Chapter Twenty-Five

Monopoly Behavior

How Should a Monopoly Price?

- So far a monopoly has been thought of as a firm which has to sell its product at the same price to every customer. This is **uniform pricing**.
- Can **price-discrimination** earn a monopoly higher profits?

Types of Price Discrimination

1st-degree: Each output unit is sold at a different price. Prices may differ across buyers.

2nd-degree: The price paid by a buyer can vary with the quantity demanded by the buyer. But all customers face the same price schedule. E.g. bulk-buying discounts.

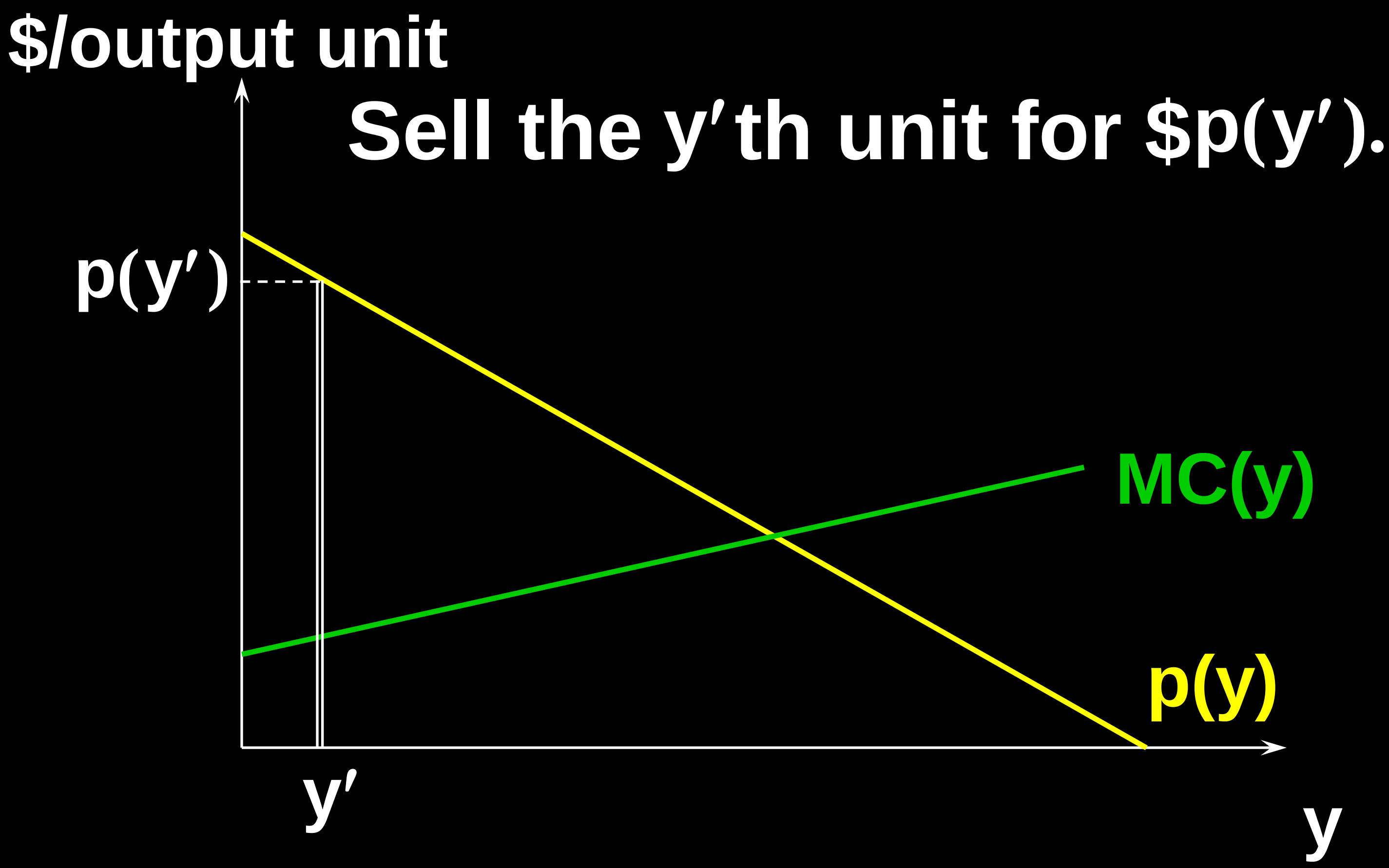
Types of Price Discrimination

3rd-degree: Price paid by buyers in a given group is the same for all units purchased. But price may differ across buyer groups.
E.g., senior citizen and student discounts vs. no discounts for middle-aged persons.

First-degree Price Discrimination

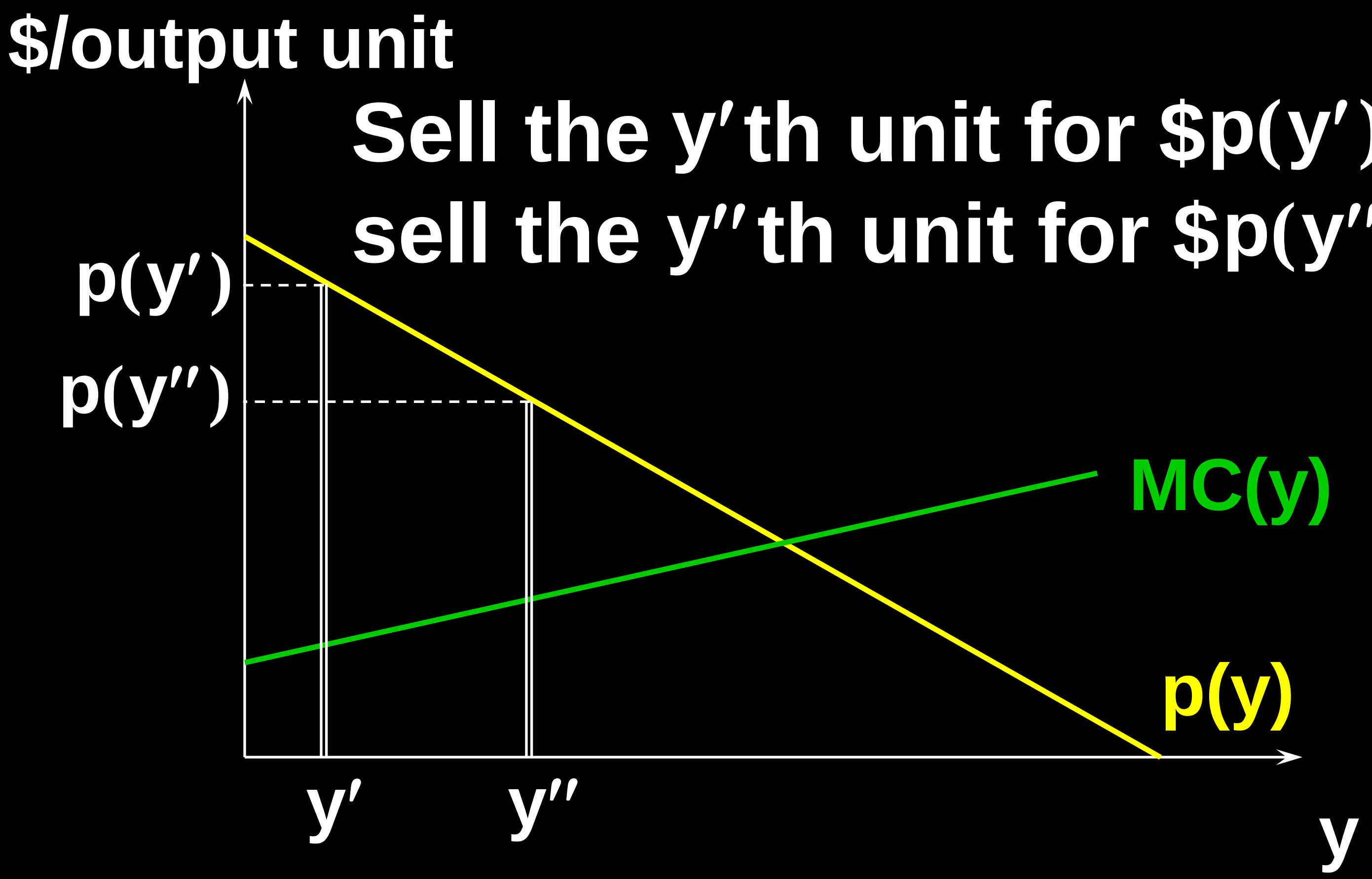
- **Each output unit is sold at a different price. Price may differ across buyers.**
- **It requires that the monopolist can discover the buyer with the highest valuation of its product, the buyer with the next highest valuation, and so on.**

