Competition

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ECON 2216: Industrial Organization

Outline

1. Perfect Competition
   - Assumptions
   - Behavior of a Single Firm
   - Competitive Market
   - Elasticities and the Residual Demand Curve
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   - Monopsony
   - Dominant Firm with a Competitive Fringe

Outline

Outline

Assumptions[1]

- Homogeneous Perfectly Divisible Output
  - All firms sell an identical product
  - Consumers view the products of various firms as the same
- Perfect Information
  - Buyers and sellers have all relevant information about the market, including the price and quality of the product
  - Avoids problems caused by large discrete changes in either supply or demand in response to small price changes
- No Transaction Costs
  - Neither buyers nor sellers incur costs or fees to participate in the market

Assumptions[2]

- Price Taking
  - Price is determined by the market, so each buyer and seller takes the price as given
  - Buyers and sellers cannot individually influence the price
- No Externalities
  - Each firm bears the full costs of its production process
  - The firm does not impose externalities: no uncompensated costs on others
  - For example, pollution produced by a firm is an externality because the firm does not recompense the victims

Outline

Profit Maximization[1]

- The objective of any firm, including a competitive firm, is to maximize its profits:

$$\max_q \pi = pq - C(q)$$

- p is price, q is output, and $C(q)$ is total cost
- Its first-order condition is found by differentiating p with respect to q and setting that equal to zero:

$$p - C'(q) = 0$$

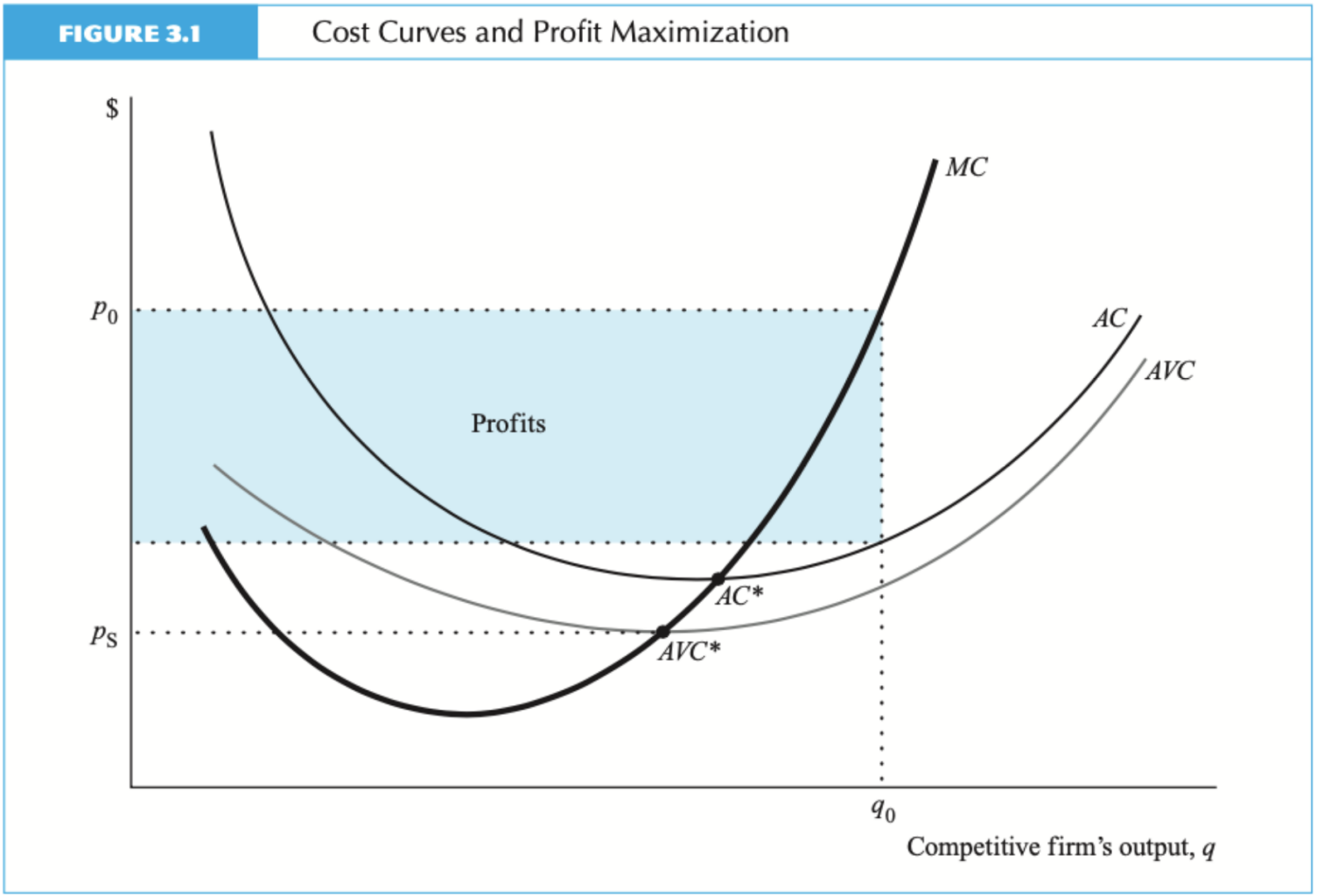
  - Where $C'(q) = \frac{dC(q)}{dq} = MC$
- First-order condition is price equals marginal cost. $p = MC$ is a necessary condition for profit maximization
- Second-order condition is $C''(q) < 0$. That is, MC be upward sloping at the equilibrium
- A firm's profits are total revenue minus total cost:

$$\pi = pq - C$$

$$or$$

$$\pi = (p - AC)q$$

Profit Maximization[2]



Profit Maximization[3]

- If the $p$rises above p_0, the firm earns higher profits at q_0,
  - it earns even higher profits if it expands output until $p = MC$
- If the $p$falls below p_0, the firm earns lower profits at q_0,
  - it suffers less of a reduction if it reduces its output until $p = MC$
- As the price rises, the firm moves up its marginal cost curve, and its profits rise; as the price falls, the firm moves down its marginal cost curve to minimize the reduction in its profits

Shutdown Decision

- A firm produces only if doing so is more profitable than not producing
- The rule for deciding whether to remain in business is:
  - produce and sell only if revenues are at least as great as total variable cost
  - equivalently, the firm should produce and sell at price p only if p equals or exceeds average variable cost (AVC).
- In the short run, minimum average cost (AC^*) is greater than minimum average variable cost (AVC^*), because average costs are average variable costs plus average fixed costs (i.e., $AC = AVC + FC$)
- If $p < AC^*$ but $p > AVC^*$, a firm finds it more profitable to produce and earn some revenue in excess of variable cost than to shut down and earn no revenues, which can help offset the fixed costs

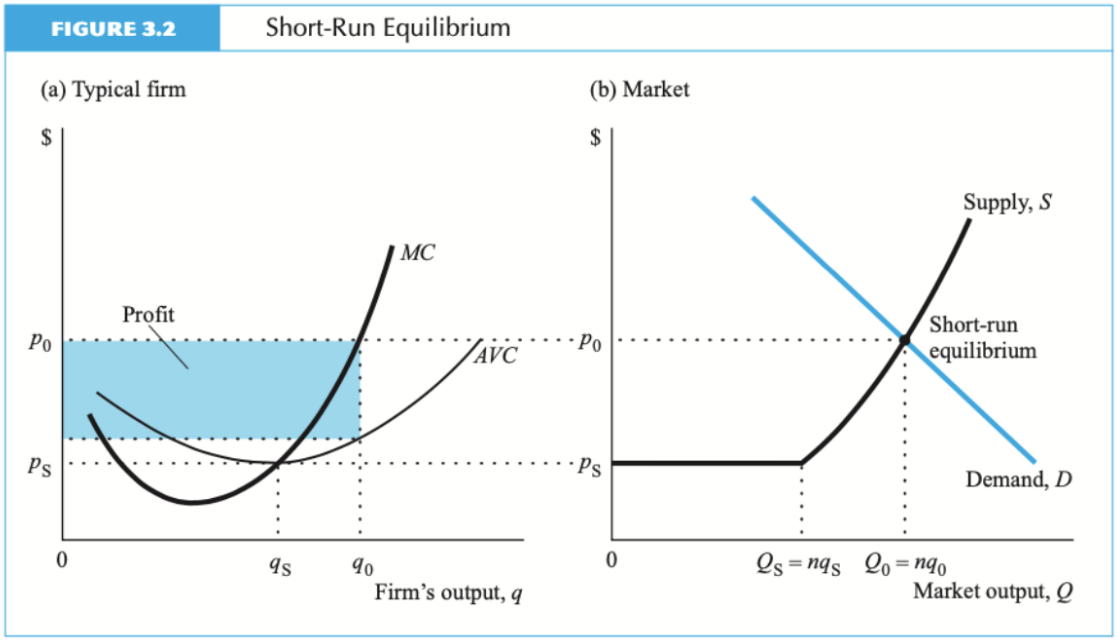
[Example]Shutdown Decision

- Example: suppose a firm's fixed cost is \$200 and sunk. Its marginal cost (MC) is constant at \$10 at quantities less than 100 units. At more than 100 units, MC is extremely high. There are three scenarios:
  1. If the price is \$10, the firm produces and sells 100 units. The firm just covers its production cost and makes no contribution to the \$200 fixed cost: It loses \$200
  2. If the price is \$9, the firm is better off not producing at all, because it loses an additional \$1 for every unit it produces and would lose \$300 if it produced 100 units. It is better to shut down and lose only \$200 than to produce and suffer greater losses
  3. If the price is \$11, by producing 100 units, the firmnow more than covers variable cost: It earns \$100 above variable cost. It still loses money overall $(-200 + 100 = -100)$, but it is better to lose \$100 than \$200
- The price at which a firm ceases production is the shutdown point, which is p_s in Figure 3.1
- In the extreme, when there are no sunk costs (all fixed costs are avoidable), the shutdown point coincides with the minimum point on the AC curve. Thus, a firm shuts down before it incurs economic losses.

