

Microeconomics Review: Monopoly

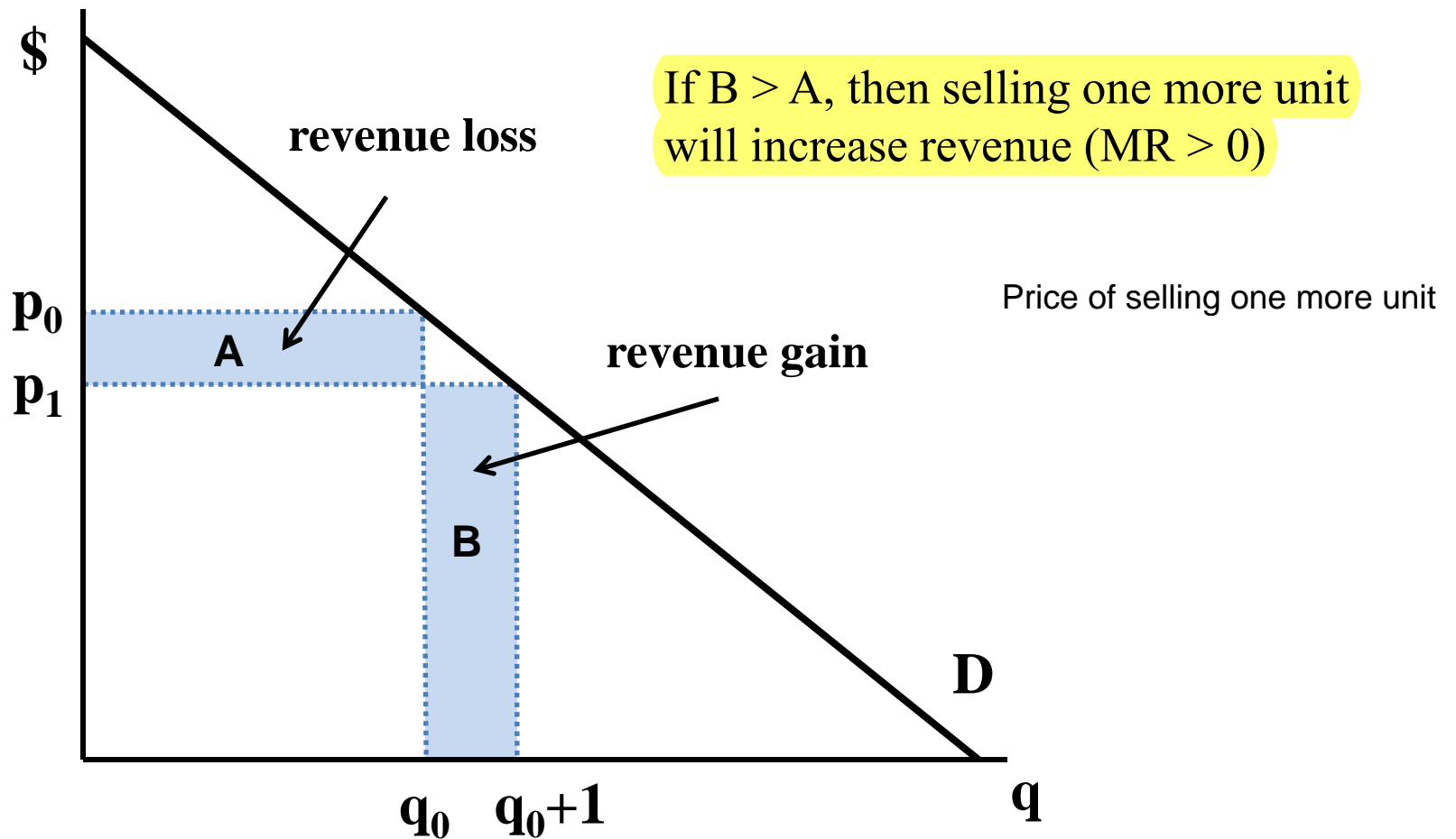
Reference: any intermediate microeconomics text

Monopoly

- A firm is a monopoly if it is the only supplier of a product for which there are no close substitutes
- A monopoly chooses output to maximize profit (just like a competitive firm)
- But since the demand for its product (market demand) is downward sloping, the more it sells, the lower price has to be
- In fact, choosing price and output is the same decision as a monopolist is choosing a point on the demand curve
- A competitive firm faces a horizontal demand curve → price does not change as output is expanded

Monopoly (marginal revenue)

- For competitive firms, **MR** is constant and equal to the given price: $MR = p$
- For a monopolist, **MR** depends on the demand curve

