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Intermediate Microeconomics W3211

Lecture 22: Game Theory 4 – Not Really Game Theory

Columbia University, Spring 2016
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Introduction

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The Story So Far....

- Last lecture we compared the behavior of a monopolist to oligopolists who competed on quantity
- When we thought about the monopolist, we restricted the types of thing they could do
 - They were allowed to pick the per unit price at which they sold their product
 - Each unit sold at the same price, regardless of who bought it
 - No additional charges or fees

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Today

- We are going to think about other sneaky things that a monopolist could do
 1. Two part tariff
 2. Price discrimination

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Monopoly Behavior

1: Two part tariff

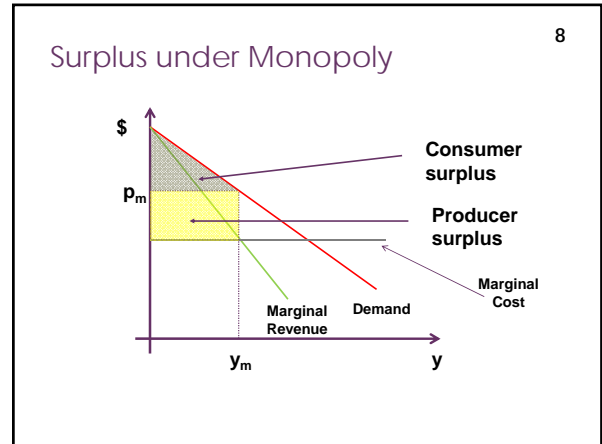
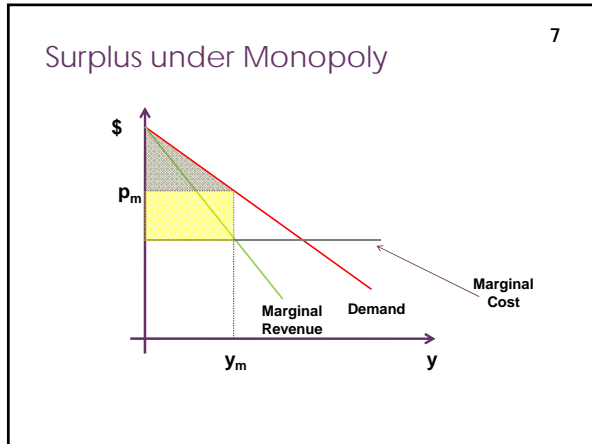
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Two Part Tariff

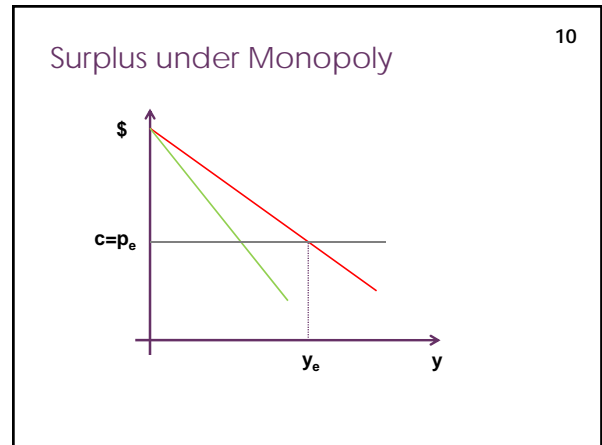
- Think of a monopolist who has costs of producing y given by cy
- And faces a demand curve given by $p = a - by$
- We showed last lecture that if the firm chooses y to maximize $\pi = py - cy$
- Then they will set marginal revenue equal to marginal costs

