Price discrimination

Partial equilibrium monopoly theory claims that the monopolist produces less than the socially efficient output.

- This leaves mutually beneficial trades unexploited and so is bad for the monopolist as well as the economy as a whole.
- The monopolist couldn’t exploit these trades because we assumed it must set one price for the whole market.
- Price discrimination involves selling different units of output at different prices.
  - First-degree or perfect price discrimination: selling different units of output for different prices and at different prices to different people.
  - Second-degree price discrimination: selling different units of output for different prices, but prices are the same for everybody who buys the same amount.
  - Third-degree price discrimination: selling output to different people at different prices, but prices are the same for every unit sold to a given person.

First-degree price discrimination

Under first-degree price discrimination, each unit can be sold by the monopolist to the individual who values it most at that individual’s maximum WTP.

- This immediately undercuts the problem of unexploited trades.
- The ‘next’ unit can be sold for maximal WTP without affecting the price of the inframarginal units.
- So as long as marginal WTP exceeds marginal cost, the monopolist will be willing to produce the ‘next’ unit.
- The monopolist’s incentives are aligned with social incentives.

![Graph showing Monopolist’s optimal choice and socially efficient choice](image-url)
First-degree price discrimination

We can also view this as the firm offering an all-or-nothing price-quantity pair that varies by consumer.

- To see this explicitly, consider an economy with a monopolist and two consumers, A and B. Let MC and fixed costs be zero for simplicity.
- Say that both consumers have downward-sloping demand, but that consumer A has a higher WTP for each unit than consumer B.
- What price will the perfectly discriminating monopolist charge to each?

High demand consumer

Consumer A’s demand curve

Price for each unit is precisely the WTP given from the demand curve

Low demand consumer

Consumer B’s demand curve
High demand consumer

Another way to think about this is an amount $y^*_B$ sold for a total price equal to the area under the demand curve up to $y^*_B$.

First-degree price discrimination

These offers are acceptable to both consumers - and, of course, there is no other seller of the good.

The monopolist has charged each consumer their entire consumer’s surplus for the total amount of $y$ that it can profitably sell to each.

Notice that all mutually beneficial trades are exhausted: we are at the socially efficient output, where output is the same as that associated with $p = MC$!

We have an institution that has delivered a Pareto efficient outcome outside the confines of the first welfare theorem: the market is certainly not competitive.

Of course, while the sum of producer’s and consumer’s surplus is maximized, the firm has captured all of this surplus in this case.

First-degree price discrimination

This is the same reasoning that we saw with first-degree price discrimination in an Edgeworth box.

First-degree price discrimination

This type of price discrimination is a nice benchmark, but it is hard to find real examples.

There is the usual information constraint on the literal interpretation of this idea: how does the firm know each consumer’s WTP for each unit?

Consumers would have little incentive to reveal to the firm their true WTP, and instead pretend to be willing to pay very little.

Let’s turn to more realistic examples of price discrimination that acknowledge this.
Self-selection
If the monopolist offers the two price-quantity pairs we identified but cannot tell the consumers apart, consumer $A$ prefers the offer intended for consumer $B$.
- There is a self-selection problem.
- If the monopolist can’t, or isn’t allowed to, tell the consumers apart, it must cleverly design the price menu so that each type of consumer willingly picks the option ‘designed’ for her.
- An example is airline seats: if you charge the full WTP for the business traveler for business class, she might choose the economy class ticket rather than have all her surplus extracted in the expensive business seat.
- So the firm must think about how to make the business seat more attractive. This could involve making it cheaper than the full WTP by the business traveler, or maybe making economy class more unpleasant...
- Things like ‘virtual waiting rooms’ and lineups for tickets could also be analyzed in this way.

Both consumers’ demand curves

The first degree price menu fails self selection: $A$ prefers $y^*_B$ at price $a$ to $y^*_A$ at price $a + b + c$

Monopolist could charge $a + c$ for $y^*_A$: the menu says choose either $y^*_B$ at price $a$ or $y^*_A$ at a price $a + c$
Changing the bundles

But the menu can be more sophisticated than that: make the ‘small’ bundle smaller and cheaper - monopolist gains e and loses d

Second-degree price discrimination

Second-degree price discrimination is the name for a situation in which the firm sells different bundles at different prices in this fashion.

- For example bulk discounts or buy one get one free.
- The high-demand consumers are induced to ‘reveal’ their type when they choose the high-price, high quantity bundle.
- This helps the monopolist extract more surplus overall, although less than under first degree discrimination: price can be different for different units of output, partly circumventing the inframarginal pricing problem.

Profit-maximizing bundles

Best menu for the monopolist: offer \( y^*_A \) for price \( a + c + d \) and \( y^*_B \) for price a

Third-degree price discrimination

Under third-degree price discrimination, the monopolists sells to different consumers at different prices.