Outline

Short-Run Equilibrium[1]

- Suppose there are n identical firms and that all fixed costs are sunk in the short run:

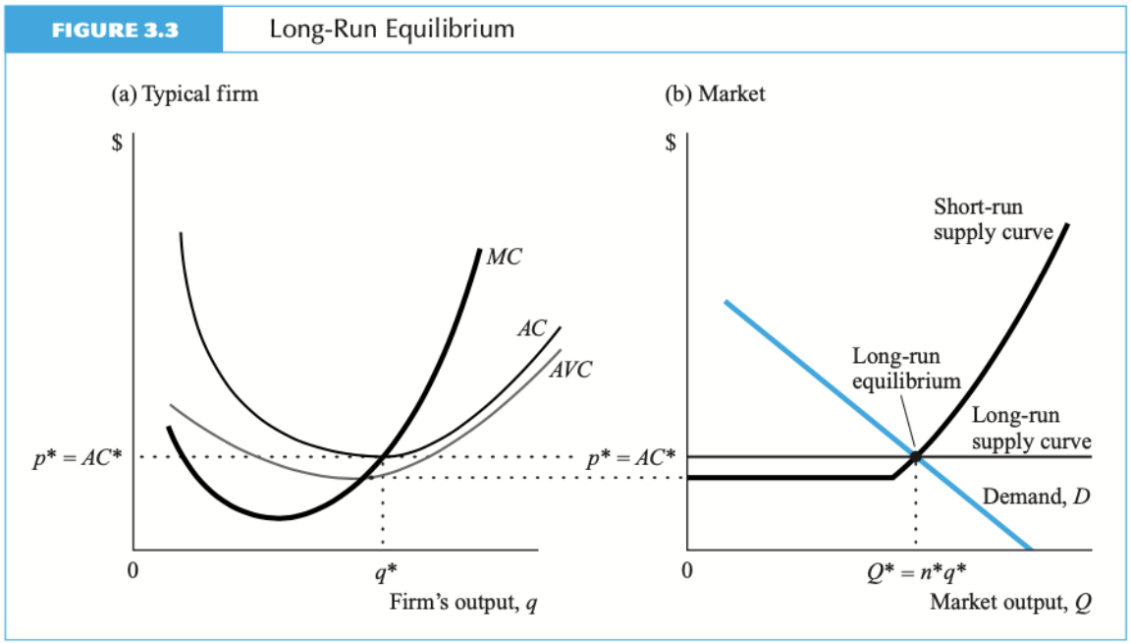


Short-Run Equilibrium[2]

- The short-run market supply curve (S) is the horizontal sum of the supply curves of each firm, the MC curve above the minimum of the AVC curve
- The horizontal portion of the market supply curve reflects
  - no output is forthcoming if price is below the shutdown point
  - all firms produce at a price slightly above the shutdown point
- The intersection of the demand curve with the short-run market supply curve determines the short-run equilibrium price (p_0) and quantity (Q_0)
- The amount that firms want to supply at the equilibrium price exactly equals the amount that consumers demand at that price

Long-Run Equilibrium[1]

- In the long run, firms can adjust their levels of capital so that they can enter this market
- Short-run profits or losses induce firms to enter or leave the market until price is driven to the minimum long-run average cost



Long-Run Equilibrium[2]

- If the number of firms that can potentially produce at the same cost is very large, the long-run supply curve is horizontal at the minimum of the average cost curve
- The long-run equilibrium is determined by the intersection of the demand curve and the long-run market supply curve
- In Figure 3.3, the market is in a new short-run and long-run equilibrium because the demand curve (D) intersects both the long-run supply curve and the new short-run supply curve corresponding to the equilibrium number of firms (n*)
- The equilibrium price is $p^* = AC^*$, and equilibrium output is $Q^* = n^* q^*$
- In long-run equilibrium, firms make zero profit

Outline

Elasticities and the Residual Demand Curve[1]

- Elasticity of demand is the percentage change in quantity demanded in response to a given small percentage change in price
  - elasticity of demand is always a negative number
  - the price elasticity of demand at price p and quantity Q is the percentage change in quantity divided by the percentage change in price (if that change is small):

$$\textit{price elasticity of demand} = \frac{\Delta Q}{\Delta p}\frac{p}{Q}$$

- Elasticity of supply is the percentage change in quantity supplied in response to a given small percentage change in the price
  - elasticity of supply is usually, but not always positive

Elasticities and the Residual Demand Curve[2]

- If the absolute value of the elasticity of demand > 1:
  - demand curve is elastic
  - a 1 percent increase in price leads to a more than a 1 percent reduction in the quantity demanded
- If the absolute value of the elasticity of demand $= 1$:
  - demand curve is unitary elasticity
  - a 1 percent change in price causes a 1 percent change in the quantity demanded, and the total amount paid remains constant
- If the absolute value of the elasticity of demand < 1:
  - demand curve is inelastic
  - a 1 percent increase in price causes less than a 1 percent decline in the quantity demanded, and the total amount paid rises
- Elasticities of demand and supply depend upon many economic factors, such as level of output, availability of substitute product, and the ease with which suppliers can alter production

Outline

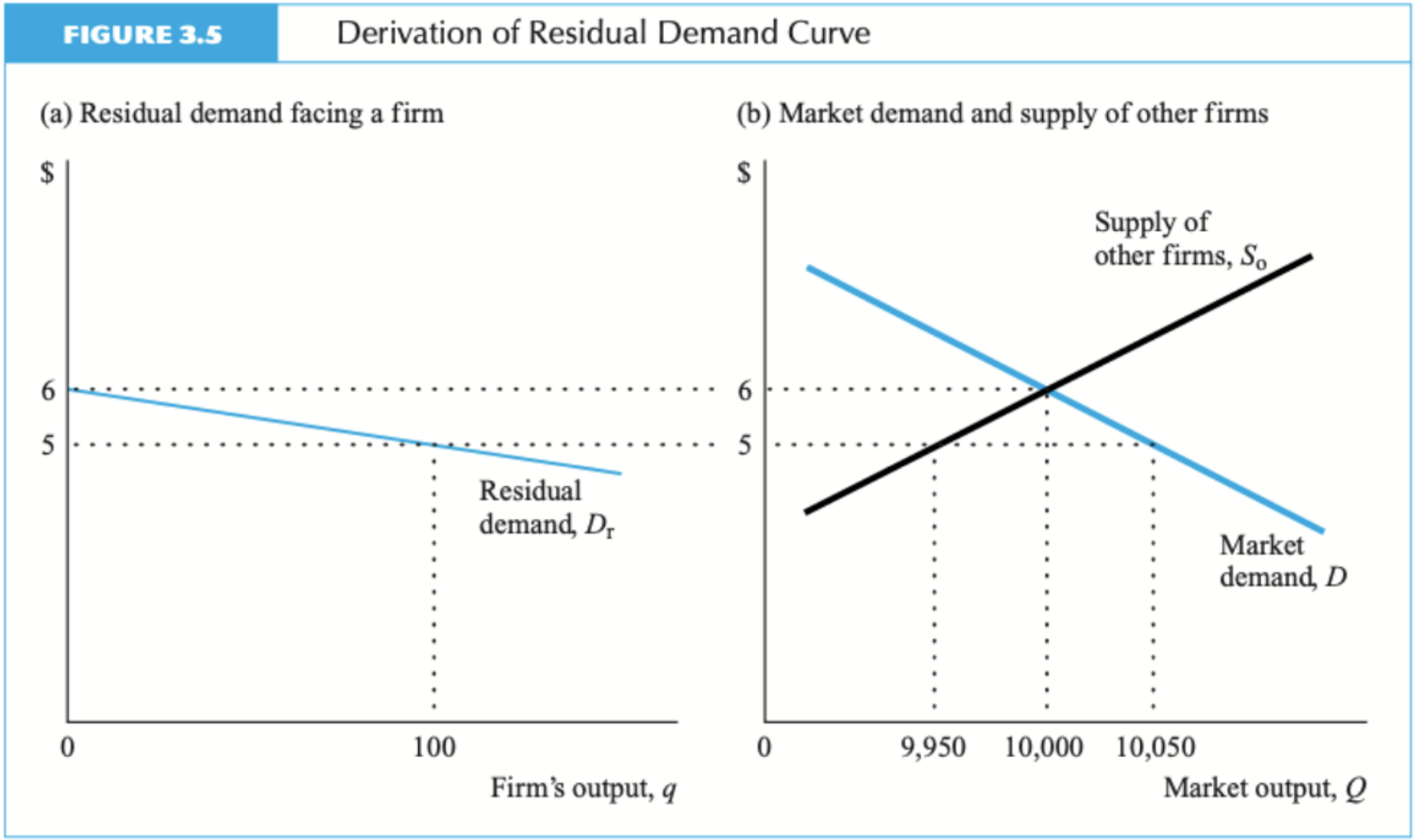
The Residual Demand Curve of Price Takers[1]

