Pricing With Market Power

Contents
Introduction
First Degree Price Discrimination
Second Degree Price Discrimination
Third Degree Price Discrimination
Peak-Load Pricing
Two-Part Tariff
Bundling
Advertising

Introduction:
In previous notes we restricted a firm to charging the same price per unit for all of the units of its output sold. Rather than charge the same price to all buyers, it is almost always a better idea, when possible, to employ alternate pricing strategies; these strategies will almost invariably result in higher profits for the firm. We shall discuss some of these pricing strategies in the pages to follow. Happy reading.

First Degree Price Discrimination
Imagine if a seller to could determine the maximum price that each of its buyers is willing to pay. The seller then seeks out the buyers willing to pay the most for the product, charging each of them the highest price that each is willing to pay. Hey…there ain't no way to make more profits than with this strategy!!! That's why it is called *perfect* price discrimination—also known as *first degree* price discrimination.

Problem: first degree price discrimination is impossible in the real world, except for the Psychic Friends Network.

But let's do some examples of it anyway.

Revenues under 1st Degree Price Discrimination:
Recall that the demand curve illustrates the maximum price that will be paid for each unit produced. And there's a bonus with perfect price discrimination. Price equals marginal revenue!!! Let's demonstrate with a table below.

Grumpy Inc. sells bottles of coffee to professors who stay up all night to write notes. Grumpy has identified the 5 people willing to pay the most for the coffee, and the firm knows exactly the maximum price that each is willing to pay per bottle. Here they are:

Mike:	$50 for a bottle
Ron:	$49 for a bottle
Heather:	$48 for a bottle
Karen:	$47 for a bottle
Anna:	$46 for a bottle

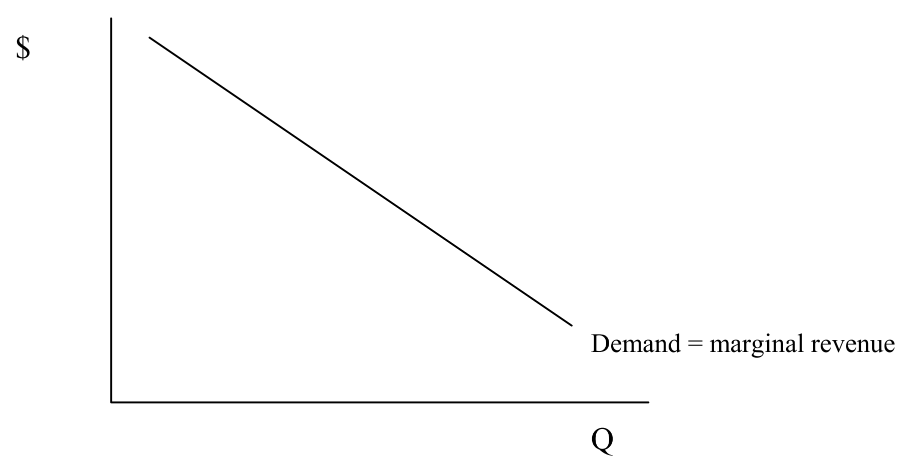
Suppose Grumpy sells five bottles—one to each of these people. It sells the first bottle to Mike, the second to Ron, the third to Heather, the fourth to Karen, and the fifth to Anna. Each person is charged his/her *reservation price*—the maximum price he/she is willing to pay. Let's construct a revenue table for Grumpy inc.

(Don't forget: marginal revenue is the INCREASE in total revenue when 1 more unit of the product is sold)

Quantity sold, Q	Price paid for the unit	Total revenue, R	Marginal revenue, MR	Average revenue (=R/Q)
0	na	$0	na	na
1	50	50	50	50
2	49	99 (50+49)	49	49.5
3	48	147 (50+49+48)	48	49
4	47	194 (50+49+48+47)	47	48.5
5	46	240 (50+49+48+47+46)	46	48

Note from the above table: plotting the first two columns of the table gives you the demand curve; plotting the first and fourth columns gives you the marginal revenue curve. But look! You get the same exact curve! Coincidence? No!

