

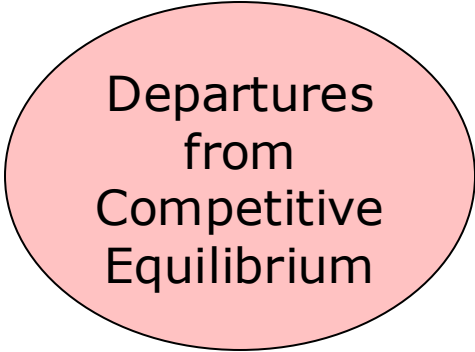
Intermediate Microeconomics

Spring 2025

Week 10: Monopoly

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Big Picture



Departures
from
Competitive
Equilibrium

1. Violation of the “private good” assumption
2. Violation of the “price-taking” assumption
3. Violation of the “complete market” assumption

This class

Road Map

1. Set up a simple model of a “monopolist”

- A firm that can single-handedly change market price for a good (by choosing to produce different quantities)
- Study welfare consequences (quantity distortion, DWL) of such market power

2. Study pricing strategies monopolists can use to improve profits, when the market is populated with different types of consumers

- 1st degree price discrimination
- 2nd degree price discrimination
- 3rd degree price discrimination

Competitive Assumptions and Market Failures

- In the last lecture(s), we considered the impact of relaxing the competitive assumption on “private goods”
 - Market allocations in the presence of externalities are not efficient.

Competitive Assumptions and Market Failures

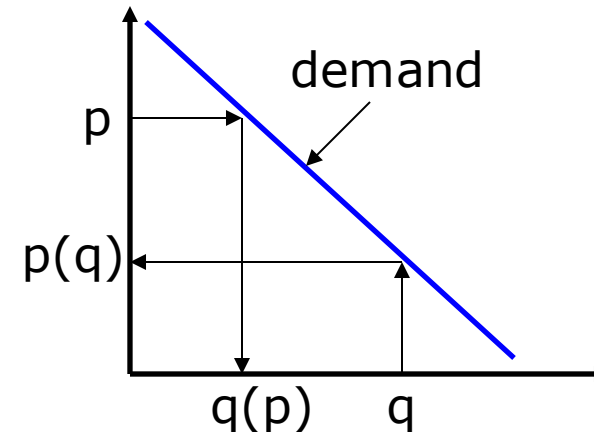
- In the last lecture(s), we considered the impact of relaxing the competitive assumption on “private goods”
 - Market allocations in the presence of externalities are not efficient.
- Today, we consider situations where the price taking assumption does not hold.
 - Price taking: firms believe that they can sell as much as desired at the posted price.
 - When price taking does not hold, firms believe that if they make more available for sale, the price will go down.
- We will focus on a particular case, Monopoly.
 - Monopoly: there is a single firm that sells the good.

“Monopolist”: Clarification

- We will use the term “monopolist” without any sentiment
 - It simply refers to a market structure where a firm can influence price of good
 - It does not mean the market structure is necessarily “bad” (we will have some discussion on why)
- Our goal is to study *what happens* when a firm has market power
- Whether a firm *should* be allowed to have market power is a completely different (and more complicated) issue
 - Depends on what type of commodity we are talking about, legal institutions, cultural context, etc.

Monopoly Pricing

- We typically think of the monopolist as choosing price and letting quantity be determined by the market.
- However, the demand curve gives a one-to-one relationship between prices and quantities.
 - We could also think of the monopolist as choosing quantity and letting the price be determined by the market.
 - This turns out to be a bit more convenient.

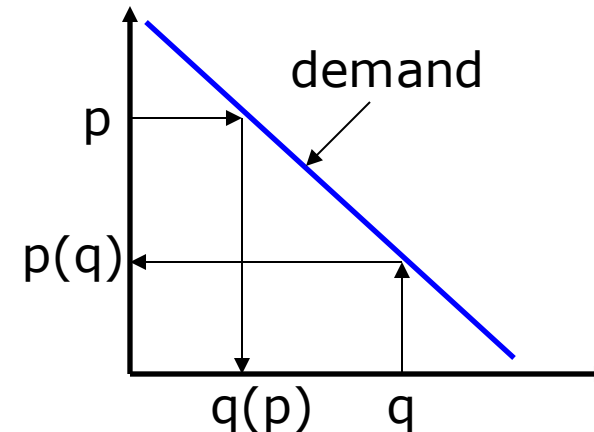


Monopoly Pricing

- Let $p(q)$ denote the monopolist's (inverse) demand curve.
- The monopolist's problem can also be written:

$$\max_q p(q) q - c(q).$$

- We will generally work with this formulation.