First-degree Price Discrimination



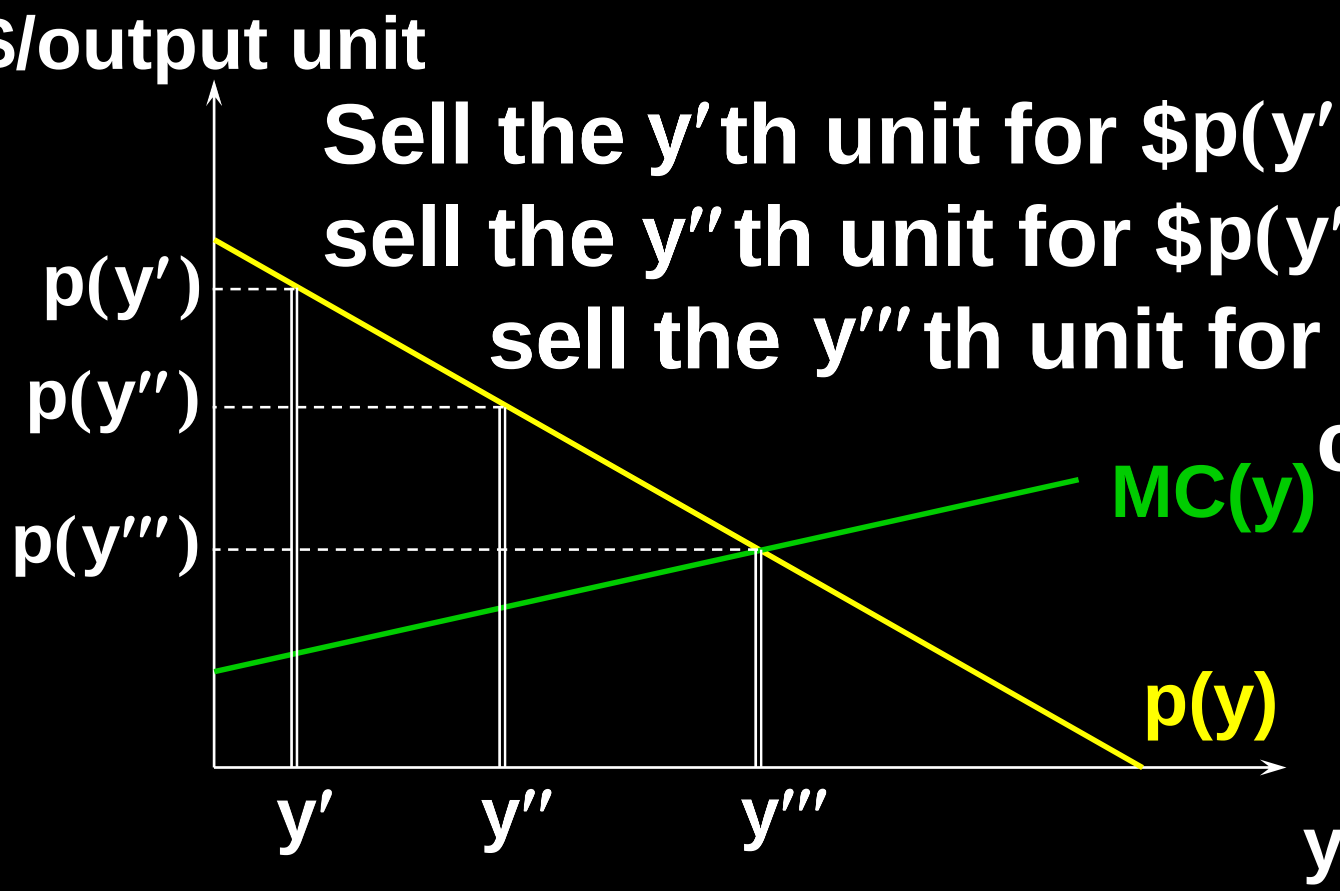
First-degree Price Discrimination

Sell the y′th unit for \$p(y′). Later on sell the y″th unit for \$p(y″).

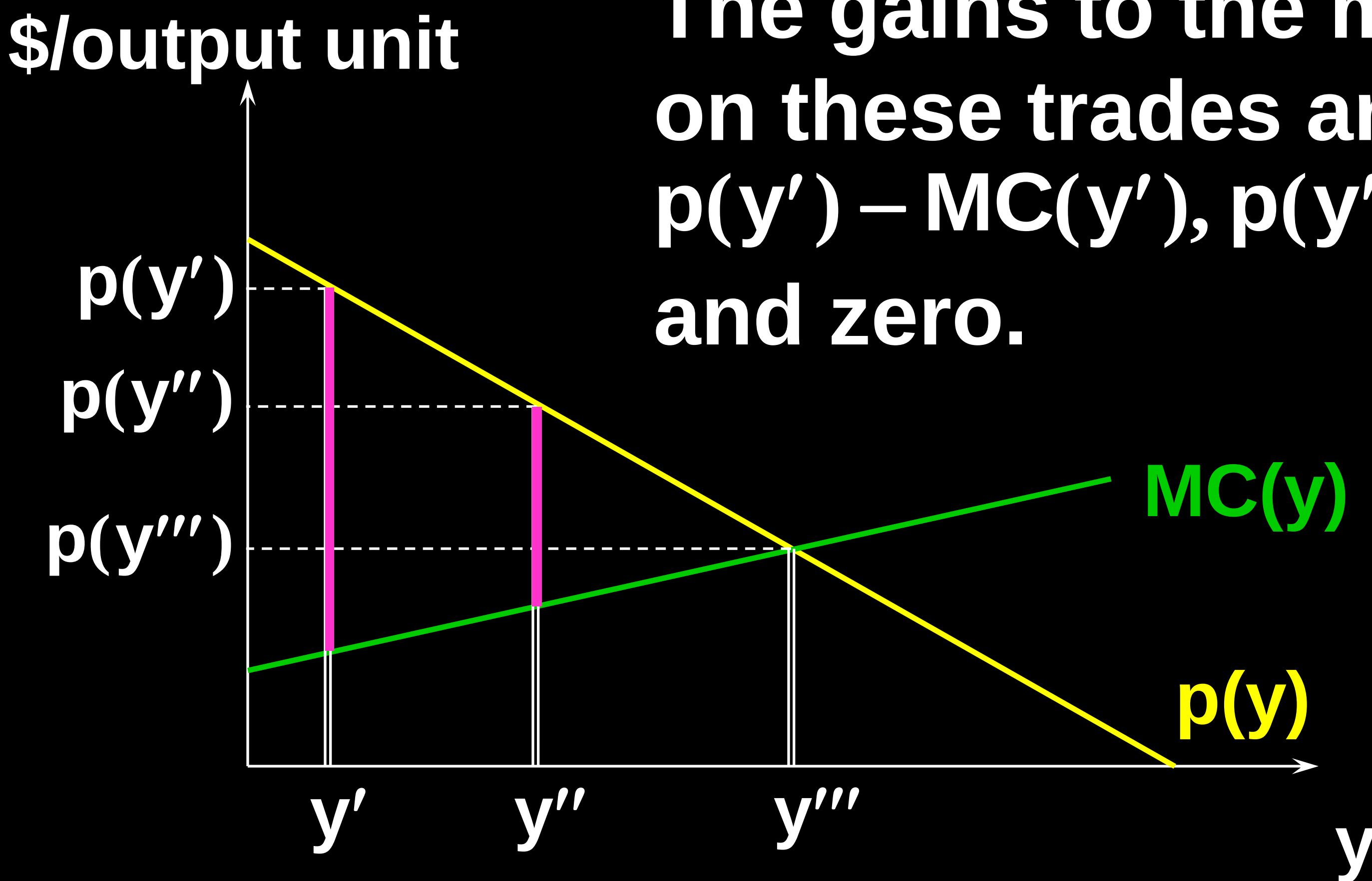


First-degree Price Discrimination

Sell the y'th unit for $\$p(y')$. Later on sell the y''th unit for $\$p(y'')$. Finally sell the y'''th unit for marginal cost, $\$p(y''')$.



