Intermediate Microeconomics. Lecture 18

Market Power and Profit Maximization

Oscar Gálvez-Soriano[1]

[1]University of Houston
Department of Economics

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Market Power

- A firm with market power can generate a substantial amount of producer surplus and profit in a way that a competitive firm cannot
- Barriers to entry are the factors that keep entrants out of a market despite the existence of a large producer surplus

Natural Monopoly

- A natural monopoly is a market in which it is efficient for a single firm to produce the entire industry output
- In this market, the cost curve of a firm exhibits economies of scale at any output level
- In this situation, it is efficient (from a production standpoint) for society if a single firm produces the entire industry output; splitting output across more firms would raise the average total cost of production

Natural Monopoly

Suppose a company could produce as large a quantity as it wants at a constant marginal cost of \$10 per unit and has a fixed cost of \$100. In this case, average total cost declines across all quantities of output

$$TC = FC + VC = 100 + 10Q$$

$$ATC = \frac{100}{Q} + 10$$

Switching Costs

- If customers must give something up to switch to a competing product, this will tend to generate market power for the incumbent and make entry difficult
- For some products, the switching cost comes from technology
- Perhaps the most extreme version of switching costs exists with a network good: a good whose value to each customer increases with the number of other consumers who use the product

Product Differentiation

- The imperfect substitutability across varieties of a product is called product differentiation, and it is another source of market power
  - Ready to eat cereal. Aviv Nevo (Econometrica, 2001)
  - Vehicles (minivans). Petrin (Journal of Political Economy, 2002)
  - Computer industry. Goeree (Econometrica, 2008)
- In some industries, product differentiation can be spatial

Other barriers to entry

- Firm's absolute cost advantage over other firms in obtaining a key input
  - Special asset that other firms do not have
  - A secret formula
  - Scarce resource
- Government regulation
  - Licensing requirements
  - Copyrights
  - Patents

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Monopoly

- A firm with market power faces a downward-sloping demand curve

- An oligopoly is a market structure characterized by competition among a small number of firms
- A monopolistic competition is a type of imperfect competition where a large number of firms have some market power, but each makes zero economic profit in the long run
- The difference between monopoly and these other two cases is that in an oligopoly and in monopolistic competition, the particular shape of the demand curve faced by any given firm depends on the supply decisions of the other firms in the market

