

## Durability

**Durable goods:** goods that last for several time periods, like for example, irrigation infrastructure in a field, machinery, and personal expenditure items such as washers, cars, light bulbs.

Manufacturers of durable goods decide how long their product will last. By an additional cost the manufacturer can maybe make its product last longer.

We'll look, in this context, at two questions:

1. Does market structure affect the durability of products? That is, does a monopolist, for example, produce products as durable as competitive firms?
2. Does it matter if a monopolist rents or sells a durable good?

We will see next that:

Market structure usually does not affect durability choice.

Generally, a monopolist is better off if it can rent its durable product than if it must sell them.

If the monopolist has to sell, he will want to commit himself not to expand production in the future and not to lower the price in the future. (To avoid problems due to consumer expectations about future prices (Coase's conjecture))

Under certain conditions a monopolist that sells a durable good may make no monopoly profits at all!

## Durability

### Firms' durability decisions:

Consumers, when buying durable good, such as a car, are willing to pay a higher price initially conditional on how long it should last and what the resale value is likely to be.

If the car is likely to have a longer durability, firms set its price higher because initial manufacturing costs are higher.

The firm will increase durability of the car until the marginal cost of greater durability equals marginal benefit from higher sales price.

Firm's decision may be influenced by the presence of a resale market.

**The durable good is a machine, or a capital asset** that lasts for many periods and that provides a service each period. Renting is then like selling the service, rather than selling the asset.

### May the firm's decision be influenced by its market power?

#### Competition

Let  $c(N)$  be the marginal cost of manufacturing a good that lasts for  $N$  years.

Total present value of a good with life time  $N$  is given by

$$TPV(N) = C(N) + c(N) \text{ } N \text{ periods later} + c(N) \text{ } 2N \text{ periods later} + \dots$$

$$\text{For example let } C(N) = N^{0.487}.$$

The competitive firm will minimize  $TPV(N)$  with respect to  $N$ .

The future is discounted, by an interest rate  $r$ .

The key point is that, the higher the interest rate, the less durable is the good, because the savings from delaying replacement of the bulb diminish, whereas the cost of making the good more durable is made today and not discounted.

### **Monopoly**

Does the monopolist make a different decision than the competitive firm?

Short answer: No.

Suppose the monopolist rents the asset at rental price  $R$ . Let  $Q(R)$  be the number of services demanded if rental price is  $R$ . This demand curve does not change over time. If the monopolist chooses a durability  $N$  and rental price  $R$ , then it maximizes TPV of profits =  $TPV(R, Q(R))$  minus –production costs of  $Q(R)$  units forever. Revenues are independent of  $N$ .

Due to constant returns to scale, this is equivalent to choosing  $N$  that minimizes costs of producing one unit.

Note 1: the monopolist, will, for a given  $N$ , produce/rent fewer assets, for a higher price than competitive firms.

Note 2: if installation is costly for different consumers or if better maintenance can extend a product life than durability can differ across market structures. In particular lead to different behavior by a monopolist who rents relatively to a monopolist who sells.

### Application: *United Shoe*

Originally United Shoe (had over 80% of shoe-making machines business) would only lease certain machines to produce shoes. After antitrust case lost (1953) it was forced to sell.

Lease only policies was a response to the need to obtain quick repair of the machine. If a firm bought the machine instead of renting it would worry that United Shoe would not provide quick and reliable service. Lease only policies were used for machines that were critical to production process. Leasing versus selling enables to increase prices though...

### Rent versus Sell

Indifferent as long as the monopolist can convince consumers that it will stick to a particular pricing policy in the future.

If the monopolist cannot convince consumers that it will stick to a particular pricing policy (that is not lower prices) in the future a monopolist may prefer to rent rather than sell.

Consumers expectations constrain the monopolist. This will lead to a surprising result **Coase's Conjecture** (1972):

*A durable goods monopolist has less market power if he sells its product (in the extreme no market power) when compared to a monopolist that rents the durable good.*

The intuition behind this result is that the monopolist that sells has an incentive to cut price in the future.

Consumer's expectations about the future resale price affects the initial price.

The incentive to cut price in the future does not happen if the monopolist is renting.

The problem is that in the posterior periods the monopolist has an incentive to increase production and lower price. Consumers know that and so will not buy at high price in the first period.

What can the firm do to avoid this intertemporal competition from itself?

