LECTURE 4.0

PRICING

PRICING BEHAVIOURS

Firms adopt many different pricing strategies

- Offer a variety of versions of products.
- Rebates via an online code
- Mac versions of software may be priced higher
- Packets of 50 @ $1.13 each, packets of 2000 @ $0.13 each.
- Combinations priced lower than individual purchases of items

McAfee notes that American Airlines changes airfares ½ million times a day.

Why? Firms want to maximise profits. Pricing is one way to do this.

PRICING- OUTLINE

PRICING - READING

Chapter 10, “Pricing with Market Power” in Perloff and Brander (2016) *Managerial economics and strategy*

Chapter 11, “Pricing” in McAfee (2002) *Competitive Solutions*

Links to readings or downloads are available in Canvas.

LECTURE 4.1

MARKET POWER AND OPTIMAL PRICING

PRICING BEHAVIOURS

In a competitive market:

$$P = MC$$

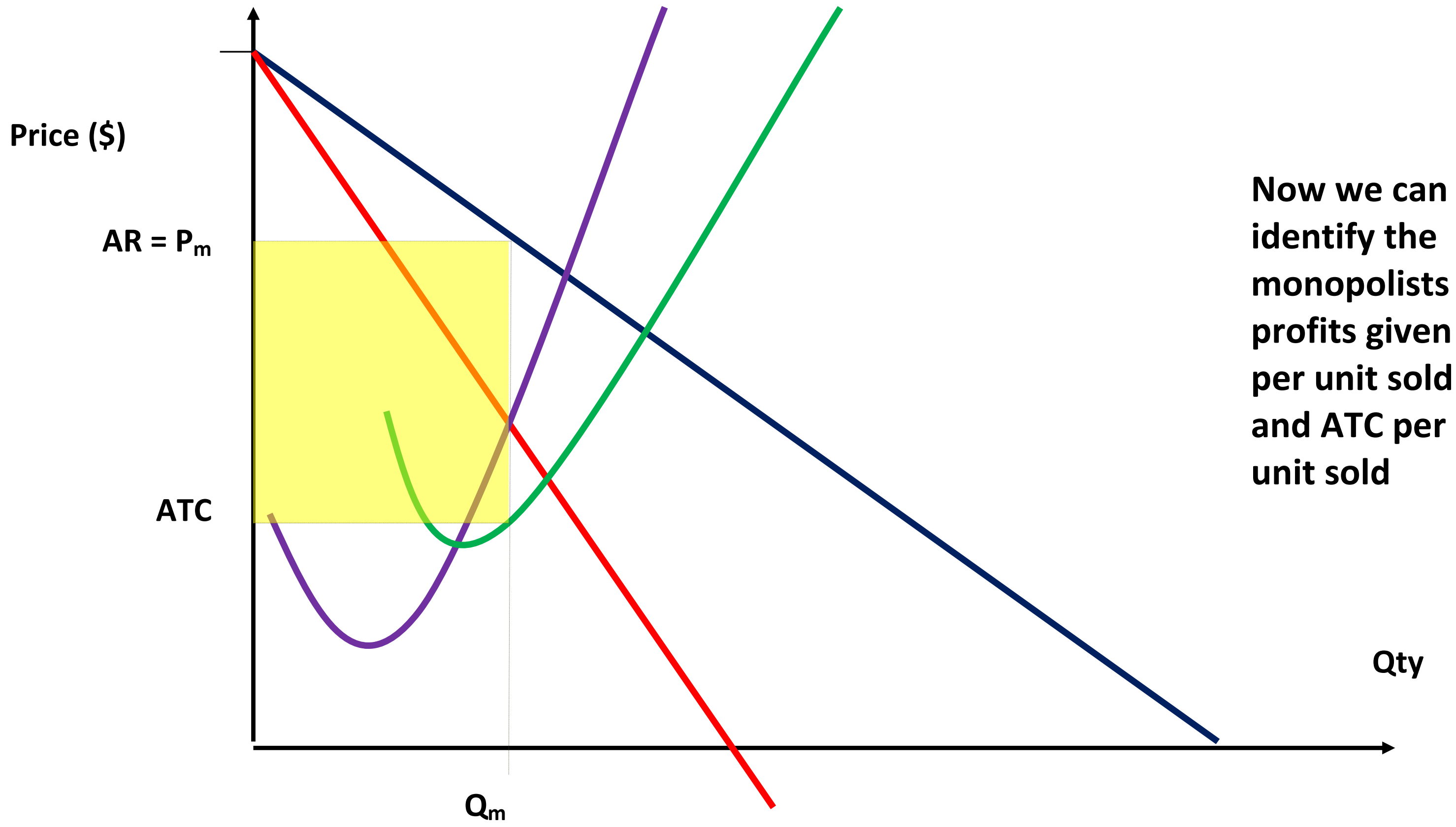
For price to exceed marginal cost, firms must have market power.

We have seen that profit maximisation for a firm with market power requires:

$$\text{Marginal revenue} = \text{Marginal cost}$$

Note that such a strategy leaves some consumer surplus on the table

SINGLE PRICE MONOPOLIST



Now we can identify the monopolists profits given AR per unit sold and ATC per unit sold

There are a number of features of this diagram including….