- Competitive firms are often described as price takers
- There are three equivalent ways to describe a firm's inability to affect price:
  - a competitive firm is a price taker
  - the demand curve facing a competitive firm is horizontal at the market price
  - the elasticity of demand facing a competitive firm is infinite
- If the number of firms in a market is large, the demand curve facing any one firm is nearly horizontal (elasticity of demand is infinite)
  - residual demand curve

$$D_r(p) = D(p) - S_o(p)$$

  - where
    - $D_r(p)$ is residual demand
    - $D(p)$ is market demand
    - $S_o(p)$ is supply of other firms

The Residual Demand Curve of Price Takers[2]



The Residual Demand Curve of Price Takers[3]

- The residual demand curve facing the firm in Figure 3.5a, is much flatter than the market demand curve in Figure 3.5b.That is, the single firm's demand elasticity is much higher than the market elasticity
- if there are n identical firms in the market, then the elasticity of demand facing Firm i is

$$\epsilon_i = \epsilon n - \eta_0(n-1)$$

  - where
    - ϵ is market elasticity of demand
    - η_0 is elasticity of supply of the other firms
    - $(n-1)$ is number of other firms

The Residual Demand Curve of Price Takers[4]

TABLE 3.1 **Price Elasticity for a Single Firm**

Number of Firms n	Market Elasticity: Inelastic $\epsilon = -0.5$	Unitary $\epsilon = -1$	Elastic $\epsilon = -5$
10	−5	−10	−50
25	−12.5	−25	−125
50	−25	−50	−250
100	−50	−100	−500
500	−250	−500	−2,500
1,000	−500	−1,000	−5,000

Note: Because the supply of the other identical firms is assumed to be perfectly inelastic ($\eta_o = 0$), the elasticity of demand facing a particular firm is $\epsilon_i = n\epsilon$.

The Residual Demand Curve of Price Takers[5]

- Table 3.1 shows how the elasticity of demand facing a single firm varies with the number of firms and the market elasticities, given that the supply of other firms is completely inelastic ($\eta_0 = 0$)
- For example,
  - if the market elasticity is unitary ($\epsilon = -1$) and there are 50 firms, then $\epsilon_i = -50$. That is, if a firm were to increase its price by 1 percent, the quantity it sells would fall by about 50 percent
  - if the market demand elasticity is -0.5 and there are 1,000 firms, $\epsilon_i = -500$, so that if the firm were to raise its price by a tenth of a percent, the quantity it sells would fall by 50 percent

Outline

Efficiency

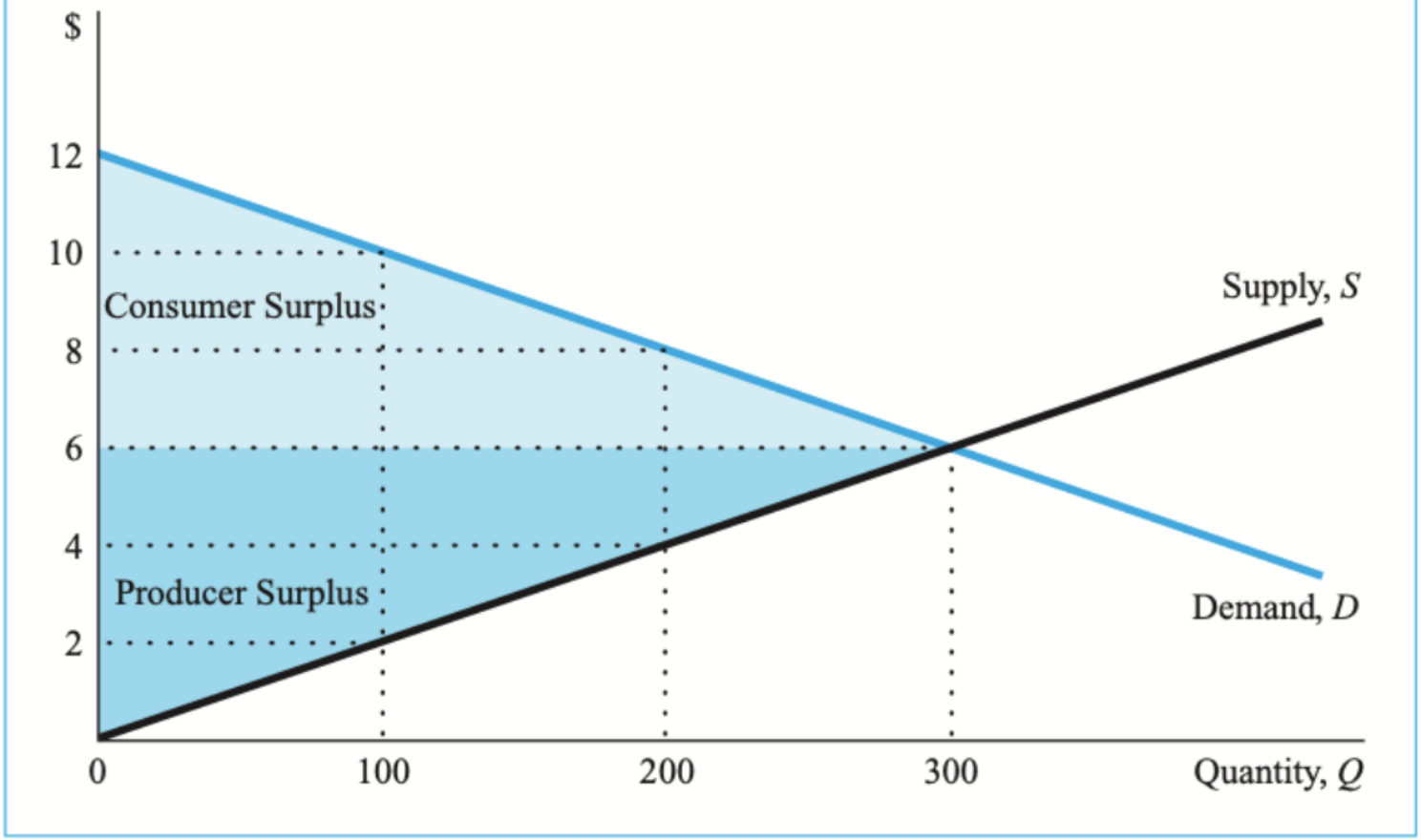
- Competitive equilibrium of price and quantity has two desirable efficiency properties:
  1. production is efficient in the sense that there is no possible rearrangement of resources among firms that can increase the output of one product without reducing the output of at least one other product
  2. consumption is efficient - the value that a buyer places on consuming the good is exactly equal to the marginal cost of producing that good

Welfare[1]

- **Consumer Surplus**
  - The amount above the price paid that a consumer would willingly spend to consume the units purchased
- **Producer Surplus**
  - The largest amount that could be subtracted from a supplier's revenues and yet the supplier would still willingly produce the product
- **Welfare**
  - The sum of consumer surplus and producer surplus:
    $\textit{Total Welfare} = \textit{Consumer Surplus} + \textit{Producer Surplus}$
  - Measure of welfare is the value that consumers and producers would be willing to pay to purchase the equilibrium quantity of output at the equilibrium price

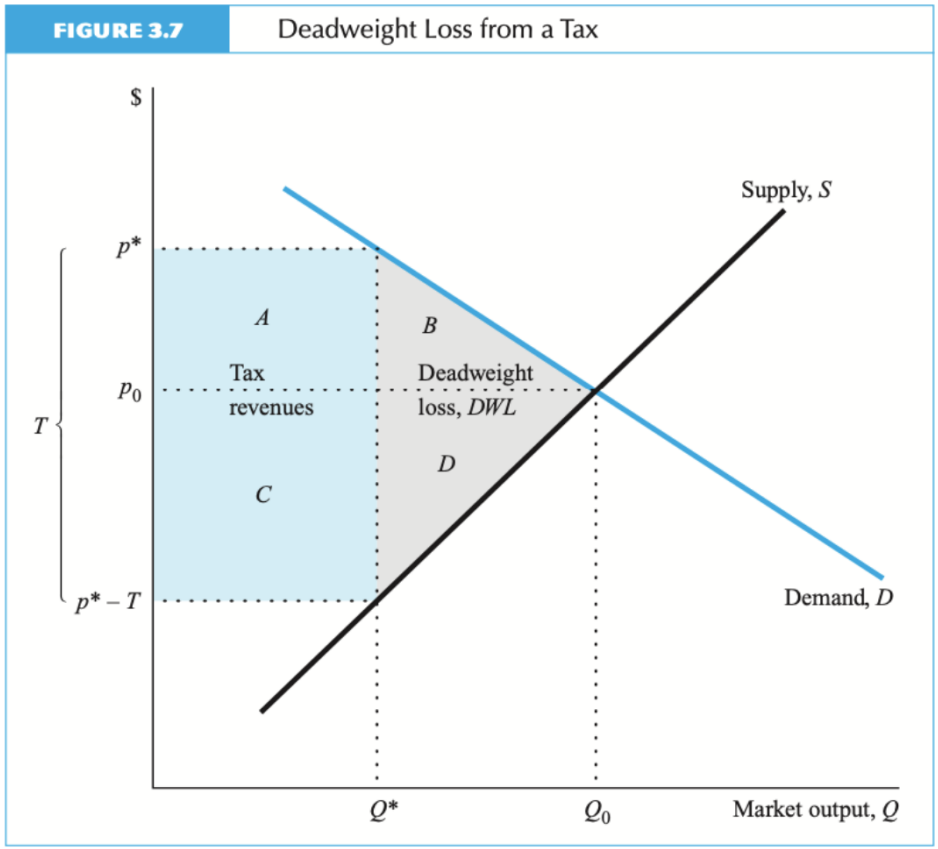
Welfare[2]