$$y = \frac{a - c}{2b}$$

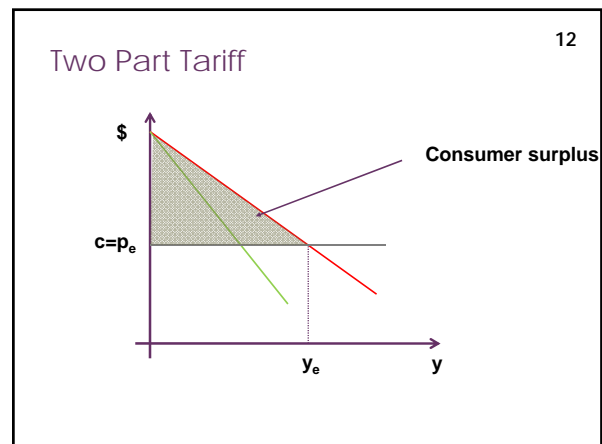
$$\pi = \frac{(a - c)^2}{4b}$$



- Monopolies 9
- Here is another strategy
 - Charge the consumer a fixed fee F to be allowed to buy stuff from you at all
 - After they have paid F , the consumer can buy as much as they like at a price equal to your marginal cost



- Two Part Tariff 11
- How much profit does the firm make before charging F ?
 - Zero!
 - Revenue = $py = cy$
 - Cost = cy
 - So all profits come from F
 - What is the largest F they can charge?
 - Well, think back to consumer surplus
 - We said that the consumer surplus of output y at price p is the amount that the consumer would be prepared to pay to buy that amount at that price
 - So that is the maximum amount that the firm could charge



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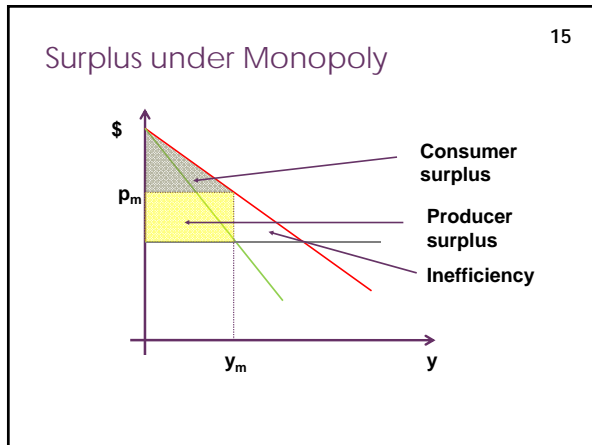
Two Part Tariff

- The consumer surplus of selling y_e at price c is equal to $\frac{(a-c)^2}{2b}$
- This is the maximum amount of profit the firm could make
- Greater than what they would get from selling y_m at p_m and charging no fee!

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Two Part Tariff

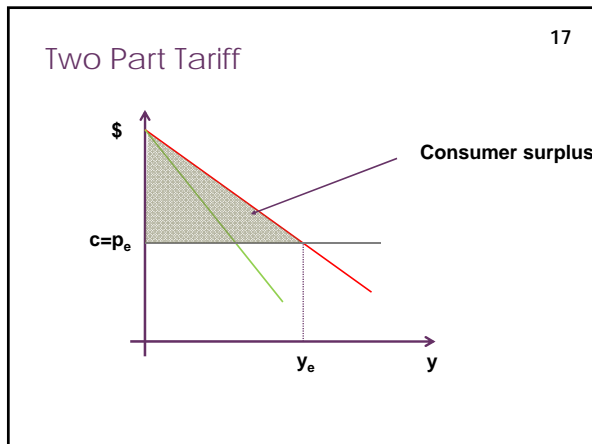
- What is going on here?
- The strategy of selling y_m at p_m is inefficient
 - Does not maximize total surplus