- Demand curve
- Relationship between the **MC** and **AC** curves
- Profit maximising choice

PROFIT MAXIMISING PRICING

As demand becomes less elastic the mark up over marginal cost becomes higher.

Recall:

$$MR = p\left[1 - \frac{1}{\eta}\right] = MC$$

Set higher prices for groups with less elastic demand:

$$\frac{p - MC}{p} = \frac{1}{\eta}$$

PROFIT MAXIMISING PRICING

Over the long-run entry means elasticity tends to ∞.

$$\frac{MC}{P} = \left[1 - \frac{1}{\eta}\right]$$

$$\frac{MC}{P} = \left[\frac{\eta - 1}{\eta}\right]$$

$$\frac{P}{MC} = \left[\frac{\eta}{\eta - 1}\right]$$

$$\lim_{\eta \to \infty} \frac{P}{MC} = \lim_{\eta \to \infty} \left[\frac{\eta}{\eta - 1}\right] = 1$$

PROFIT MAXIMISING PRICING

That is, in the limit :

$$P = MC$$

Conversely, the less elastic demand is the greater will be the mark-up over marginal cost.

LECTURE 4.2

FIRST DEGREE PRICE DISCRIMINATION

PRICE DISCRIMINATION

Price discrimination (PD): selling the same/similar good at different prices to different customers.

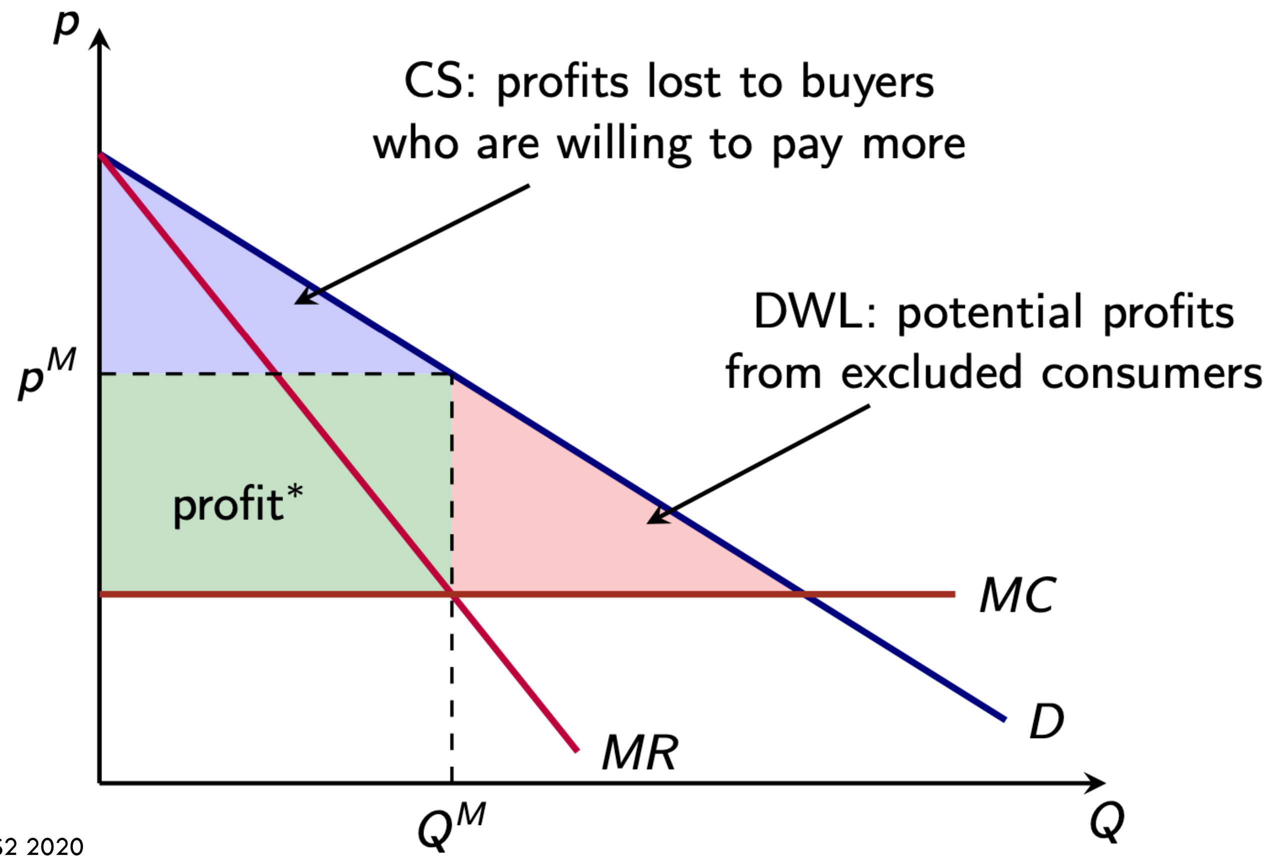
Price discrimination manifests in many ways:

- Different prices for different groups of customers (e.g. student/senior discounts, purchase history dependent prices)
- Quantity/bulk discounts; Selling a package of products at a discounted price
- Offering different “versions” of a product/service (e.g., economy class vs. business class)
- Varying prices over time (e.g. the prices of movies, books, and video games often decline over time; sales and fluctuating prices)

Crucial point: these price differences arise because of differences in demand, not the costs of serving the consumers.