First-degree Price Discrimination

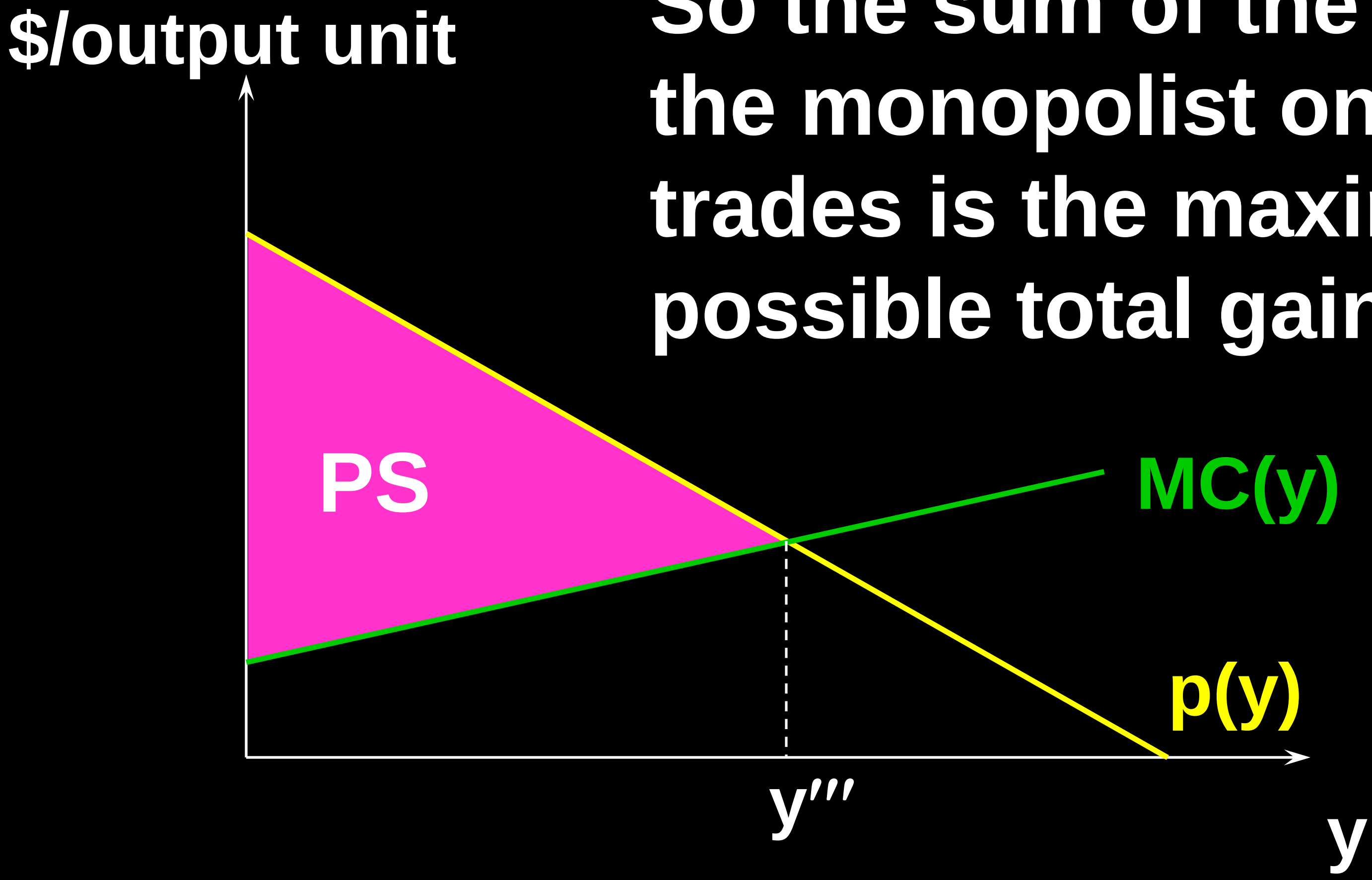


The gains to the monopolist on these trades are: $p(y') - MC(y')$, $p(y'') - MC(y'')$ and zero.

The consumers' gains are zero.

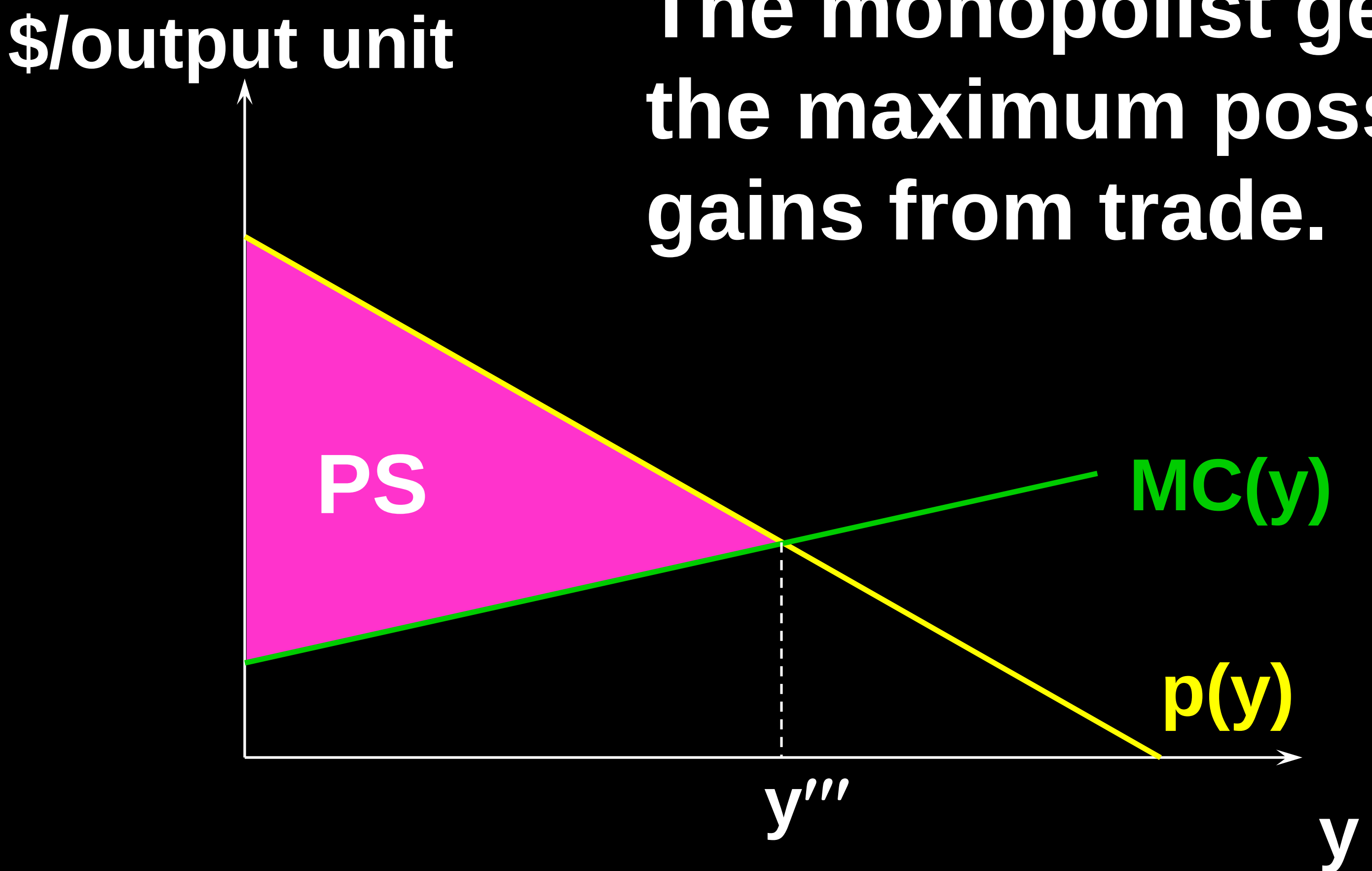
First-degree Price Discrimination

So the sum of the gains to the monopolist on all trades is the maximum possible total gains-to-trade.



First-degree Price Discrimination

The monopolist gets the maximum possible gains from trade.



First-degree price discrimination is Pareto-efficient.

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.

Third-degree Price Discrimination

Price paid by buyers in a given group is the same for all units purchased. But price may differ across buyer groups.

Third-degree Price Discrimination

- 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?”

Third-degree Price Discrimination

- 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

- 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

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

The profit-maximization conditions are

$$\frac{\partial \Pi}{\partial y_1} = \frac{\partial}{\partial y_1}\left(p_1(y_1)y_1\right) - \frac{\partial c(y_1 + y_2)}{\partial (y_1 + y_2)} \times \frac{\partial (y_1 + y_2)}{\partial y_1}$$

$$= 0$$

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$$\frac{\partial \Pi}{\partial y_2} = \frac{\partial}{\partial y_2}\left(p_2(y_2)y_2\right) - \frac{\partial c(y_1 + y_2)}{\partial (y_1 + y_2)} \times \frac{\partial (y_1 + y_2)}{\partial y_2}$$

$$= 0$$

Third-degree Price Discrimination

$$\frac{\partial(y_1+y_2)}{\partial y_1}=1$$ and $$\frac{\partial(y_1+y_2)}{\partial y_2}=1$$ so

the profit-maximization conditions are

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

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

Third-degree Price Discrimination

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

Third-degree Price Discrimination

$$\underbrace{\frac{\partial}{\partial y_1}\left(p_1(y_1)y_1\right) = \frac{\partial}{\partial y_2}\left(p_2(y_2)y_2\right)} = \frac{\partial\, c(y_1 + y_2)}{\partial\, (y_1 + y_2)}$$

$MR_1(y_1) = MR_2(y_2)$ says that the allocation y_1, y_2 **maximizes the revenue** from selling $y_1 + y_2$ output units.

