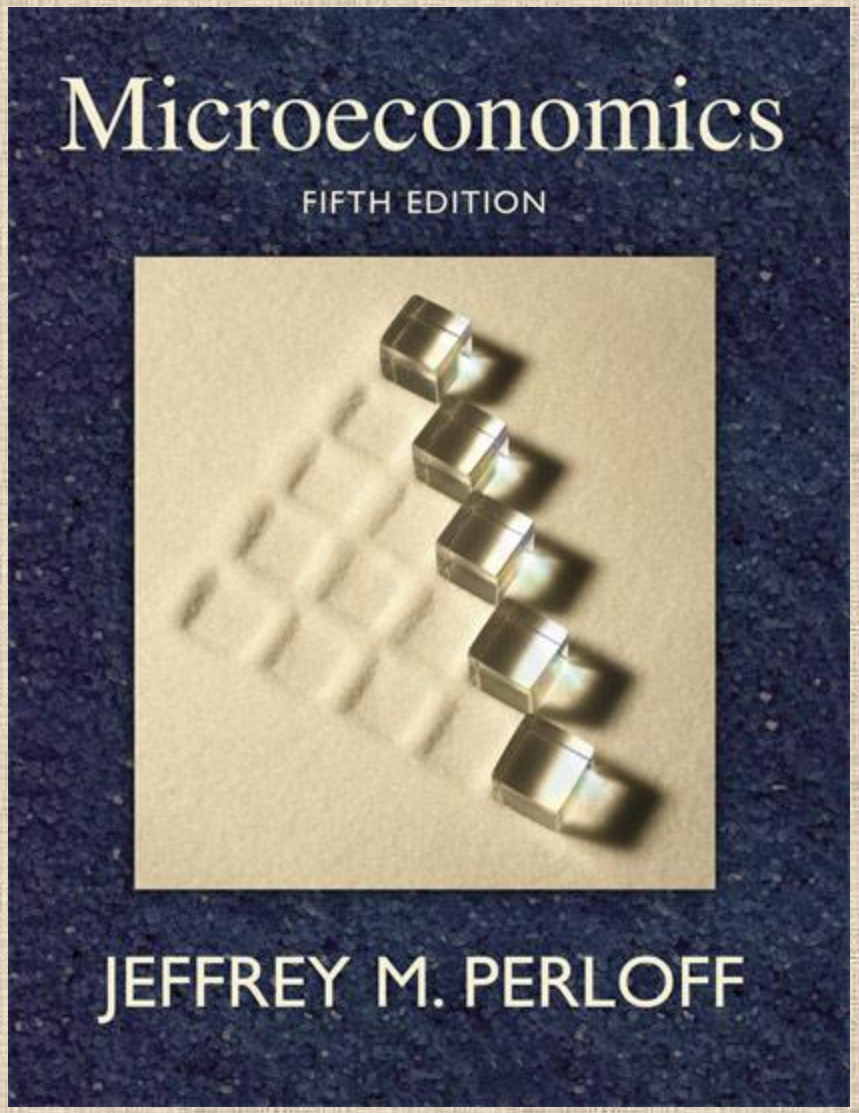


Chapter Nine

Applying the Competitive Model

Topics

- Consumer Welfare.
- Producer Welfare.
- Competition Maximizes Welfare.
- Policies That Shift Supply Curves.
- Policies That Create a Wedge Between Supply and Demand.
- Comparing Both Types of Policies: Imports.

Measuring Consumer Welfare Using a Demand Curve

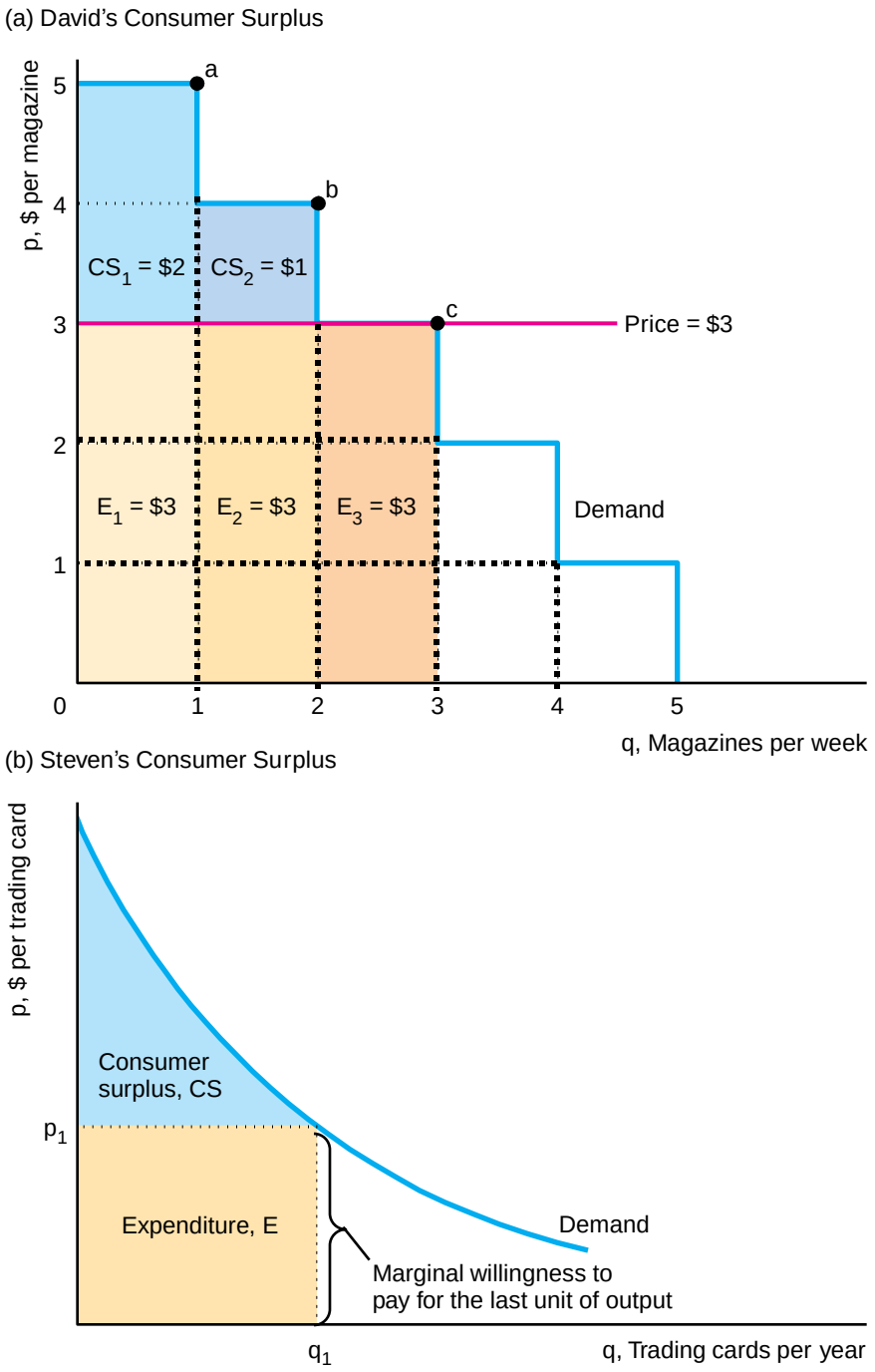
- *Consumer welfare from a good is the benefit a consumer gets from consuming that good minus what the consumer paid to buy the good*.

- The demand curve reflects a consumer's *marginal willingness to pay*.