Profit Maximization

- The monopolist chooses q to maximize profit $p(q)q - c(q)$.
- Take derivative with respect to q , set equal to zero:

$$p'(q)q + p(q) - c'(q) = 0$$

- Rearrange:

Marginal
revenue

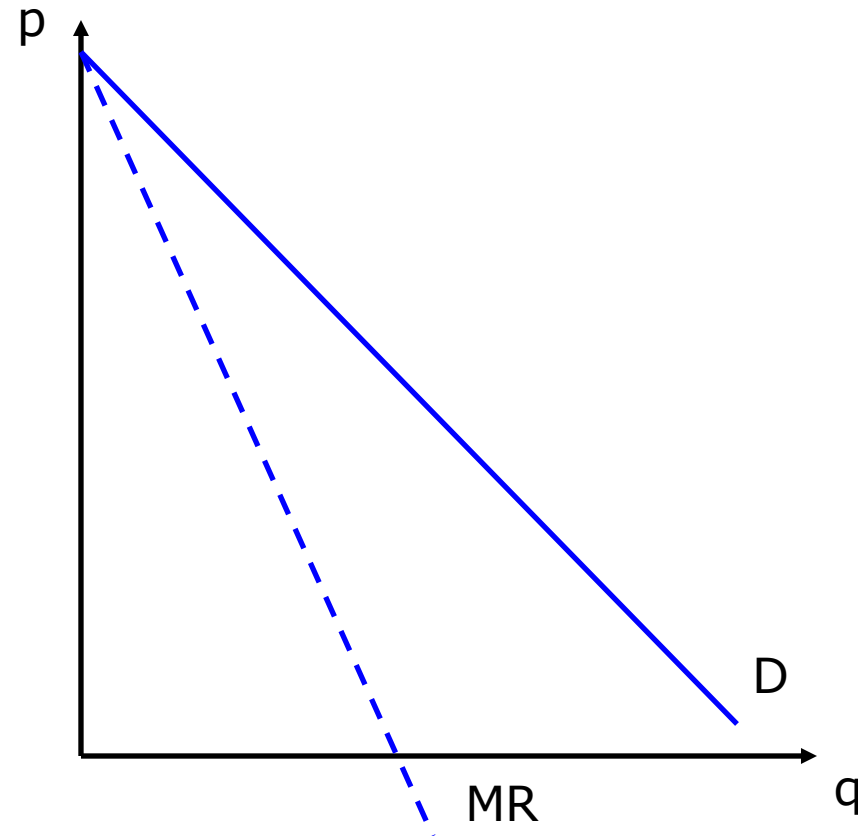
$$p'(q)q + p(q) = c'(q)$$

Marginal cost

- **Marginal Revenue:** the rate at which revenue changes when you increase q by a small amount.
- Also need to consider whether it's better to produce $q^* = 0$