- Refuse to sell. Just lease.
- Planned obsolescence – have new models each year
- Construct production process such that it is prohibitively costly to increase production in the future, e.g. an artist who destroys the plate for a serigraphy, and a limited series is printed in the first period.
- Guaranty to buy-back products at the price consumers paid for it.
- Acquire a reputation of never lowering price, example De Beers, next.

### Alcoa Case: Aluminum Company of America

Main issue here: Existence of Resale market (different than recycling market) and market power in primary market.

The Alcoa was found guilty of monopolizing the domestic aluminum market. There was a secondary market (from remelting the scrap from primary aluminum ingots). Did that cause prices to be lower than without existence of secondary market? That is, did the secondary market constraint the monopoly in the primary market? Since demand in primary market was rising over time research shows that Alcoa was little constrained by the existence of the secondary market.

### Diamonds are forever?

De Beers cartel controls 70% of rough, unpolished diamond market.

De Beers wants to convince consumers that prices will never fall.

Because diamonds are durable, the demand for diamonds depends on consumers expectations about future diamonds' prices.

Sometimes it keeps inventory, stockpiles production, to avoid prices to fall during slumps in demand. This keeps prices artificially high.

## Model – Coase's Conjecture

( from Tirole, *Theory of IO*, chapter 1):

Monopolist of a durable good, zero marginal costs.

Demand  $p=8-q$ .

The consumers who buy today won't buy tomorrow.

*"The monopolist is his worst enemy"*

If the monopolist is selling in several periods he would maximize the profits in each period given the demand he faces in each period:

In the first period:

In the second period:

In the third period:

Note that price in period 2 is lower than period 1's price and in period 3 even lower.

If consumers are patient, none of them will buy in the first period, all will wait. So the monopolist's profits will be lower because it cannot inter-temporally price discriminate.

If consumers are very impatient, then the monopolist can price discriminate.

If consumers have infinite patience then the monopolist can only sell at price equal to marginal cost in all periods.

One way to avoid this is not to revise prices!

- Guaranty to buy-back products at the price consumers paid for it.
- Acquire a reputation of never lowering price, example De Beers, next.
- Rent instead of selling

The key insights about Coase's conjecture:

*The monopolist will always not want to stay at the first period's price. In the second period he will want to explore the residual demand in that period, and hence lower price.*

*But if consumers know that the monopolist will do that they will not buy at the high price in the first period.*

*It is better for the monopolist to "credible" signal that he will maintain always high prices!*

## **Patents and Technological Change**

Patent: gives the inventor an exclusive right to sell during a certain period of time. They cover function and purpose (ideas, methods, ). Generally 20 years.

Copyrights: gives their creators the exclusive production, publication or sales rights to artistic, dramatic, literary or musical works. Generally 95 years.

Trademarks: Do not expire. Can become generic names: e.g. Tupperware, nylon, aspirin. They exist to distinguish a certain product provided by a firm from the products provided by other firms.

## Main questions:

- If there were no patents would there be less Research and Development (R&D)?
  - Yes, there would be too little R&D. In the absence of property rights investors would be prevented from capturing the values of their inventions, since there are information externalities.
- How long should be a patent?
  - A long patent grants monopoly to a firm for a long time. By shortening a patent the government is reducing harms from monopoly but also causing there to be less incentives to innovate!
- Are the monopoly profits higher if patent holder produces himself or if he licenses to others (in return for a royalty) for production?
  - The same. From minor cost-saving inventions all the social benefits can be captured. In major inventions, prices fall and quantity consumed rises, so that total surplus increases. There the inventor's gain is less than the total social gain.
  - Gallini and Winter(1985) show that under certain circumstances licensing may reduce inefficient R&D expenditures.
- How does structure of a market affect R&D and innovation?
  - Shumpeter-ian (1950) view: large firms innovate more than small firms, there is a positive relationship between innovation and market power. It is however unclear on theoretical grounds ... it remains an empirical question.

- Some theoretical predictions:
  - A monopolist would innovate more slowly than a competitive firm
  - A monopolist wants to prevent other firms from engaging in a patent race because patents are worth more to the monopolist than to the competitive firm. If the monopolist gets the patent first it gets the monopolist profits whereas the competitive firm has to compete with the former monopoly or earn duopoly profits.
  - Sometimes monopolist may get the patents first and put those to sleep. This prevents anyone else from using them