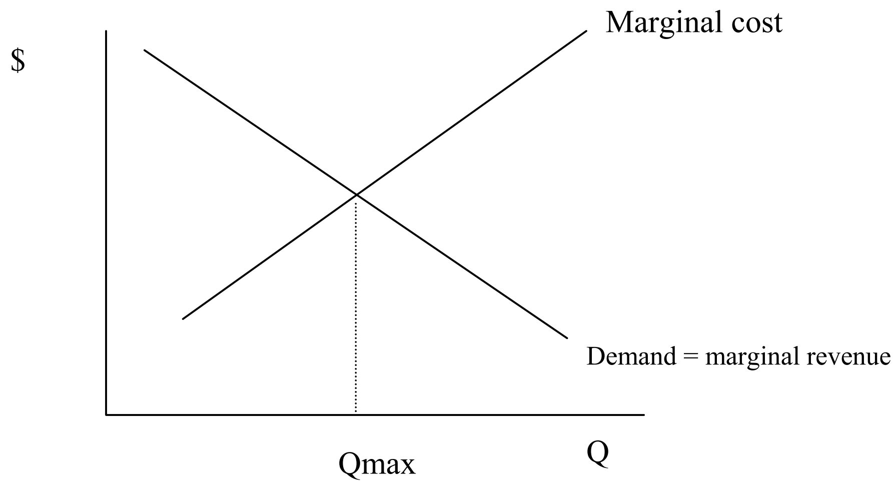
Market demand with first degree price discrimination



Profit-maximizing rule under first degree price discrimination:

Recall that a firm maximizes profits when it produces the quantity of output where marginal revenue equals marginal cost. This rule still works here, but remember—the demand curve is now the marginal revenue curve. So the profit-maximizing output now looks like this:

Profit-Maximization Under First Degree Price Discrimination



Social efficiency? YES! Under first degree price discrimination.
Recall that social efficiency requires that a product be produced as long as the marginal value of the product exceeds the marginal cost of its production. Mathematically, this requires that production proceed until the point where price equals marginal cost. Well, check out the graph above! Under first degree price discrimination, the profit maximizing outcome is socially efficient, since it occurs where P=MC.

Algebraic example: A monopoly: to discriminate or not?
Let's illustrate the value of first degree price discrimination to the firm's coffers by doing an example:
A firm has demand curve $P = 100 - Q$
And cost curve $C = Q^2$

Calculate:
a) Equilibrium price, quantity, and profits if price discrimination is impossible.
b) Equilibrium quantity and profits if first degree price discrimination is possible.

Solution:
a) Impossible to price discriminate (so all buyers pay the same price per unit):
Set MR = MC to get Q
MR is twice as steep as demand $MR = 100 - 2Q$
MC is the derivative of C with respect to Q $MC = 2Q$

$$100 - 2Q = 2Q \rightarrow \mathbf{Q = 25}$$

Next plug Q = 25 into demand to get price per unit

P = 100 – Q = 100 – 25 **= $75**

Profits = revenue – cost = PQ – C = $75(25) – 25^2 = $1250

b) First degree price discrimination case (so each unit sold sells for a different price):

Set MR = MC

In this case, MR is the demand curve! MR = 100 - Q
MC is the derivative of total cost with respect to Q. MC = 2Q