PRICE DISCRIMINATION

Motivation :



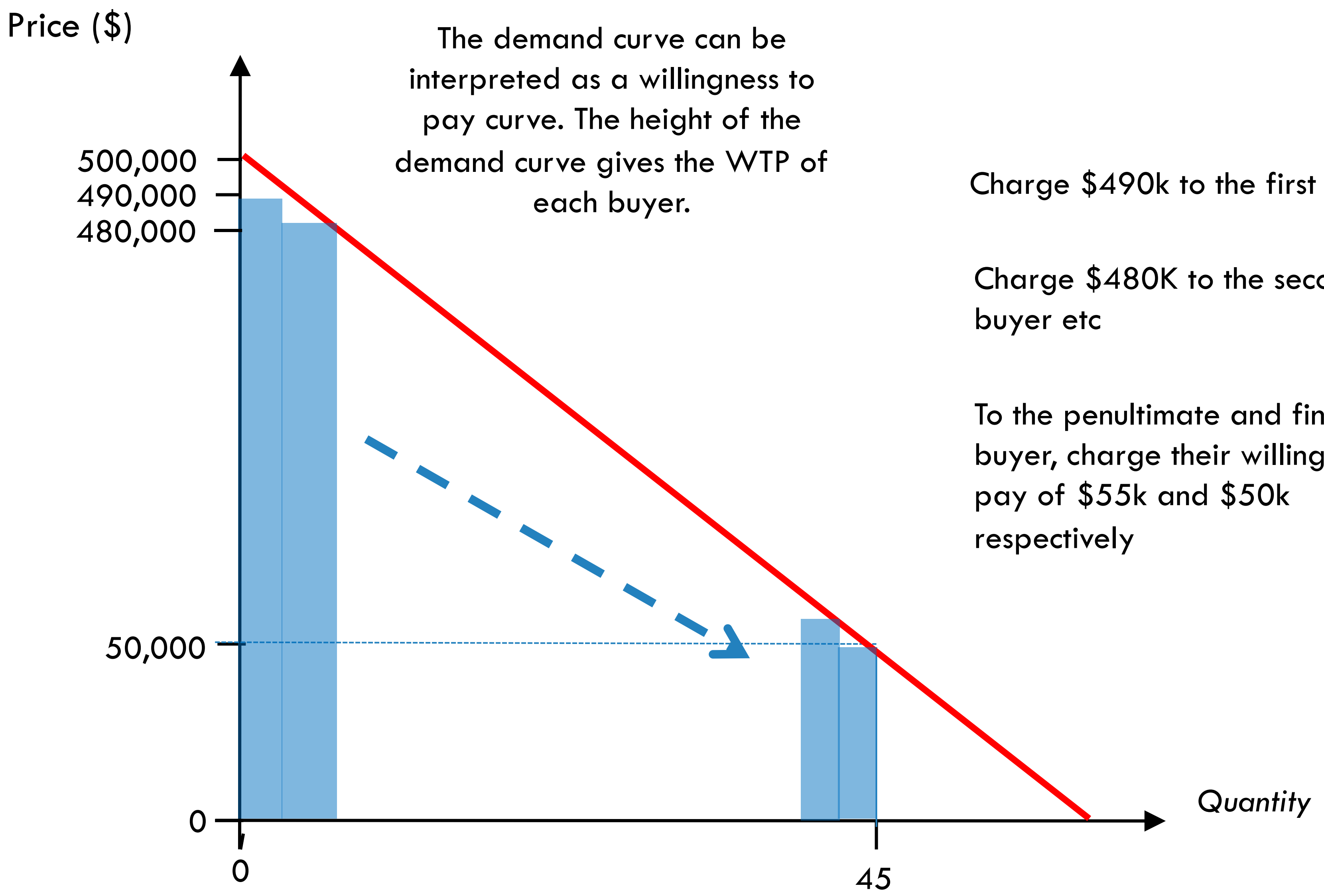
FIRST DEGREE PRICE DISCRIMINATION

What if you have heterogeneous customers, each with their own willingness to pay?

- Simply charge willingness to pay for each customer. This is first degree price discrimination.
- The firm extracts all surplus.
- Market efficiency is improved. There is no deadweight loss.

Is it ever feasible?

- Requires complete information about tastes and willingness to pay.



Charge $490k to the first buyer

Charge $480K to the second buyer etc

To the penultimate and final buyer, charge their willingness to pay of $55k and $50k respectively