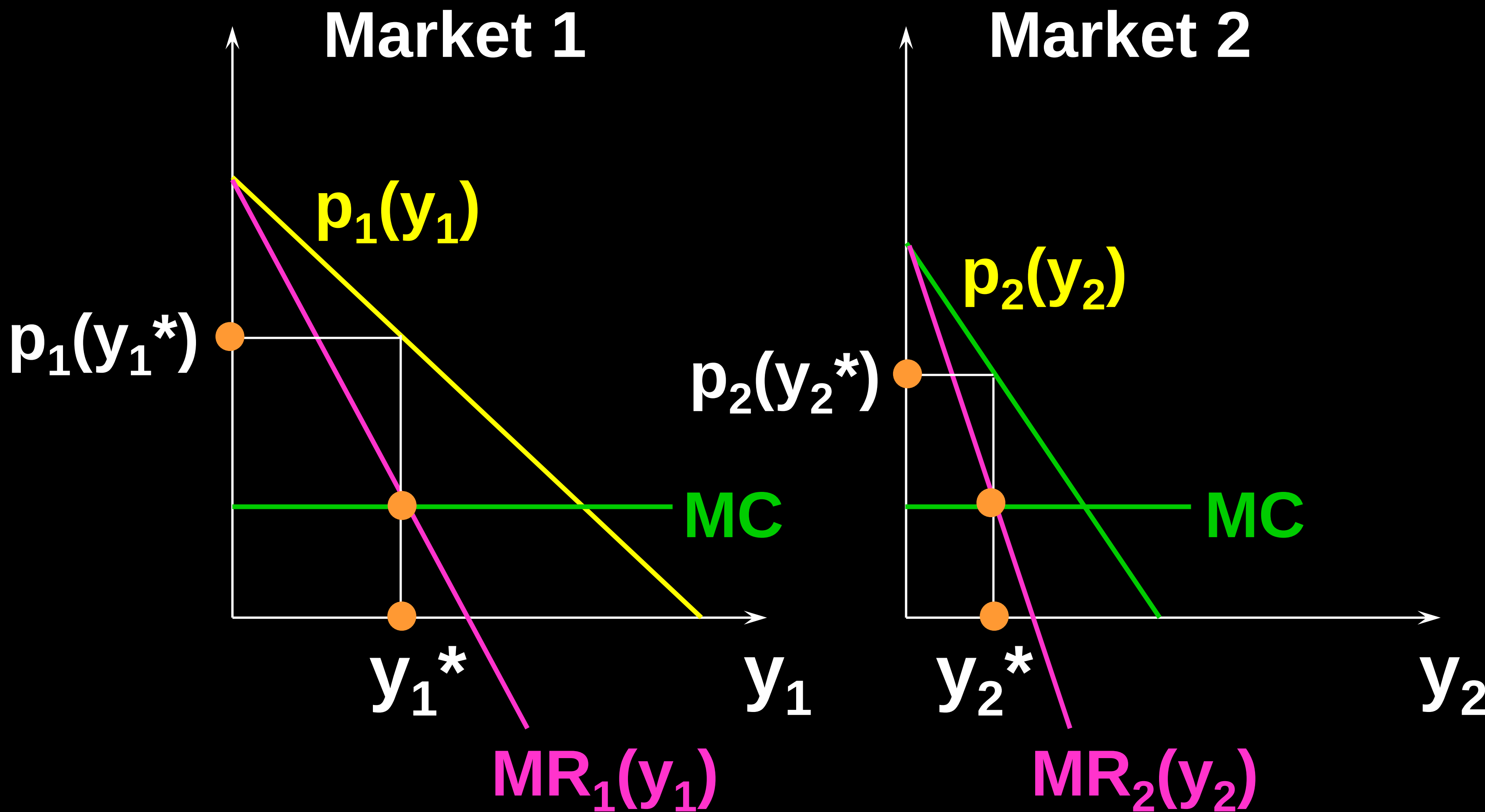
E.g. if $MR_1(y_1) > MR_2(y_2)$ then an output unit should be moved from market 2 to market 1 to increase total revenue.

Third-degree Price Discrimination

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

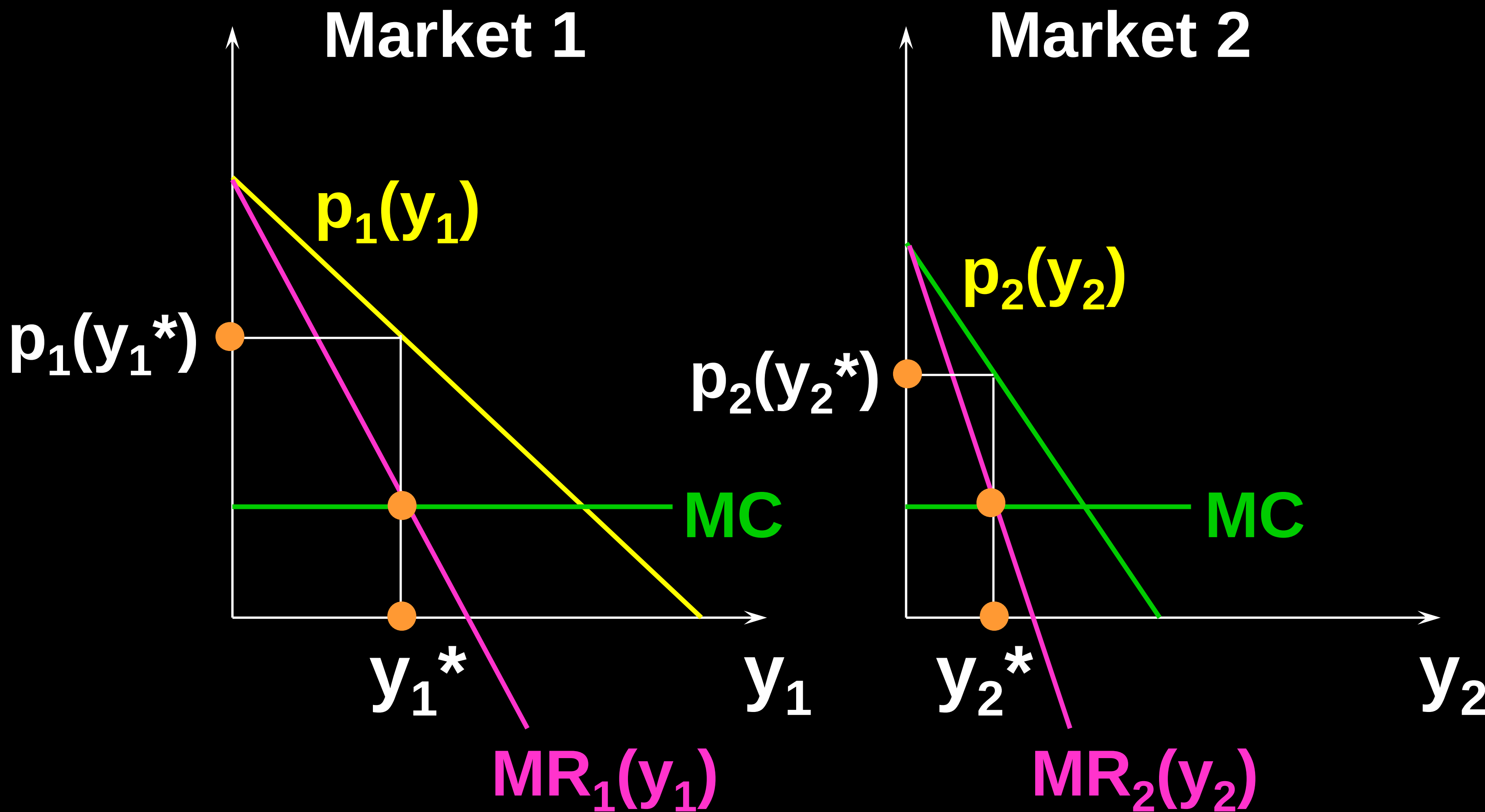
The marginal revenue common to both markets equals the marginal production cost if profit is to be maximized.

Third-degree Price Discrimination



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

Third-degree Price Discrimination



$MR_1(y_1^*) = MR_2(y_2^*) = MC$ and $p_1(y_1^*) \neq p_2(y_2^*)$.

Third-degree Price Discrimination

In which market will the monopolist set the higher price?

Third-degree Price Discrimination

In which market will the monopolist cause the higher price?

Recall that

$$MR_1(y_1) = p_1(y_1)\left[1 + \frac{1}{\varepsilon_1}\right]$$

and

$$MR_2(y_2) = p_2(y_2)\left[1 + \frac{1}{\varepsilon_2}\right].$$

Third-degree Price Discrimination

In which market will the monopolist cause the higher price?

Recall that

$$MR_1(y_1) = p_1(y_1)\left[1 + \frac{1}{\varepsilon_1}\right]$$

and

$$MR_2(y_2) = p_2(y_2)\left[1 + \frac{1}{\varepsilon_2}\right].$$

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

Third-degree Price Discrimination

So $$p_1(y_1^*)\left[1+\frac{1}{\varepsilon_1}\right]=p_2(y_2^*)\left[1+\frac{1}{\varepsilon_2}\right].$$

Third-degree Price Discrimination

So $$p_1(y_1^*)\left[1+\frac{1}{\varepsilon_1}\right] = p_2(y_2^*)\left[1+\frac{1}{\varepsilon_2}\right].$$

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

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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.

Two-Part Tariffs

- A two-part tariff is a lump-sum fee, p_1, plus a price p_2 for each unit of product purchased.
- Thus the cost of buying x units of product is

$$p_1 + p_2x.$$

Two-Part Tariffs

- Should a monopolist prefer a two-part tariff to uniform pricing, or to any of the price-discrimination schemes discussed so far?
- If so, how should the monopolist design its two-part tariff?

Two-Part Tariffs

$$p_1 + p_2x$$

Q: What is the largest that p_1 can be?