Marginal Revenue

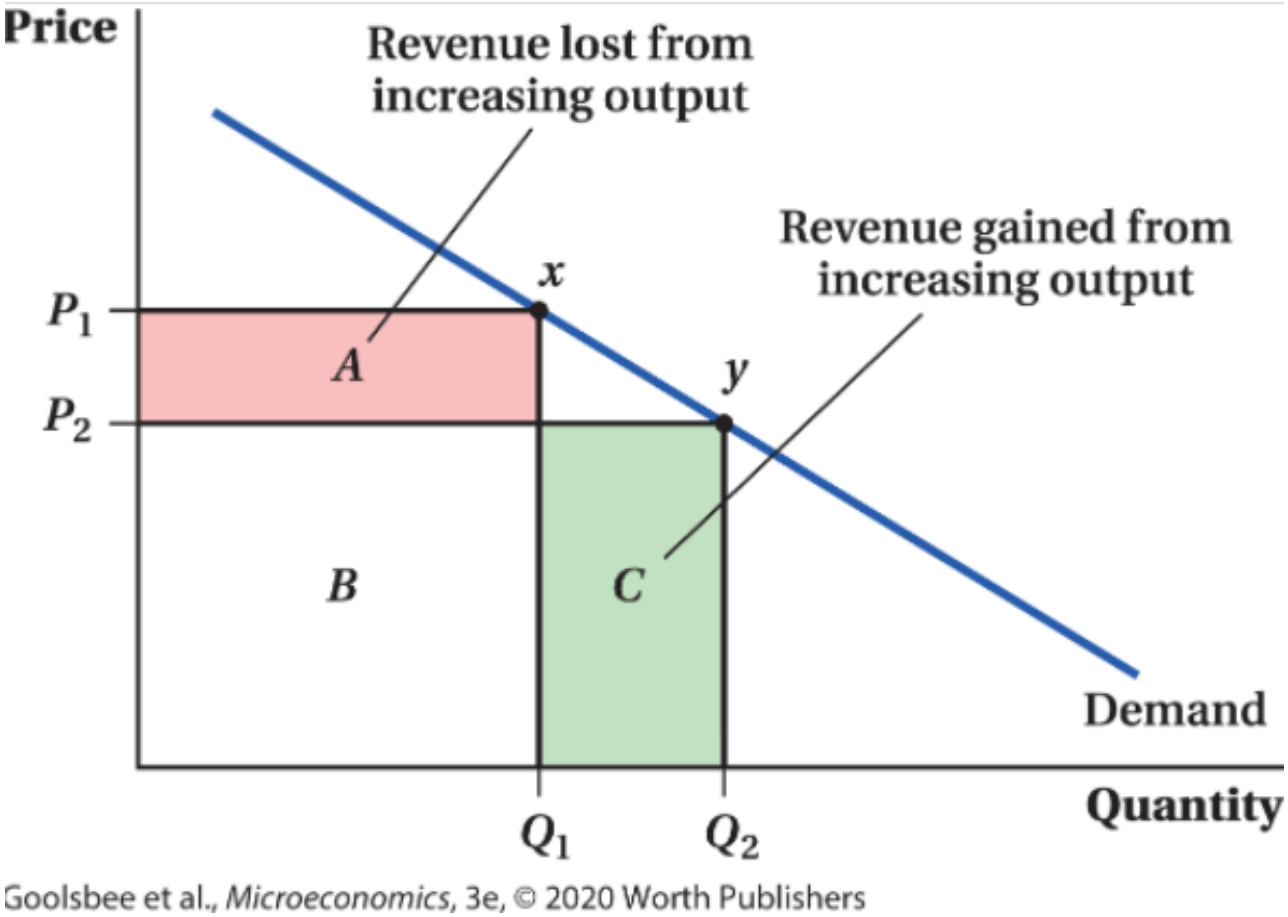

Figure: Understanding Marginal Revenue

Marginal Revenue

To compute the marginal revenue (MR) we start from our definition of total revenue (TR)

$$TR = P(Q) \cdot Q$$

where $P(Q)$ is the inverse demand equation, and we take the derivative with respect to Q

$$MR = \frac{dTR(Q)}{dQ}$$

In particular,

$$MR = \frac{dP(Q)}{dQ} \cdot Q + P(Q)$$

Marginal Revenue: example 1

Suppose that the inverse demand equation is the following:

$$P(Q) = 100 - 10Q$$

Then, the total revenue is

$$TR = P(Q) \cdot Q = (100 - 10Q) * Q = 100Q - 10Q^2$$

We now take the derivative with respect to Q in order to obtain the Marginal Revenue (MR)