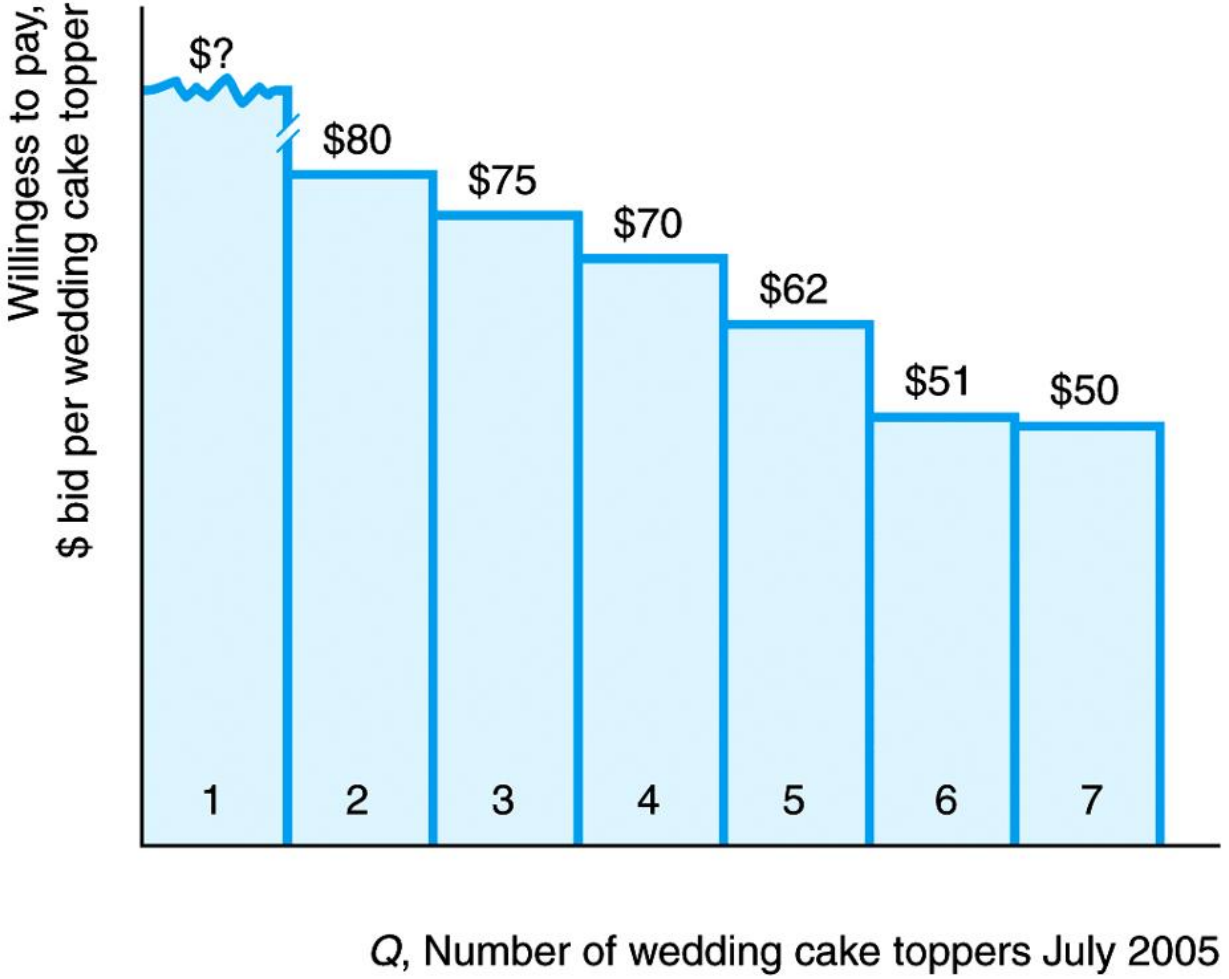
Measuring Consumer Welfare Using a Demand Curve

- The demand curve reflects a consumer's *marginal willingness to pay*.
  - the maximum amount a consumer will spend for an extra unit.
  - the *marginal value* the consumer places on the last unit of output.

Figure 9.1 Consumer Surplus



Application Willingness to Pay on eBay



Consumer Surplus.

- **consumer surplus (*CS*) -** the monetary difference between what a consumer is willing to pay for the quantity of the good purchased and what the good actually costs.
  - *an individual's consumer surplus is the area under the demand curve and above the market price up to the quantity the consumer buys*.

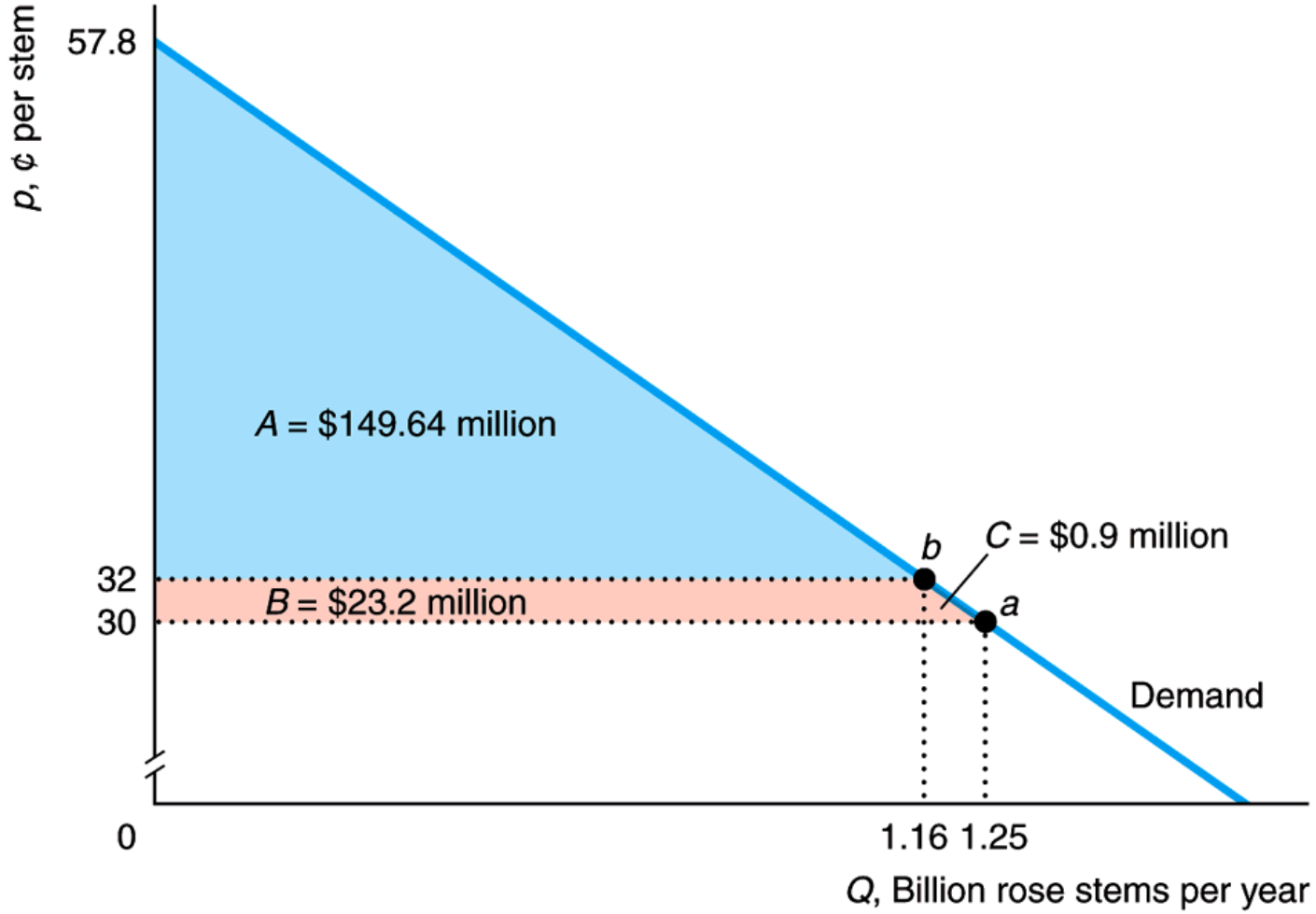
Consumer Surplus.

- **consumer surplus (*CS*) -** the monetary difference between what a consumer is willing to pay for the quantity of the good purchased and what the good actually costs.
  - *Market consumer surplus is the area under the market demand curve above the market price up to the quantity consumers buy*.

Effect of a Price Change on Consumer Surplus

- If the supply curve shifts upward or a government imposes a new sales tax, the equilibrium price rises, reducing consumer surplus.

Figure 9.2 Fall in Consumer Surplus from Roses as Price Rises



Markets in Which Consumer Surplus Losses Are Large.