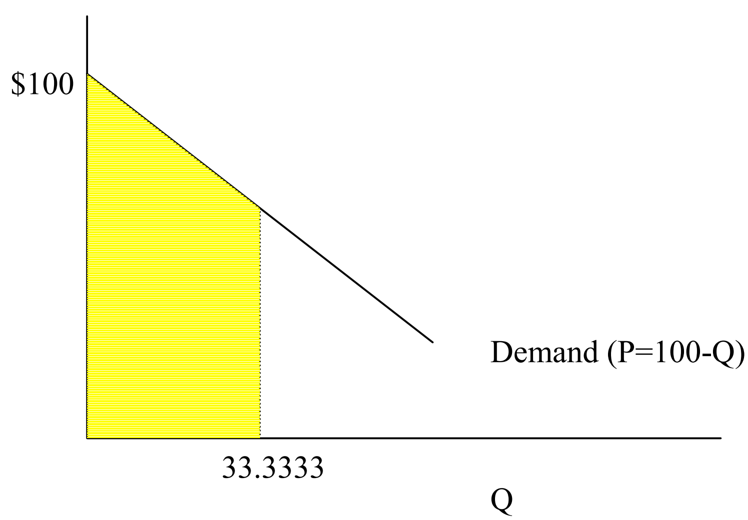
100 – Q = 2Q → Q = 33.3333

Profit = revenue – cost

Cost = C = 33.3333^2 = 1111.11

But what is revenue? Remember, each buyer is charged the maximum that he/she is willing to pay. In this case, revenue is the area under the demand curve between Q = 0 and Q = 33.3333, as in this graph:

(This assumes that the firm can sell little fractions units of output.)



Hence, revenue = area of trapezoid

Recall from geometry class that:

area of trapezoid = base x average of the two heights

= 33.3333[(100+66.6667)/2] = 2777.7777

So profit = 2777.77 – 1111.11 = $1666.66

Notice the extra profit relative to case (a), the no price discrimination case?

1st degree price discrimination is really impossible in the real world; there's no way that a firm can discover all of its buyers' reservation prices. Perhaps there are some alternate strategies. Read on, campers.

Second Degree Price Discrimination

Under second degree price discrimination, different prices are charged for different quantities, or "blocks," of the same good. Examples:

Buy 1st pizza for 10 bucks, get second pizza for $5
Buy 1 pair of jeans, get 2nd at 50% off
Pay $100 for A on first exam, get A on 2nd exam for a mere 75 bucks.

See, this is a good idea due to the law of diminishing marginal utility. The average buyer gets less extra utility as she consumes more units of a good, so he/she is less willing to pay for the extra units. It makes sense to reduce the price on these successive units (as long as the reduced price is not below marginal cost); this way, the seller gets high prices for the first few units sold, and the seller only lowers price on the higher quantities.

Third Degree Price Discrimination

Using this strategy, the firm separates buyers into groups. Each group has a different demand curve, and each group is charged a different price per unit. Examples:

$7 to see a movie for most adults; $5 for those aged 55 and older
$35 to get into Disneyland for California residents; $45 for others
$50 per year for a *Newsweek* subscription, unless you're a student--$25
$1000 for an airline ticket to Dallas for a businesswoman; $29 for a tourist

See, the idea is, you charge a higher price for folks in a group with a greater willingness to buy.(Under no circumstance should you charge a price below marginal cost.) One must be careful to avoid arbitrage among buyers, e.g. a Californian selling a Disneyland ticket to a Texan for $40.

Profit-Maximizing Strategy Under 3rd degree price discrimination:
Produce and sell units to each group as long as the marginal revenue generated exceeds the marginal cost of the production. Pretty simple, eh? (And consistent with everything else we've been doing this semester. It's all about comparing incremental benefit with incremental cost.)

Tabular Example of profit-maximizing strategy: 3rd degree Price Discrimination
A firm sells the same product to two (and only two) groups of buyers. Marginal revenue from the two buyers is as follows:

Group 1

Units sold to group 1	Marginal revenue $
1	50
2	40.01
3	30
4	20
5	10

Group 2

Units sold to group 2	Marginal revenue $
1	80
2	60
3	40
4	30
5	15

Now here's the marginal cost of production:

Quantity produced (= units sold to group 1 + units sold to group 2)	Marginal cost $
1	1
2	5
3	14
4	24
5	39.99
6	69
7	123
8	134
9	145
10	167

Firm should:	Marginal revenue	marginal cost	addition to profits
Sell 1st unit to group 2 (production: 1 unit)	80	1	79
Sell 2nd unit to group 2 (production: 2 units)	60	5	59
Sell 1st unit to group 1 (production: 3 units)	50	14	36
Sell 2nd unit to group 1 (production: 4 units)	40.01	24	16.01
Sell 3rd unit to group 2 (production: 5 units)	40	39.99	.01

Stop! (next unit cost $69 to produce, would only bring in $30 if sold to group 1)

So group 2 buys 3 units and group 1 buys 2 units; the firm produces 5 units in total.