$$MR = \frac{dTR(Q)}{dQ} = 100 - 20Q$$

Marginal Revenue: example 1

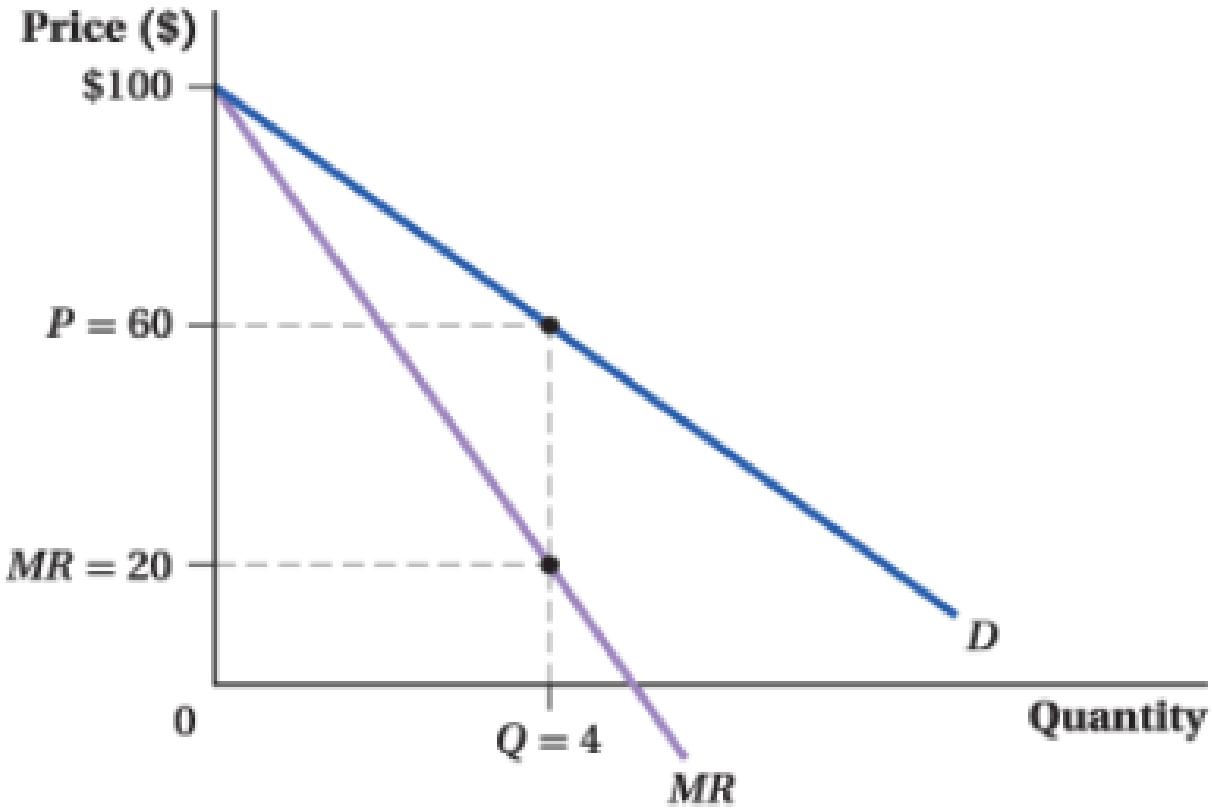

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Figure: Marginal Revenue

Marginal Revenue: example 2

Suppose the demand curve is

$$Q = \frac{25}{2} - \frac{1}{4}P$$

- What is the marginal revenue curve that corresponds to this demand curve?

Let us start finding the inverse demand equation

$$\frac{1}{4}P = \frac{25}{2} - Q \Rightarrow P(Q) = 50 - 4Q$$

Then, the total revenue is

$$TR = P(Q) \cdot Q = (50 - 4Q) * Q = 50Q - 4Q^2$$

Marginal Revenue: example 2

We now take the derivative of TR with respect to Q in order to obtain the Marginal Revenue (MR)

$$MR = \frac{dTR(Q)}{dQ} = \frac{d(50Q - 4Q^2)}{dQ} = 50 - 8Q$$

- Calculate marginal revenue when $Q = 6$ and when $Q = 7$

1. When $Q = 6$: $MR = 50 - 8(6) = 2$
2. When $Q = 7$: $MR = 50 - 8(7) = -6$

Note that MR falls as Q rises and can even become negative

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Profit Maximization

- To maximize its profit, a firm should choose its quantity where its marginal revenue equals its marginal cost

$$MR = MC$$

- Setting $MR = MC$ gives us the quantity, Q^*, that maximizes the firm's profit, and from that we figure out the profit-maximizing price

- The height of the demand curve at that profit-maximizing quantity Q^* tells us the market price for the firm's output