- In general, as the price increases, consumer surplus falls more:
  1. the greater the initial revenues spent on the good and
  2. the less elastic the demand curve

Table 9.1 Effect of a 10% Increase in Price on Consumer Surplus (Revenue and Consumer Surplus in Billions of 2007 Dollars)

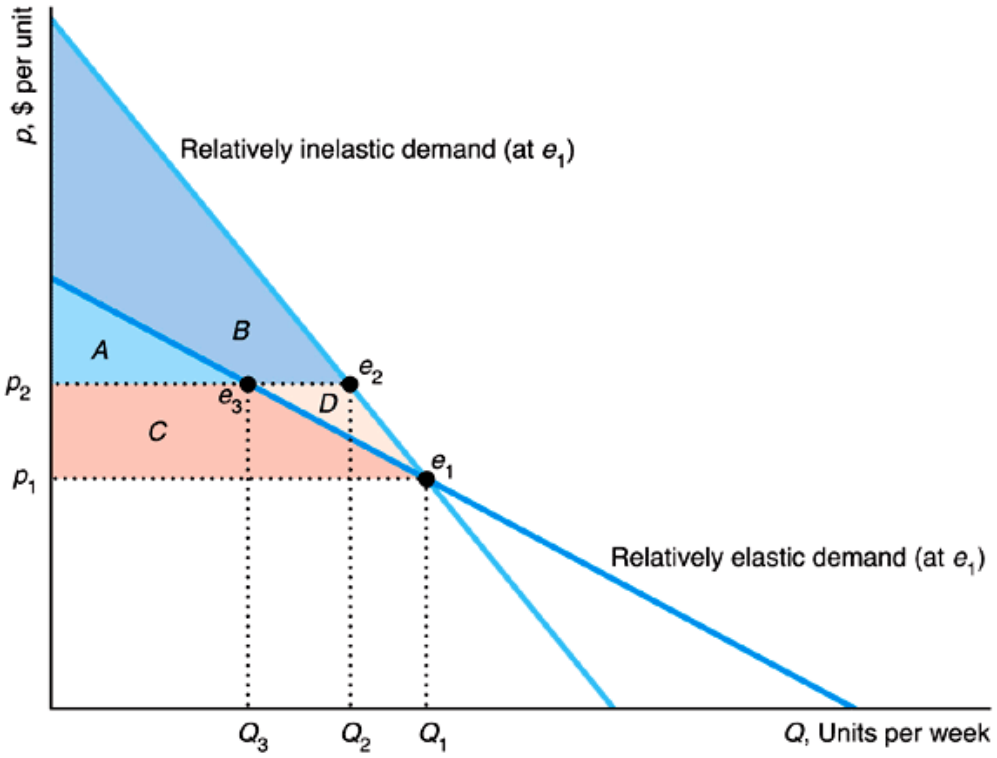
	Revenue	Elasticity of Demand, ε	Change in Consumer Surplus, ΔCS
Medical	1,545	–0.604	–150
Housing	1,375	–0.633	–133
Food	670	–0.245	–67
Clothing	363	–0.405	–36
Transportation	335	–0.461	–32
Utilities	198	–0.448	–19
Alcohol and tobacco	195	–0.162	–19

Sources: Revenues are from National Income and Product Accounts (NIPA), **www.econstats.com**; elasticities are based on Blanciforti (1982). Appendix 9A shows how the change figures were calculated.

Solved Problem 9.1

- Suppose that two linear demand curves go through the initial equilibrium, e_1. One demand curve is less elastic than the other at e_1. For which demand curve will a price increase cause the larger consumer surplus loss?

Solved Problem 9.1



	Relatively Elastic Demand Curve	Relatively Inelastic Demand Curve
Consumer Surplus at p_1	$A + C$	$A + B + C + D$
Consumer Surplus at p_2	A	$A + B$
Consumer Surplus Loss	$-C$	$-C - D$

Producer Welfare

- **producer surplus (*PS*) -** the difference between the amount for which a good sells and the minimum amount necessary for the seller to be willing to produce the good

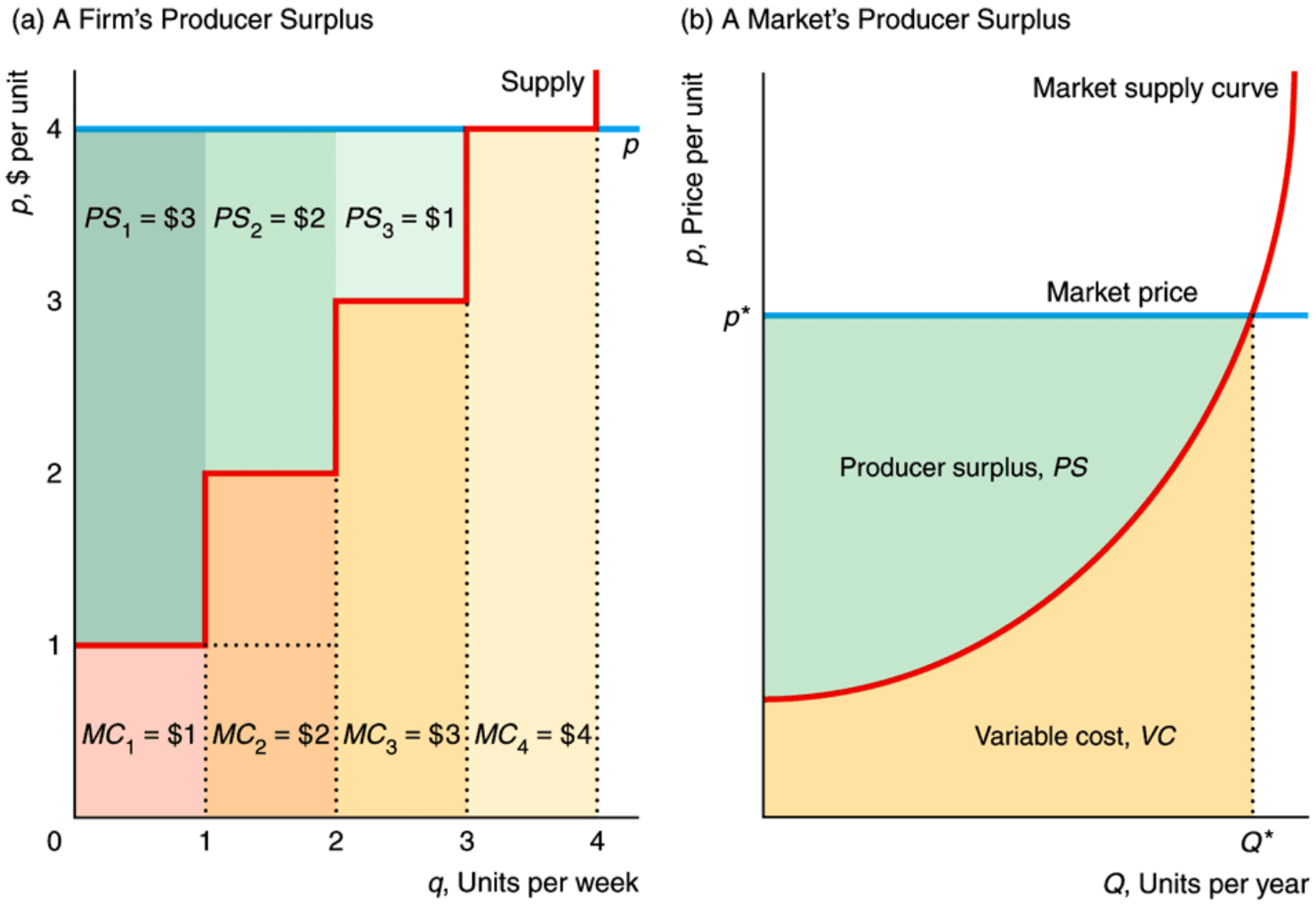
Measuring Producer Surplus Using a Supply Curve

- The total producer surplus is the area above the supply curve and below the market price up to the quantity actually produced.

$$PS = R - VC.$$

  - Thus, the difference between producer surplus and profit is fixed cost, F.

