

# Lecture 3: Theoretical tools of Public Economics (Part II)

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# Equilibrium and Social Welfare

- **Welfare economics:** The study of the determinants of well-being, or welfare, in society.
- Welfare economics is used in normative analysis.
- We discuss the determination of welfare in two steps:
  - First, we discuss **the determinants of social efficiency**, or the size of the economic pie.
  - Second, we consider how to integrate **redistribution** into this analysis so that we can measure the total well-being of society, or *social welfare*.

Demand

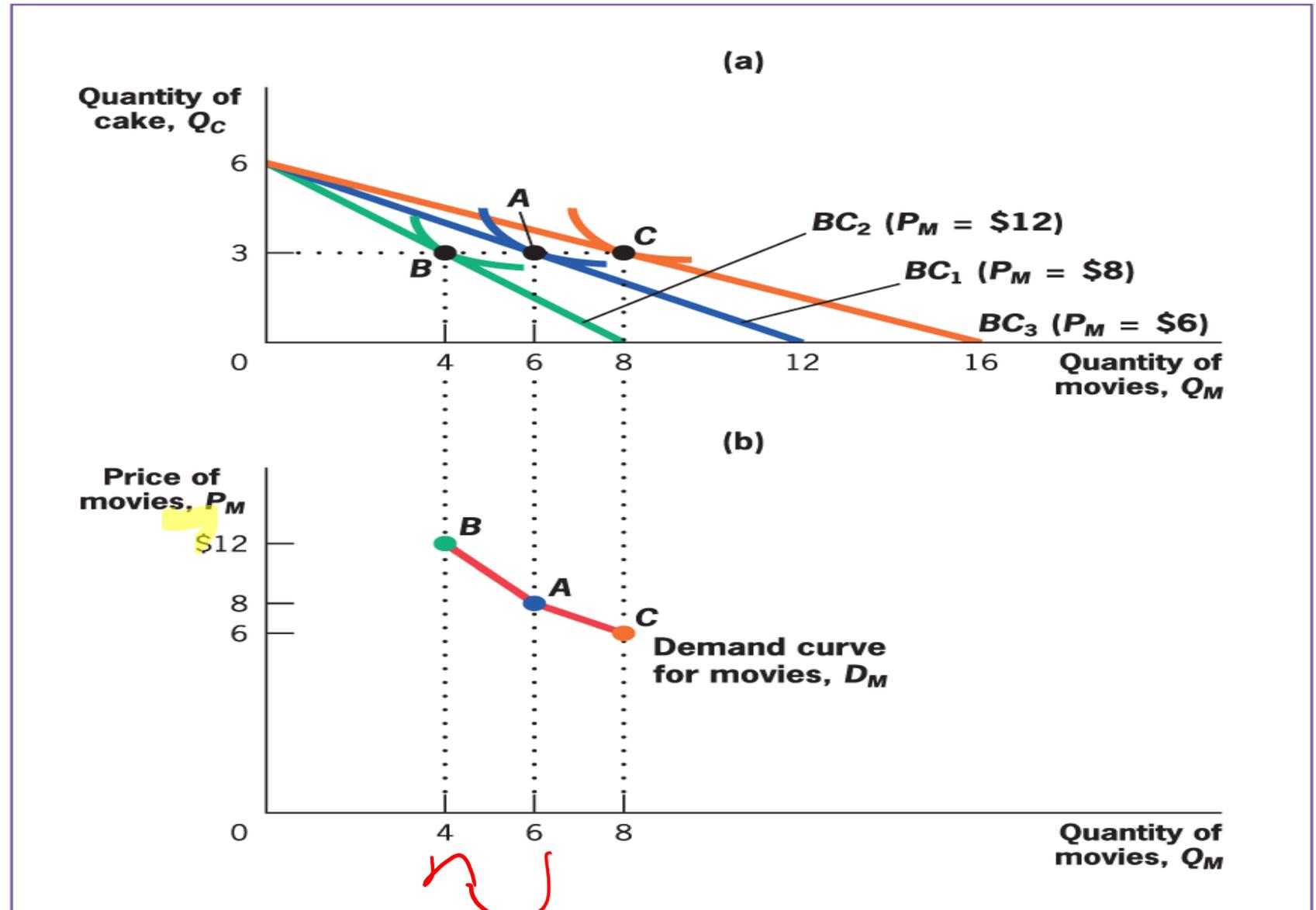
# Demand curves

- How much of a good do people want to buy at the market price?
- **Demand curve:** A curve showing the quantity of a good demanded by individuals at each price.
- Obtained by finding the utility-maximizing bundle at each price.

Constrained optimization  
as the price  
of movies increases



Demand curve is  
mapping prices and quantities  
from consumer's  
maximization problem



# Elasticity of Demand

- **Elasticity of demand:** The percentage change in the quantity demanded of a good caused by each 1% change in the price of that good.
- Mathematically:

$$\varepsilon = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}} = \frac{\Delta Q / Q}{\Delta P / P}$$

# Question

The elasticity of demand when price rises from 8 to 12 is equal to:

1. -1.5015

2. 1

3. -0.666

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# Properties of elasticity of demand

- Elasticities of demand are often negative: quantity demanded falls as price rises.
- Elasticities of demand are typically not constant along a demand curve.
- Typically, a change in the price of one good will affect demand for other goods as well.
- The effect of one good's prices on the demand for another good is the *cross-price elasticity*.