- Naturally it must be that the consumers can be distinguished from each other. It will also help if the good cannot be easily resold between the groups.
- Why would the monopolist want to set prices in this way?
Third-degree price discrimination

- Say the monopolist can distinguish consumers in group 1 from group 2.
- Let group 1 have demand given by $p_1(y_1)$ and group 2 $p_2(y_2)$.
- The monopolist’s profit-maximization problem is therefore

\[
\max_{y_1, y_2} = p_1(y_1)y_1 + p_2(y_2)y_2 - c(y_1 + y_2),
\]

for which the first-order conditions are

\[
MR_1(y_1) = MC(y_1 + y_2), \quad (2)
\]
\[
MR_2(y_2) = MC(y_1 + y_2). \quad (3)
\]

- The marginal unit must bring the same increase in revenue whether it is sold to group 1 or group 2.

We can rewrite these conditions substituting the elasticity expression for $MR$:

\[
p_1(y_1)\left[1 - \frac{1}{|\eta_1(y_1)|}\right] = MC(y_1 + y_2) \quad (11)
\]
\[
p_2(y_2)\left[1 - \frac{1}{|\eta_2(y_2)|}\right] = MC(y_1 + y_2). \quad (12)
\]

MR and elasticity

Remember that we can derive an expression for MR in terms of elasticity of demand:

\[
MR = p(y) + p'(y)y
\]

\[
= p(y) \left[1 + \frac{1}{\eta(y)}\right]
\]

\[
= p(y) \left[1 - \frac{1}{|\eta(y)|}\right]. \quad (8)
\]

Marginal revenue depends on the elasticity of demand $\eta(y)$, the rate at which demand changes as price changes.

And so at the optimum:

\[
p_1(y_1)\left[1 - \frac{1}{|\eta_1(y_1)|}\right] = p_2(y_2)\left[1 - \frac{1}{|\eta_2(y_2)|}\right]. \quad (13)
\]

- So if group 1 has a higher price elasticity of demand than group 2, at the optimum the monopolist charges them a lower price: $|\eta_1(y_1)| > |\eta_2(y_2)|$ implies $p_1(y_1) < p_2(y_2)$ at the optimum.
- This makes sense: the group that is more sensitive to price gets a lower price.
- Common third-degree price discrimination schemes such as student discounts are consistent with this logic. If students are more sensitive to the price of movie tickets, say, lowering the price of their tickets induces a bigger proportional demand response than lowering the price of full-price tickets.
Bundling

If a firm with market power sells an array of products, yet more strategic choices become available.

- **Bundling** means to sell more than one good in a package.
- Examples include MS Office, cable TV packages, magazine subscriptions...
- It might be that bundling helps to lower the average cost of each component, or that the goods are complementary.
- But it might also be that bundling is a way to exploit market power and extract surplus.

**Bundling as surplus extraction**

Consider an example with two types of consumers, A and B, and two monopolized products, 1 and 2 (say $MC = 0$ for both for simplicity). Let the valuations of each product by each type be:

<table>
<thead>
<tr>
<th>Consumer type</th>
<th>Product 1</th>
<th>Product 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

- If it must sell each product separately, the firm does best by charging 2 for each product and selling two units of each.
- But if it could bundle the two products, the firm could set the bundle price at 5 and sell one bundle to each consumer - the firm does better.

Two-part tariffs

Finally consider a situation in which a firm sells a product via a **two-part tariff**.

- This means a lump-sum payment and a further price per unit.
- Examples could be a credit card with an annual fee and a per-use fee, or an amusement park with admission and a price per ride.
- Consider the problem facing a monopolist setting price as we saw last week. Say that marginal cost is constant.
- We know that absent a two-part tariff, the monopolist produces where $MR = MC$; a two-part tariff does better.
Two-part tariffs

A two-part tariff can help a firm with market power extract consumers’ surplus.

Notice the affinity between this outcome and the outcome with first degree price discrimination.

Of course a similar pricing scheme could simply be an innocent way to recoup fixed costs.

The exact nature of real two-part tariffs is more complicated: \( p = MC \) for secondary goods is not often observed.

For example, the theme park prices rides below cost.

Exploiting market power

The general principle is that if you have price-setting power, you can in general be more profitable with creative, non-uniform pricing.

- If a firm faces downward-sloping demand—if its choice of output and price are jointly determined—then increasing output to exploit potential gains from trade hurts the price for all units.
- But with non-uniform pricing, the firm can escape this bind.
- The firm does better, and society realizes more gains from trade.
- However, some or all consumers may lose out, and so we might want to think about the distributional implications.
- We focused on a monopolist, but this applies to any firm with some degree of market power.
- And also to market power on the demand side of the market (“monopsony”).
What is lost in the general equilibrium system when there is market power?

- If an entity’s choices influence market price, not only does FTWE fail, but prevailing prices may be distorted away from the scarcity-signaling prices of competitive equilibrium.
- Next we will think about how many firms we’d have to add to an industry to make it look ‘competitive’.
- And finally we’ll think about goods with inherent properties that are difficult to allocate efficiently with the price mechanism, breaking FTWE.