

Lecture 9: Price Discrimination

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Lecture 9: Price Discrimination

Third Degree Price Discrimination

Monopsony

Double Marginalization Problem

Profit Sharing and Double Marginalization

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- ▶ Market is segmented (no re-selling across markets)
- ▶ Firm knows the characteristics of each market (demand curve)
- ▶ Consider the following example: Two kinds of consumers:

$$q_A(p_A) = 24 - p_A$$

$$q_B(p_B) = 24 - 2p_B.$$

- ▶ constant marginal cost of production of 6

If the firm were allowed to set different prices in the different markets, then he would choose:

$$\max_{p_A} (24 - p_A)(p_A - 6) \implies p_A^* = 15$$

$$\max_{p_B} (24 - 2p_B)(p_B - 6) \implies p_B^* = 9.$$

Total consumer surplus (CS) and profits of the firm in each market:

$$\pi_A^* = 81, \pi_B^* = 18, CS_A = 40.5, CS_B = 9.$$

Firm chose to set the same price in each market. Then he would maximize the following:

$$\max \left\{ \max_{p \geq 12} (24 - p)(p - 6), \max_{p < 12} (24 - p)(p - 6) + (24 - 2p)(p - 6) \right\}$$
$$= \max\{81, 75\} = 81$$

- ▶ Price of $p^* = 15$ in both markets, which leads to only consumers in market A buying
- ▶ To summarize, the consumer surplus and profits in each market are:

$$\pi_A^* = 81, \pi_B^* = 0, CS_A = 40.5, CS_B = 0.$$

- ▶ Prohibiting third degree price discrimination can exclude a whole market altogether
- ▶ Highly inefficient compared to the social welfare outcome given third degree price discrimination

- ▶ Suppose that the constant marginal cost of production is now 4 instead of 6
- ▶ With third degree price discrimination, the firm sets the following prices:

$$\max_{p_A} (24 - p_A)(p_A - 4) \implies p_A^* = 14,$$

$$\max_{p_B} (24 - 2p_B)(p_B - 4) \implies p_B^* = 8.$$

- ▶ In this case, the profits and consumer surplus in each market is given by:

$$\pi_A^* = 100, \pi_B^* = 32, CS_A = 50, CS_B = 16, TS = 198.$$

- ▶ If the firm were prohibited from using third degree price discrimination, then:

$$\begin{aligned} \max \left\{ \max_{p \geq 12} (24 - p)(p - 4), \max_{p < 12} (48 - 3p)(p - 4) \right\} \\ = \max\{100, 108\} = 108. \end{aligned}$$

- ▶ $p = 10$
- ▶ profits in both markets and the consumer surplus in both markets:

$$\pi_A^* = 84, \pi_B^* = 24, CS_A = 98, CS_B = 4, TS = 210.$$

- ▶ Consumers in region B are hurt but consumers in region A gain significantly leading to an increase in consumer surplus
- ▶ The firm's joint profits are hurt but the total surplus actually increases
- ▶ Total surplus decreases

- ▶ Third degree price discrimination is considered illegal in many countries and the European union

- ▶ It is possible to get around such allegations by claiming that the differential pricing comes from cost reasons

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- ▶ When someone or some firm is the sole buyer (monopoly is the sole seller)

- ▶ Often arises in the context of firms being the sole buyers of labor

- ▶ Let us study the profit maximization problem of a firm:

$$\max_{K,L} pf(K, L) - rK - w(L)L.$$

- ▶ w is now a function of the amount of labor demanded (reflecting the power of the firm in the labor market)

- ▶ The first order condition yields:

$$p \frac{\partial f}{\partial L}(K^*, L^*) = w'(L^*)L^* + w(L^*) \implies pMPL = L^*w' + w.$$

- ▶ In a competitive market $w' = 0$ and so $pMPL = w$
- ▶ Wages and labor below the competitive level (an argument for minimum wages and union)

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- ▶ Demand equation for good b is linear:

$$q_b(p_b) = 100 - p_b.$$

- ▶ Firm B 's optimization problem becomes:

$$\max_{q_b} (100 - q_b)q_b - p_a q_b - cq_b.$$

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- ▶ The first order condition tells us:

$$100 - 2q_b = p_a + c \implies p_a = 100 - 2q_b - c.$$

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- ▶ The first order condition tells us:

$$100 - 2q_b = p_a + c \implies p_a = 100 - 2q_b - c.$$

- ▶ Since firm b is the only demander of commodity a , we have:

$$p_a = 100 - 2q_b - c = 100 - 2q_a - c.$$

- ▶ If the price is p_a then the q_a that solves the above equation would be the amount demanded of good a