# Properties of elasticity of demand (cont'ed)

- Perfectly inelastic and perfectly elastic demand:
- When the elasticity of demand is zero, the demand curve is *perfectly inelastic*, in which case
  - the demand curve is vertical, and **quantity demanded does not change when price rises**.
- When the elasticity of demand is infinite, the demand curve is *perfectly elastic*, in which case
  - the demand curve is horizontal, and **quantity demanded changes infinitely** for even a very small change in price.

Supply

# Supply side: Production

- Producers (firms) use technology to transform inputs into outputs.
- Inputs: Labour and capital
- Output: Consumption goods
- How they choose inputs? **Profit maximization**

# Profit Maximization

- Profits are given by  $\omega = pQ - c(Q)$  so:

$$\max_Q \omega = pQ - c(Q)$$

where  $c(Q)$  denotes the cost of producing quantity  $Q$ .

$c(Q)$  is an increasing function of  $Q$ .

# Solution of profit maximization

$$\frac{\partial \omega}{\partial Q} = 0$$

$$p = c'(Q)$$

where  $c'(Q)$  is marginal cost.

Price equal to the marginal cost of production.

This problem defines **the supply curve**.

How do firms decide how much to produce?

- **Marginal productivity:** The impact of a unit change in any input, holding other inputs constant, on the firm's output.
- **Marginal cost:** The incremental cost to a firm of producing one more unit of a good.
- Firms choose quantities to maximize **profits**, the difference between revenues and costs.
- Profit is maximized when market price equals marginal cost.

# Supply Curves

- How much do firms want to sell or produce at each price?
- **Supply curve:** A curve showing the quantity of a good that firms are willing to produce (supply) at each price.
- Supply curves are the outcome of profit maximization by firms.
- Firms produce output using a production, such as  $q = \sqrt{K \times L}$ .

# Supply curve

- Supply curve is the quantity that firms in aggregate are willing to supply at each price.
- Typically, upward sloping due to decreasing returns to scale.

# Elasticity of supply

**Elasticity of supply:** The percentage change in the quantity supplied of a good caused by each 1% change in the price of that good.

Mathematically:

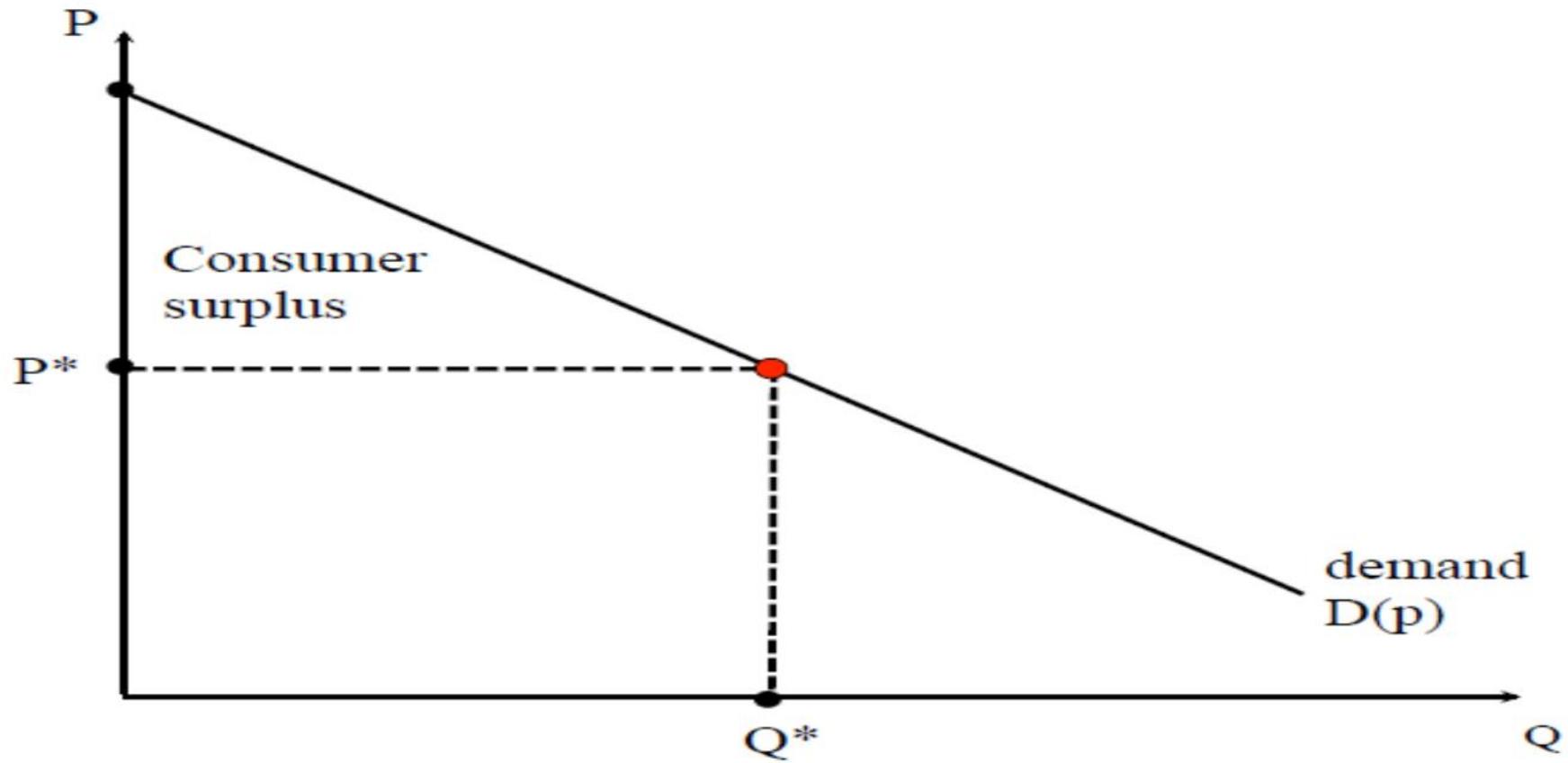
$$\varepsilon_s = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}} = \frac{\Delta Q / Q}{\Delta P / P}$$