FIGURE 3.6 Consumer Surplus and Producer Surplus



Welfare[3]

- **Deadweight Loss**
  - The cost to society of a market's not operating efficiently
  - The welfare loss—the sum of the consumer surplus and producer surplus lost—from a deviation from the competitive equilibrium



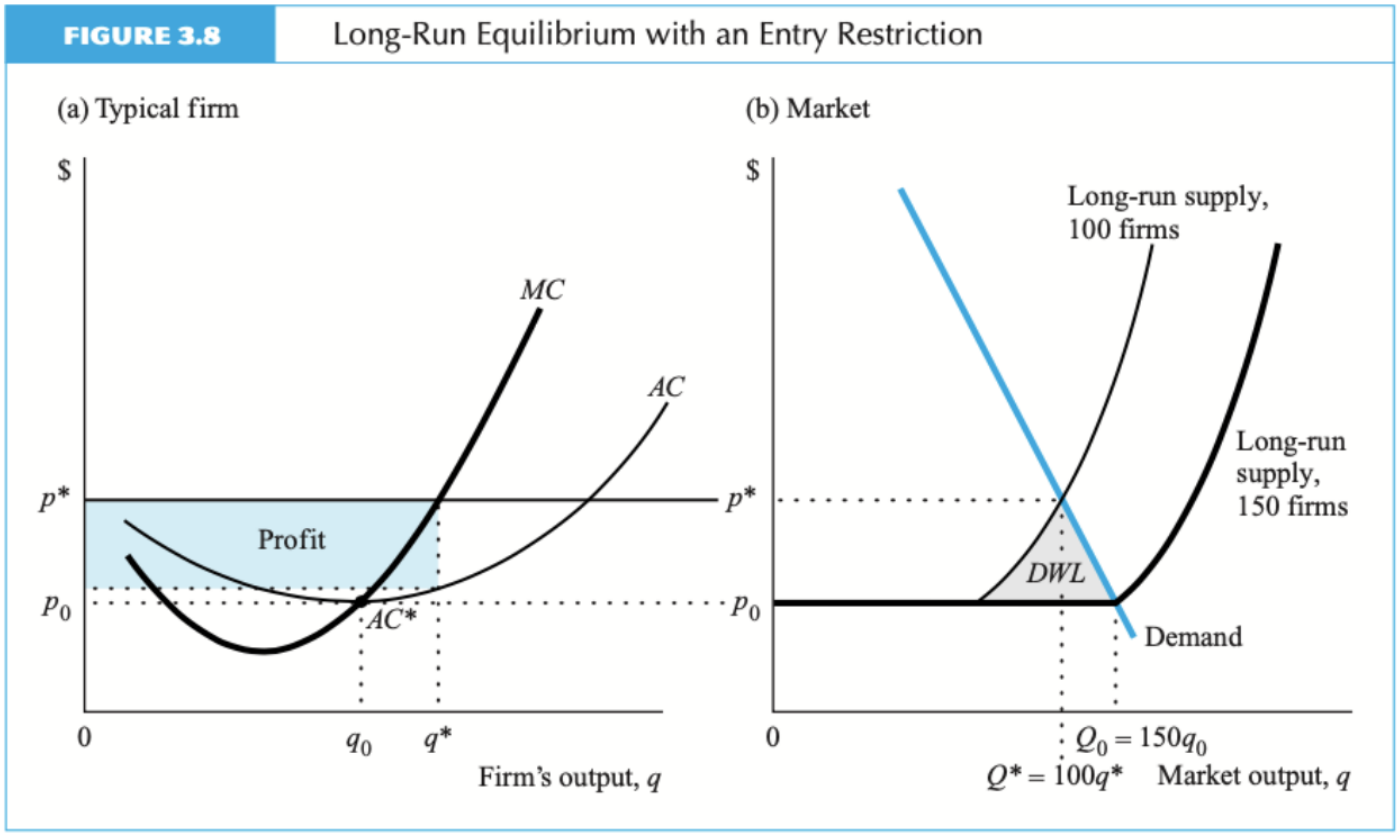
Welfare[4]

- In Figure 3.7, the competitive equilibrium is at price p_0 and quantity Q_0. At Q_0, the value that a consumer places on additional consumption equals the marginal cost of producing the good. If the government taxes this good or restricts its sale, this link between the value the consumer places on an additional unit and the cost of producing it is broken, which lowers welfare
- The deadweight loss triangle is the total loss to society if the government makes good use of the tax revenues
- The DWL triangle is an efficiency loss because the marginal cost of producing a good is less than the marginal willingness of consumers to pay for it
- As long as the government makes efficient use of this money, the tax revenues are not an efficiency loss
- The tax revenues reflect a redistribution of income from buyers and sellers of this good to those who benefit from the government's use of these funds

Outline

Restrictions on Entry[1]

- In many industries, governments or groups of firms collectively set licensing require- ments that restrict entry



Restrictions on Entry[2]

- Figure 3.8b shows two long-run supply curves for a market where all firms have identical costs. In the absence of a government restriction on entry, there are 150 firms in this market. The competitive equilibrium is determined by the intersection of the supply curve for 150 firms and the market demand curve. The equilibrium price is p_0, and each firm is producing at the minimum of its long-run average cost curve (AC*)
- If the government restricts the number of firms in the market to 100, the long-run supply curve lies to the left of the original one. With this restriction on entry, the new equilibrium price is p^*. Therefore consumers' pay a price p^*, higher than the unrestricted competitive price p_0, and consume only Q^*, which is less than the unrestricted competitive quantity Q_0. The shaded area DWL is the lost welfare from restricting entry
- The entry restriction is inefficient for two reasons:
  1. there is a loss in efficiency due to restricting output from Q_0 to Q^*
  2. the average cost of production is greater with entry restrictions

Entry Barriers

- A good example of a long-run barrier to entry is a patent. Under most patent systems, the government grants an inventor the monopoly right to sell the invention for a fixed period of time
  - A patent creates a legal monopoly through a long-run barrier to entry
  - To compete against an incumbent firm with a patent, a potential entrant has to either invent around the patent or license it from the incumbent firm.
  - Because the incumbent firm has the right to exclude anyone from using the patent, it can prevent entry
  - Identifying Barriers to Entry:
    - ★ absolute cost advantage
    - ★ economies of large-scale production that require large capital expenditures
    - ★ product differentiation: related products that have varying characteristics so that consumers do not view them as perfect substitutes (for example, Apple computers are not perfect substitutes for IBM computers)

Exit Barriers

- An important consideration in understanding a firm's incentive to enter a market is the firm's ability to exit the market
- If it is costly to exit a market, the incentives to enter are reduced
- For example, suppose that a firm in a market must have very specialized equipment that is difficult to resell. A firm contemplating entry into that market realizes that if the unusual profit opportunities in the market are short lived, it may not pay to enter

Outline

Negative Externality

- An uncompensated action that harms someone is a negative externality
- Example: pollution
  - In the absence of government regulations, manufacturing firms do not pay for the pollution they create, so they ignore the cost to society of pollution in deciding how much output to produce
  - That is, their private marginal cost (their out-of-pocket production cost) of making one more unit is less than the social marginal cost (the private marginal cost plus the damage from the pollution)
  - As a result, they produce more than is socially optimal
  - Such distortions or inefficiencies in production due to improper pricing are referred to as market failures

Positive Externality

- An uncompensated action that benefits others is a positive externality
- Example: you plant a beautiful garden in view of your neighbor, your neighbor receives a free benefit
- Two important examples of positive externalities: generation and dissemination of information, which can benefit many people at once

Public Good

- Information is also described as a public good: a commodity or service whose consumption by one person does not preclude others from also consuming it
- Another example of a public good is national defense
- In addition to being an externality, pollution is a public bad (an undesirable public "good")
- An externality can be either a private or public good or bad

Property Rights

- You have property rights when you own or have exclusive rights to use some asset such as a good or service. Others must compensate you if they wish to use your property
- Externalities arise when property rights are not clearly defined:
  - For example, you may have property rights to a particular car, but no clearly defined area of a highway belongs to you alone. You share the highway with others. If each driver claims a temporary property right in a portion of the highway by occupying it, competition for space on the highway can lead to congestion, which slows up every driver on a highway (negative externality)
  - For example, if a software company cannot protect its property right to its computer programs and prevent other firms from selling them, the company is not compensated for use of its programs (positive externality). As a result, too few resources are devoted to producing software
- Where property rights are clearly defined so there are no externalities, competitive markets are efficient