Two-Part Tariffs

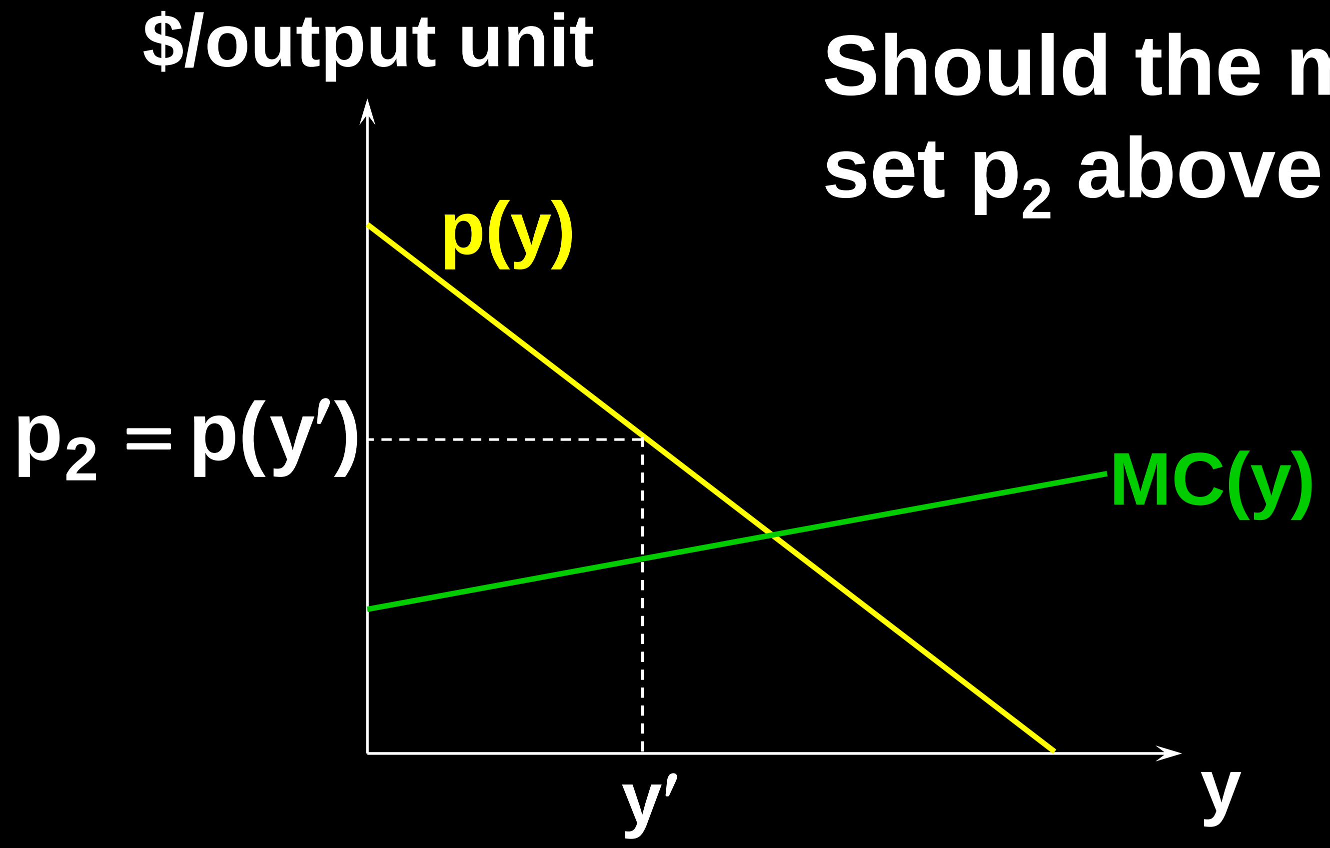
$$p_1 + p_2x$$

Q: What is the largest that p_1 can be?

A: p_1 is the "entrance fee" so the largest it can be is the surplus the buyer gains from entering the market.

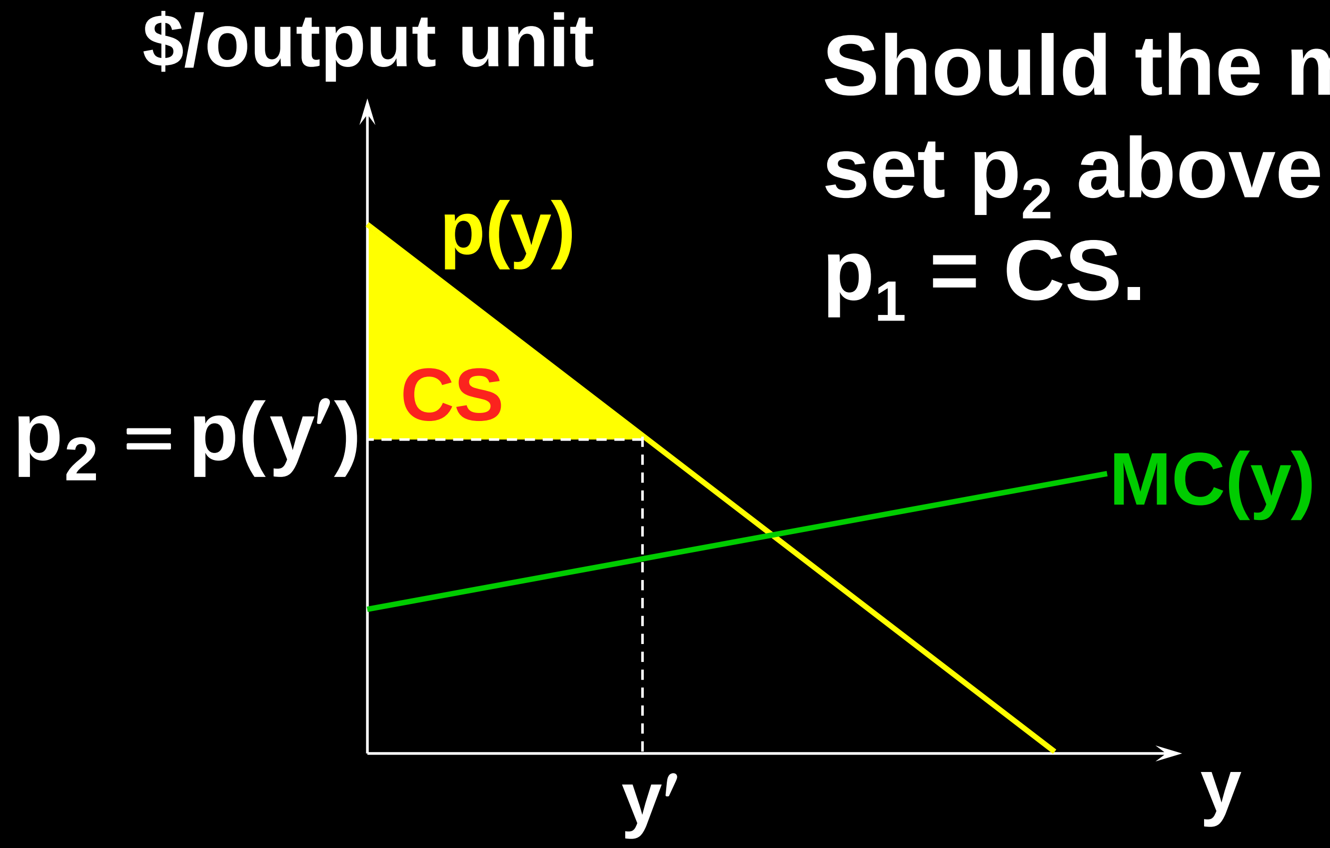
Set p_1 = CS and now ask what should be p_2?

Two-Part Tariffs



Should the monopolist set p_2 above MC?

Two-Part Tariffs



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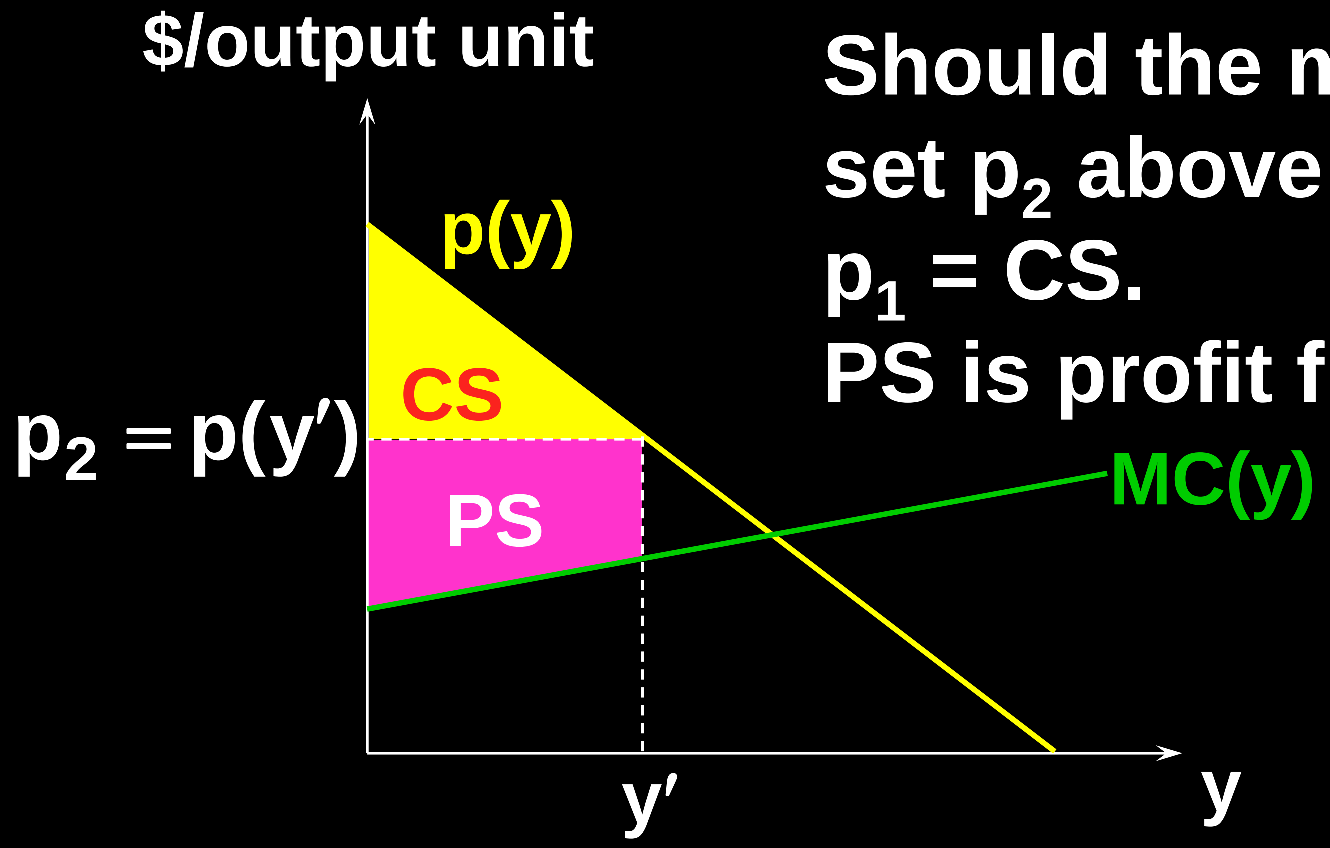
Two-Part Tariffs