# Market Equilibrium

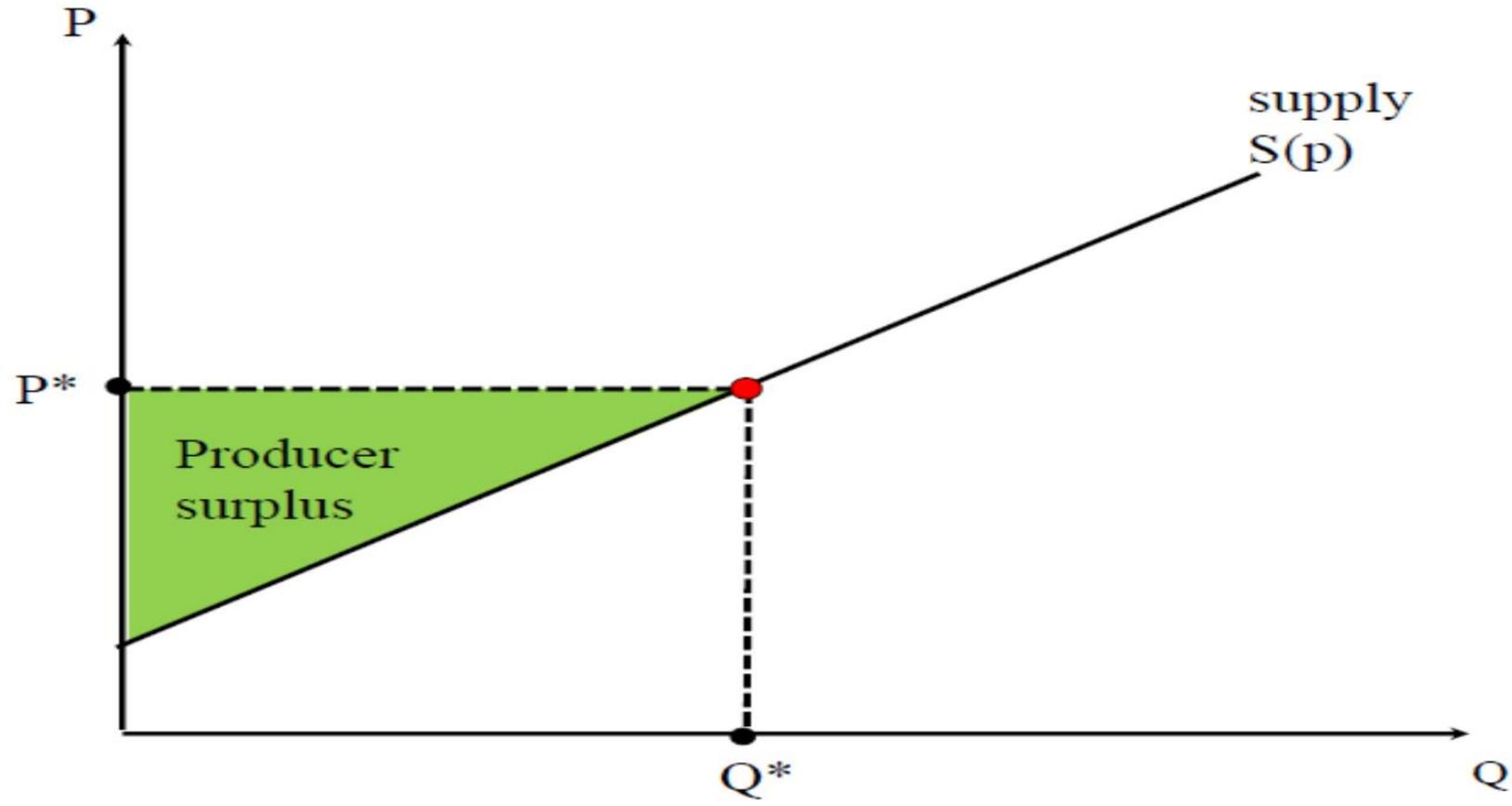
# Market equilibrium

- Consumers (demand side) and producers (supply side) interact on markets.
- The demands of each individual who is demanding goods in this market are added to obtain market demand.
- The supplies of each firm that is supplying goods in the market are added to get market supply.