LECTURE 4.3

TWO-PART TARIFFS

TWO-PART TARIFFS

There are two components to the price paid by a consumer

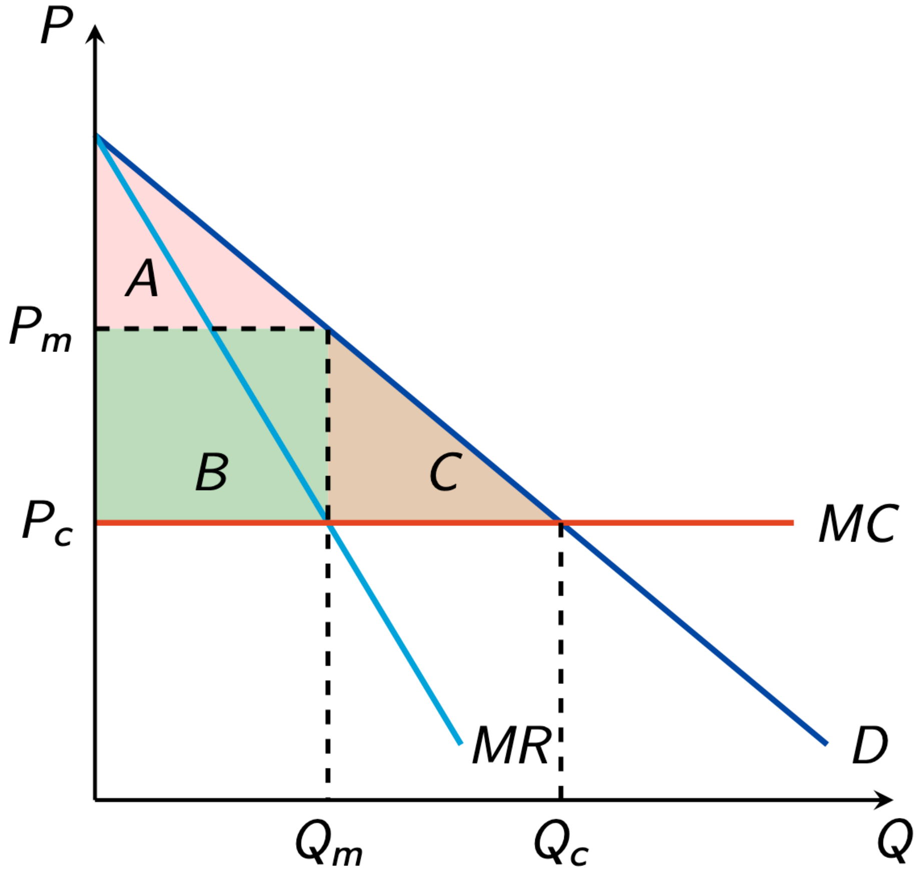
- a price per unit (e.g. $P = MC$)
- a fee to join (e.g. $F = CS$)

To buy q units, the consumer pays:

$$P_{bundle} = F + Pq$$

Examples: phone plans, theme parks, electricity plans, razors

TWO-PART TARIFFS



To sell Qc, the firm must charge $P_c < P_m$

Charge fee: $F = A + B + C$

Monopolist captures all consumer surplus and the previous deadweight loss

Higher profits than single-price monopolist

TWO-PART TARIFFS

With heterogeneous consumers the problem becomes a little more complex.

- Suppose we have two types of buyers – a high and low willingness to pay type.
- If we set per unit price = MC, the best we can do is to set the fixed fee at the consumer surplus of the low type consumer.

The optimal two-part tariff may involve a unit price different to MC

LECTURE 4.4

THIRD DEGREE

PRICE DISCRIMINATION

THIRD DEGREE PRICE DISCRIMINATION

It is difficult to learn each individual consumer's willingness to pay. It is more practical to divide consumers into a few groups according to observable characteristics.

- e.g. age or gender
- e.g. timing or location of purchase

Third degree price discrimination is the charging of a different price to different groups.

- Separate the market into the appropriate number of groups. Then maximise profit as a single price monopolist in each of the separate sub-markets.

THIRD DEGREE PRICE DISCRIMINATION

How does a single price monopolist maximise profit in each of the separate sub-markets.

- Recall, set MR = MC in each of the separate markets
- I.e. Elasticity rule implies higher prices for groups with less elastic demand.

$$\frac{p - MC}{p} = \frac{1}{\eta}$$

Examples

- student/senior/child discounts
- different price online vs. in store
- coupons mailed to some ZIP codes but not others

THIRD DEGREE PRICE DISCRIMINATION

Effects of third degree price discrimination based on market segmentation:

- Profit must go up
- Ambiguous effects on consumer surplus and total welfare.

Practical difficulties:

- Identification of each consumer group’s demand
- Arbitrage
- Possible legal/PR issues (though price discrimination is not per se illegal)

LECTURE 4.5

SECOND DEGREE

PRICE DISCRIMINATION

SECOND DEGREE PRICE DISCRIMINATION

When we can't distinguish market segments ourselves, induce self-selection so consumers distinguish themselves for us. This is second-degree price discrimination. Examples:

Versioning:

- Design product versions that appeal to different consumers (e.g. "high-end" products for high-income consumers).
- Induce consumers with higher incomes/taste for quality to pay more.

Bundling:

- Sell a package of products together, often at a discounted price.
- Induce consumers who value more products to buy more.

Key: ensure that each group of consumers prefers the scheme/product designed for them

- • e.g. economy-class seats should be "uncomfortable" enough that business- or first-class customers do not want to buy

VERSIONING

Versioning example:

- Buyers are considering two versions of tax software
- Assume each buyer buys one version of software and they choose the edition that gives them the greatest level of consumer surplus
- Assume, that the marginal cost of production is zero
- The table shows the valuations that each type of buyer places on the software.

VERSIONING

	Individual	Self employed
Income tax software (Basic)	20	35
Income tax + (Deluxe)	20	100

What is our dream outcome: P_B=20 & P_D=100, and Individual buys the Basic and Self-employed buys the Deluxe.

Profits = $120

But will this occur?

VERSIONING

	Individual	Self employed
Income tax software (Basic)	20	35
Income tax + (Deluxe)	20	100

What if we priced at: P_B=20 and P_D=84?