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2. Monopolies, Monopsonies, and Dominant Firms
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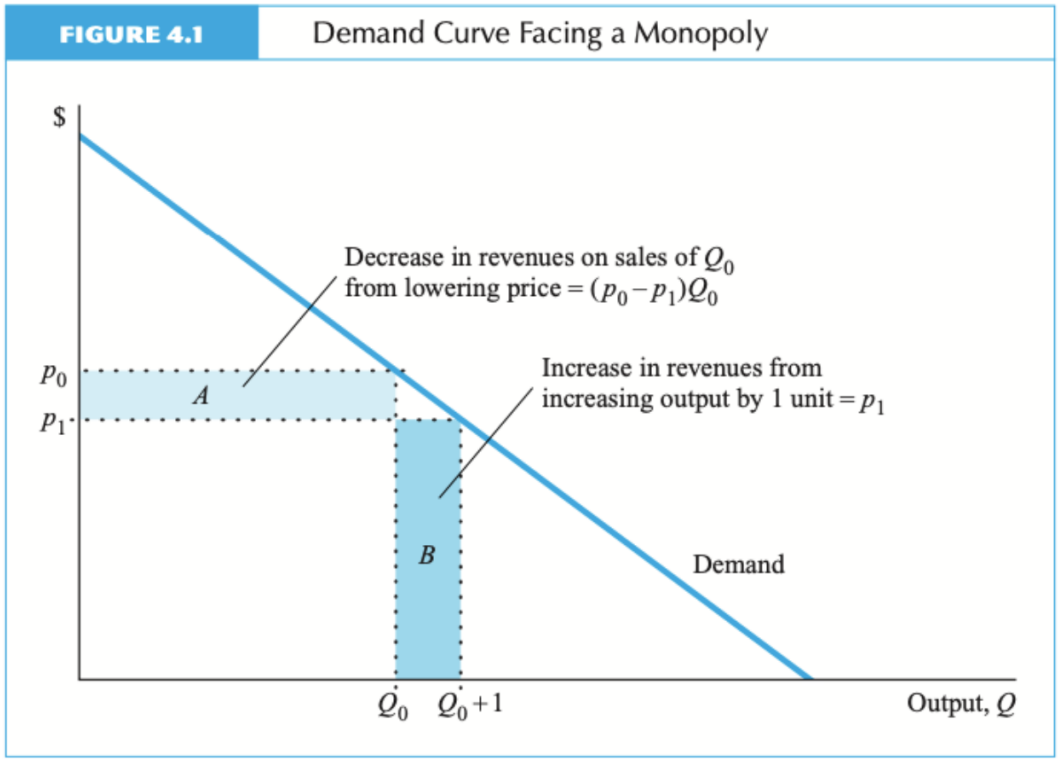
Outline

Profit Maximization[1]

- A monopoly sets its level of output to maximize its profits
- Because the market demand curve is downward sloping, the more the monopoly sells, the lower the price it receives



Profit Maximization[2]

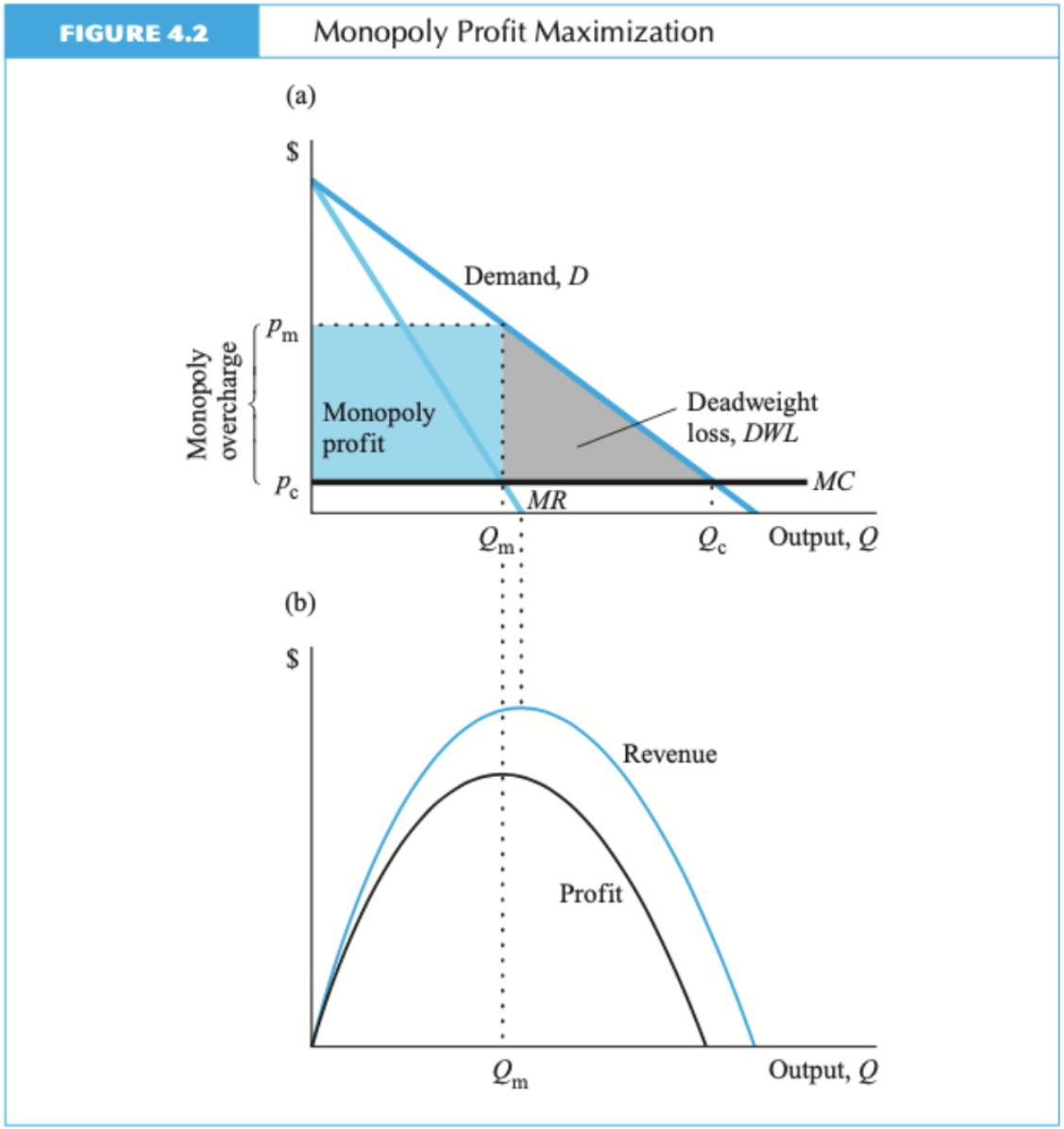
- Profit Maximization for a monopoly:

$$\max_{Q} \pi = p(Q)Q - C(Q)$$

- A monopoly maximizes its profit when the extra revenue from selling one more unit just equals the extra cost of producing that last unit of output. That is, profit is maximized where marginal revenue equals marginal cost:

$$MR = MC$$

Profit Maximization[3]



Profit Maximization[4]

- Figure 4.2a illustrates this profit-maximizing relationship. The profit-maximizing monopoly output Q_m is smaller than the competitive output Q_c, determined by the intersection of the demand curve with the marginal cost curve at price p_c. The monopoly does not have a supply curve that can be specified solely as a function of price because the monopoly's output depends on marginal revenue and marginal cost
- The properties of the demand curve determine the monopoly overcharge: the amount by which p_m exceeds p_c in Figure 4.2a. A relationship exists between the monopoly overcharge and the price elasticity of demand

Profit Maximization[5]

- Marginal revenue can be written as:

$$MR = p(1 + \frac{1}{\epsilon})$$

  - where
    - ϵ is the elasticity of demand
    - marginal revenue is positive if the demand curve is elastic ($\epsilon < -1$)
    - marginal revenue is negative if the demand curve is inelastic ($-1 < \epsilon < 0$)
- Whenever a firm can profitably set its price above its marginal cost without making a loss, it has monopoly power or market power
- The key element in an investigation of market power is the price elasticity of demand
- Lerner Index of market power:

$$L = \frac{p - MC}{p} = -\frac{1}{\epsilon}$$

The Costs and Benefits of Monopoly: the Deadweight Loss of Monopoly

- As shown in Figure 4.2a, if consumers must pay a monopoly price p_m that is above the competitive price p_c, they lose consumer surplus equal to the sum of the monopoly profits and the deadweight loss
- The monopoly profit is less than the consumer surplus loss. Thus, society suffers a deadweight loss