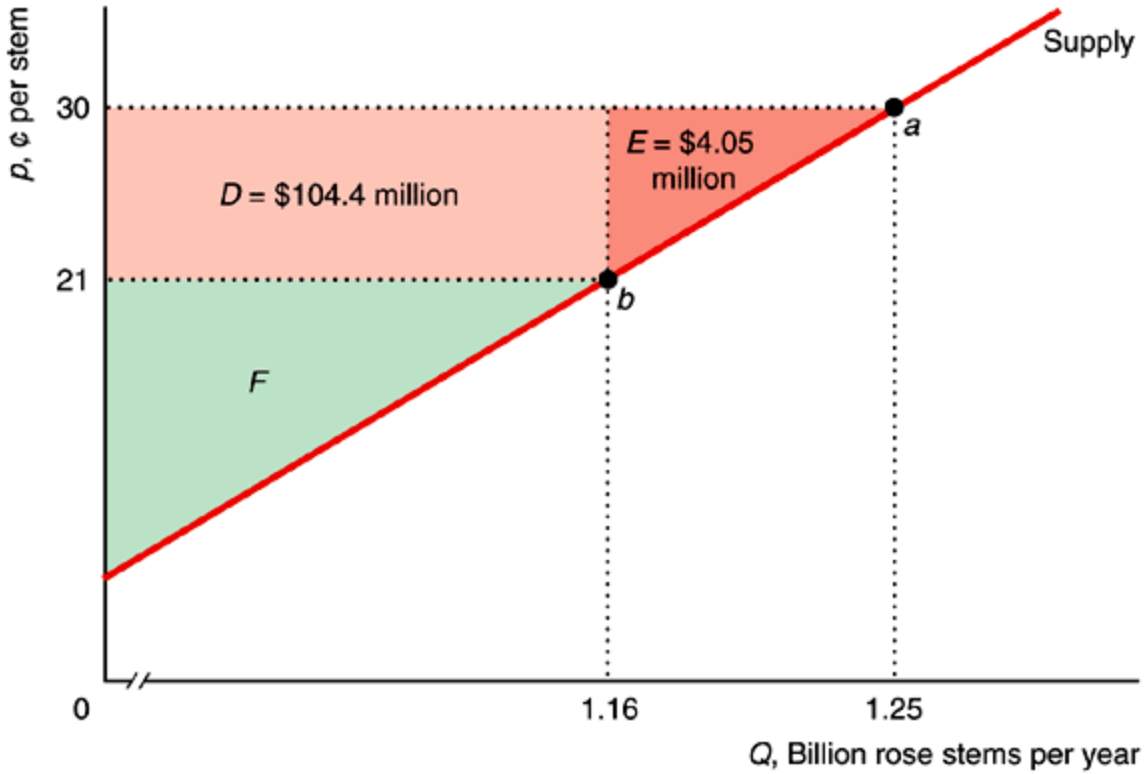
Figure 9.3 Producer Surplus



Solved Problem 9.2

- If the estimated supply curve for roses is linear, how much producer surplus is lost when the price of roses falls from 30¢ to 21¢ per stem (so that the quantity sold falls from 1.25 billion to 1.16 billion rose stems per year)?

Solved Problem 9.2



	Original Price, 30¢	Lower Price, 21¢	Change ($ millions)
Producer Surplus	$D + E + F$	F	$-(D + E) = -108.45$

Competition Maximizes Welfare

- One commonly used measure of the welfare of society, W, is the sum of consumer surplus plus producer surplus:

$$W = CS + PS.$$

Deadweight Loss (*DWL*)

- **deadweight loss (*DWL*) -** the net reduction in welfare from a loss of surplus by one group that is not offset by a gain to another group from an action that alters a market equilibrium.
  - *The deadweight loss results because consumers value extra output by more than the marginal cost of producing it*.

Figure 9.4 Why Reducing Output from the Competitive Level Lowers Welfare

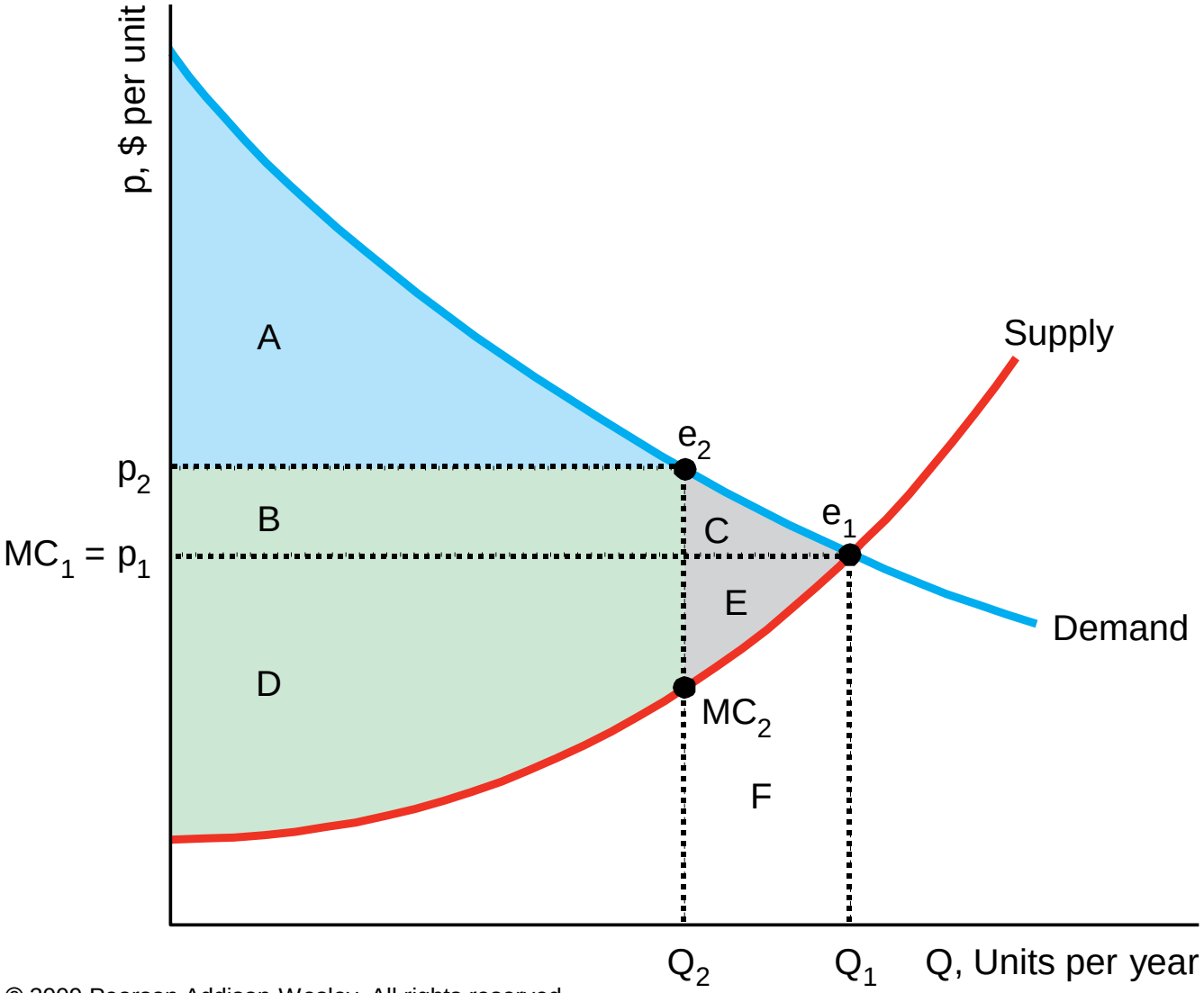


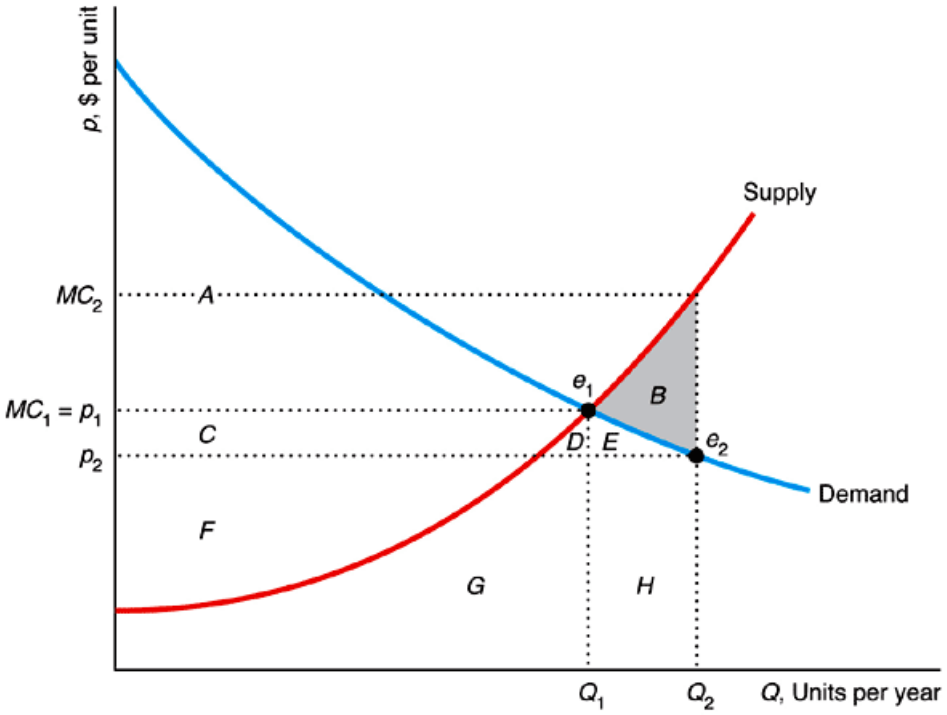
Figure 9.4 Why Reducing Output from the Competitive Level Lowers Welfare

	Competitive Output, Q_1 (1)	Smaller Output, Q_2 (2)	Change (2) – (1)
Consumer Surplus, *CS*	$A + B + C$	A	$-B - C = \Delta CS$
Producer Surplus, *PS*	$D + E$	$B + D$	$B - E = \Delta PS$
Welfare, $W = CS + PS$	$A + B + C + D + E$	$A + B + D$	$-C - E = \Delta W = DWL$

Why Producing More than the Competitive Output Lowers Welfare

- Increasing output beyond the competitive level also decreases welfare because the cost of producing this extra output exceeds the value consumers place on it.