Profit Maximization: Graphical Approach

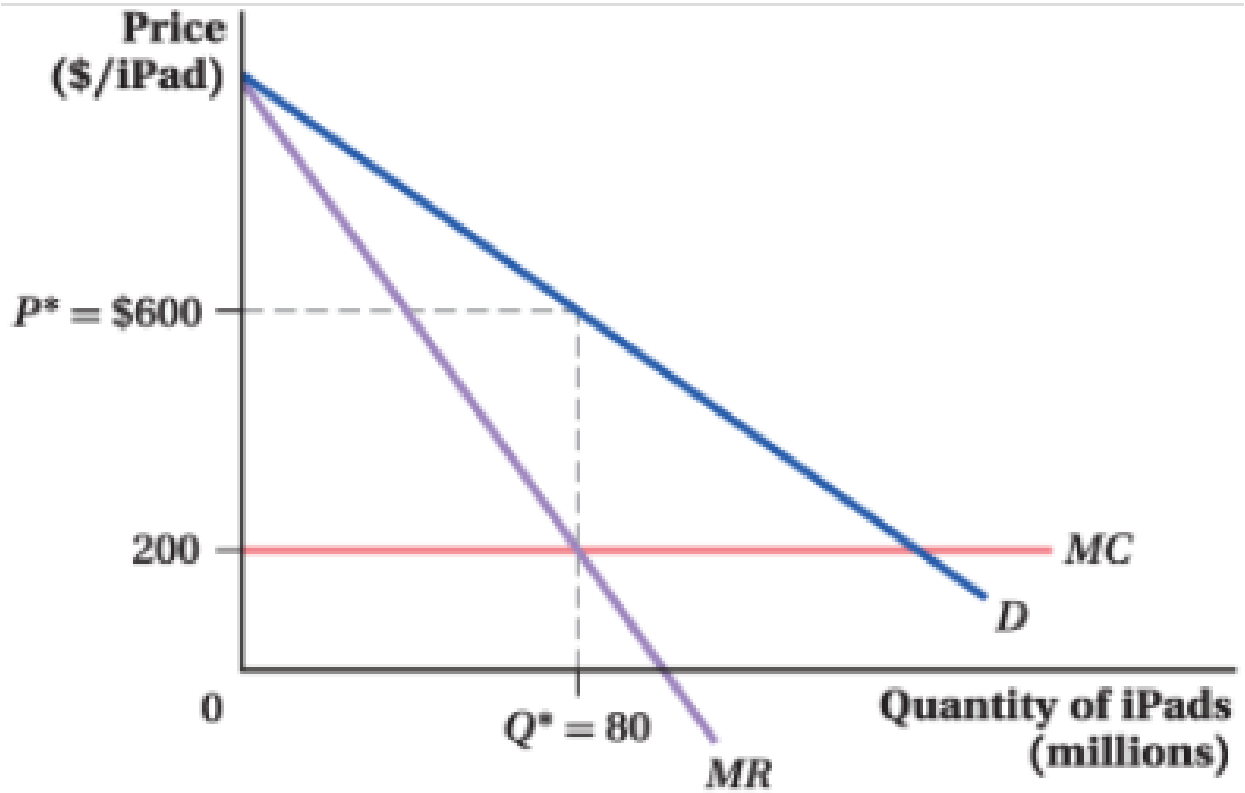

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Figure: How a Firm with Market Power Maximizes Profit

Profit Maximization: Mathematical Approach

Suppose Apple's marginal cost of producing iPads is constant at \$200, and the demand curve for iPads is

$$Q = 200 - \frac{1}{5}P$$

- How much should Apple charge for iPads, and how many will it sell at that price?

We will find monopoly price and quantity in two steps.

1. First, use the optimal condition to find the optimal quantity

$$MR = MC$$

$$1,000 - 10Q = 200 \Rightarrow \boxed{Q^* = 80}$$

Profit Maximization: Mathematical Approach

2. Second, plug the optimal quantity (Q^*) in the inverse demand equation

$$P = 1,000 - 5Q = 1,000 - 5(80) \Rightarrow \boxed{P^* = 600}$$

Profit Maximization: example

Babe's Bats (BB) sells baseball bats for children around the world. The firm faces a demand curve of

$$Q = 10 - \frac{2}{5}P$$

BB has a marginal cost curve that is equal to

$$MC = 5Q$$

- Solve for BB's profit-maximizing level of output. Show the firm's profit-maximization decision graphically
- What price will BB charge to maximize its profit?