# Demand curve



# Supply curve

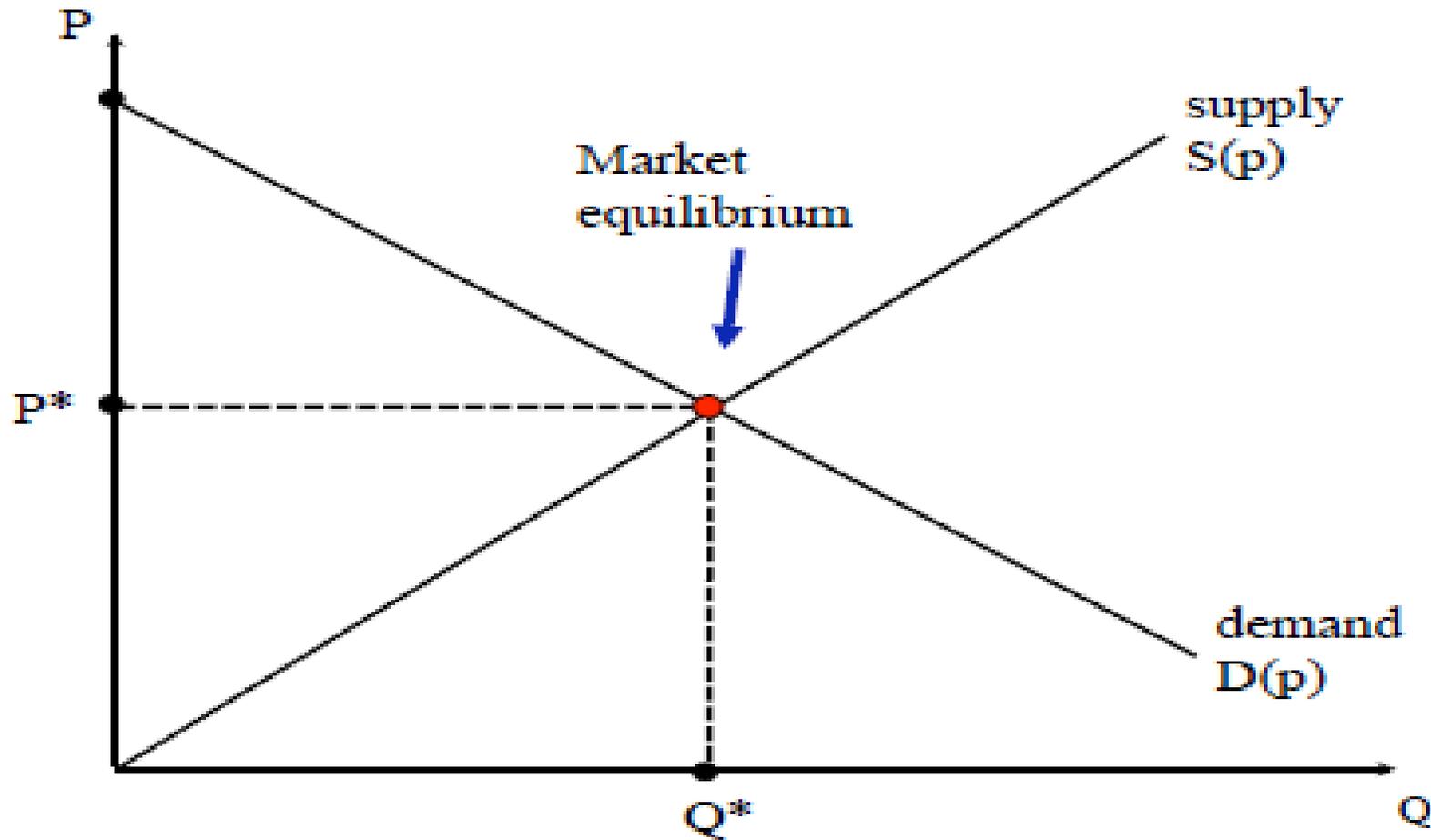


# Market equilibrium

Definition: The market equilibrium is a price,  $p^*$ , and a quantity,  $Q^*$ , such that supply equals demand:

$$Q^* = D(p^*) = S(p^*)$$

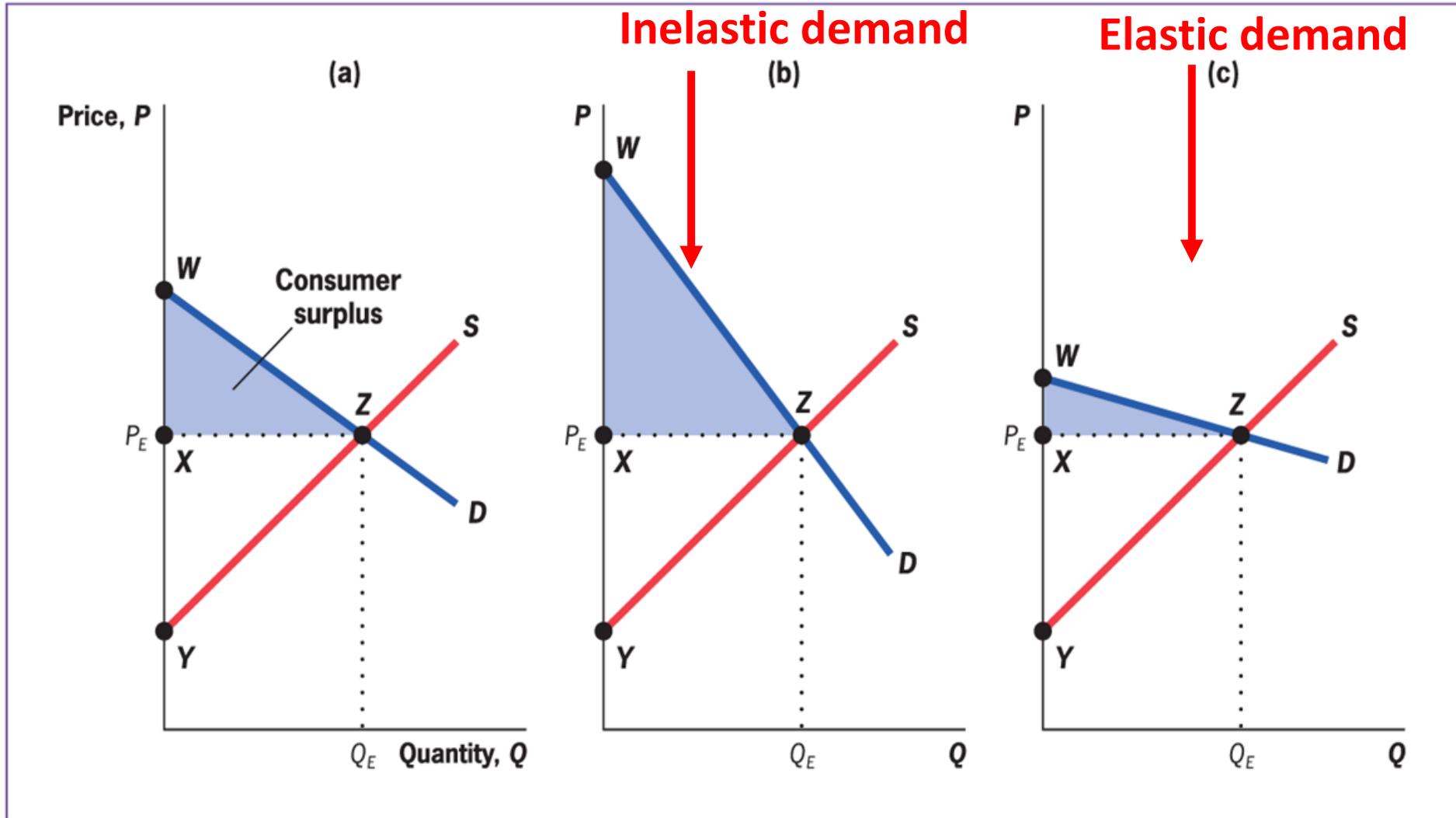
# Market Equilibrium: Graphical Representation