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- ▶ Thus firm B 's maximization problem has given us an inverse demand function for commodity a

- ▶ Since firm A is also a monopolist in producing good a , we can solve firm A 's maximization problem in the following way:

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$$100 - 4q_a - c = 0 \Rightarrow q_a^* = \frac{100 - c}{4}, p_a^* = 50 - \frac{c}{2}.$$

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$$100 - 4q_a - c = 0 \Rightarrow q_a^* = \frac{100 - c}{4}, p_a^* = 50 - \frac{c}{2}.$$

- ▶ Firm a decides to supply the above units of a at a price $50 - c/2$

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▶ To summarize, we have:

$$p_a^* = 50 - \frac{c}{2} \tag{1}$$

$$q_a^* = \frac{100 - c}{4} \tag{2}$$

$$p_b^* = 75 + \frac{c}{4} \tag{3}$$

$$q_b^* = \frac{100 - c}{4} \tag{4}$$

▶ **Case 1:** $c = 0$



$$p_a^* = 50, q_a^* = 25, p_b^* = 75, q_b^* = 25.$$

- ▶ If the firms were to merge so that whatever is produced by one of the firms can be used freely by that firm?
- ▶ The monopolists problem becomes:

$$\max_q q(100 - q).$$

- ▶ The first order condition states that:

$$100 - 2q^* = 0 \implies q^* = 50, p^* = 50.$$

- ▶ Price of good b comes down from 75 to 50
- ▶ Production of good b goes up from 25 to 50
- ▶ This increases both the profits of the firm *and* the consumer surplus!

▶ **Case 1:** $c = 10$



$$p_a^* = 45, q_a^* = 22.5, p_b^* = 77.5, q_b^* = 22.5.$$

- ▶ If the firms were to merge so that whatever is produced by one of the firms can be used freely by that firm?
- ▶ The monopolists problem becomes:

$$\max_q q(100 - q) - 10q$$

- ▶ The first order condition states that:

$$100 - 2q = 10 \implies p^* = 55, q^* = 45.$$

- ▶ This increases both the profits of the firm *and* the consumer surplus!

- ▶ What is going on in the above examples?
- ▶ because the first firm is a monopolist, it charges a mark up above marginal cost for its intermediate good
- ▶ This then distorts the marginal cost of firm B up additionally
- ▶ This then leads an even larger mark up on top of this additional marginal cost that affects the price of good b
- ▶ Essentially a markup on product a indirectly leads to an even larger markup on the final product b
- ▶ This is called the **double marginalization problem**

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- ▶ Double marginalization can lead to inefficiently high prices and inefficiently low levels of production
- ▶ By merging, both profits of the firm and consumer surplus may simultaneously go up
- ▶ Difficult to tell if two firms are merging to solve a double marginalization problem or if they are simply merging to create a monopoly
- ▶ What are some potential ways to solve this problem without mergers?
- ▶ One possible way might be to engage in profit sharing

- ▶ Firms agree to share profits according to the following rule
- ▶ Prices charged for good a are zero
- ▶ In exchange, the profits of firm B are shared via a split of α going to firm A and $(1 - \alpha)$ going to firm B

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- ▶ Prices charged for good a are zero
- ▶ In exchange, the profits of firm B are shared via a split of α going to firm A and $(1 - \alpha)$ going to firm B
- ▶ Firm A 's decision is trivial. He simply produces $q_a = q_b$
- ▶ Firm B chooses to maximize:

$$\max_q (1 - \alpha) ((100 - q)q - cq) = (1 - \alpha) \left(\max_q (100 - q)q - cq \right).$$

- ▶ Term inside the parentheses is just the monopoly profits if the two firms merged:

$$(1 - \alpha) \max_q \Pi^m(q).$$

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- ▶ For any $\alpha \in (0, 1)$, we get an increase in consumer surplus and total profits
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- ▶ Such arrangements can break down easily. Profits are hard to verify.

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- ▶ Suppose that $\alpha = 1/2$ and $c = 10$. Then firm 2 maximizes:

$$\max_q \frac{1}{2}q(100 - q) - 10q.$$

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- ▶ The first order condition gives:

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- ▶ Firm will produce below monopoly profits since it will produce at a point where $MR = 2MC$ instead of $MR = MC$

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- ▶ This does solve the double marginalization problem slightly:

$$p_b^* = 77.5 > p^* = 60, q_b^* = 22.5 < q^* = 40.$$