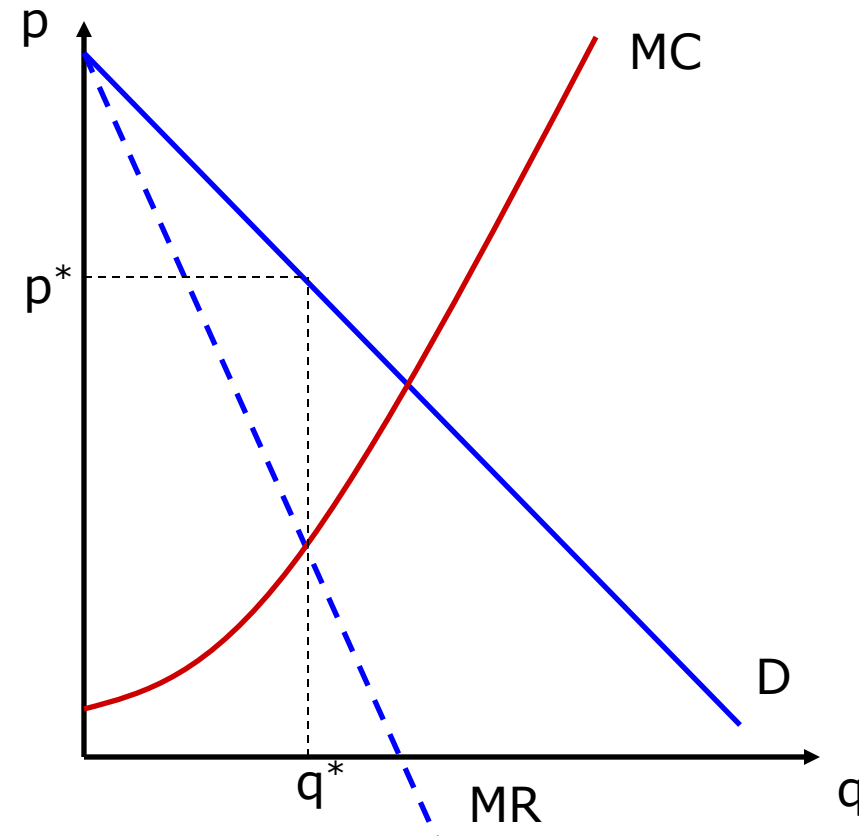
Optimal choice of q^*

- How do MR and $p(q)$ compare?
- Demand slopes down: $p'(q) < 0$
- So, $p'(q)q + p(q) < p(q)$
- Marginal revenue lies below D.



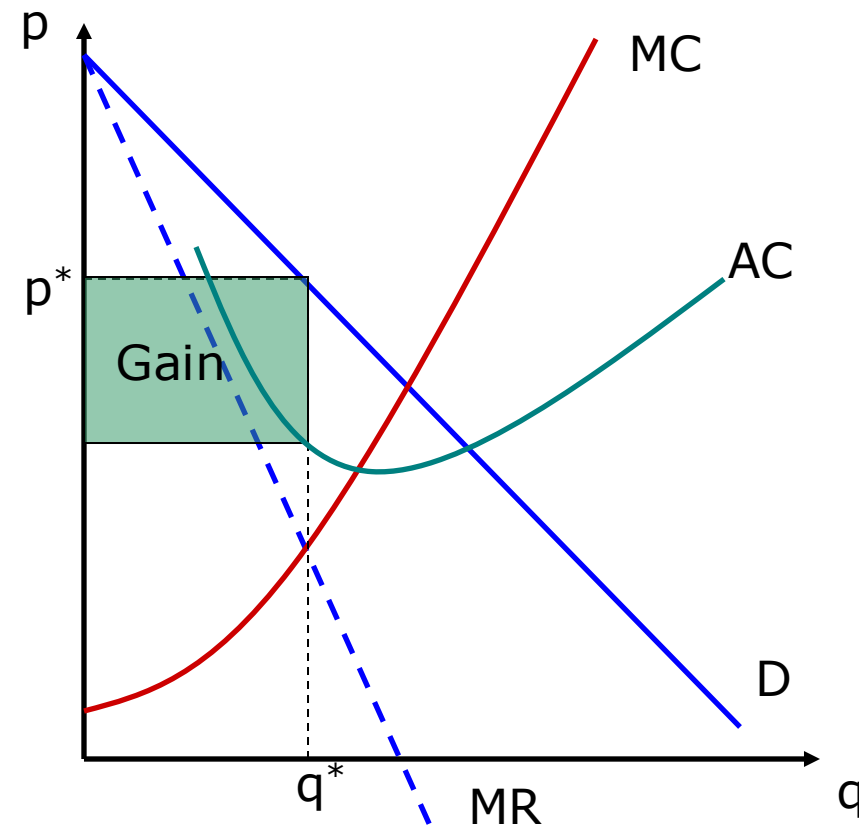
Optimal choice of q^*

- Monopolist chooses q^* where $MR = MC$.
- Optimal price p^* is found by evaluating $p(q)$ at q^* .
- Frequent mistake: don't plug q^* into MR by mistake!