Individual buys the Basic and Self-employed buys the Deluxe.

Profits = $104

VERSIONING

	Individual	Self employed
Income tax software (Basic)	20	35
Income tax + (Deluxe)	20	100

What if we priced at: P_B=20 and P_D=86?

Individual buys the Basic and Self-employed buys the Basic.

Profits = $40

VERSIONING

	Individual	Self employed
Income tax software (Basic)	20	35
Income tax + (Deluxe)	20	100

What if we priced at: P_D=100? (We only sell the Deluxe)

Individual buys nothing and Self-employed buys the Deluxe.

Profits = $100

VERSIONING

	Individual	Self employed
Income tax software (Basic)	20	35
Income tax + (Deluxe)	20	100

What if we priced at: P_B=20? (We only sell the basic)

Individual buys the Basic and Self-employed buys the Basic.

Profits = $40

Note: in each case we cannot determine each type. They sort themselves.

VERSIONING

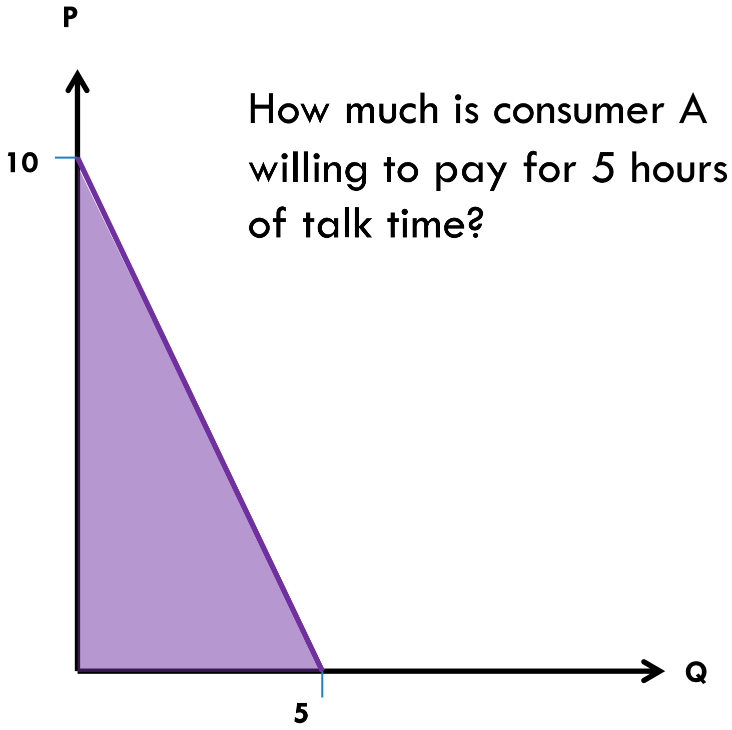
We can also think about menu pricing or second degree price discrimination using demand curves.

The key here is that the area under the demand curve represents the willingness to pay for individuals.

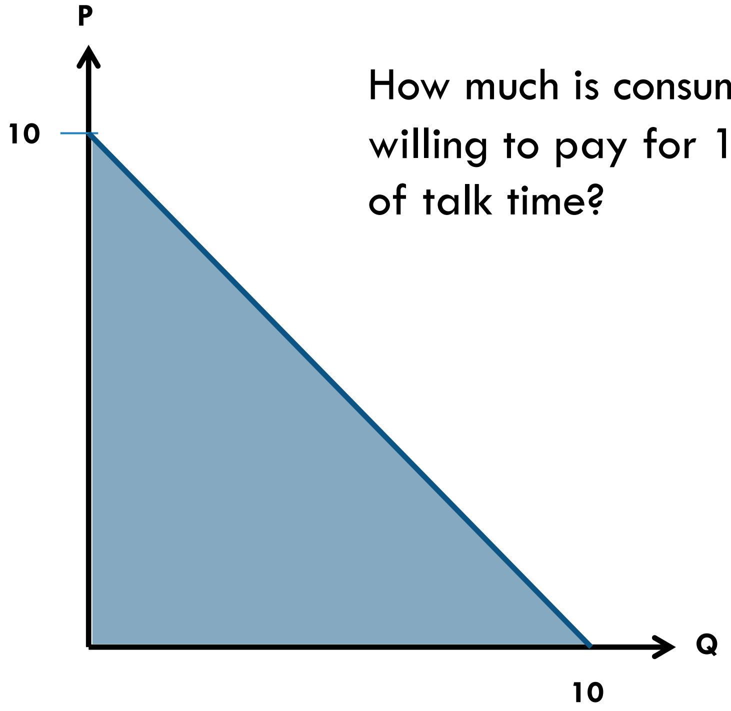
We need to ensure that each individual purchases the appropriate (i.e. profit maximising) option.

Consider the following example of willingness to pay for phone plans.