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Two Part Tariff

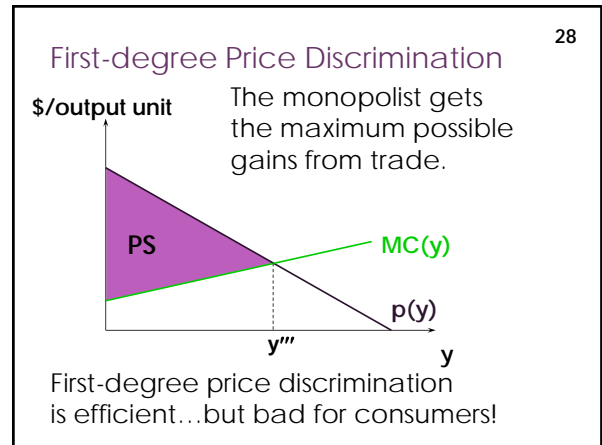
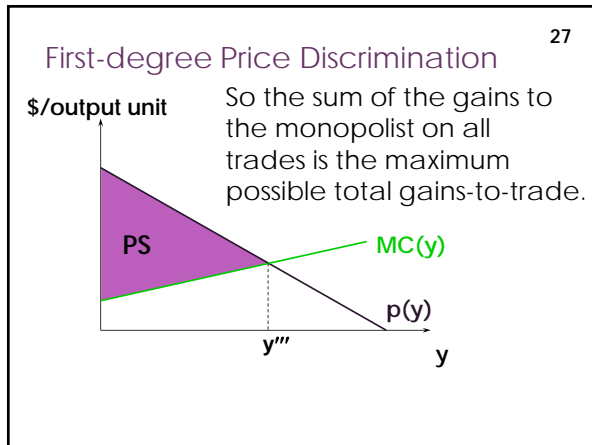
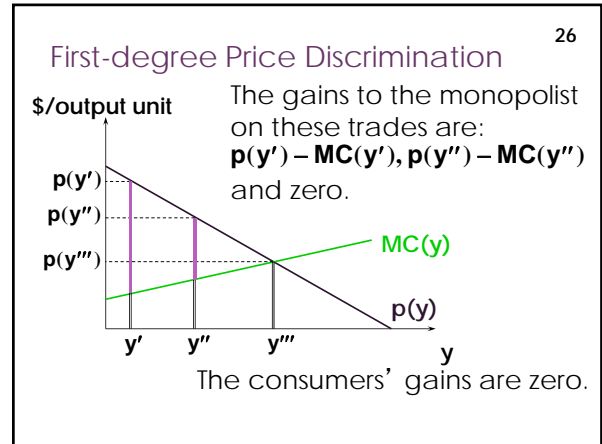
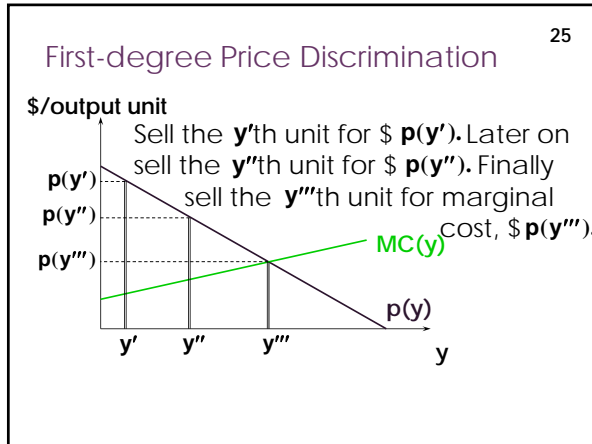
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- The strategy of selling y_m at p_m is inefficient
 - Does not maximize total surplus
- The strategy of selling y_m at c is efficient
 - It is the outcome we would expect from perfect competition
 - Maximizes total surplus



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Two Part Tariff

- What is going on here?
- The strategy of selling y_m at p_m is inefficient
 - Does not maximize total surplus
- The strategy of selling y_m at c is efficient
 - It is the outcome we would expect from perfect competition
 - Maximizes total surplus
- So with a two part tariff the monopoly can
 - Maximize total surplus
 - Extract all of it with the up front fee!
- Real life examples?
 - Mobile phones?
 - TV bundles?



