort he will put in product marketing, he doesn't necessarily have the incentives to do it).
- In order to alleviate the free-riding problem, the upstream firm should take some measures to reduce competition in the downstream market (exclusive territories, resale maintenance).
- Competition between upstream firms means that more than one producers compete with each other to sell their products to retailers.
- Vertical restraints are prohibited by the article 85-1 of the treaty of Rome but the article 85-3 grant exemptions when consumer benefits from the restraint. Exclusive territory is exempted since 1967, franchise agreements exempted since 1988. RPM is illegal but non-binding recommended prices are allowed.