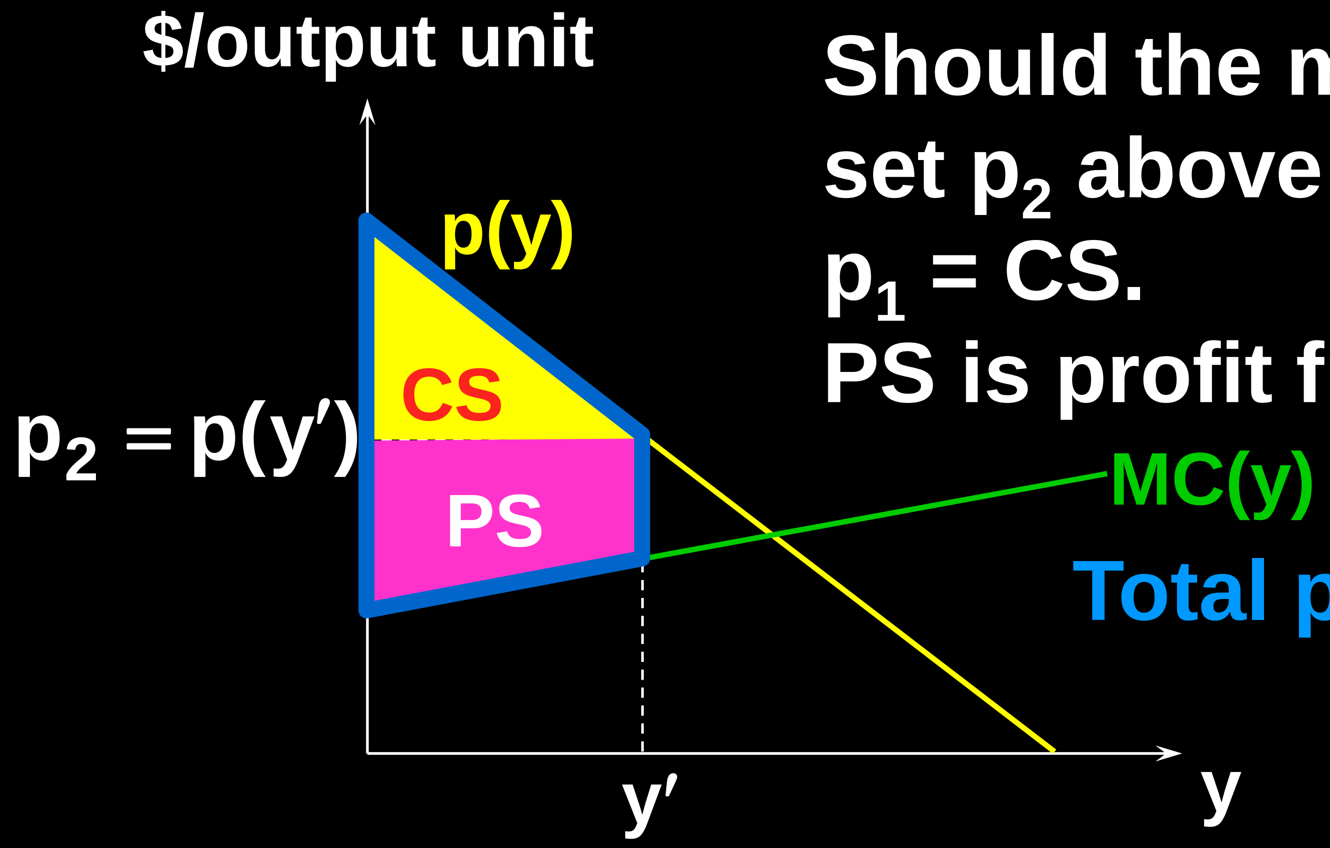


Should the monopolist set p_2 above MC?

p_1 = CS.

PS is profit from sales.

Two-Part Tariffs



Should the monopolist set p_2 above MC?

p_1 = CS.

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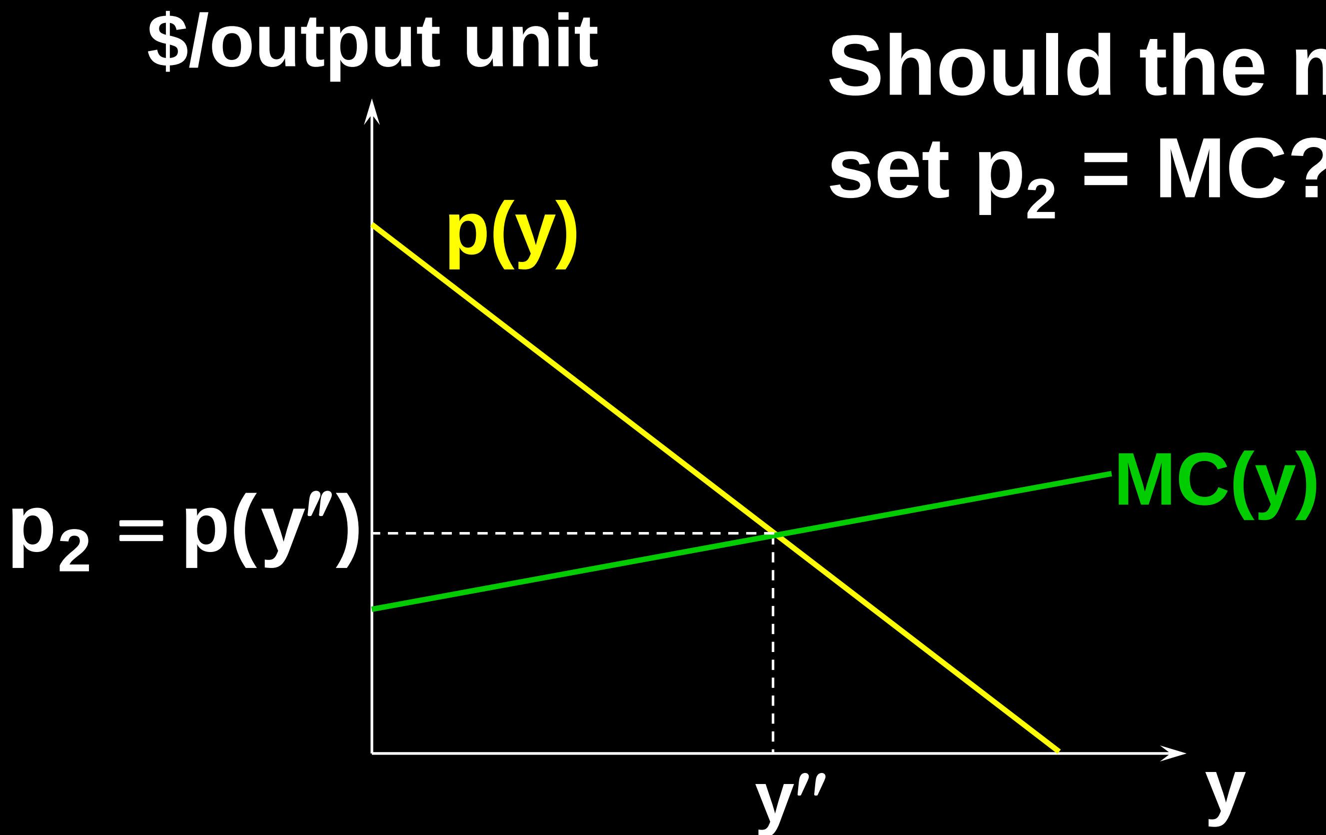
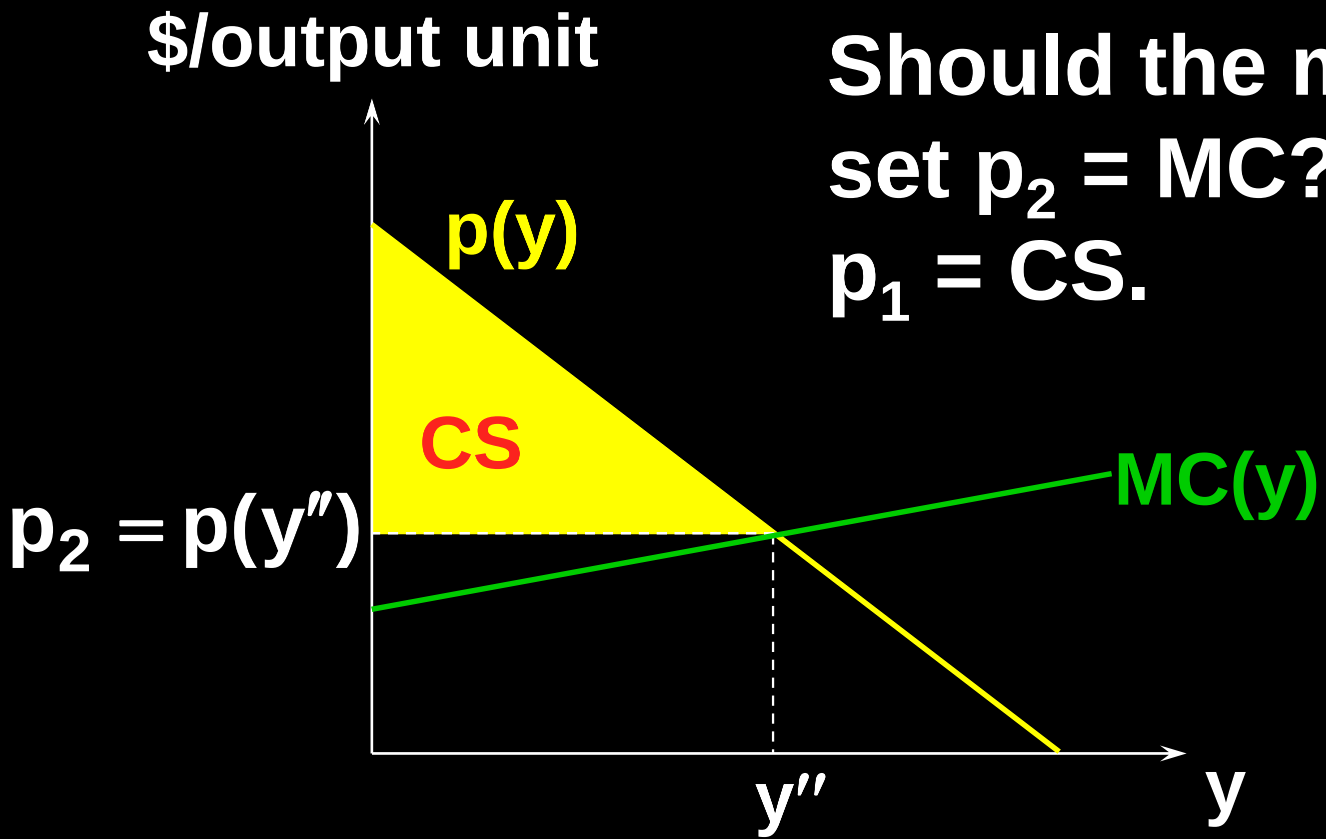
Total profit