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- ### First-degree Price Discrimination
- First-degree price discrimination gives a monopolist all of the possible gains-to-trade, leaves the buyers with zero surplus, and supplies the efficient amount of output.
 - Real world example? Hard for monopolists to do this.
 - Requires
 - Can identify the willingness to pay of all consumers
 - Can charge different consumers different prices
 - No reselling

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- ### Second-degree Price Discrimination
- Second-degree price discrimination is when all customers have access to the same price schedule, but consumers self-select
 - Unlike first example, cannot **explicitly** charge different prices to different people
 - Idea: Monopolist differentiates by offering to high-willingness-to-pay customers a high price, and to low-willingness-to-pay customers a lower price but also lower quality

Second-degree Price Discrimination 31

- Example? TV Bundles
 - If you buy just the sports package, then this is quite expensive
 - If you buy sports and movies both become cheaper
 - Someone who cares only about sport pays a higher price
 - Someone who cares about movies (and so has the movie channel) faces a lower price for sports
- Key is to make bundles **incentive compatible**
 - People buy the packages they are supposed to
 - As you will see for homework

Third-degree Price Discrimination 32

- Price paid by buyers in a given group is the same for all units purchased. But price may differ across buyer groups.
 - Cannot charge different prices to **everyone**
 - Can charge different prices to different groups

Third-degree Price Discrimination 33

- A monopolist manipulates market price by altering the quantity of product supplied to that market.
- So the question "What discriminatory prices will the monopolist set, one for each group?" is really the question "How many units of product will the monopolist supply to each group?"
- Two markets, 1 and 2.
- y_1 is the quantity supplied to market 1. Market 1's inverse demand function is $p_1(y_1)$.
- y_2 is the quantity supplied to market 2. Market 2's inverse demand function is $p_2(y_2)$.

Third-degree Price Discrimination 34

- For given supply levels y_1 and y_2 the firm's profit is

$$\Pi(y_1, y_2) = p_1(y_1)y_1 + p_2(y_2)y_2 - c(y_1 + y_2).$$

- What values of y_1 and y_2 maximize profit?

Third-degree Price Discrimination 35

$$\Pi(y_1, y_2) = p_1(y_1)y_1 + p_2(y_2)y_2 - c(y_1 + y_2).$$

The profit-maximization conditions are

$$\frac{\partial}{\partial y_1}(p_1(y_1)y_1) = \frac{\partial c(y_1 + y_2)}{\partial y_1}$$

and

$$\frac{\partial}{\partial y_2}(p_2(y_2)y_2) = \frac{\partial c(y_1 + y_2)}{\partial y_2}.$$

Third-degree Price Discrimination 36

$$\frac{\partial}{\partial y_1}(p_1(y_1)y_1) = \frac{\partial}{\partial y_2}(p_2(y_2)y_2) = \frac{\partial c(y_1 + y_2)}{\partial (y_1 + y_2)}$$

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Third-degree Price Discrimination

$$\frac{\partial}{\partial y_1}(p_1(y_1)y_1) = \frac{\partial}{\partial y_2}(p_2(y_2)y_2) = \frac{\partial c(y_1+y_2)}{\partial (y_1+y_2)}$$