Profit Maximization: example

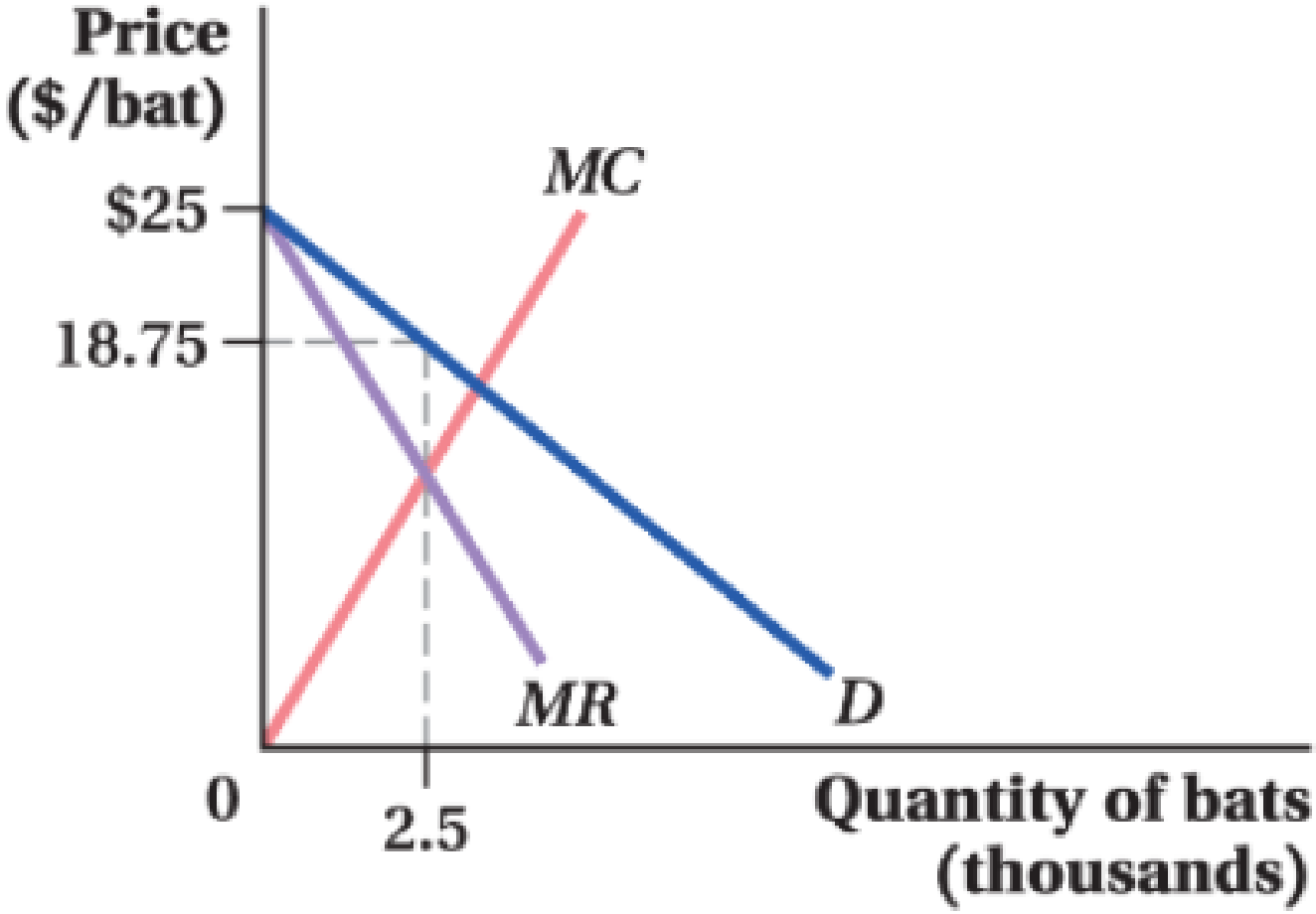

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Figure: Graphical representation of BB's maximization problem

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The Lerner Index

Start with the definition of MR

$$MR = \frac{dP(Q)}{dQ} \cdot Q + P$$

We know that the firm maximizes its profits by setting $MR = MC$

$$MR = \frac{dP(Q)}{dQ} \cdot Q + P = MC$$

Multiply by $\frac{P}{P}$

$$\frac{dP(Q)}{dQ} \cdot \frac{P}{P} \cdot Q + P = MC$$

The Lerner Index

Now rearrange terms

$$P + \left(\frac{dP(Q)}{dQ} \cdot \frac{Q}{P} \right) \cdot P = MC$$

$$P + \left(\frac{1}{E^D} \right) \cdot P = MC \Rightarrow \boxed{\frac{P - MC}{P} = -\frac{1}{E^D}}$$