Figure 9.5 Why Increasing Output from the Competitive Level Lowers Welfare



	Competitive Output, Q_1	Larger Output, Q_2	Change
Consumer Surplus, CS	A	$A + C + D + E$	$C + D + E = \Delta CS$
Producer Surplus, PS	$C + F$	$F - B - D - E$	$-B - C - D - E = \Delta PS$
Welfare, $W = CS + PS$	$A + C + F$	$A + C + F - B$	$-B = \Delta W = DWL$

Why Producing More than the Competitive Output Lowers Welfare (cont).

- *The reason that competition maximizes welfare is that price equals marginal cost at the competitive equilibrium*.

- **market failure -** inefficient production or consumption, often because a price exceeds marginal cost

Policies That Shift Supply Curves

- Welfare tools are helpful in predicting the impact of government policies and other events that alter a competitive equilibrium.

Policies That Shift Supply Curves (cont).

- All government actions affect a competitive equilibrium in one of two ways.
  1. by shifting the supply or demand curve.
  2. by creating create a wedge between price and marginal cost so that they are not equal, as they were in the original competitive equilibrium.

Policies That Shift Supply Curves (cont).

- The two most common types of government policies that shift the supply curve are:
  - limits on the number of firms in a market and
  - quotas or other limits on the amount of output that firms may produce.

Policies That Shift Supply Curves (cont).

- Governments, other organizations, and social pressures limit the number of firms in at least three ways:
  - explicitly in some markets, such as the one for taxi service.
  - barring some members of society from owning firms or performing certain jobs or services.
  - by raising the cost of entry.

Restricting the Number of Firms

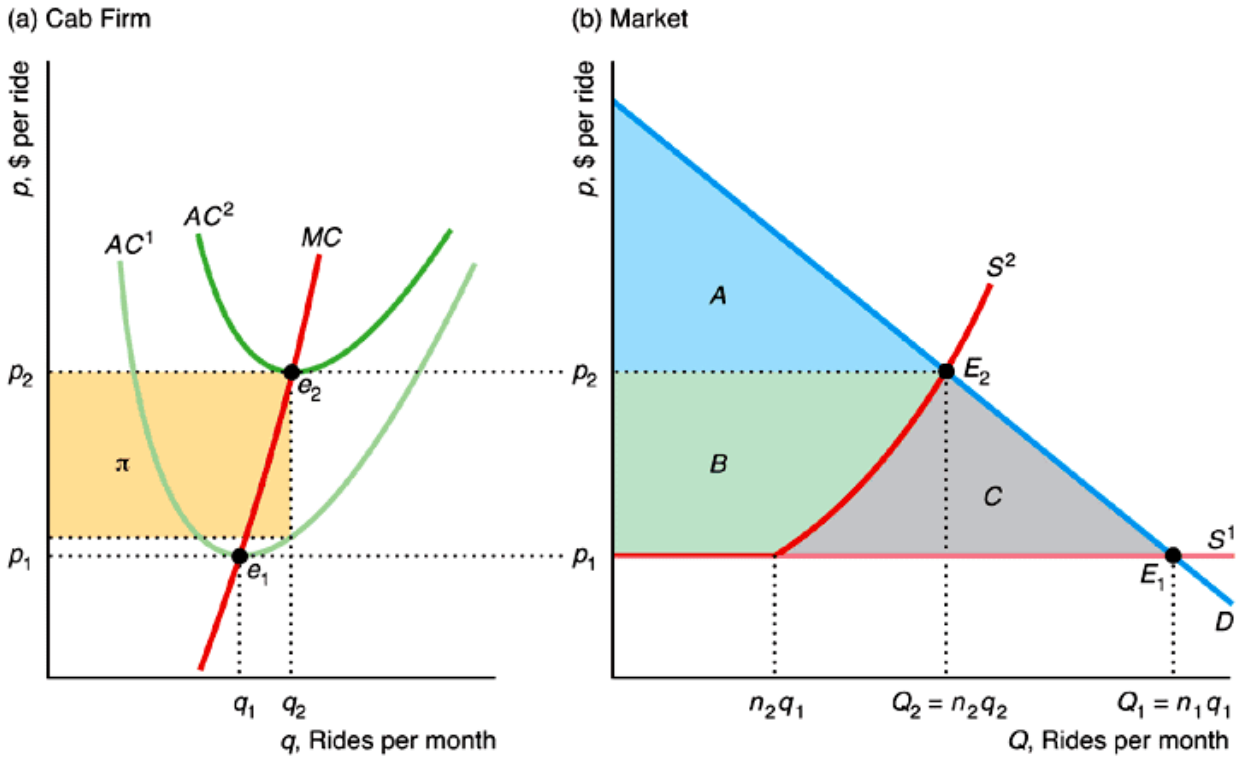
- A limit on the number of firms causes a shift of the supply curve to the left, which raises the equilibrium price and reduces the equilibrium quantity.
  - Consumers are harmed since they don't buy as much as they would at lower prices.
  - Firms that are in the market when the limits are first imposed benefit from higher profits.

Restricting the Number of Firms: Example

- Regulation of taxicabs.
  - Countries throughout the world regulate taxicabs.

    To operate a cab in these cities legally, you must possess a city-issued permit, which may be a piece of paper or a medallion.

Figure 9.6 Effect of a Restriction on the Number of Cabs



	No Restrictions	Restrictions	Change
Consumer Surplus, *CS*	$A + B + C$	B	$-B - C = \Delta CS$
Producer Surplus, *PS*	0	A	$B = \Delta PS$
Welfare, $W = CS + PS$	$A + B + C$	$A + B$	$-C = \Delta W = DWL$

Raising Entry and Exit Costs

- **Barrier to entry -** an explicit restriction or a cost that applies only to potential new firms—existing firms are not subject to the restriction or do not bear the cost

  - Costs incurred by both incumbents and entrants do not discourage potential firms from entering a market if existing firms are making money.

Raising Entry and Exit Costs (cont).

- Large sunk costs can be barriers to entry under two conditions:
  - First, if capital markets do not work well, so new firms have difficulty raising money, new firms may be unable to enter profitable markets.
  - Second, if a firm must incur a large *sunk* cost, which makes the loss if it exits great, the firm may be reluctant to enter a market in which it is uncertain of success.

Raising Entry and Exit Costs (cont).

- Exit barriers:
  - Some markets have barriers that make it difficult (though typically not impossible) for a firm to exit by going out of business.

Welfare Effects of a Sales Tax

- A new sales tax:
  - causes the price consumers pay to rise
    resulting in a loss of consumer surplus
  - a fall in the price firms receive
    resulting in a drop in producer surplus

- However, the new tax provides the government with new tax revenue

Welfare Effects of a Sales Tax (cont).