Now that we've done a tabular example of 3rd degree price discrimination, let's do an example using algebra.

Algebra of profit-maximizing strategy: 3rd degree Price Discrimination

Let's enter the world of algebra, in which the firm can sell non-integer amounts of a product. In this world, the firm should continue selling to any group as long as the marginal revenue of the sale exceeds the marginal cost. In the limit, the firm should keep selling until marginal revenue from each group of buyers equals marginal cost:

$$MR_1 = MR_2 = MC$$

Algebraic example of profit-maximizing strategy: 3rd degree Price Discrimination

A firm has two groups of buyers

Group 1 demand: $P = 50 - Q_1$

Group 2 demand: $P = 90 - 4Q_2$

The firm also has a constant marginal cost of production of $10

Also note that total production of the firm is Q, so $Q = Q_1 + Q_2$

Calculate profit-maximizing unit sales to each group.

Set $MR_1 = MC$:

Note: Each MR curve is twice as steep as each demand curve, with same vertical intercept:

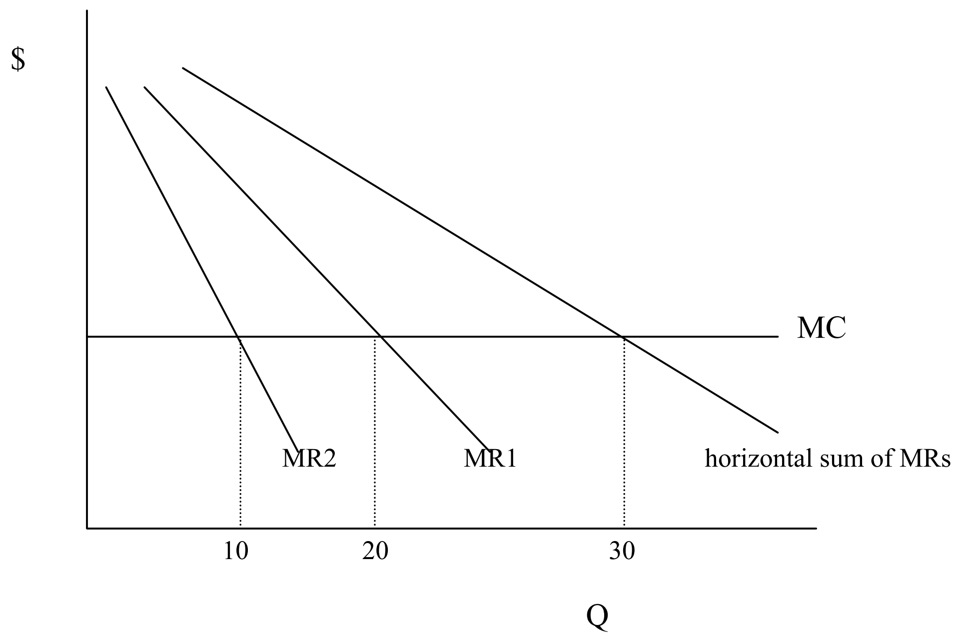
$MR_1 = 50 - 2Q_1$ $MR_2 = 90 - 8Q_2$

Note: MC = 10

$50 - 2Q_1 = 10 \rightarrow Q_1 = 20$

$90 - 8Q_2 = 10 \rightarrow Q_2 = 10$

Graphically, the above result looks like: (graph's scale is off)



Now, another pricing strategy

Peak Load Pricing
Charge different prices for the same good, depending on the time when it's bought. Examples:
- --bargain matinee at the movies
- --5 cents a minute long distance at night

This strategy is wise if willingness to buy varies by time of day. If there is lower demand to see a movie during the day, then it makes sense to charge less to induce demand. (Never charge less than marginal cost, however.)