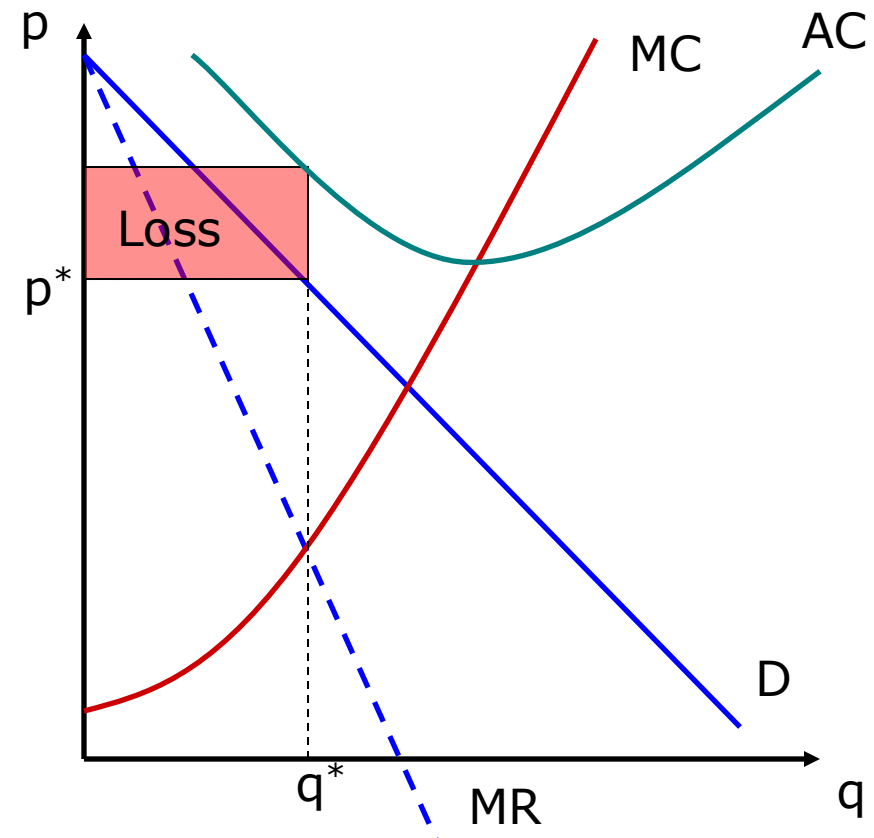
Optimal choice of q^*

- After finding q^* , compute profit: $p(q^*) q^* - c(q^*)$.
- Compare to profit if produce 0.
- If profit for $q^* >$ profit for 0, produce.
- Otherwise, shut down/exit.



Optimal choice of q^*

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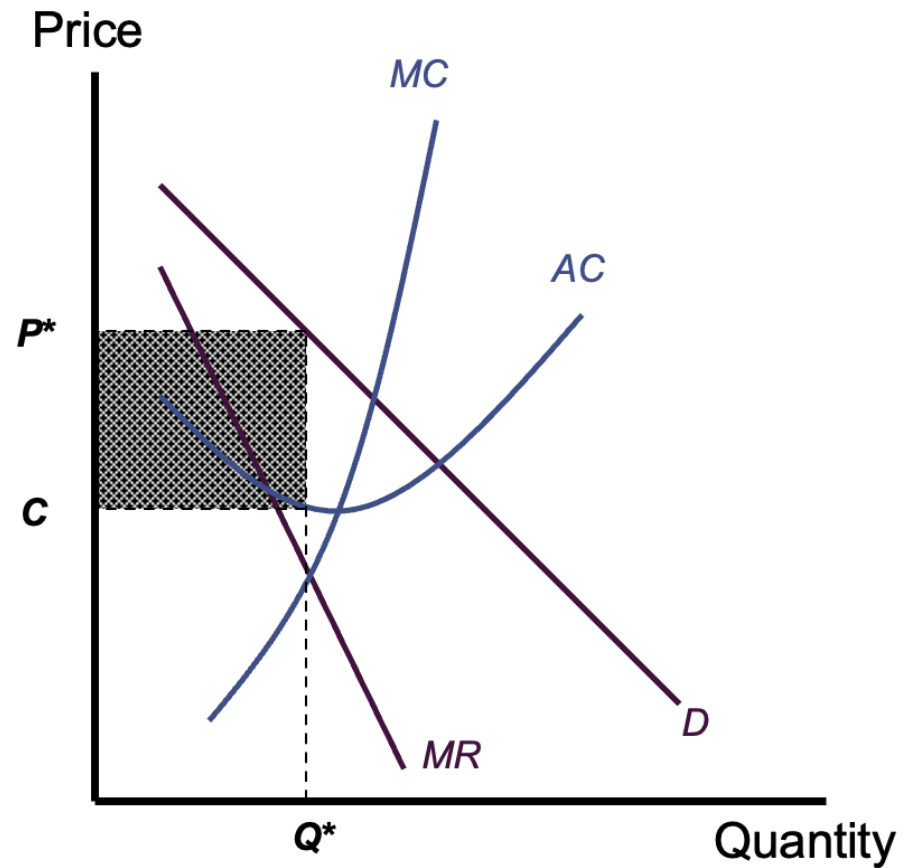
Monopoly Profits