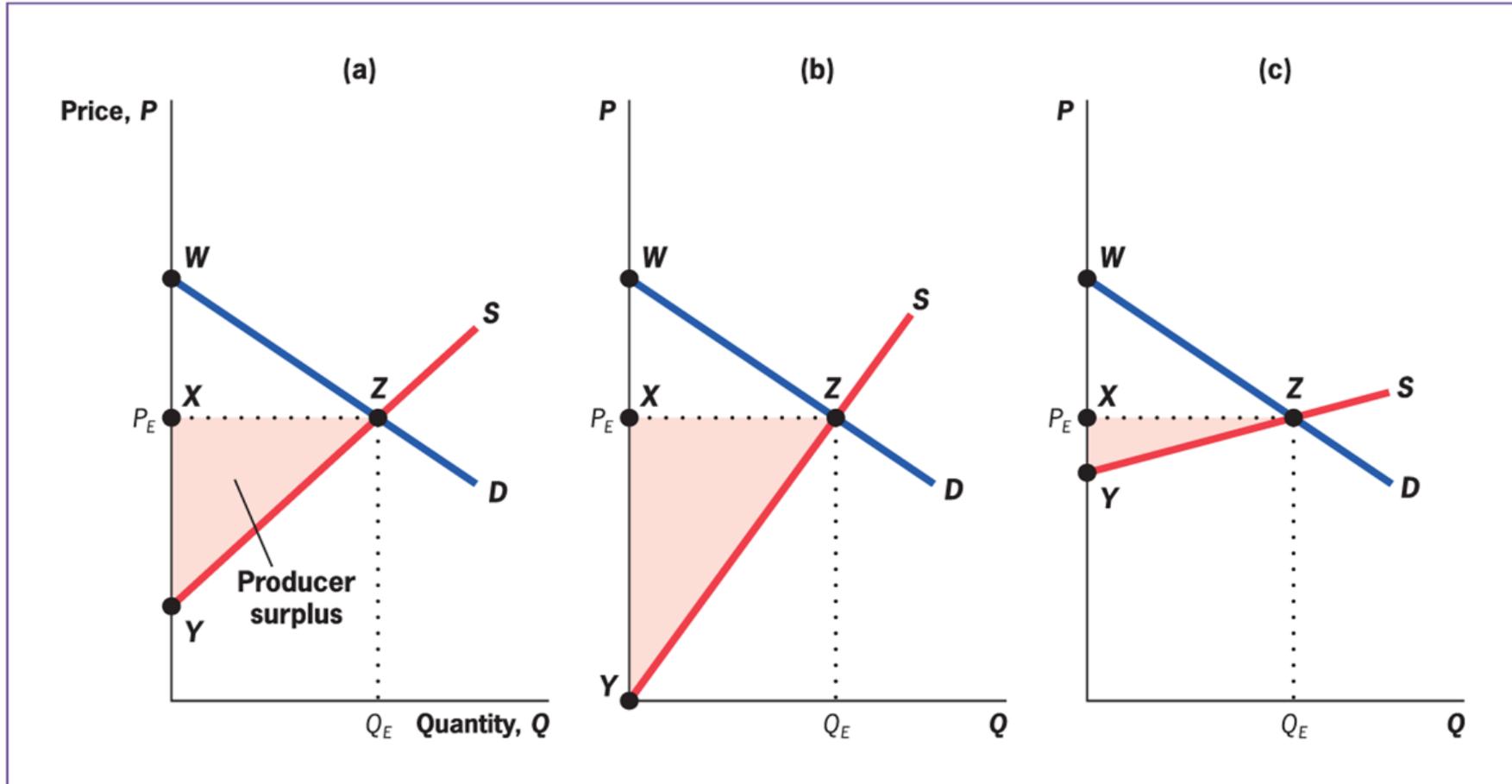
# Social Efficiency

- **Social efficiency** represents **the net gains to society from all trades** that are made in a market, and it consists of the sum of two components: *consumer* and *producer surplus*. Also called **total social surplus**.
- **Consumer surplus:** The benefit that consumers derive from consuming a good, above and beyond the price they paid for the good.
- **Producer surplus:** The benefit that producers derive from selling a good, above and beyond the cost of producing that good.