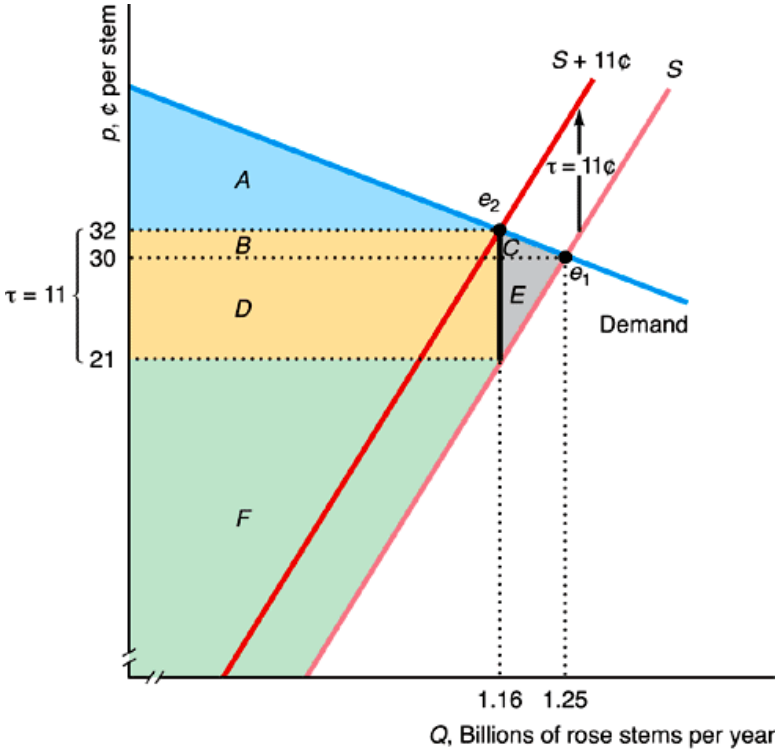
- Assuming that the government does something useful with the tax revenue, we should include tax revenue in our definition of welfare:

$$W = CS + PS + T.$$

- As a result, the change in welfare is

$$\Delta W = \Delta CS + \Delta PS + \Delta T.$$

Figure 9.7 Welfare Effects of a Specific Tax on Roses

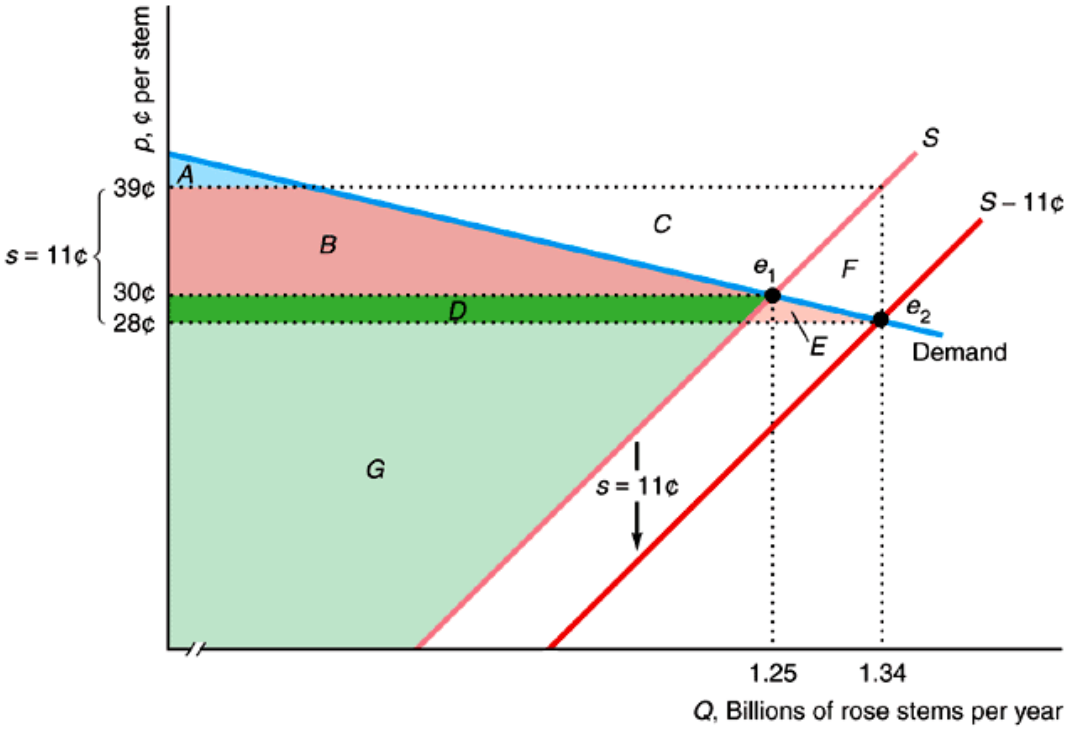


	No Tax	Specific Tax	Change ($ millions)
Consumer Surplus, *CS*	$A + B + C$	A	$-B - C = -24.1 = \Delta CS$
Producer Surplus, *PS*	$D + E + F$	F	$-D - E = -108.45 = \Delta PS$
Tax Revenue, $T = \tau Q$	0	$B + D$	$B + D = 127.6 = \Delta T$
Welfare, $W = CS + PS + T$	$A + B + C + D + E + F$	$A + B + D + F$	$-C - E = -4.95 = DWL$

Solved Problem 9.3

- Suppose that the government gives rose producers a specific subsidy of $s = 11¢$ per stem. What is the effect of the subsidy on the equilibrium prices and quantity, consumer surplus, producer surplus, government expenditures, welfare, and deadweight loss? (*Hint*: A subsidy is a negative tax, so we can use the same approach as with a tax.)

Solved Problem 9.3



	No Subsidy	Subsidy	Change ($ millions)
Consumer Surplus, *CS*	$A + B$	$A + B + D + E$	$D + E = 116.55 = \Delta CS$
Producer Surplus, *PS*	$D + G$	$B + C + D + G$	$B + C = 25.9 = \Delta PS$
Government Expenses, *X*	0	$-B - C - D - E - F$	$-B - C - D - E - F = -147.4 = \Delta X$
Welfare, $W = CS + PS - X$	$A + B + D + G$	$A + B + D + G - F$	$-F = -4.95 = DWL$

Welfare Effects of a Price Ceiling

- *price ceiling* - the highest price that a firm can legally charge.

Welfare Effects of a Price Ceiling (cont).

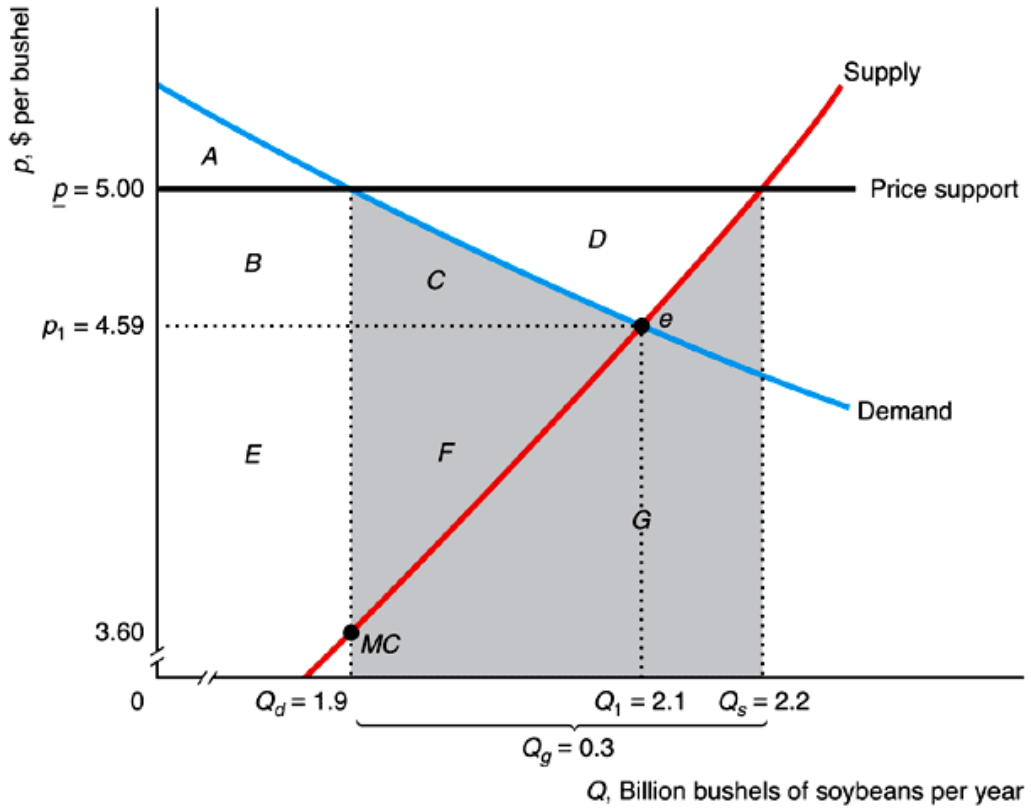
- If the government sets the ceiling below the precontrol competitive price,
  - consumers demand more than the precontrol equilibrium quantity and
  - firms supply less than that quantity

    Producer surplus must fall because firms receive a lower price and sell fewer units.