- Monopoly profits will be positive as long as $P > AC$
- Monopoly profits can continue into the long run because entry is not possible
 - some economists refer to the profits that a monopoly earns in the long run as monopoly rents
 - the return to the factor that forms the basis of the monopoly

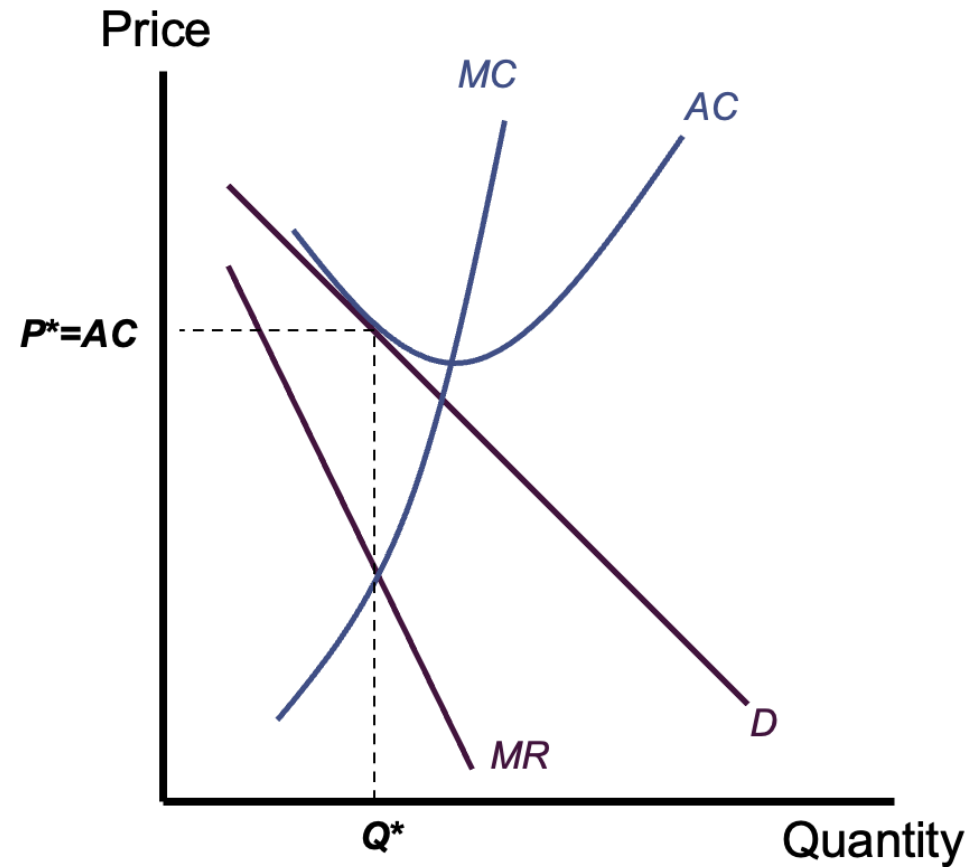
Monopoly Profits

- The size of monopoly profits in the long run will depend on the relationship between average costs and market demand for the product