Two-Part Tariffs

Should the monopolist set p_2 = MC?



Two-Part Tariffs



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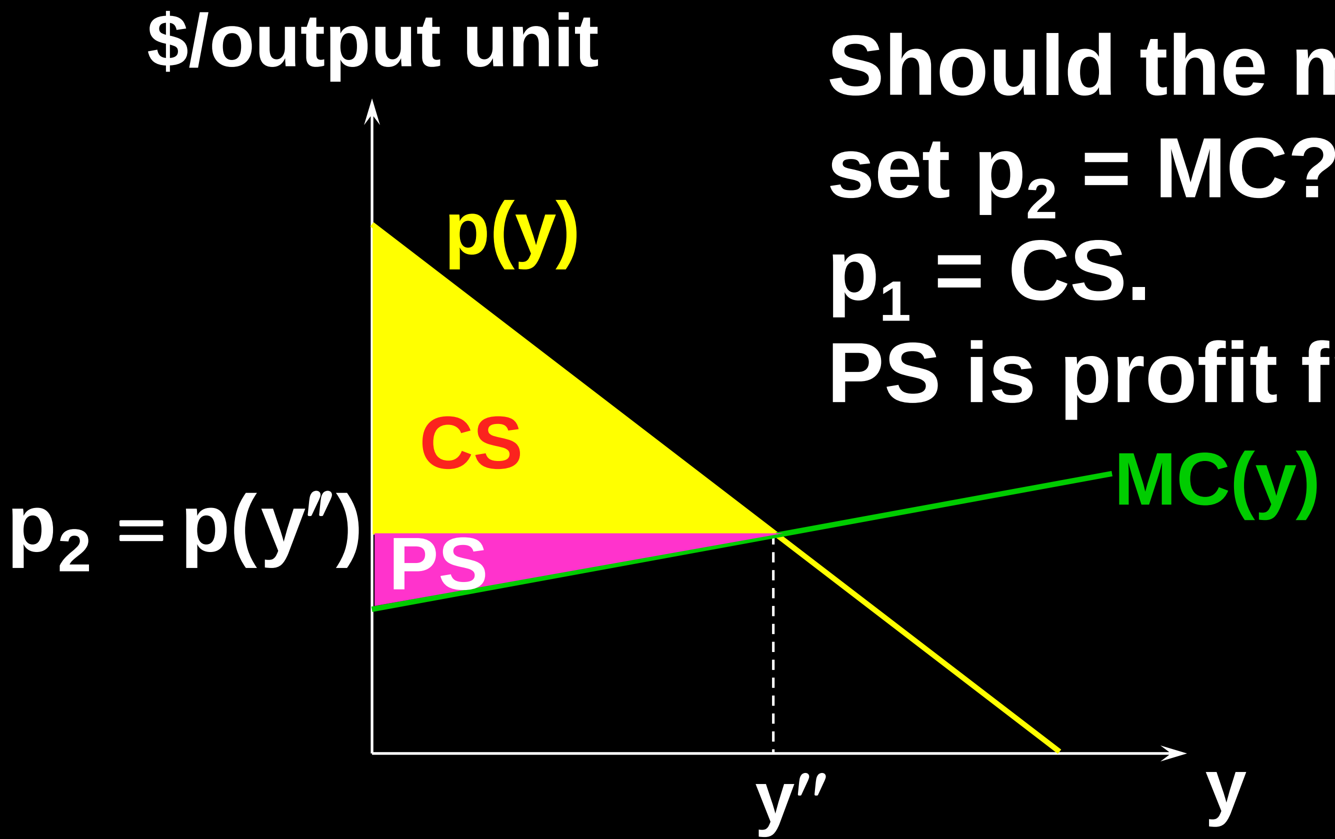
Two-Part Tariffs



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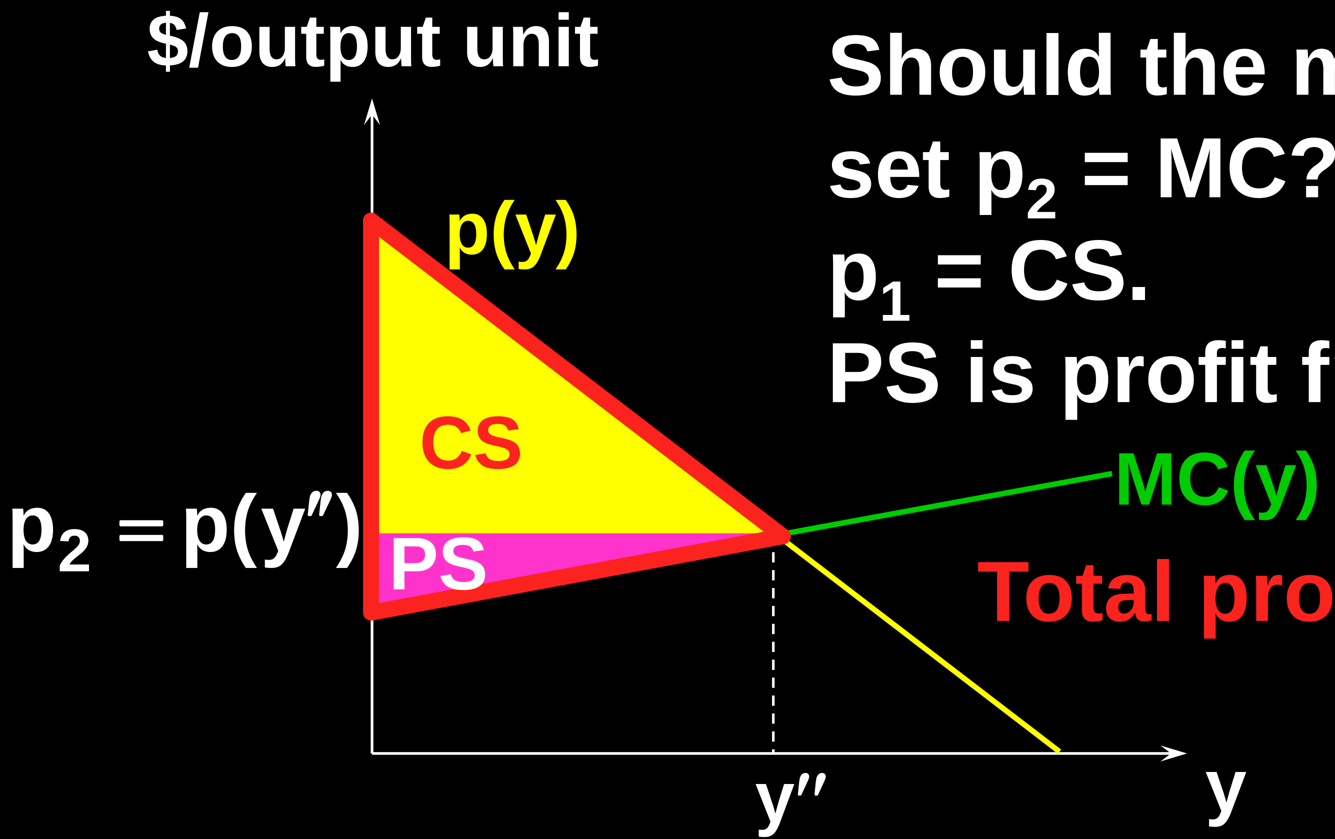
Two-Part Tariffs