Now, another pricing strategy

Two Part Tariff
Charge the buyer two fees for use of a product:
- an *entry fee*—an up front fee, which does not change as purchases of the product change
- a *user fee*—a charge for each unit of the product consumed

Examples:

Everyone's Internet Company: Charges a $30 "setup" entry fee, and a $10 per month user fee.

Houston Oaks Country Club: Charges a $1500 "initiation" entry fee, and a $150 per month user fee.

Profit-maximizing two-part tariff strategy:

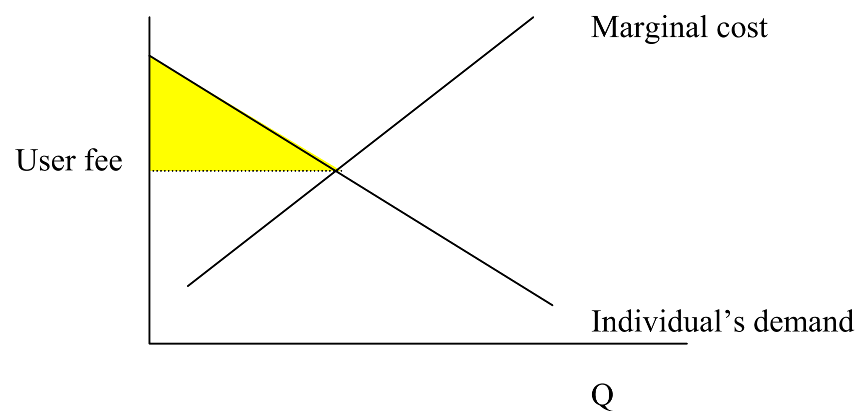
If the firm knows the consumer's demand curve precisely, then it should:

a) Charge a user fee where price equals the marginal cost of production, and

b) Charge an entry fee equal to the area between the demand curve and the user fee.

(This is the highest entry fee that the consumer is willing to pay.)

Here's what the profit-maximizing strategy looks like. The entry fee is the shaded area:



Algebra of the profit-maximizing two-part tariff strategy:

The firm knows a buyer's demand for its product is P = 100 – Q

The firm has constant marginal cost of $10.

Calculate the profit-maximizing quantity bought by the buyer, user fee and entry fee.

Solution:

Quantity bought: Set P = MC

$100 - Q = 10 \rightarrow Q = 90$

User fee: set it to equal MC. User fee = $10

Entry fee: area of triangle = .5 x base of triangle x height of triangle

Base of triangle = quantity sold = 90

Height = vertical distance between user fee and point where demand curve intersects vertical axis

= 100 – user fee = 100 – 10 = 90

Area of "triangle" = .5(90)(90) = 4050

Two Part tariff socially efficient? Yes!!
Recall that social efficiency requires that a product be produced as long as the marginal value of the product exceeds the marginal cost of its production. Mathematically, this requires that production proceed until the point where price equals marginal cost. Well, check out the graph above! Under a two-part tariff, the profit maximizing outcome is socially efficient, since it occurs where P=MC.

Advertising

Any firm with market power can effectively advertise if, by advertising, it increases the demand for its product more than the advertising increases its average cost. (This is true for a monopoly, despite misperceptions that a monopoly, since it has no competition, need not advertise. On the contrary: a monopoly has much to gain by effectively advertising; just look at all of the advertisements for patented drugs (such as Allegra).)

Special case: You may think that advertising will definitely cause a company to charge higher prices than if it did not advertise. But this is not necessarily true for a firm with economies of scale. If such a firm with economies of scale can increase demand by a lot by advertising, then advertising may actually reduce its average cost of production, since it can increase its production and take advantage of its scale economies.

Bundling

If a firm produces more than one product, it can sometimes increase profits by selling two or more of the products together. This is known as bundling. That's all you need to know about bundling for the exam. (This is a very complicated topic, most of which is beyond the scope of our class. Perhaps you can see that, if you're a company that produces many products, then the combinations of products that can be sold together is quite large.)

Hey, were done with pricing strategies! What a deal!