VERSIONING

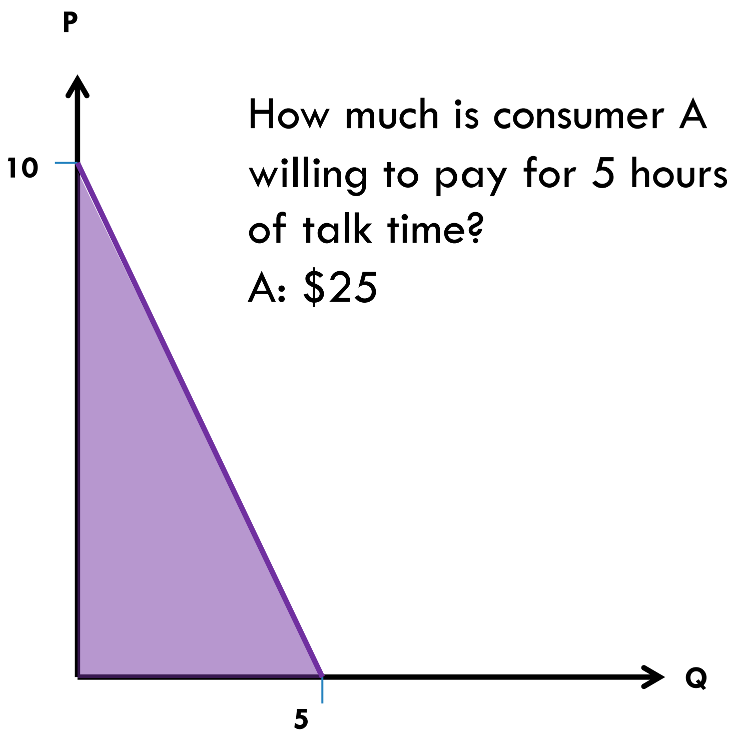


How much is consumer A willing to pay for 5 hours of talk time?



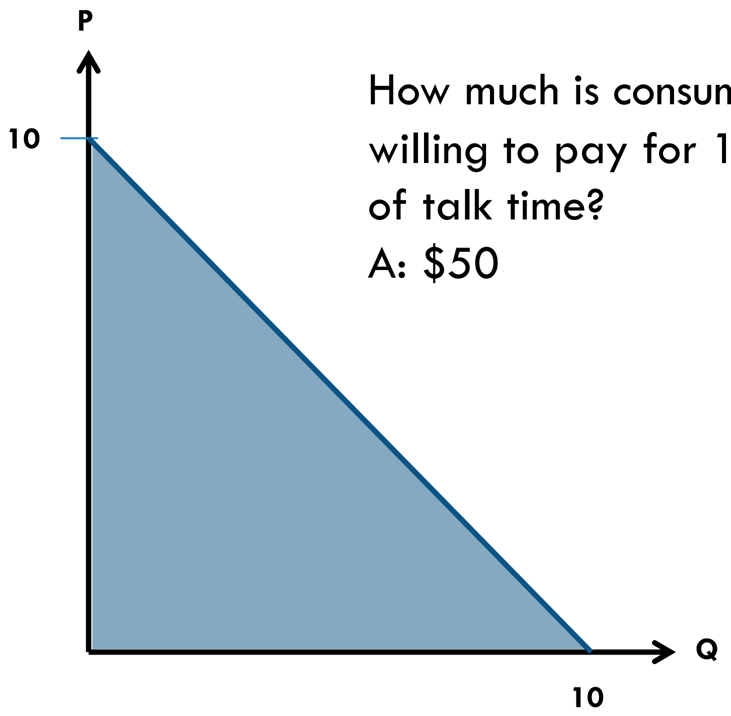
How much is consumer B willing to pay for 10 hours of talk time?

VERSIONING



How much is consumer A willing to pay for 5 hours of talk time?

A: $25



How much is consumer B willing to pay for 10 hours of talk time?