Monopoly Profits



Positive profits



Zero profit

No Monopoly Supply Curve

- With a fixed market demand curve, the supply “curve” for a monopolist will only be one point
 - the price-output combination where $MR = MC$
- If the demand curve shifts, the marginal revenue curve shifts and a new profit-maximizing output will be chosen

Practice Example:

Monopoly with Linear Demand

- Suppose that the market for frisbees has a linear demand curve of the form

$$Q = 2,000 - 20P$$

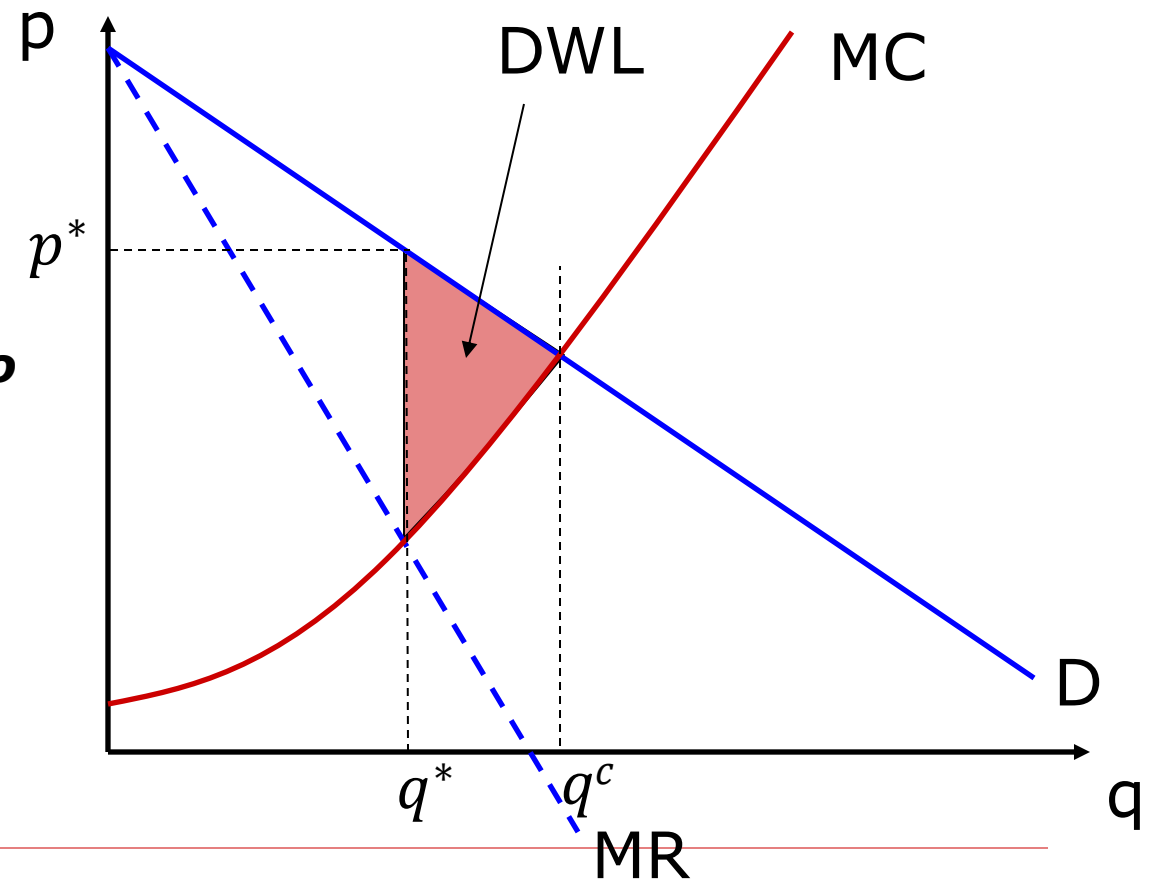
- The total costs of the frisbee producer are given by

$$C(Q) = 0.05Q^2 + 10,000$$

- What is the monopolist's optimal price and quantity?

