Monopoly

Monopoly 4: Durable Goods

Monopoly

Overview

Definition: A firm is a monopoly if it is the **only** supplier of a product in a market. A monopolist's demand curve slopes down because firm demand equals industry demand.

Five cases:

1. Base Case (One price, perishable good, non-IRS Costs).
2. Natural Monopoly
3. Price Discrimination
4. Bundling
5. **Durable Goods**

Durable Goods Monopoly

Coase Conjecture.

Consider the example of a monopolist who owns all the land in the world and wants to sell it at the largest discounted profit.

- In year 1, the monopolist sets a monopoly price and sells half the land. (Think of a linear demand curve with marginal cost at zero.)
- In year 2, the monopolist will want to do the same with the remaining land, but unless the population is growing very quickly, demand for land will be lower. Thus, the monopoly land price in year 2 will be lower.

Coase conjecture: if consumers do not discount time too heavily and if consumers expect price to fall in future periods, current demand facing the monopolist will fall, implying that the monopoly will charge a lower price (compared to a perishable good).

(Price is driven to marginal cost "in the blink of an eye")

Durable Goods Monopoly

Crucial assumptions:

1. durable good
2. demand does not grow quickly over time
3. consumers anticipate price cuts

As we will see, the assumption of a downward sloping demand (with a continuum of consumers) is also a crucial assumption.

Durable Goods Monopoly

Model I: Continuum of consumers, downward sloping demand.
Assumptions:

- Consumers live for 2 periods
- Product lasts for 2 periods

The aggregate one-period demand for the services of the good is :

$$p = 100 - q.$$

That is, if the good were only sold in period 2, this is what demand in period 2 would look like. If a consumer buys in period 1, that consumer gets twice the consumer surplus that they would get if that had bought at the same price in period 2. That is, they get to consume for an extra period...

Durable Goods Monopoly

Define a game:

1. Set of players: seller and buyers
2. Set of actions/strategies for each player:
   - seller chooses price in period 1
   - buyers choose whether to buy in period 1
   - seller chooses price in period 2
   - buyers choose whether to buy in period 2
3. Pay-off function (producer and consumer surplus)

Use backward induction to solve:

Durable Goods Monopoly

In period 2, demand is

$$p_2 = 100 - \bar{q}_1 - q_2$$

because people who bought in period 1 do not need to buy again.
Set MR = MC (assume) = 0, just like always. Then

$$MR = 100 - \bar{q}_1 - 2q_2 = 0$$

Implying

$$q_2 = 50 - \frac{\bar{q}_1}{2} \quad \text{(turns out p = q in this example)}$$

and

$$\pi_2 = p_2 q_2 = \left(50 - \frac{\bar{q}_1}{2}\right)^2$$

Durable Goods Monopoly

If the monopolist sells to the $\bar{q}_1$ buyers with the highest valuations in period 1, then the marginal buyer must be indifferent between purchasing the good in period 1, or waiting until period 2.

Thus, the marginal buyer's utility is equivalently given by:

value in period 1 - price in period 1 = value in period 2 - price in period 2

$$2(100 - \bar{q}_1) - p_1 = (100 - \bar{q}_1) - \left(50 - \frac{\bar{q}_1}{2}\right)$$

Now it is straightforward to solve for p_1 as a function of $\bar{q}_1$:

$$p_1 = 150 - \frac{3\bar{q}_1}{2}.$$

Durable Goods Monopoly

Now we can write the firm's profit maximization problem as a function of q1 only:

$$\max_{q_1}(\pi_1 + \pi_2) = \left(150 - \frac{3q_1}{2}\right) q_1 + \left(50 - \frac{q_1}{2}\right)^2$$

Take F.O.C. and solve. . .

We find $q_1 = 40$; $q_2 = 30$; $p_2 = 30$; $p_1 = 90$. This implies that total profits for both periods (no discounting) are $4,500$.

Durable Goods Monopoly

An alternative strategy set: RENT.

Define selling vs. renting. (See Shy: "Selling means charging a single price for an indefinite period. . . Renting means charging a price for using the product for a limited time period.")

How does the firm maximize discounted profits if it rents out the good?

Durable Goods Monopoly

Recall that the aggregate one-period demand for the services of the good is p = 100 - q.

Therefore, solve the static model twice (a repeated game). F.O.C. (MR = MC) imply

$$\begin{aligned} p_t &= 50 \\ &\Longrightarrow \quad \pi_t = 2,500 \\ &\Longrightarrow \quad \pi_1 + \pi_2 = 5,000. \end{aligned}$$

The firm does better by renting out the product.

That is, by renting (and turning a durable good into a non-durable) they firm avoids the coase conjecture problem of having to charge lower prices.

Durable Goods Monopoly

Two outstanding issues:

1. How does the analysis work when demand is discrete?
2. Does the firm have any other choice variables? . . .

The relative level of "durability." The usual example is lightbulbs.

This highlights the role of the firm's cost function, which we have been assuming is zero.

Durable Goods Monopoly

Choosing a lower relative level of durability is one way of solving the problem of consumers' expectations.

Other ways include:

1. Renting (we just did that)
2. Planned obsolescence (new car models, new fashions... as long as costs are not too high)
3. Capacity constraints (numbered prints)
4. Buy-back provisions (not useful if consumers can damage good, or easily resell)
5. Announcements/advertising future prices

Durable Goods Monopoly

Discrete demand (Shy's example in his textbook with two types of consumers):

- Two types of consumers
- Consumers are "different enough" in their willingness to pay for the good
- Two periods for consumption

Shy shows: selling may be more profitable than renting.

This reverses the coase conjecture intuition - instead, the extreme heterogeneity in consumer types means that the durability enables a form of type 2 price discrimination to work...