Solved Problem 9.4

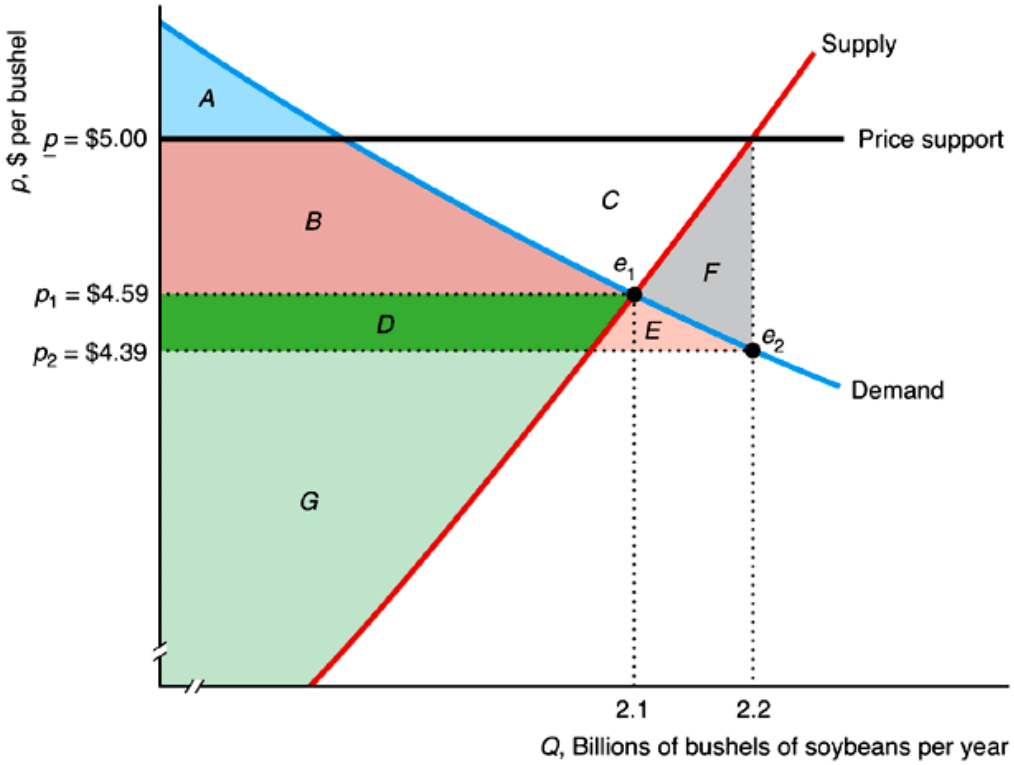
- What are the effects in the soybean market of a $5-per-bushel price support using a deficiency payment on the equilibrium price and quantity, consumer surplus, producer surplus, and deadweight loss?

Figure 9.8 Effect of Price Supports in Soybeans



	No Price Support	Price Support	Change ($ millions)
Consumer Surplus, *CS*	$A + B + C$	A	$-B - C = -864 = \Delta CS$
Producer Surplus, *PS*	$E + F$	$B + C + D + E + F$	$B + C + D = 921 = \Delta PS$
Government Expense, $-X$	0	$-C - D - F - G$	$-C - D - F - G = -1{,}283 = \Delta X$
Welfare, $W = CS + PS - X$	$A + B + C + E + F$	$A + B + E - G$	$-C - F - G = -1{,}226 = \Delta W = DWL$

Solved Problem 9.4

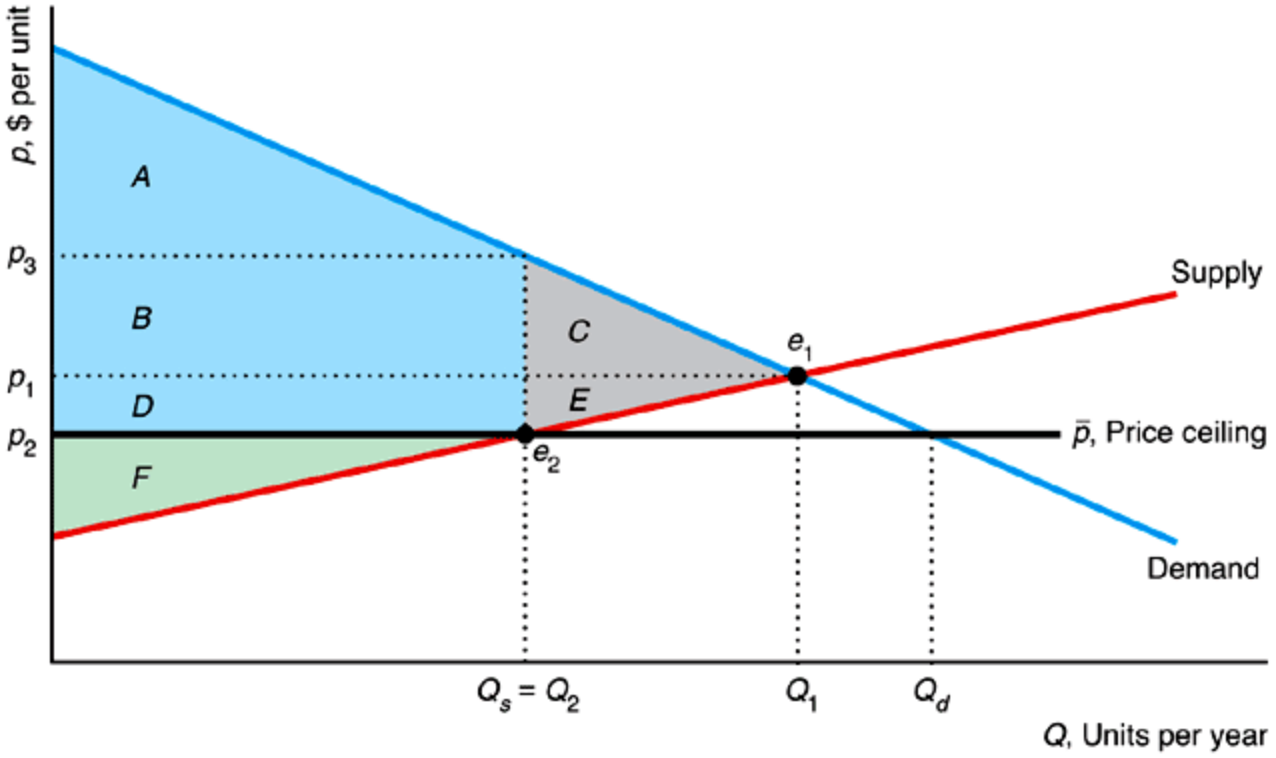


	No Price Support	Price Support	Change
Consumer Surplus, *CS*	$A + B$	$A + B + D + E$	$D + E = \Delta CS$
Producer Surplus, *PS*	$D + G$	$B + C + D + G$	$B + C = \Delta PS$
Government Expense, $-X$	0	$-B - C - D - E - F$	$-B - C - D - E - F = \Delta X$
Welfare, $W = CS + PS - X$	$A + B + D + G$	$A + B + D + G - F$	$-F = \Delta W = DWL$

Solved Problem 9.5

- What is the effect on the equilibrium and welfare if the government sets a price ceiling, p below the unregulated competitive equilibrium price?