- The left-hand side of this equation equals the firm's profit-maximizing markup, the percentage of the firm's price that is greater than its marginal cost
- What this equation indicates is that such a markup should depend on the price elasticity of demand that the firm faces
- As demand becomes more elastic the optimal markup as a fraction of price falls

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Change in Marginal Cost

In the iPad example, marginal cost was constant at \$200 and the inverse demand curve was

$$P = 1,000 - 5Q$$

Suppose there's a fire in the plant that manufactures the screen on the iPad, raising the marginal cost of screens, and as a result, the marginal cost of the iPad increases from \$200 to \$250

- Find the new equilibrium price and quantity

Change in Marginal Cost

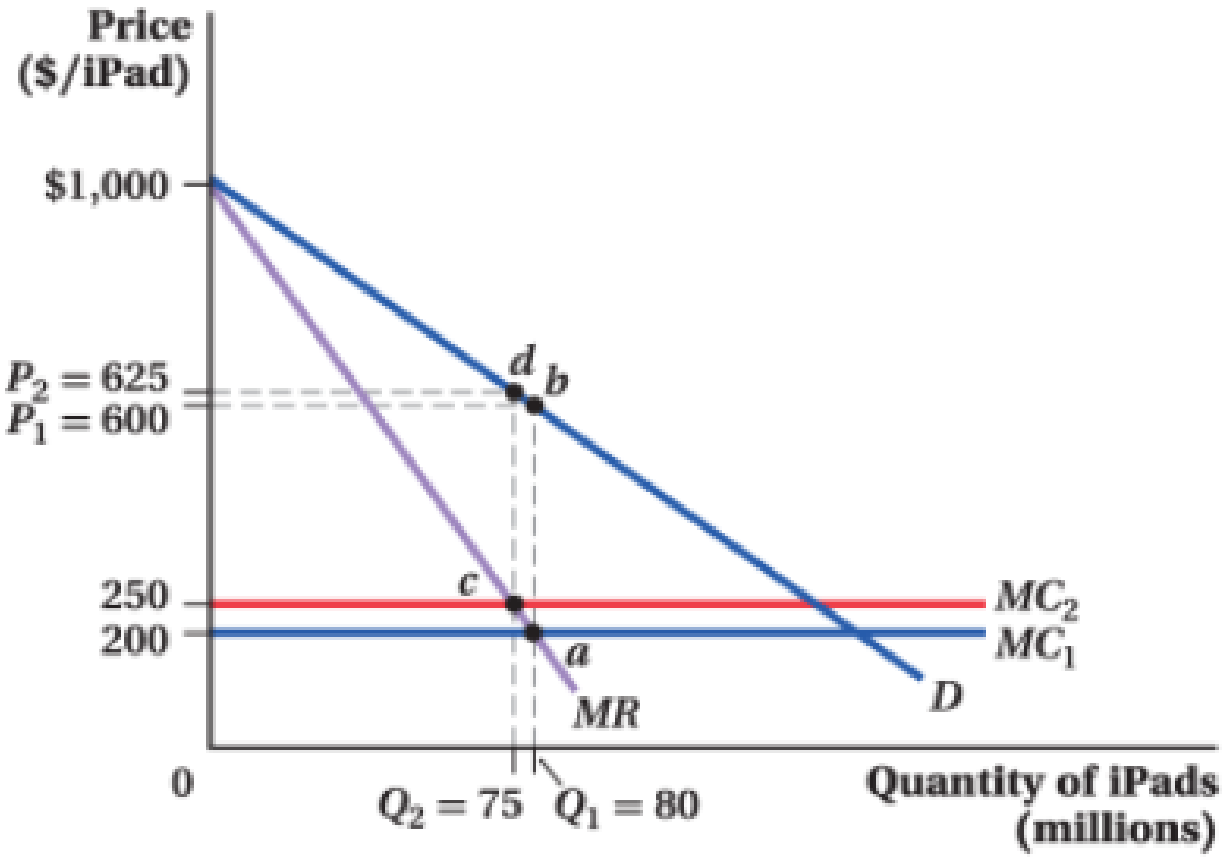

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Figure: How a Firm with Market Power Reacts to an Increase in Marginal Cost