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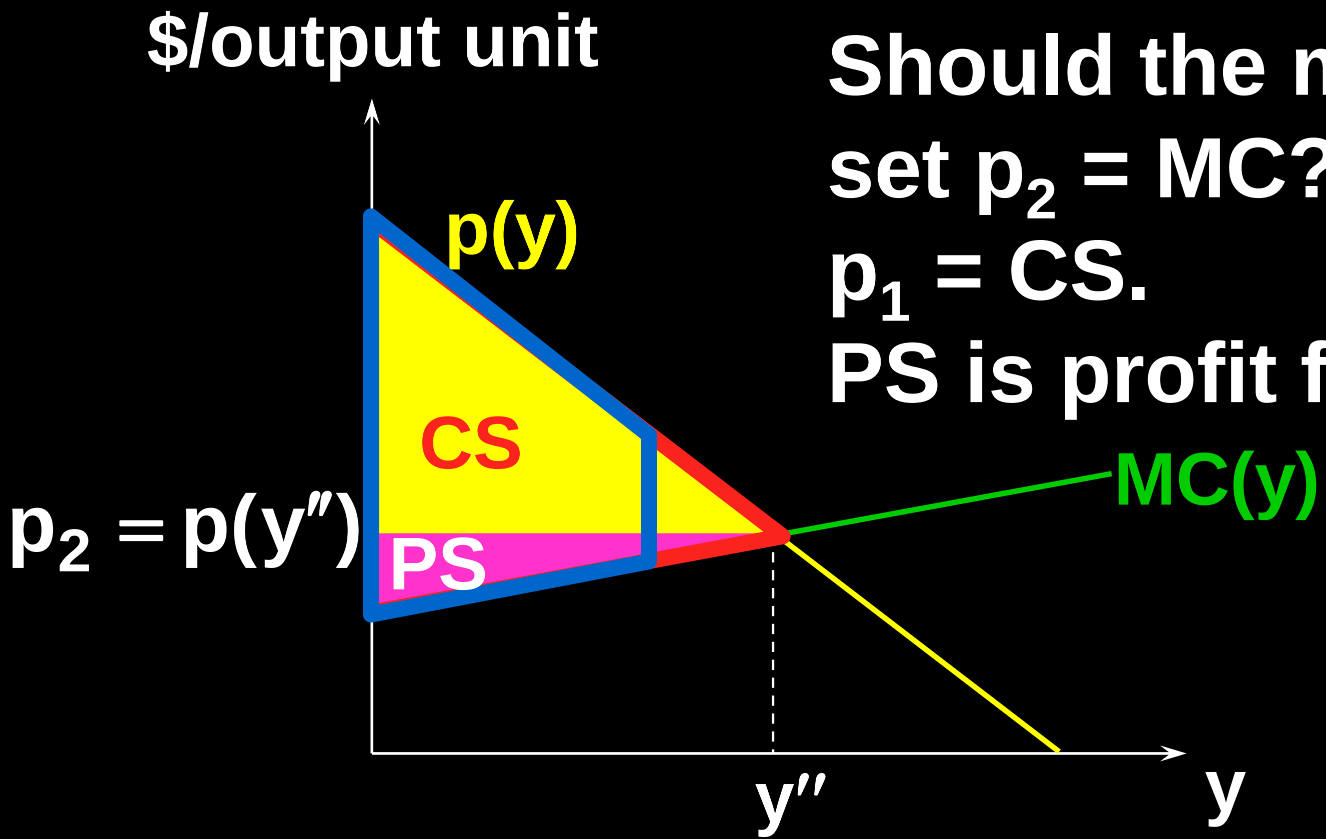
Two-Part Tariffs



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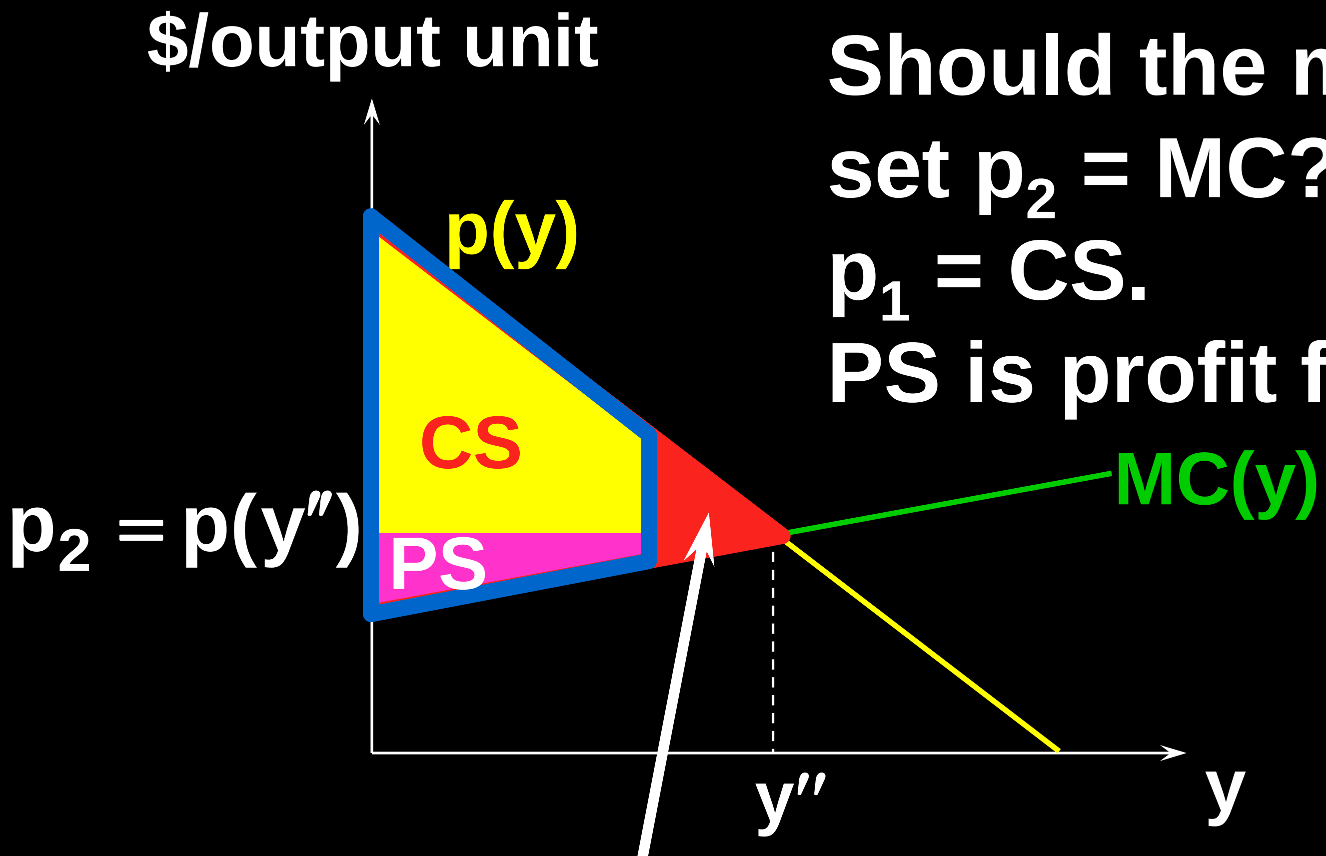

Should the monopolist set p_2 = MC?

p_1 = CS.

PS is profit from sales.

Additional profit from setting p_2 = MC.

Two-Part Tariffs

The monopolist maximizes its profit when using a two-part tariff by setting its per unit price p_2 at marginal cost and setting its lump-sum fee p_1 equal to Consumers' Surplus.

Two-Part Tariffs

A profit-maximizing two-part tariff gives an efficient market outcome in which the monopolist obtains as profit the total of all gains-to-trade.