A: $50

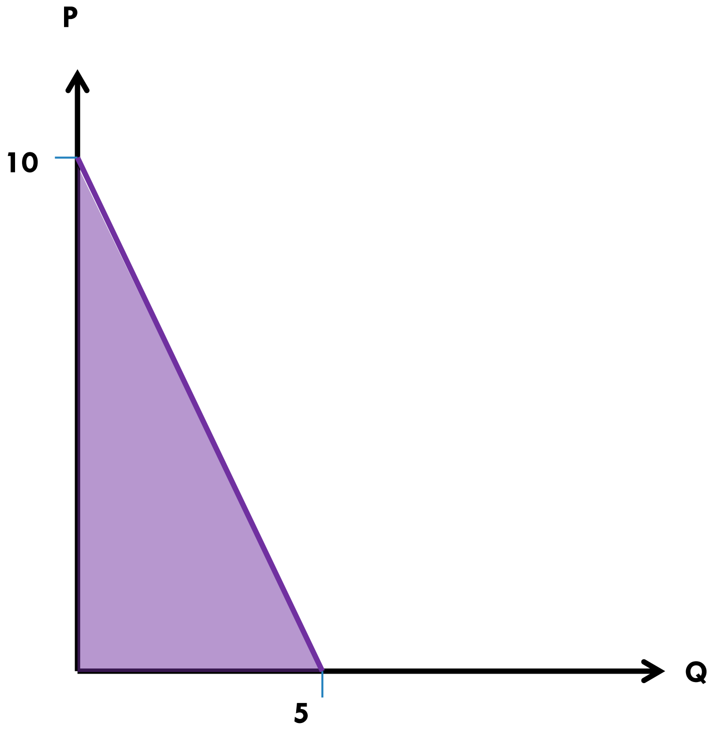
VERSIONING

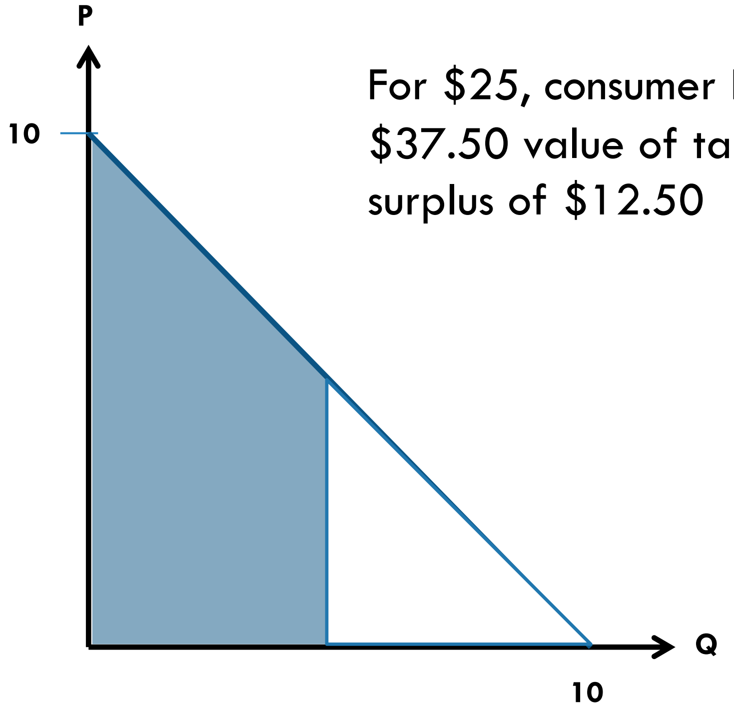
Suppose that two plans are offered – the budget (5 hours talk time per month) for $25 and deluxe (10 hours talk time) for $50.

Person A buys the budget, as does person B.

Why?

VERSIONING





For $25, consumer B gets $37.50 value of talk time: surplus of $12.50

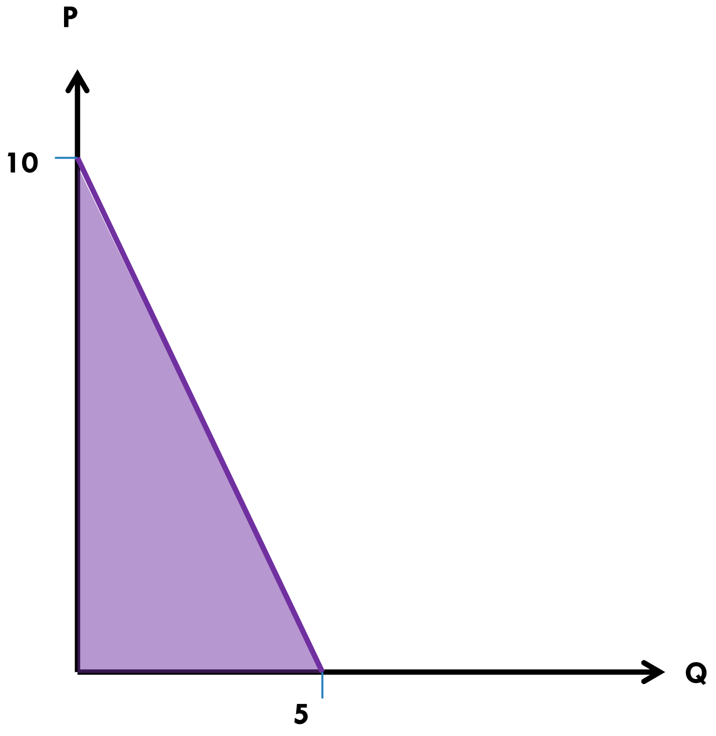
VERSIONING

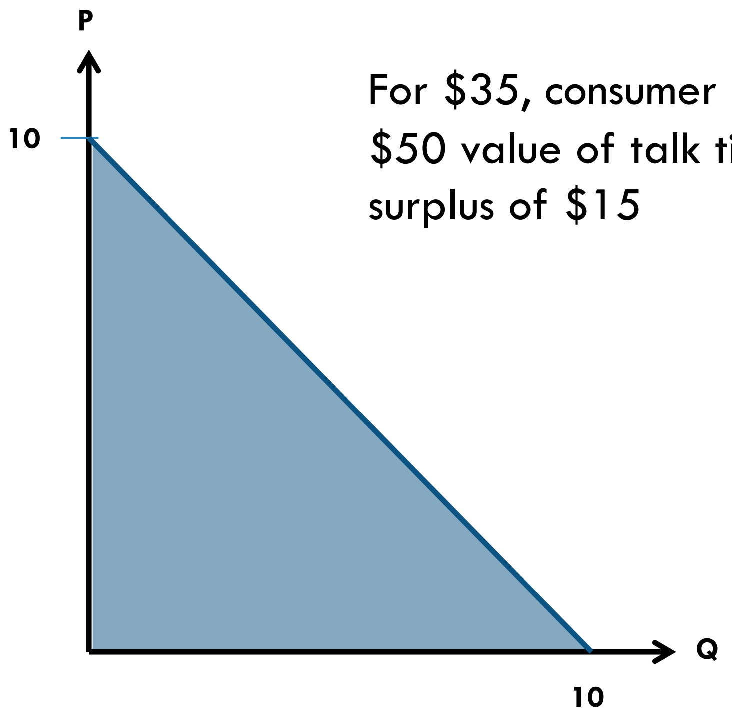
Suppose that two plans are offered – the budget (5 hours talk time per month) for $25 and deluxe (10 hours talk time) for $35.