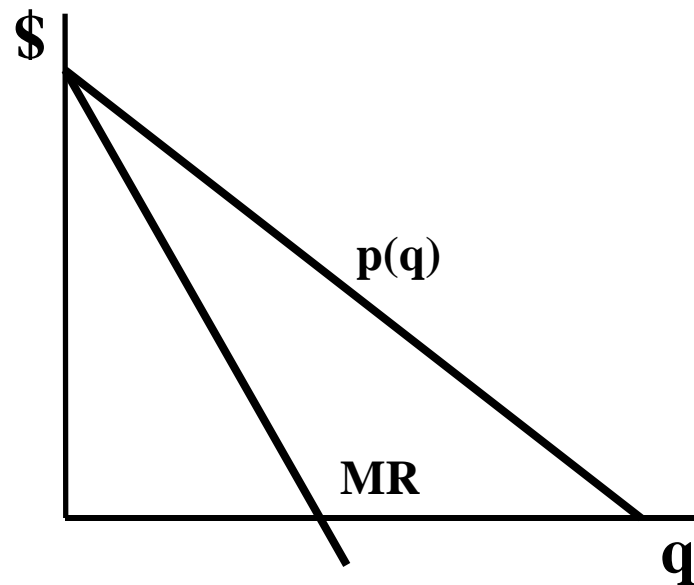


Monopoly (marginal revenue)

- It's more convenient to use a calculus-based approach:

$$MR = \frac{\partial R(q)}{\partial q} = \frac{\partial (p(q)q)}{\partial q} = \frac{\partial p(q)}{\partial q} q + p(q)$$

- Since demand is downward sloping, **MR** is less than price: **$MR < p(q)$**
- Suppose demand is linear



$$p(q) = a - bq$$

$$MR(q) = a - 2bq$$

Monopoly (elasticity)

- There exists an explicit relationship between the MR and the price elasticity of demand:

$$MR = p + \frac{\partial p}{\partial q} q = p \left(1 + \frac{\partial p}{\partial q} \frac{q}{p} \right) = p \left(1 + \frac{1}{\varepsilon} \right)$$

- If demand is elastic ($\varepsilon < -1$), then
 - Quantity demanded is sensitive to price changes
 - Need to decrease p just a little to sell another unit so $MR > 0$
- If demand is inelastic ($-1 < \varepsilon < 0$), then
 - Quantity demanded is not very sensitive to price changes
 - Need to decrease p a lot to sell another unit so $MR < 0$

Monopoly (elasticity)

- We can rewrite the profit maximization condition $MR = MC$ as a function of the elasticity:

$$p \left(1 + \frac{1}{\varepsilon} \right) = MC \rightarrow \frac{p - MC}{p} = -\frac{1}{\varepsilon}$$

- The LHS is the price-cost margin and is called the **Lerner index**
 - It is a commonly used measure of market power
- The monopoly price is close to MC (the competitive price) when the demand is very elastic and increasingly exceeds MC when demand becomes less elastic

○ If $\varepsilon = -100$, then more
sensitive

$$\frac{p - MC}{p} = \frac{1}{100} = .01 \xrightarrow{1 \text{ percent}} p = 1.01MC$$

○ If $\varepsilon = -2$, then less
sensitive

$$\frac{p - MC}{p} = \frac{1}{2} = 0.5 \xrightarrow{50 \text{ percent}} p = 2MC$$



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PRE-SCHOOL MILK WITH EYE Q PLUS
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1.8 KG

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more substitutes thus firm have
to drop its price

Monopoly (elasticity)

- Also, note from the optimality condition that a monopoly will never choose output that falls on the inelastic part of the demand curve
- In this case, since $MR < 0$, if the monopolist decreases output, revenue would increase, costs would decrease, and profit would go up