The Costs and Benefits of Monopoly: Rent-Seeking Behavior

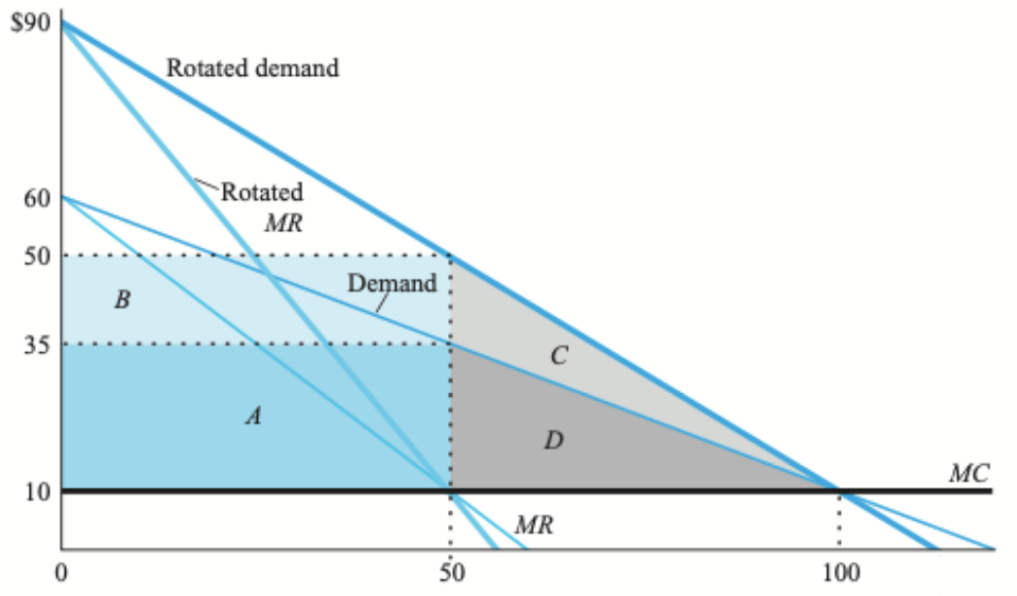
- The opportunity to earn positive monopoly profit could create the incentive for a firm to use valuable resources up to the amount of monopoly profits in order to become or secure a monopoly
- For example, suppose that a firm can become a monopoly by persuading the government to pass a law that restricts entry into the market. The use of a firm's resources to hire lobbyists, lawyers, and economists to argue its case before legislators is a cost to society, because these resources could have been productively employed elsewhere
- Because firms compete to earn the "rent" (monopoly profits) from the monopoly, the expenditure of resources to attain government-created monopoly profits is called rent seeking
- If rent seeking occurs, the calculation of the deadweight loss from monopoly must include that part of the transfer that is dissipated by the firms seeking to become the monopoly

Monopoly Profits and Deadweight Loss Vary with the Elasticity of Demand[1]

- Monopoly profits and the deadweight loss triangle depend on the shape of the demand curve
- In Figure 4.3, monopoly profits and deadweight loss vary with the elasticity of demand with a linear demand curve:

$$p = a - bQ$$

FIGURE 4.3 Monopoly Profits and Deadweight Loss Vary with the Elasticity of Demand



Monopoly Profits and Deadweight Loss Vary with the Elasticity of Demand[2]

- As the demand curve becomes less elastic at the monopoly equilibrium, an increase in price causes the quantity people purchase to fall by less than if demand were more elastic
- Realizing this opportunity exists, the monopoly may increases its equilibrium price and earns a larger monopoly profit
- As the demand curve becomes steeper at a given quantity (demand is more inelastic), the deadweight loss increases

The Benefits of Monopoly

- The prospect of receiving monopoly profits may motivate firms to develop new products, improve products, or find lower-cost methods of manufacturing
- The benefit of monopoly is most clearly recognized in research and development: if a firm succeeds in developing a new product, it can obtain a patent that prohibits other firms from using the patented technology for a fixed number of years

Creating and Maintaining a Monopoly: Government-Created Monopolies

- A firm may be a monopoly because the government protects it from entry by other firms
- For example, suppose a firm invents a new product and realizes that imitation is possible technically. In most countries, the original innovating firm can obtain legal protection to prevent entry for some period of time. The law on intellectual property grants a legal monopoly to a firm that has discovered a new product or technique. A firm can obtain a patent on a new product that prevents any other firm from copying its product and competing with it for a fixed period of years
- Generally, government restrictions on entry allow at least a few firms to produce, but they prevent the normal competitive forces from driving price and profits down to competitive levels
- Similarly, trade barriers can be used to prevent entry. For example, in 1992, the Ontario government agency that monopolizes the sale of beer in that province, the Liquor Control Board of Ontario, announced a ban on American beer imports

Creating and Maintaining a Monopoly: Natural Monopoly

- In some markets, it is efficient for only one firm to produce all of the output
- When total production costs would rise if two or more firms produced instead of one, the single firm in a market is called a natural monopoly
- A firm is a natural monopoly if it can produce the market quantity Q , at lower cost than can two or more firms:
  - Let $q_1, ..., q_k$ be the output of the $(k \geq 2)$ firms in a market that produce an identical product so that total market output equals the sum of the firms' output: $Q = q_1 + ... + q_k$
  - If each firm has a cost function $C(q_i)$ and one firm can produce Q at lower cost than the sum of the k firms, i.e. $C(Q) < C(q_1) + C(q_2) + ... + C(q_k)$, then the most efficient way to produce is to have one firm produce all Q units
  - A cost function is said to be subadditive at Q if this inequality holds
  - Subadditivity is a necessary condition for the existence of a natural monopoly
- Examples: electrical, gas, telephone, and cable television

Outline

Monopsony[1]

- A single buyer in a market is called a monopsony
- The monopsony decides how much to purchase by choosing a price-quantity pair on the market supply curve
- Monopsony is the flip side of monopoly: both a monopoly and a monopsony recognize that their actions affect the market price
- A monopsony buys more of the good as long as the value of the extra consumption as given by its demand curve equals or exceeds its marginal cost of consuming one more unit

Monopsony[2]

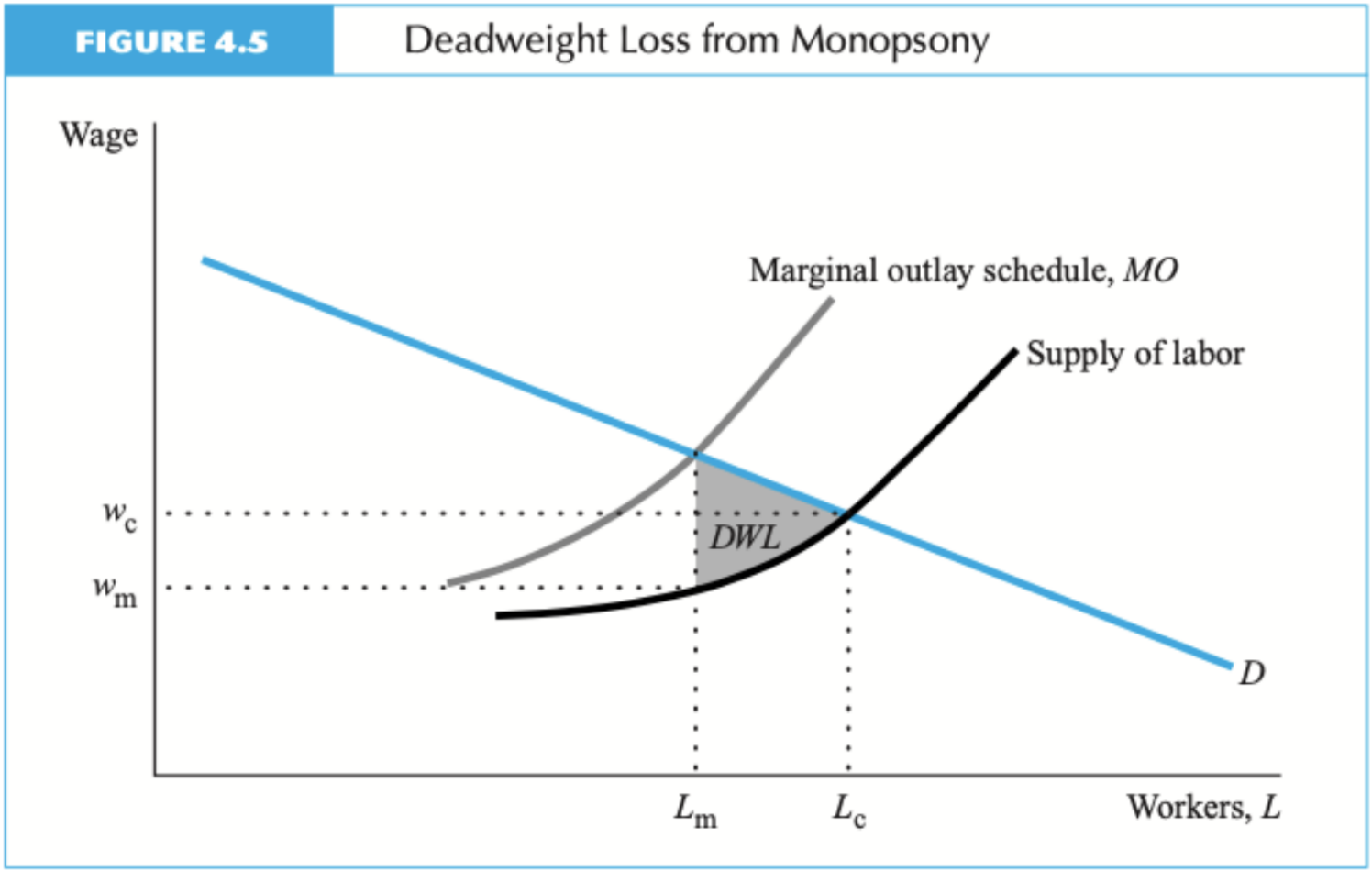


FIGURE 4.5
Deadweight Loss from Monopsony
Wage
Marginal outlay schedule, MO
Supply of labor
w_c
w_m
DWL
D
L_m
L_c
Workers, L

