

Monopoly Pricing

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1 Preliminaries about the course

- Revised office hours : Monday 4-5, E53-289 [no o.h 10 September]
- Exams and what you are expected to know
- Problem sets

2 Preliminaries about monopolies

- What is a monopoly? For this course, a monopoly is just a firm that can set prices without thinking about the strategies of any actual or potential competitors. When the monopoly raises prices demand may fall, but this is thought of as consumers substituting to different goods rather than competitors.
- In 14.272 monopolies are defined more precisely by identifying “relevant product markets”. In addition, 272 looks at typical cost characteristics that lead to natural monopolies (especially “sub-additivity”), how monopolies may protect their position (“foreclosure”) and considers how to regulate monopolies.

3 Monopoly pricing [Tirole, Chapter 1]

3.1 Static single product case

- Demand : $q = D(p)$, Inverse Demand : $p = P(q)$
- Cost: $C = C(q)$, Marginal Cost: $C'(q)$
- A1 : Demand differentiable and decreasing in price ($D'(p) < 0$)
- A2 : Cost differentiable and increasing in output ($C'(q) > 0$)

- Monopolist problem is:

$$\begin{aligned} & \text{Max}_p [p \cdot D(p) - C(D(p))] \\ \text{FOC} & : D(p^*) + p^* \cdot D'(p^*) - C'(D(p^*)) \cdot D'(p^*) = 0 \\ \text{or} & : p^* - C'(D(p^*)) = -\frac{D(p^*)}{D'(p^*)} \\ \text{as} & : \epsilon = -\frac{D'(p) \cdot p}{D(p)} \text{ or } \frac{dQ}{dp} \cdot \frac{p}{Q} \end{aligned}$$

$$\text{therefore : } \frac{p^* - C'}{p^*} = \frac{1}{\epsilon}$$

- note that you should also check the second order conditions to make sure that you have found a maximum.
- This is the INVERSE ELASTICITY RULE OF MONOPOLY PRICING: as demand becomes more elastic the monopolist sets lower prices.
- Formula also implies that the monopolist only prices at a point where $\epsilon > 1$, i.e. where the demand is elastic. If there was a constant elasticity of less than 1 then the model implies infinite prices.
- The expression $\frac{p^* - c}{p^*}$ is known as the Lerner Index. We calculate it for oligopolies as well as monopolies.
- Special case : $q = kp^{-\epsilon}$ (constant elasticity of demand), implies a constant Lerner Index. If cost is trebled then the pricing rule implies that price is trebled as well.
- We can also show that a monopolist price is a non-decreasing function of marginal cost (C'). The proof follows revealed preference arguments:
 - two alternative cost functions : $C_1(q), C_2(q), C'_2(q) > C'_1(q) \forall q$ (i.e. for any particular output q technology 2 has higher marginal cost)
 - the cost functions are differentiable
 - revealed preference implies that:

$$\begin{aligned} p_1^m \cdot q_1^m - C_1(q_1^m) & \geq p_2^m \cdot q_2^m - C_1(q_2^m) \\ p_2^m \cdot q_2^m - C_2(q_2^m) & \geq p_1^m \cdot q_1^m - C_2(q_1^m) \end{aligned}$$

- these can be added together:

$$C_2(q_1^m) - C_2(q_2^m) \geq C_1(q_1^m) - C_1(q_2^m)$$

- exploiting the differentiable assumption, we can also write:

$$\int_{q_2^m}^{q_1^m} [C_2'(x) - C_1'(x)].dx \geq 0$$

- as $C_2'(q) > C_1'(q) \forall q$ the above can only hold if $q_1^m \geq q_2^m$.

3.2 Welfare in the static single product case

- The key for measuring the welfare loss due to monopoly is not the Lerner Index but the deadweight loss triangle [DIAGRAM]
- An important result is that welfare loss does not decrease monotonically as demand becomes more elastic even though the monopoly mark-up does. This is because for inelastic demand the quantity change caused by monopoly is small, tending to make the width of the DWL triangle small too.
- NOTE: this may seem counterintuitive to those of you who do PF where Jim Poterba teaches the Harberger Loss formula, where DWL due to taxation increases as demand becomes more elastic. That result is for the case of a competitive industry where the tax is given. In this case we look at the case of a monopoly where the mark-up chosen varies with the elasticity.
- Policy : to get socially optimal consumption of the monopolist's good we must subsidise the monopolist's output so that consumers actually face the marginal cost of consumption. Of course in general we don't subsidise monopolies.

3.3 The interesting extensions [Glenn talks about these]

- Multiproduct monopolist:
 - if costs and demand are independent then the monopolist just sets prices as above in each market
 - if costs are independent, but demands are dependent then the incentive of the monopolist to increase the mark-up depends on whether goods are complements or substitutes. For complements, the monopolist will set a lower mark-up in order to increase the quantity demanded of the complementary good [example: MS, Windows and Excel]. For substitutes, the monopolist will set higher prices than a single product monopolist because some of the demand is deflected to its other products [example: channel bundles on Pay-TV].
- Bundling [example: Pay-TV]
- Learning by doing [example: aircraft production]

- Durable Goods
- Price discrimination