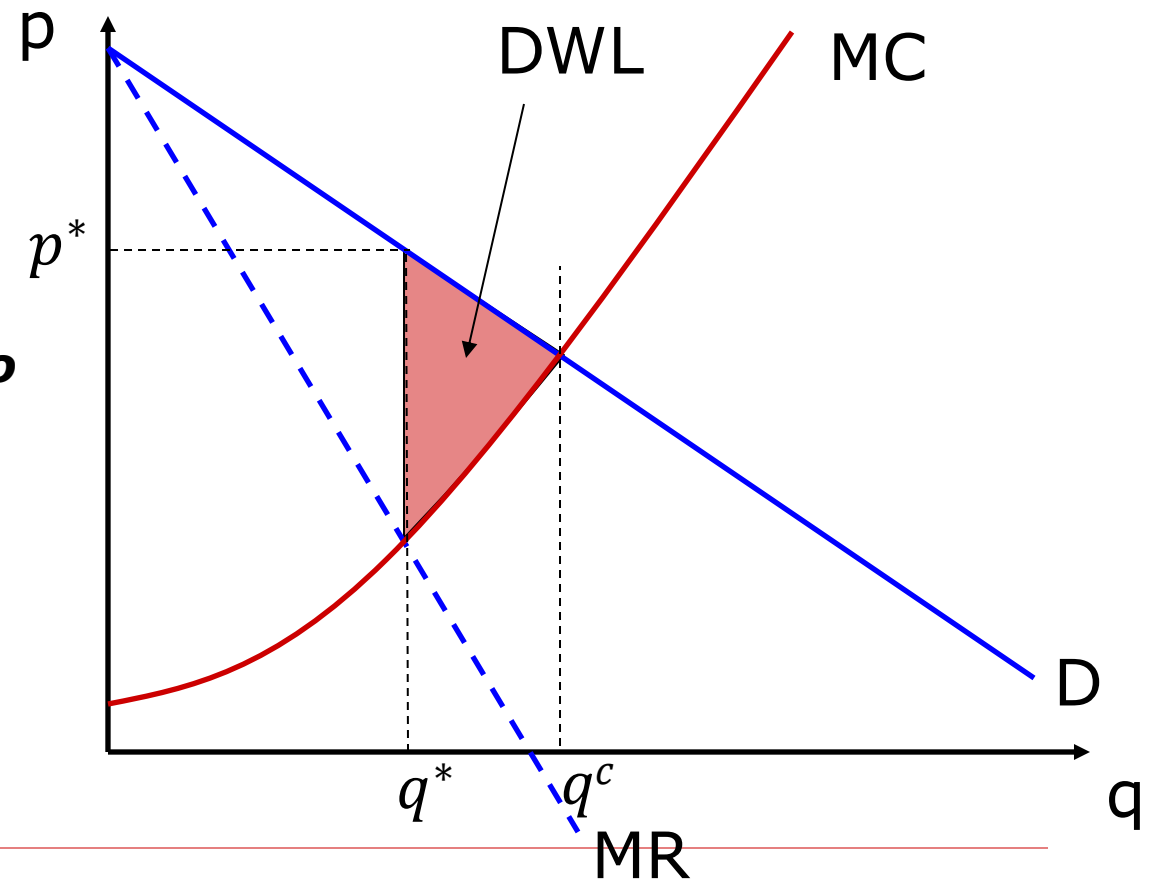
DWL of Monopoly

- Because $MR < D$, $q^c > q^*$ → there is a deadweight loss from monopoly.
 - Units between q^* have a positive surplus ($MU > MC$) but are not produced.
 - Left to their own devices, **monopolists always produce less than firms with no market power.**
- Questions to ponder:
 - Is there always a DWL?



DWL of Monopoly

- Because $MR < D$, $q^c > q^*$ → there is a deadweight loss from monopoly.
 - Units between q^* have a positive surplus ($MU > MC$) but are not produced.
 - Left to their own devices, **monopolists always produce less than firms with no market power.**
- Questions to ponder:
 - Is there always a DWL?
 - It depends. If there is a negative externality AND a monopolist, a monopolist could produce too much OR too little relative to the socially optimal quantity.