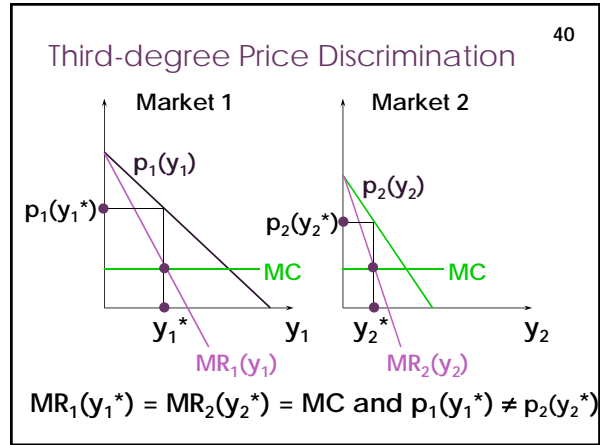
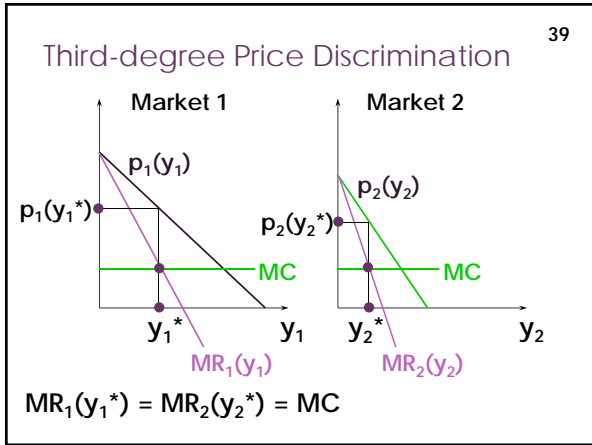
MR₁(y₁) = MR₂(y₂) says that the allocation y₁, y₂ maximizes the revenue from selling y₁ + y₂ output units.
E.g., if MR₁(y₁) > MR₂(y₂) then an output unit should be moved from market 2 to market 1 to increase total revenue.

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Third-degree Price Discrimination

$$\frac{\partial}{\partial y_1}(p_1(y_1)y_1) = \frac{\partial}{\partial y_2}(p_2(y_2)y_2) = \frac{\partial c(y_1+y_2)}{\partial (y_1+y_2)}$$

The marginal revenue common to both markets equals the marginal production cost if profit is to be maximized.



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Third-degree Price Discrimination

- In which market will the monopolist cause the higher price?

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Third-degree Price Discrimination

- In which market will the monopolist cause the higher price?
- Recall that

$$MR_1(y_1) = p_1(y_1) \left[1 + \frac{1}{\epsilon_1} \right]$$

and

$$MR_2(y_2) = p_2(y_2) \left[1 + \frac{1}{\epsilon_2} \right].$$

Third-degree Price Discrimination

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- In which market will the monopolist cause the higher price?

- Recall that

$$MR_1(y_1) = p_1(y_1) \left[1 + \frac{1}{\epsilon_1} \right]$$

and

- But,

$$MR_2(y_2) = p_2(y_2) \left[1 + \frac{1}{\epsilon_2} \right].$$

$$MR_1(y_1^*) = MR_2(y_2^*) = MC(y_1^* + y_2^*)$$

Third-degree Price Discrimination

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$$\text{So } p_1(y_1^*) \left[1 + \frac{1}{\epsilon_1} \right] = p_2(y_2^*) \left[1 + \frac{1}{\epsilon_2} \right].$$

Third-degree Price Discrimination

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$$\text{So } p_1(y_1^*) \left[1 + \frac{1}{\epsilon_1} \right] = p_2(y_2^*) \left[1 + \frac{1}{\epsilon_2} \right].$$

Therefore, $p_1(y_1^*) > p_2(y_2^*)$ if and only if

$$1 + \frac{1}{\epsilon_1} < 1 + \frac{1}{\epsilon_2}$$

Third-degree Price Discrimination

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$$\text{So } p_1(y_1^*) \left[1 + \frac{1}{\epsilon_1} \right] = p_2(y_2^*) \left[1 + \frac{1}{\epsilon_2} \right].$$

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Third-degree Price Discrimination

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The monopolist sets the higher price in the market where demand is least own-price elastic.

Examples of 3rd degree price discrimination?

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- Can we think of examples?

Examples of 3rd degree price discrimination?

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- Can we think of examples?
- Think of **student discounts!**
- One may say, "these are nice guys that want to help students"
- But in truth, this is a way to price discriminate
- Students usually have a lower available income, so their demand is more elastic (they won't pay too much)
- Discrimination allows firm to charge **more** to non-students
- So this is not done to lower student's prices, **but to increase the price to others!!**
- Coherent with what we have seen: lower price to more price-sensitive group

Summary

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Summary

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- Today we have
- Modelled two ways for monopolists to extract more profit
 - Two part tariffs
 - Price discrimination