Solved Problem 9.5



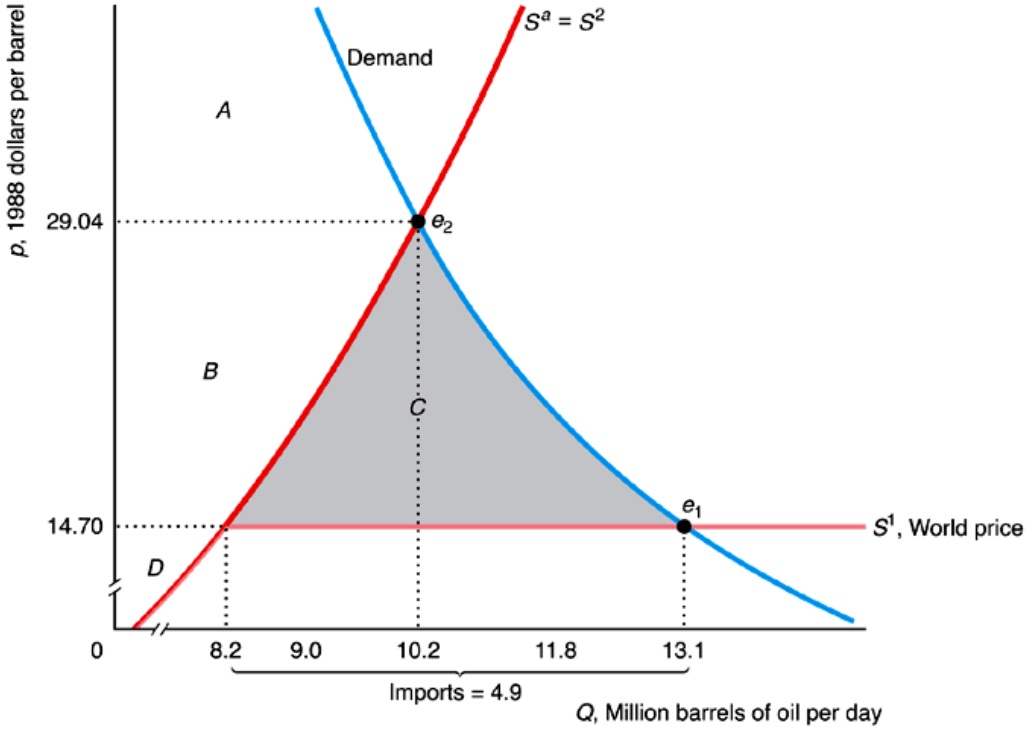
	No Ceiling	Price Ceiling	Change
Consumer Surplus, CS	$A + B + C$	$A + B + D$	$D - C = \Delta CS$
Producer Surplus, PS	$D + E + F$	F	$-D - E = \Delta PS$
Welfare, $W = CS + PS$	$A + B + C + D + E + F$	$A + B + D + F$	$-C - E = \Delta W = DWL$

Comparing Both Types of Policies: Imports

- The government of the (potentially) importing country can use one of four import policies:
  - **Allow free trade.**
  - **Ban all imports.**
  - **Set a positive quota.**
  - **Set a tariff.**

    a tax on only imported goods

Figure 9.9 Loss from Eliminating Free Trade



U.S.	Free Trade	U.S. Import Ban	Change ($ millions)
Consumer Surplus, *CS*	$A + B + C$	A	$-B - C = -163.7 = \Delta CS$
Producer Surplus, *PS*	D	$B + D$	$B = 132.5 = \Delta PS$
Welfare, $W = CS + PS$	$A + B + C + D$	$A + B + D$	$-C = -31.2 = \Delta W = DWL$

Free Trade Versus a Tariff

- There are two common types of tariffs:
  - *specific tariffs* — τ dollars per unit and
  - *ad valorem tariffs* — α percent of the sales price.

- Tariffs are just taxes.
  - If the only goods sold were imported, the effect of a tariff in the importing country is the same as we showed for a sales tax.

Figure 9.10 Effect of a Tariff (or Quota)

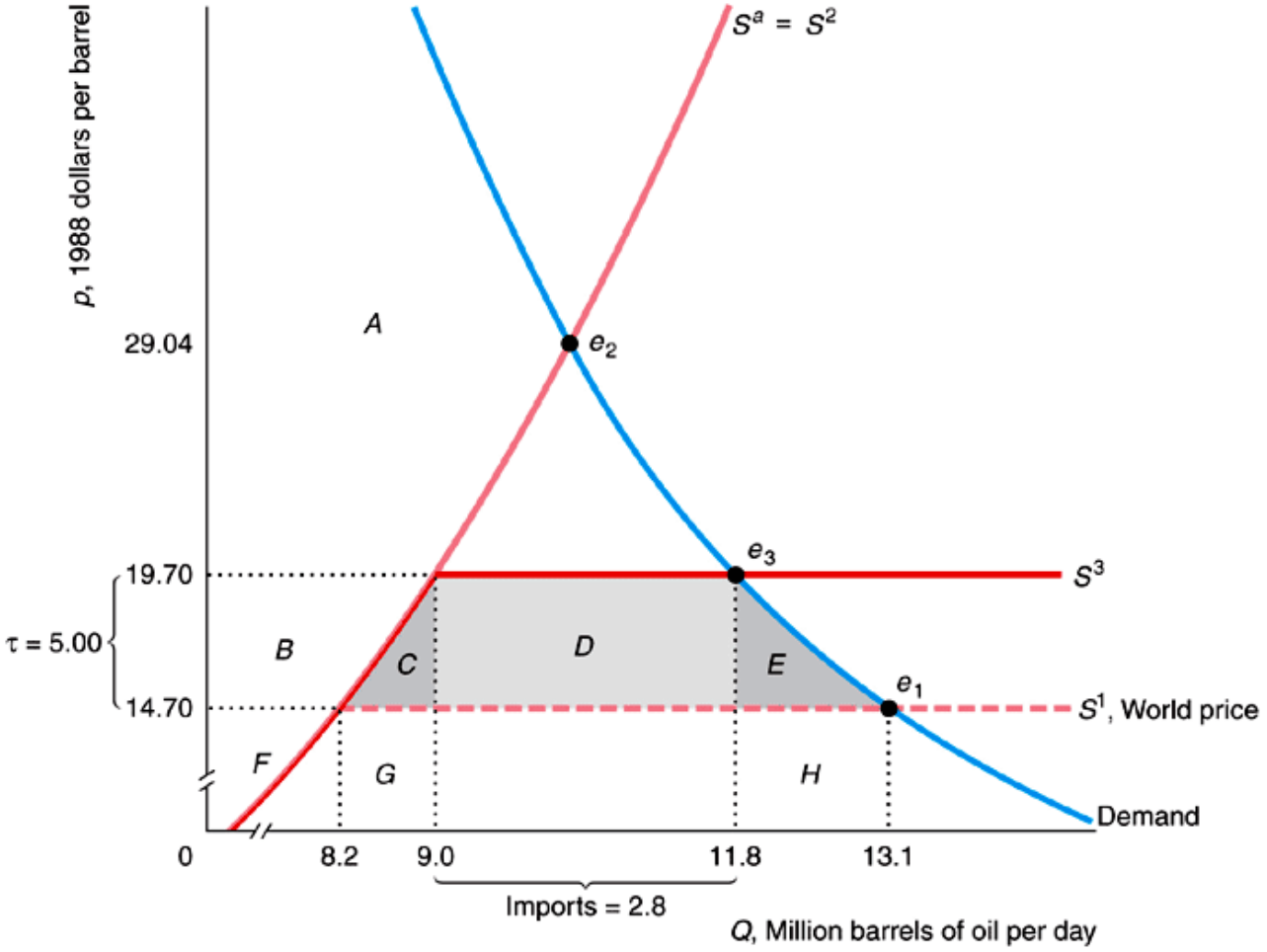


Figure 9.10 Effect of a Tariff (or Quota)

U.S.	Free Trade	U.S. Tariff or Quota	Change ($ millions)
Consumer Surplus, CS	$A + B + C + D + E$	A	$-B - C - D - E = -61.9$
Producer Surplus, PS	F	$B + F$	$B = 42.8$
Tariff Revenues, T	0	D (tariff)	$D = 14.0$ (tariff)
		0 (quota)	0 (quota)
Welfare from a Tariff, $W = CS + PS + T$	$A + B + C + D + E + F$	$A + B + D + F$	$-C - E = -5.1 = DWL$
Welfare from a Quota, $W = CS + PS$	$A + B + C + D + E + F$	$A + B + F$	$-C - D - E = -19.1 = DWL$

Free Trade Versus a Tariff

- The tariff *protects* American producers from foreign competition.
  - The larger the tariff, the less is imported, hence the higher the price that domestic firms can charge.

Rent Seeking

- Given that tariffs and quotas hurt the importing country, why do the Japanese, U.S., and other governments impose tariffs, quotas, or other trade barriers?
  - domestic producers stand to make large gains from such government actions.

Rent Seeking (cont).

- **rent seeking -** efforts and expenditures to gain a rent or a profit from government actions

Table 9.2 Welfare Cost of Trade Barriers (millions of 2007 dollars)

Industry	*DWL*	Δ*PS*	Government Revenues	Δ*CS*
Meat products	–33	2,777	80	–2,891
Dairy products[a]	–18,116	33,080	1,241	–48,514
Sugar confectionery[a]	–1,131	5,188	330	–6,646
Grain mill products	–12	1,350	12	–1,260
Fats and oils	–157	2,800	5	–2,964
Beverages	–11	1,295	173	–1,478
Tobacco	–242	4,521	112	–4,874
All food and tobacco	**–15,961**	**57,750**	**2,342**	**–76,050**

[a] Import quotas are the primary instrument of protection.

Notes: As estimated, $\Delta CS = DWL - \Delta PS$ – government revenue. Dollar amounts were adjusted using the Consumer Price Index.

Source: Lopez and Pagoulatos (1994).