Change in Demand

Now suppose that instead of a cost shift, there is a parallel shift in the demand curve. Specifically, let's say the new inverse demand curve is

$$P = 1,400 - 5Q$$

- Find the new equilibrium price and quantity (consider that $MC = 200$)

$$\boxed{Q^* = 120}$$

$$\boxed{P^* = 800}$$

Changing the Price Sensitivity of Customers

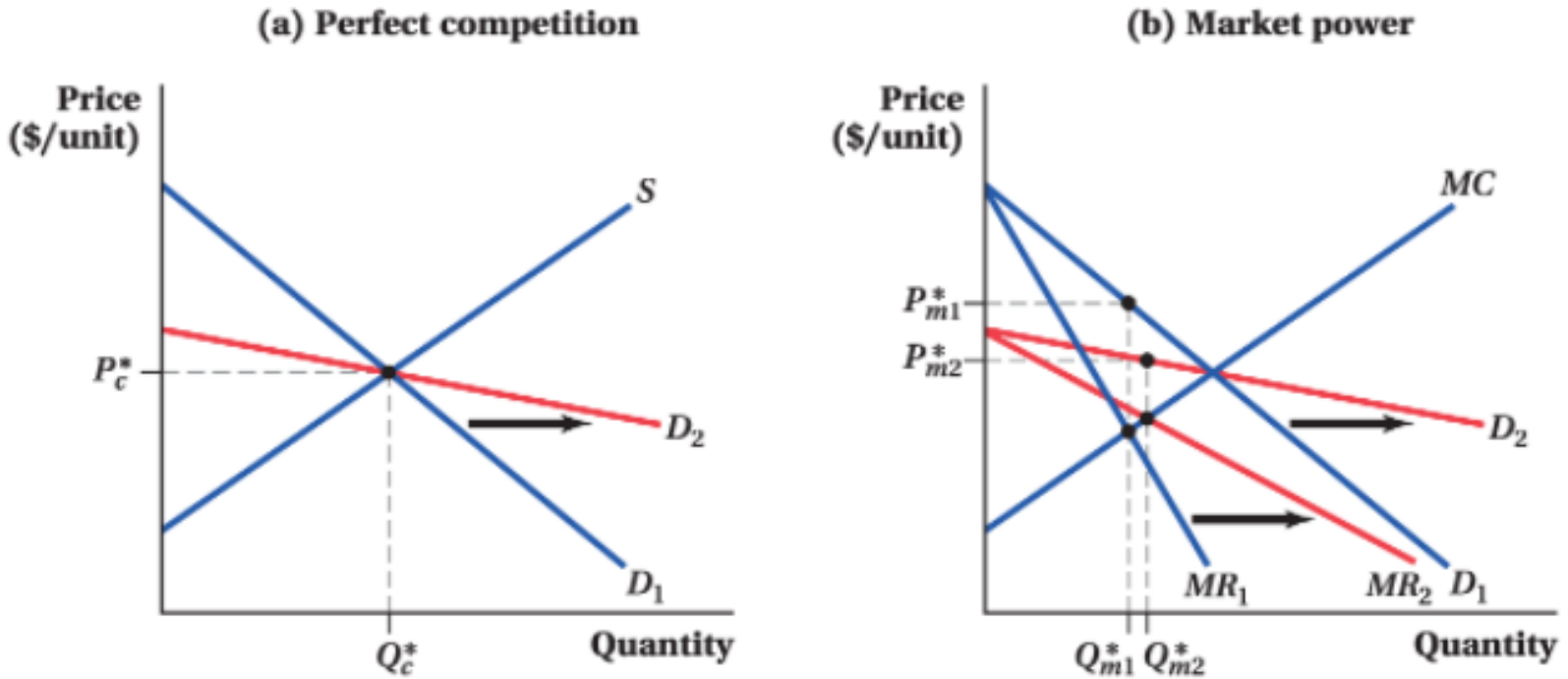

Figure: Responses to a Rotation in the Demand Curve