Monopsony[3]

- In Figure 4.5, there is a competitive labor market, each firm takes the wage rate as given, and the marginal cost of hiring one more worker is simply the wage rate:
  - now suppose there is only one local employer (buyer of labor services): a monopsony. It faces an upward-sloping supply curve for labor
  - in order to hire an extra worker, the monopsony must not only pay that worker a slightly higher wage rate but also pay all its other workers a slightly higher wage rate, because only by raising the wage can extra labor be induced into the marketplace
  - the monopsony hires an extra worker only if the marginal benefit as given by its labor demand curve exceeds its marginal cost of hiring an additional worker

Outline

Dominant Firm and Fringe Firm

- **Dominant firms**: a price setter, faces smaller, price-taking firms, and typically has a large market share
- **Fringe firms**: smaller, price-taking firms and each have a very small share of the market, though collectively they may have a substantial share of the market

Possible Reasons that Create a Dominant Firm-competitive Fringe Market Structure[1]

- Dominant firms may have lower costs than fringe firms
  - A firm may be more efficient than its rival. It may be better management or better technology that allows it to produce at lower costs
  - An early entrant to a market may have lower costs from having learned by experience how to produce more efficiently
  - An early entrant may have had time to grow large optimally so as to benefit from economies of scale. By spreading fixed costs over more units of output, it may have lower average costs of production than a new entrant could instantaneously achieve
  - The government may favor the original firm. For example, the U.S. Postal Service does not pay taxes or highway user fees, which reduces its cost relative to that of competing package delivery services

Possible Reasons that Create a Dominant Firm-competitive Fringe Market Structure[2]

- A dominant firm may have a superior product in a market where each firm produces a differentiated product
  - This superiority may be due to a reputation achieved through advertising or through goodwill generated by its having been in the market longer
- A group of firms may collectively act as a dominant firm
  - A groups of firms in a market may have an incentive to act collectively to promote its best interests: a cartel
  - If all the firms in a market coordinate their activities, then the cartel is effectively a monopoly
  - If only some of them do so, then the group acts as a dominant firm facing a competitive fringe of noncooperating firms

The No-Entry Model[1]

- Consider a market with a dominant firm and a competitive fringe in which no additional fringe firms can enter
- Two key results emerge from an analysis of this model:
  - It is more profitable to be the gorilla of a market than a mere fringe firm
  - The existence of the fringe limits the dominant firm's market power—that is, it is more profitable to be the only firm in a market (a monopoly) than merely a dominant firm

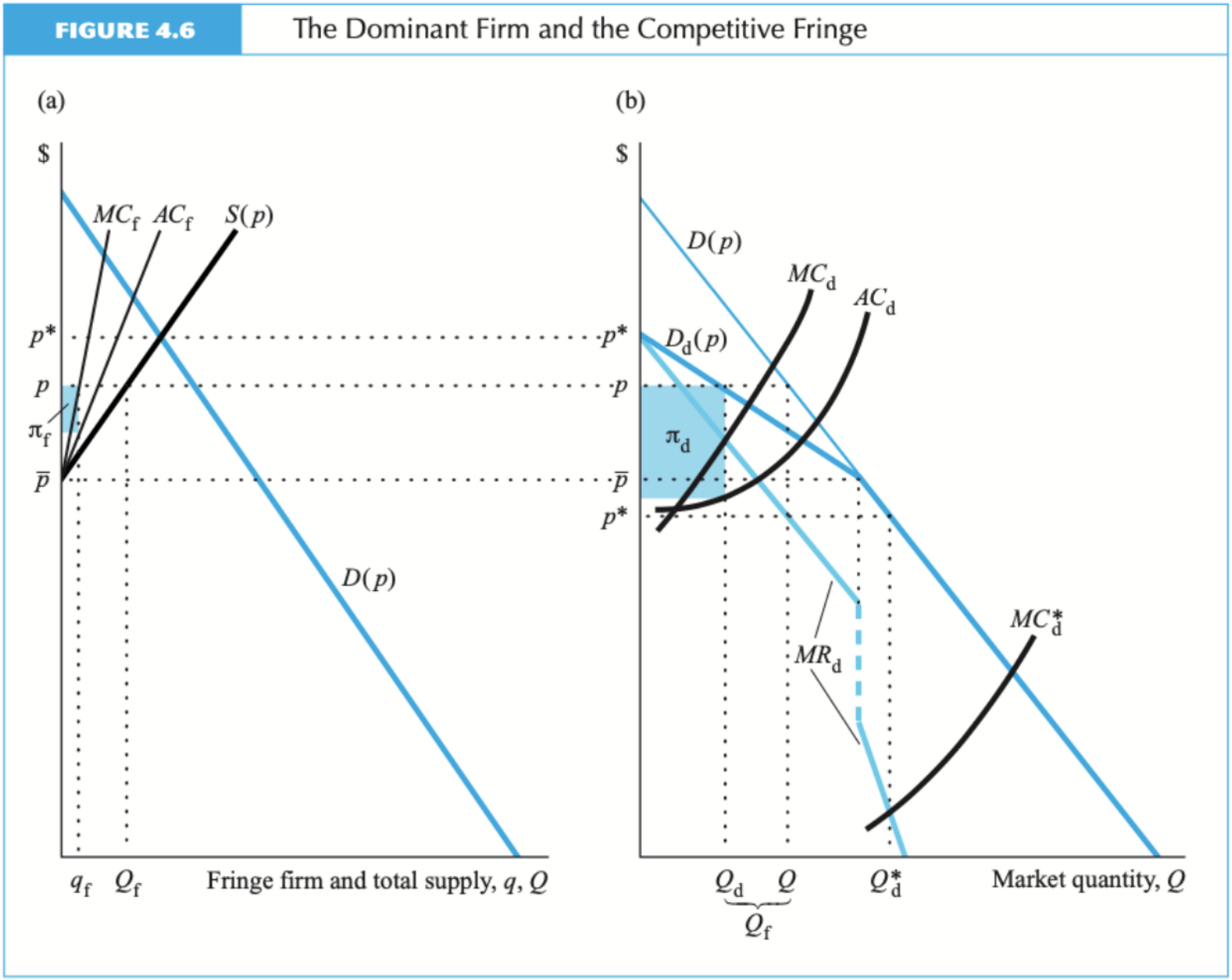
The No-Entry Model[2]

- Five crucial assumptions underlie this no-entry model:
  1. There is one firm that is much larger than any other firm because of its lower production costs
  2. All firms, except the dominant firm, are price takers, determining their output levels by setting marginal cost equal to the market price
  3. The number of firms (n) in the competitive fringe is fixed: No new entry can occur.
     - ⋆ that is, the dominant firm knows that it can raise the market's price without causing new firms to enter the market or existing firms to build additional plants
  4. The dominant firm knows the market's demand curve $D(p)$. Each firm produces a homogeneous product, so that there is a single price in this market
  5. The dominant firm can predict how much output the competitive fringe will produce at any given price; that is, it knows the competitive fringe's supply curve $S(p)$
- The first three assumptions determine that this market has a dominant firm facing a competitive fringe with no more than n firms
- The last two assumptions ensure that the dominant firm knows enough to be able to set its output level optimally

The Dominant Firm's Behavior[1]

- To maximize dominant firm's profits, the competitive fringe's actions must be taken into account
- The optimal output can be decided by a two-step procedure
  - First, determine the dominant firm's residual demand curve
  - Second, the dominant firm acts like a monopoly with respect to the residual demand

The Dominant Firm's Behavior[2]



The Dominant Firm's Behavior[3]

- Figure 4.6a:
  - The fringe firm's supply curve is its marginal cost curve above the minimum of its average cost curve p. That is, the fringe firm's shutdown price is p:
    - ⋆ above p, each fringe firm makes positive economic profits
    - ⋆ at p, each fringe firm makes zero profits and is indifferent between operating and shutting down
    - ⋆ below p, each firm shuts down, and the dominant firm is a monopoly
  - The competitive fringe's supply curve $S(p)$ is the horizontal summation of the individual fringe firm's supply curves $S(p) = nq_f(p)$, where n is number of firms and qf is output of a typical fringe firm
  - The dominant firm's residual demand curve is the horizontal difference between the market demand curve and the competitive fringe's supply curve: $D_d(p) = D(p) - S(p)$

The Dominant Firm's Behavior[4]

- Figure 4.6b:
  - The market demand curve $D(p)$ is above the residual demand curve $D_d(p)$ at prices above p and equal to it at prices below p
  - That is, the fringe firms meet some or all of the market demand if price is above p, but they drop out of the market and leave all of the demand to the dominant firm if price falls below p
  - At p^*, the quantity that the fringe supplies equals the quantity that the market demands, so the dominant firm has no residual demand
  - The dominant firm maximizes its profits by picking a price or equivalent an output level so that its marginal cost equals its marginal revenue
  - The dominant firm's marginal revenue curve MR_d is derived from its residual demand curve and has two distinct sections
    - ★ If the competitive fringe produces positive levels of output, the dominant firm's residual demand curve lies below (and is flatter than) the market demand curve
    - ★ The dominant firm's marginal revenue curve MR_d in this region is flatter than the marginal revenue curve in the region where the dominant firm's residual demand curve and the market demand curve are coincident
    - ★ There is a discrete jump between the two sections of the marginal revenue curve at the point where the residual demand curve and the market demand curve meet