# Consumer Surplus: Graphical Representation

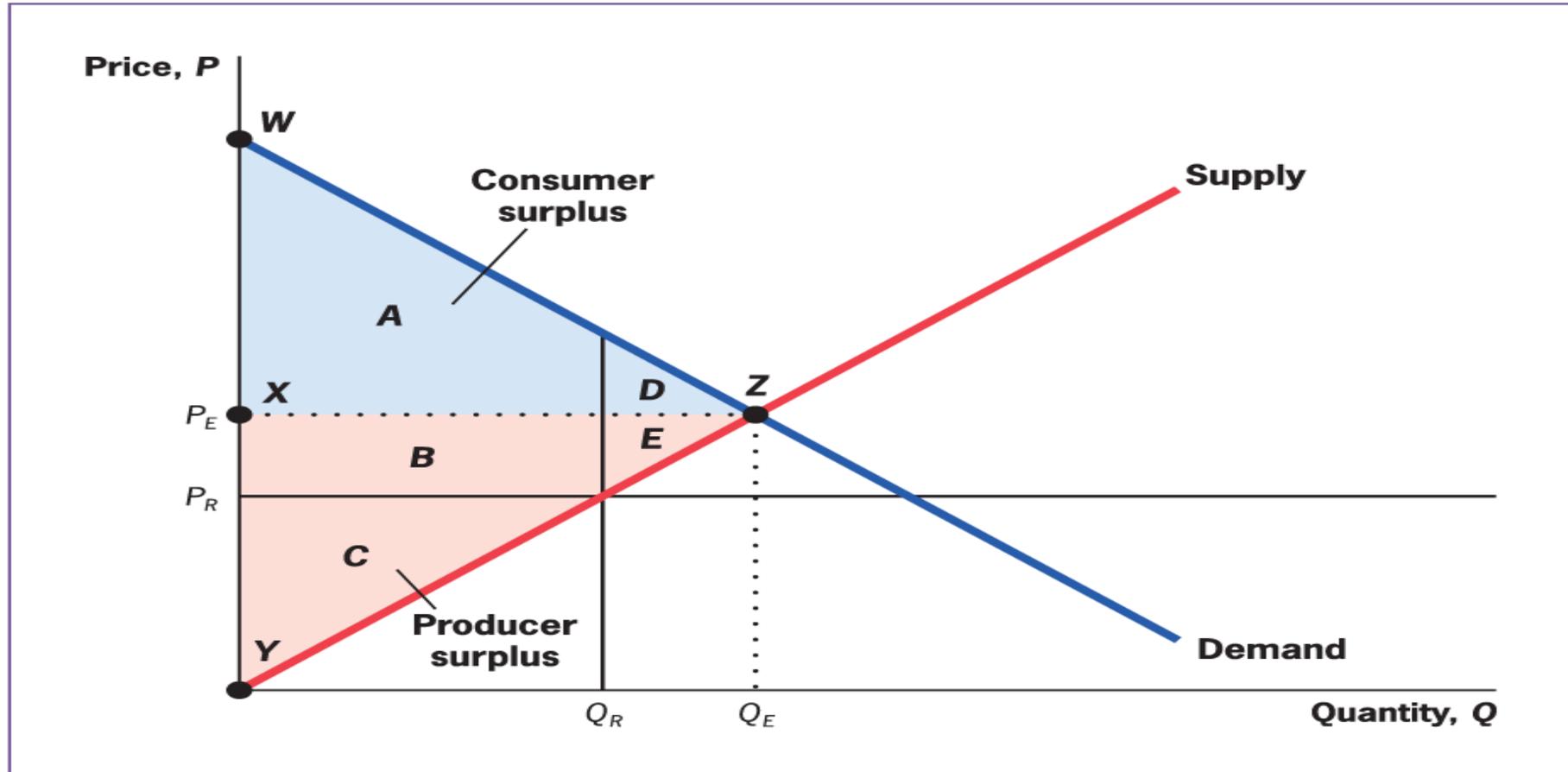


# Producer Surplus: Graphical Representation



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

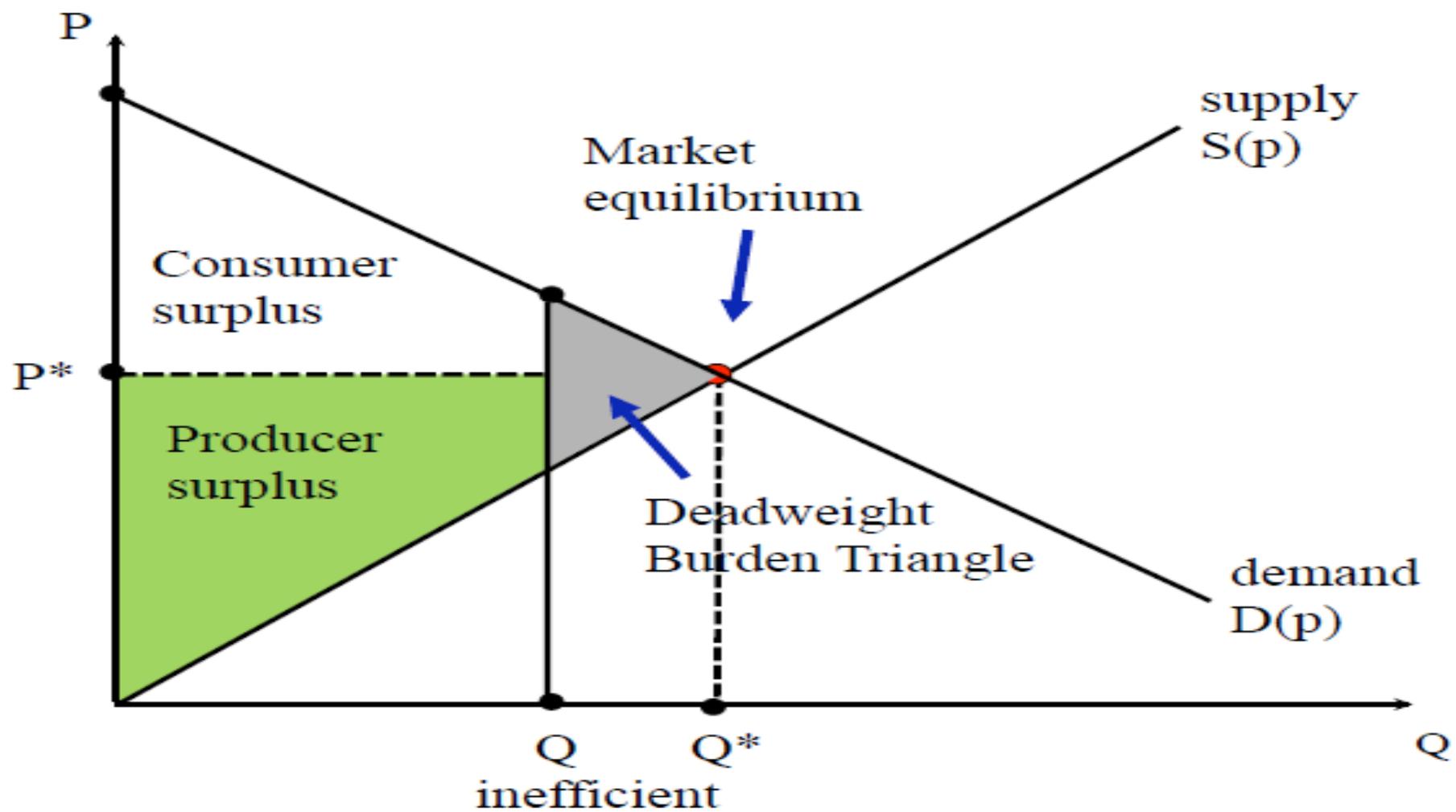
# Social Surplus: Graphical Representation