Barriers to Entry

- The reason a monopoly exists is that other firms find it unprofitable or impossible to enter the market
- Barriers to entry are the source of all monopoly power
- there are two general types of barriers to entry
 - technical barriers
 - legal barriers

Technical Barriers to Entry

- The production of a good may exhibit decreasing marginal and average costs over a wide range of output levels
 - in this situation, relatively large-scale firms are low-cost producers
 - this situation is known as natural monopoly
 - once the monopoly is established, entry of new firms will be difficult
 - Another technical basis of monopoly is special knowledge of a low-cost productive technique
 - it may be difficult to keep this knowledge out of the hands of other firms
 - Ownership of unique resources may also be a lasting basis for maintaining a monopoly
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Legal Barriers to Entry

- Many monopolies are created as a matter of law
 - with a patent, the basic technology for a product is assigned to one firm
 - the government may also award a firm an exclusive franchise to serve a market

Creation of Barriers to Entry

- Some barriers to entry result from actions taken by the firm
 - research and development of new products or technologies
 - purchase of unique resources
 - lobbying efforts to gain monopoly power

- The attempt by a monopolist to erect barriers to entry may involve real resource costs

Monopoly and Product Quality

- The market power enjoyed by a monopoly may be exercised along dimensions other than the market price of its product
 - type, quality, or diversity of goods
- Whether a monopoly will produce a higher-quality or lower-quality good than would be produced under competition depends on demand and the firm's costs

Monopoly and Product Quality

- Suppose that consumers' willingness to pay for quality (X) is given by the inverse demand function $P(Q, X)$ where

$$\partial P / \partial Q < 0 \text{ and } \partial P / \partial X > 0$$

- If costs are given by $C(Q, X)$, the monopoly will choose Q and X to maximize

$$\pi = P(Q, X)Q - C(Q, X)$$

Monopoly and Product Quality

□ First-order conditions for a maximum are

$$(1) \quad \frac{\partial \pi}{\partial Q} = P(Q, X) + Q \frac{\partial P}{\partial Q} - C_Q = 0$$

■ $MR = MC$ for output decisions

$$(2) \quad \frac{\partial \pi}{\partial X} = Q \frac{\partial P}{\partial X} - C_X = 0$$

■ Marginal revenue from increasing quality by one unit is equal to the marginal cost of making such an increase

Monopoly and Product Quality

- The level of product quality that will be opted for under **competitive** conditions is the one that maximizes net social welfare

$$SW = \int_0^{Q^*} P(Q, X) dQ - C(Q, X)$$

- Maximizing with respect to X yields

$$\frac{\partial SW}{\partial X} = \int_0^{Q^*} P_X(Q, X) dQ - C_X = 0$$

Monopoly and Product Quality

- The difference between the quality choice of a competitive industry and the monopolist is:
 - the *monopolist* looks at the marginal valuation of one more unit of quality assuming that Q is at its profit-maximizing level

$$\frac{\partial \pi}{\partial X} = Q^M \frac{\partial P}{\partial X} - C_X = 0$$

- the *competitive* industry looks at the marginal value of quality averaged across all output levels

$$\frac{\partial SW}{\partial X} = \int_0^{Q^*} P_X(Q, X) dQ - C_X = 0$$

Monopoly and Product Quality

- Even if a monopoly and a perfectly competitive industry chose the same output level, they might opt for different quality levels
 - each is concerned with a different margin in its decision making

Practice example: product quality

- Suppose a monopolist produces alkaline batteries that may have various useful lifetimes (X). Suppose also that consumers' (inverse) demand depends on batteries' lifetimes and quantity (Q) purchased according to the function

$$P(Q, X) = g(X * Q),$$

where $g' < 0$.

- That is, consumers care only about the product of quantity times lifetime ($X*Q$): They are willing to pay equally for many short-lived batteries or few long-lived ones. (*Hint: Treat XQ as a composite commodity.*)

- Assume also that battery costs are given by

$$C(Q, X) = C(X) * Q$$

where $C'(X) > 0$.

- Show that, in this case, the monopoly will opt for the same level of X as does a competitive industry even though levels of output and prices may differ.