Empirical example – Breakfast Cereal

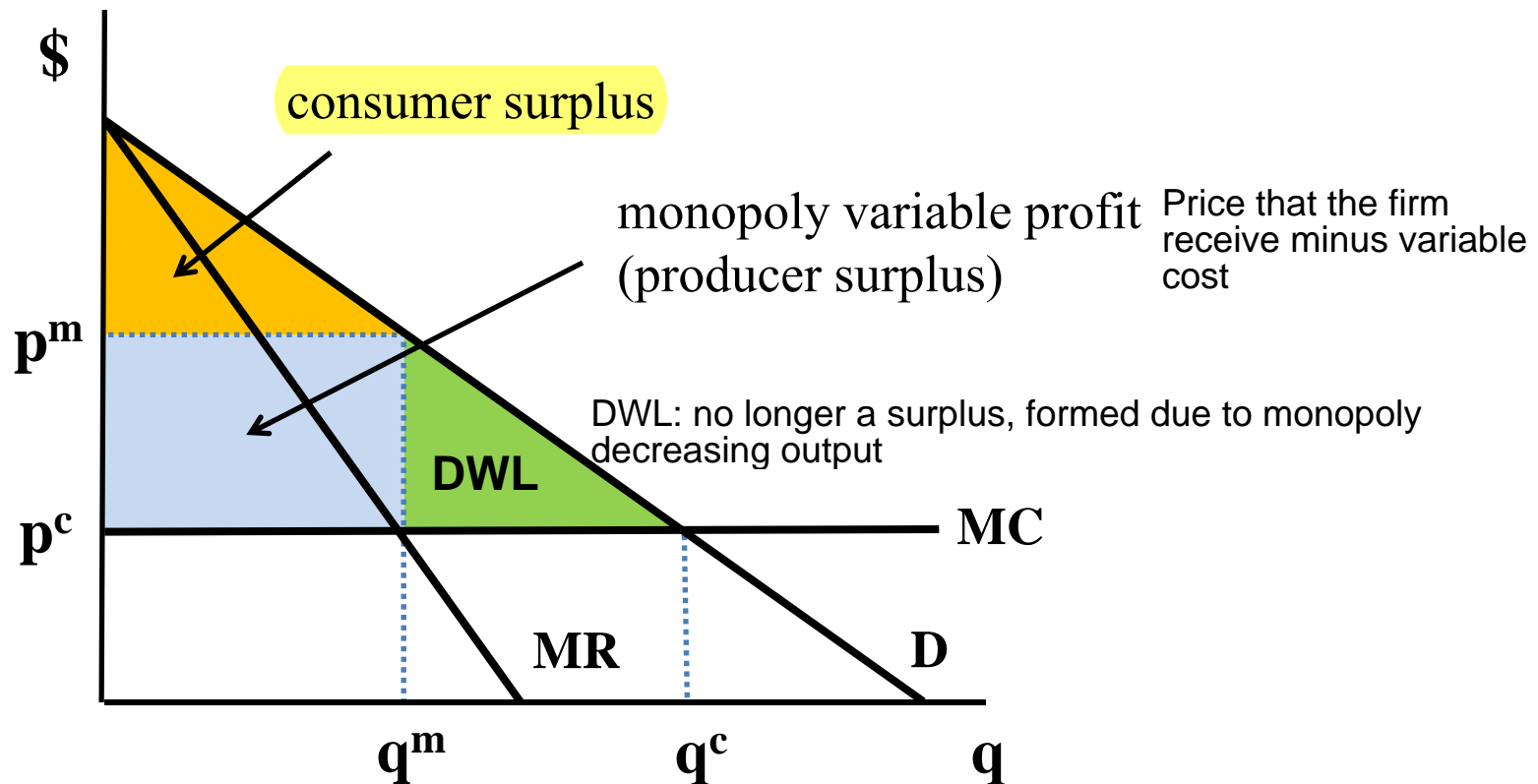
- In 1995, 2 NY politicians accused the four largest companies – Kellogg, General Mills, Post and Quaker Oats – of colluding to keep prices high
 - “There is no real competition in this industry. We are paying caviar prices for cornflake quality”
- Some stylized facts about the industry that are difficult to rationalize:
 - High market concentration: $C3 = 75\%$, $C6 = 90\%$
 - High price-cost margins: 45% if the margins are high, then more firms would enter the market to compete away the high profits. Later examples will show that there were barriers to entry.
 - Why are there so few firms when margins are so high?
- Aviv Nevo (2001) studied this market using data on prices, product characteristics, and consumer demographics

Empirical example – Breakfast Cereal

- He estimated price elasticities and then computed Lerner indices under 2 scenarios:
 - firms are colluding
 - firms are competing
- He found that under collusion the Lerner index of an individual brand would be 65 to 75%
- Under competition, the Lerner index of an individual brand would be 40 to 44%
- How do these results compare to the actual Lerner index for the industry?
- Using accounting data Nevo computed the Lerner index in the mid-1990s to be approximately 45%, far below the predicted value under collusion
- Nevo concluded that market power arises because of differentiation of products (consumers are willing to pay a lot for their favorite brands)

Deadweight loss

- A monopoly restricts its output such that price is above MC and society suffers DWL



Empirical Example: How bad is deadweight loss?

- It is important to know how much DWL there is
- A small amount of DWL means that antitrust enforcement is not worthwhile
- The first attempt to measure DWL was made by Harberger (1954)
- He estimated DWL for 73 manufacturing industries using data from 1924 – 1928

Empirical Example: How bad is deadweight loss?

$$\begin{aligned} DWL &= \frac{1}{2}(p^m - p^c)(q^c - q^m) \\ &= -\frac{1}{2}(p^m - mc)^2 \frac{(q^m - q^c)}{(p^m - p^c)} \\ &= -\frac{1}{2} \left(\frac{p^m - mc}{p^m} \right)^2 \frac{\Delta q}{\Delta p} \frac{p^m}{q^m} p^m q^m \\ &= -\frac{1}{2} r^2 \varepsilon p^m q^m \end{aligned}$$

Can ignore these steps!

Empirical Example: How bad is deadweight loss?

- Here r is the rate of return on sales. Harberger computed it from accounting data.
- The second term is the elasticity of demand. Harberger assumed that the elasticity was nearly inelastic for the industries in his sample and set $\varepsilon = -1$
- Data on the last term, revenue, was directly available.
- Using this equation, Harberger estimated that the deadweight loss in the manufacturing sector was just one-tenth of 1% of US GDP
- This result raised a serious question about the cost effectiveness of the large antitrust agencies, the Department of Justice and the Federal Trade Commission, with have budgets between one and two-tenths of 1% of GDP

Empirical Example: How bad is deadweight loss?

- A number of criticisms followed (e.g., the sensitivity of the estimate to the assumed value of ε) and better estimates with better data were produced
- E.g., Cowling and Mueller (1978) used firm-level data to estimate ε
- They found DWL to be between 4 and 13% of GDP