Gruber, *Public Finance and Public Policy*, 6e, © 2019 Worth Publishers

# First Fundamental Theorem of Welfare Economics

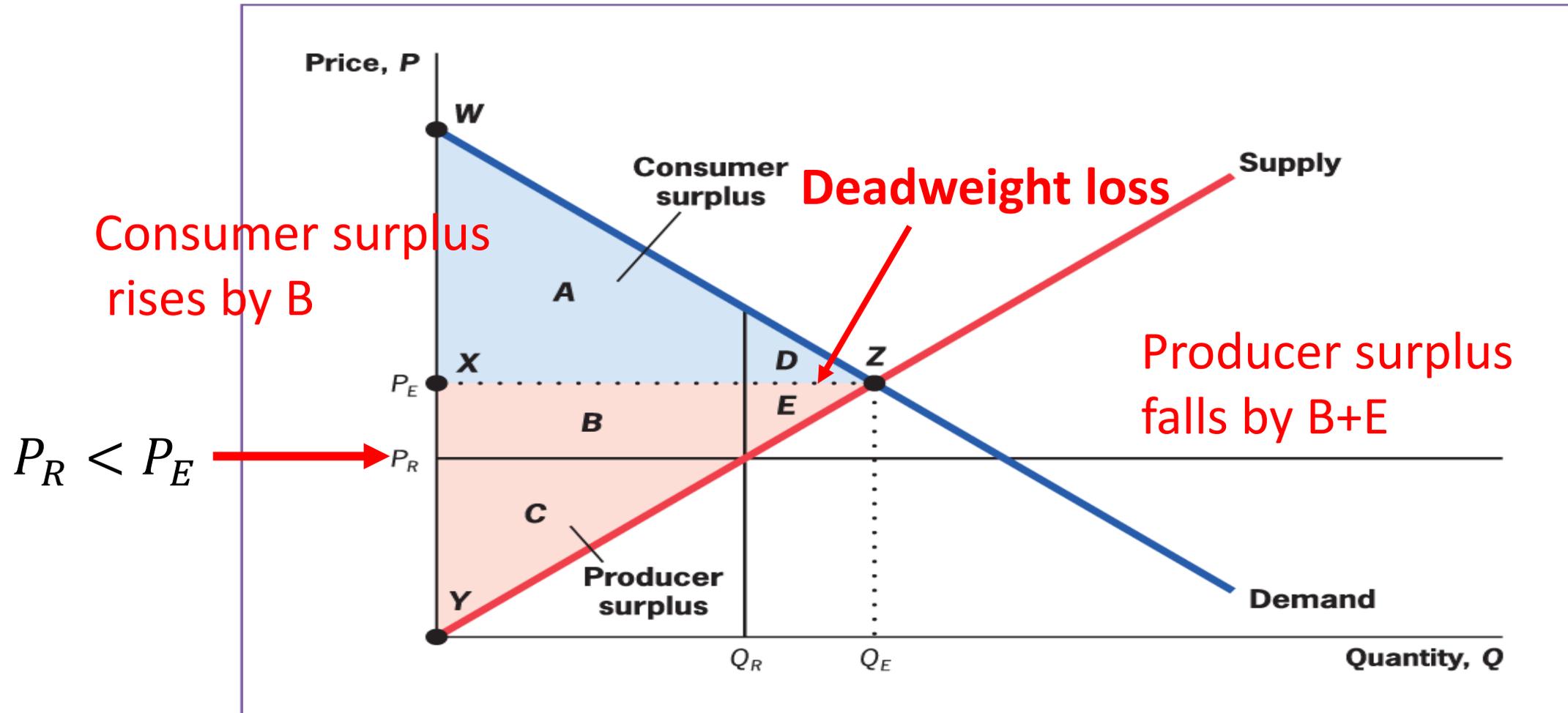
**The competitive equilibrium, where supply equals demand, maximizes social efficiency.**



# Deadweight loss

**The reduction in social efficiency from preventing trades for which benefits exceed costs.**

# Deadweight loss in more detail



# From social efficiency to social welfare: The role of distribution

- Market equilibrium maximizes social welfare (the so called size of economic pie).
- However, societies usually care about not only about the **size of social surplus**, but also how it is **distributed** among the population.
- Under certain assumptions, society doesn't have just one socially efficient point but a whole series of socially efficient points from which it can choose.

# Second Fundamental Theorem of Welfare Economics

Society can attain any efficient outcome by suitably redistributing resources among individuals and then allowing them to freely trade.

- Difficult in practice to redistribute like this.
- **Social welfare:** The level of well-being in society.
  - Determined by both how much gets produced and how it is distributed.
- **Equity–efficiency trade-off:** The choice society must make between the total size of the economic pie and its distribution among individuals.
- We model government's trade-off using a social welfare function.

# Social Welfare Functions

**Social Welfare Function (SWF):** A function that combines the utility functions of all individuals into an overall social utility function.

It represents government's (or society) preferences.

Common specifications:

- A government which cares about efficiency.
- A government which cares about the distribution of resources.

# Utilitarian social welfare

The *utilitarian social welfare function* maximizes the sum of individual utility:

$$SWF^U = U_1 + U_2 + \cdots + U_N$$

# Rawlsian social welfare

The Rawlsian social welfare function maximizes the utility of the worst-off member of society:

$$SWF^R = \min(U_1, U_2, \dots, U_N)$$

# Choosing an Equity Criterion

Social welfare functions reflect different possible equity criteria, including:

- **Commodity egalitarianism:** The principle that society should ensure that individuals meet a set of basic needs but that beyond that point, income distribution is irrelevant.
- **Equality of opportunity:** The principle that society should ensure that all individuals have equal opportunities for success but not focus on the outcomes of choices made.

# Additional Reading (More Advanced)

- Hindricks J. and Myles G.D. (2013). Intermediate Public Economics. *MIT Press*.
  - Chapter 2
  - Especially pp. 35-39 which focus on the two Fundamental Theorems of Welfare Economics.