The Dominant Firm's Behavior[5]

- The dominant firm behaves as a monopoly would with respect to the residual demand; it sets its price (or output) so that its marginal cost equals marginal revenue
- Because the marginal revenue curve has two sections, there are two possible types of equilibria:
  1. The dominant firm charges a high price, so that it makes economic profits and the fringe firms also make profits or break even
  2. The dominant firm sets a price so low that the fringe firms shut down to avoid making losses. The dominant firm is now a monopoly

The Dominant Firm–Competitive Fringe Equilibrium[1]

- Dominant firm charges a high price so that it makes economic profits and the fringe firms also make profits or break even
  - The first type of equilibrium occurs if the dominant firm's costs are not substantially less than those of the fringe firms.
  - In Figure 4.6b, the dominant firm's marginal cost curve MC_d crosses the first downward-sloping segment of the marginal revenue curve MR_d. The dominant firm chooses to produce Q_d level of output at price p. At the price level p, the difference between the market demand Q and dominant firm's output Q_d is the competitive fringe's supply Q_f
  - If the dominant firm's costs are this high, it does not drive the competitive fringe out of business. Its own profits are maximized at a price so high that the fringe firms make positive profits
  - That is, the dominant firm maximizes its profits by charging a price so high that it loses some of its market share to the competitive fringe
  - In most markets, positive economic profits would attract new entrants. In this market, no new firms can enter (by assumption), so both the dominant firm and the competitive fringe firms can make positive profits forever

The Dominant Firm–Competitive Fringe Equilibrium[2]

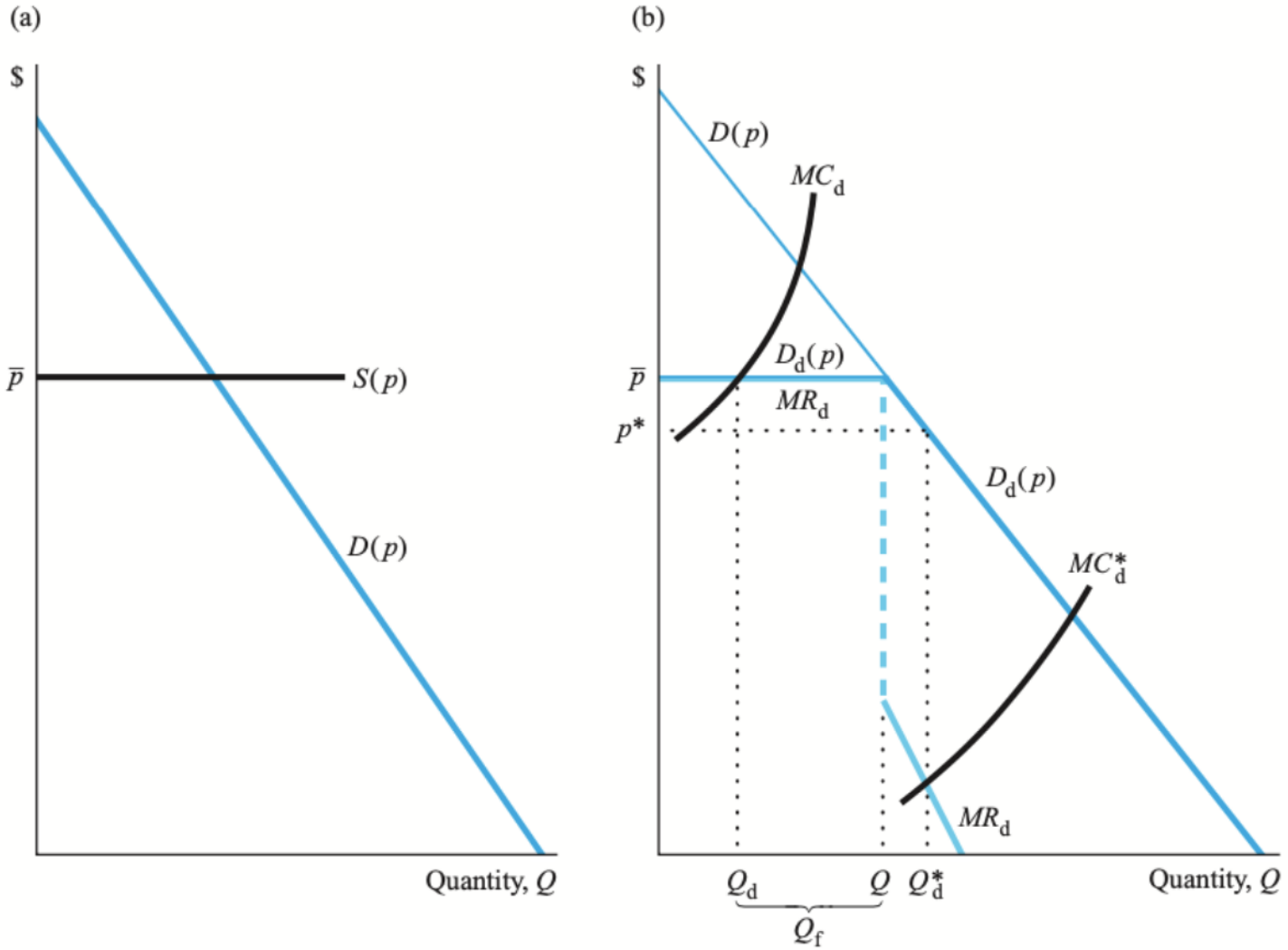
- Dominant Firm as Monopoly
  - Suppose that the dominant firm has extremely low costs compared to the fringe firms, so that its marginal cost curve is MC_d^* in Figure 4.6b
  - Notice that MC_d^* crosses MR_d in the lower part of its two downward-sloping sections. The dominant firm chooses to produce Q_d^* level of output at price p^*
  - Because p^* is below the fringe firms' shutdown point $\bar{p}$, the fringe firms produce nothing $Q_f^* = 0$
  - As a result, market output Q^* equals the dominant firm's output Q_d^*
  - The dominant firm sets a monopoly price, and no competitive-fringe firm enters. The dominant firm is thus a monopoly

A Model with Free, Instantaneous Entry[1]

- If unlimited entry is possible, a dominant firm cannot set as high a price as it can if entry is limited or prevented
- Firms enter if they can make positive profits
- Fringe firms cannot make profits in the long run; they either break even or are driven out of business
  - If identical fringe firms produce at all, the market price ultimately can go no higher than a fringe firm's minimum average cost, so that fringe firms always just break even. After all, if they made positive profits, more firms would flood into the market and drive price down to the level where each earns zero economic profits
- Because the dominant firm has lower costs than fringe firms, it makes positive profits, but its profits are lower than if entry did not occur

A Model with Free, Instantaneous Entry[2]

FIGURE 4.7 Dominant Firm with Free, Instantaneous Entry by Fringe Firms



A Model with Free, Instantaneous Entry[3]

- In Figure 4.7a:
  - the number of firms grows large, the fringe's supply curve becomes essentially horizontal. That is, as long as price is at least p, the competitive fringe is capable of and is willing to supply any quantity that the market demands

- In Figure 4.7b:
  - the residual demand curve $D_d(p)$ facing the dominant firm is horizontal at $\bar{p}$ so the corresponding marginal revenue curve is also flat
  - below $\bar{p}$, the residual demand curve $D_d(p)$ is the market demand that slopes downward, so that the corresponding marginal revenue curve also slopes downward
  - the marginal revenue curve corresponding to the residual demand curve jumps at the quantity where the kink in the residual demand curve occurs

A Model with Free, Instantaneous Entry[4]

- There are two possible equilibria:
  1. if the dominant firm's marginal cost is relatively high (MC_d in Figure 4.7b), it intersects the horizontal portion of the MR_d curve. The price is $\bar{p}$ and the competitive fringe meets some of the market's demand. At $\bar{p}$, each fringe firm makes zero economic profits and is indifferent between staying in business and leaving the market. Collectively, the fringe firms produce an output level $Q_f = Q - Q_d$. It is possible that $Q_f = 0$ even though the presence of the fringe constrains price to equal p
     - ⋆ If fringe firms flood into a market whenever positive profits can be made, the dominant firm cannot charge a price above the minimum average cost of a fringe firm. Although a dominant firm can make positive profits, competitive-fringe firms just break even
     - ⋆ If the dominant firm's price would be above $\bar{p}$ in the absence of entry, consumers are better off if entry is possible because it results in lower prices
  2. if the dominant firm's marginal cost is lower (MC_d^* in Figure 4.7b), it hits the marginal revenue curve in its downward sloping portion. No fringe firm stays in the market as the dominant firm's costs are lower than the fringe firms' costs. This equilibrium is (Q_d^* , p^*)
     - ⋆ The dominant firm is a monopoly, and the potential supply of fringe firms is irrelevant

For Further Reading I

- Carlton, Dennis W., and Jeffrey M. Perloff. Modern Industrial Organization. Fourth edition. Harlow, Essex, England: Pearson, 2015. Print.
- Belleflamme, Paul., and Martin. Peitz. Industrial Organization : Markets and Strategies. Cambridge, UK ;: Cambridge University Press, 2010. Print.