Person A buys the budget, and person B buys the deluxe.

Why?

VERSIONING





For $35, consumer B gets $50 value of talk time: surplus of $15

BUNDLING

Bundling example:

- Buyers are considering two television station bundles
- Assume that the marginal cost of production is $10
- The table shows the valuations that each type of buyer places on each package.

BUNDLING

	Malcolm	Tony
Trump Apprentice Network	60	40
World Series Triathalon	40	60

What if we priced at: P_A=40 and P_T=40?

Malcolm and Tony buy both channels. Revenue is $160.

Profits = $120

BUNDLING

	Malcolm	Tony
Trump Apprentice Network	60	40
World Series Triathalon	40	60

What if we only sold the two together as a bundle: P_B=100?

Malcolm and Tony buy the bundle. Revenue is $200.

Profits = $160

BUNDLING

Pure bundling: several products are sold in a package, and no separate purchase is available

- e.g. music albums, newspapers and magazines, cable packages, degree programs

Mixed bundling: alongside each separately priced product, a package of more than one product is sold at a discount relative to the components

- season tickets, software suites, TV + Internet + Telephone, value meals

BUNDLING

Bundling example:

- Buyers are considering two software packages
- Assume that the marginal and average cost of production is $0
- The table shows the valuations that each type of buyer places on each product.

BUNDLING

	Marge	Aaron	Brigette	Chuck
Word Processor	120	110	90	30
Spreadsheet	30	90	110	120

What if we did not bundle and priced at: P_W=90 and P_S=90?

Buyers of each are circled (sell three of each at $90).

Profits = $540

BUNDLING

	Marge	Aaron	Brigette	Chuck
Word Processor	120	110	90	30
Spreadsheet	30	90	110	120

What if we bundled and priced at: P_B=150?

Buyers of each are circled (sell four of each at $150).

Profits = $600

BUNDLING

	Marge	Aaron	Brigette	Chuck
Word Processor	120	110	90	30
Spreadsheet	30	90	110	120

What if we had optional bundling and priced at: P_W=120, P_W=120 and P_B=200?

Buyers of each are circled (sell three bundles and one each of the standalone products).

Profits = $640

PROFIT MAXIMISING PRICING – OTHER STRATEGIES

Coupons:

- Idea: buyers with low willingness to pay may also value their time less, and will spend more time clipping coupons
- Outcome: people with higher value of time pay more

Pricing complementary products:

- Idea: reducing one product price increases the demand for both products (e.g. razor blades and razors, Kindle and Amazon e-books)
- Outcome: lower price than when each product is sold by separate firms

Inter-temporal price discrimination:

- Price declines over time (e.g. movies, books, electronics, video games) • Idea: high valuation users are often less patient
- Outcome: less patient (or high valuation) consumers pay more

LECTURE 4.6

DYNAMIC PRICING:

YIELD MANAGEMENT

DYNAMIC PRICING: YIELD MANAGEMENT

Discussion to this point has largely been static, but we don't live in a static world.

Airlines are the masters of changing prices over time. This also works for services such as hotel rooms

Think about dynamic price discrimination, revenue management or yield management

Why dynamic? Because booking a ticket now precludes the option of booking it later at a higher price. The flexibility or option value is lost when a ticket is booked.

DYNAMIC PRICING: YIELD MANAGEMENT

Consider the problem of selling Q tickets for a flight at date T. The opportunity cost of selling a ticket to a customer today is the foregone sales to another customer later.

Suppose there are two types of customer

- First-class: willing to pay up to p_f
- Discount: willing to pay up to p_d

Customer arrival is uncertain

- let n be the probability the next customer is a discount traveller
- let s be the probability the flight will sell out at a price p_f before travel i.e. a seat sold today will displace a first-class passenger

Suppose q out of Q seats have been sold. Should the airline sell only premium fares (p_f) from now on?

DYNAMIC PRICING: YIELD MANAGEMENT

If a discount traveller arrives, it is better to sell a discounted fare if:

$$p_d > p_f(1 - n + ns) = p_f\big(1 - n(1 - s)\big)$$

The term in the first brackets is the sum of two probabilities that selling the seat at a discount today will displace a full fare passenger

- with probability $1 - n$, the next traveller is first-class
- with probability ns, the next will not pay the first-class fare, but the flight will sell out.

Rearranging, we obtain:

$$n(1 - s) > \frac{p_f - p_d}{p_f}$$

[Note: this comes from McAfee – there is an error in McAfee leading to a slightly different equation.]

DYNAMIC PRICING: YIELD MANAGEMENT

Sell a discounted fare if:

$$n(1-s) > \frac{p_f - p_d}{p_f}$$

What happens over time?

- *s* decreases as time passes without sales → better to sell a discount fare now
- *s* increases every time a seat is sold → remaining seats become more valuable

As we approach the travel date, what happens to *n*?

If *n* gets smaller as time to flight departure approaches, then it makes it less likely that the expression above holds in which case the airline is better off NOT selling another discount fare. That is, they offer only full fares as the departure date fo the flight approaches.

What does this imply about the profitability of selling discount tickets?