

LECTURE 7: The Analysis of Market Intervention

- Evaluating the Gains and Losses from Government Policies
- The Efficiency of a Competitive Market
- Minimum Prices
- Price Supports and Production Quotas
- Import Quotas and Tariffs
- The Impact of a Tax or Subsidy

Market Intervention: a Positive Analysis

- Market Intervention ^{시장개입}:
 - When government intervenes market process, for example to controls price, some people are better off.
 - May be able to buy a good at a lower price
- The effect on society as a whole?
 - Is total welfare higher or lower and by how much?
- A way to measure gains and losses from government policies is needed
 - Tools: Consumer and Producer Surplus

Consumer and Producer Surplus

1. Consumer surplus 소비자 잉여

the total benefit or value that consumers receive beyond what they pay for the good.

- ▣ Assume market price for a good is W5
- ▣ Some consumers would be willing to pay more than W5 for the good
- ▣ If you were willing to pay W9 for the good and pay W5, you gain W4 in consumer surplus

Consumer and Producer Surplus

- Consumer surplus measures the total net benefit to consumers
 - ▣ The demand curve shows the willingness to pay for all consumers in the market
 - ▣ Consumer surplus can be measured by the area between the demand curve and the market price

Consumer and Producer Surplus

2. Producer surplus 공급자잉여

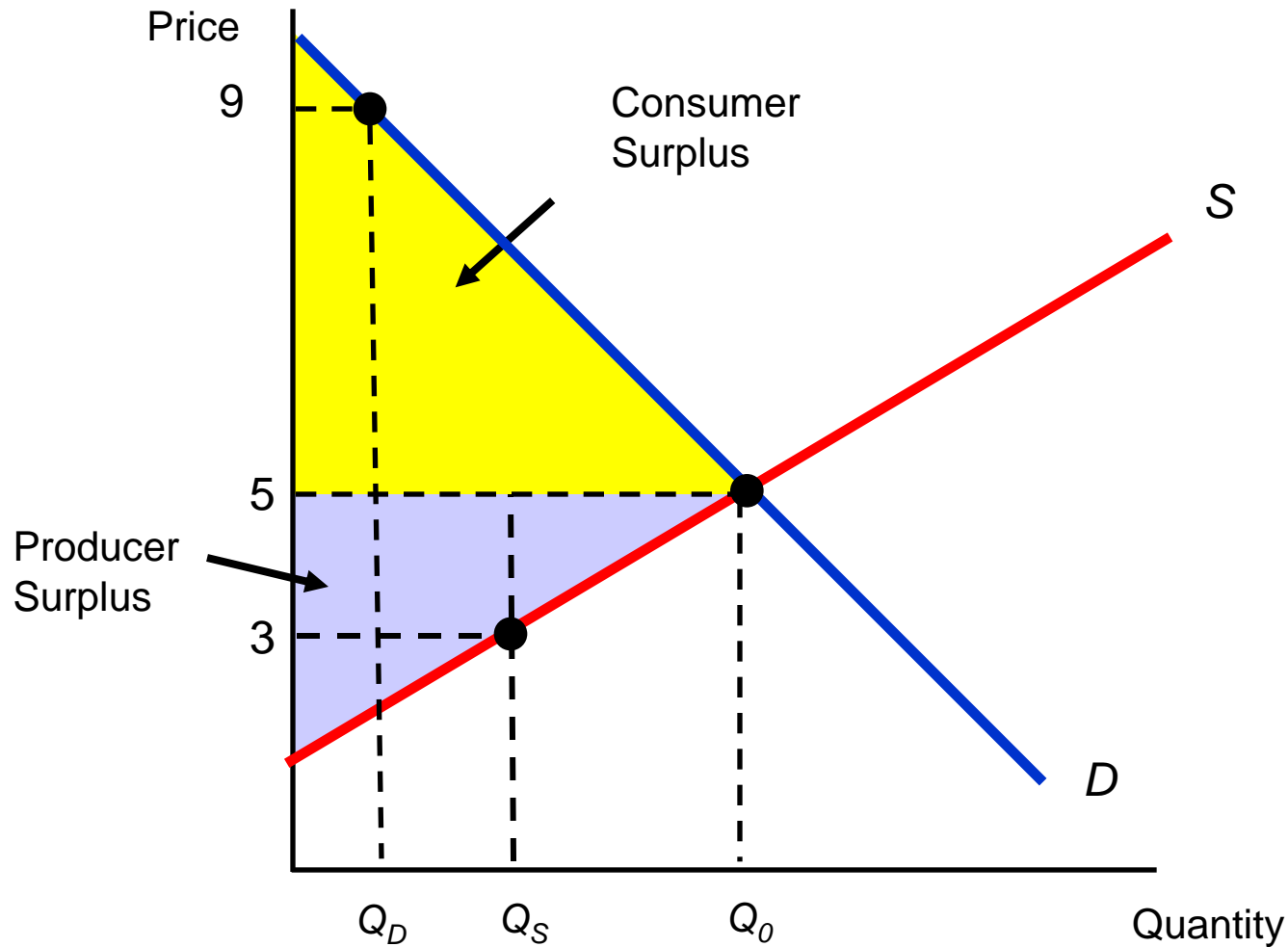
is the total benefit or revenue that producers receive beyond what it cost to produce a good.

- Some producers produce for less than market price and would still produce at a lower price
- A producer might be willing to accept W3 for the good but get W5 market price
- Producer gains a surplus of W2

Consumer and Producer Surplus

- Producer surplus measures the total net benefit to producers
 - ▣ The supply curve shows the amount that a producer is willing to take for a certain amount of a good
 - ▣ Producer surplus can be measured by the area between the supply curve and the market price

Consumer and Producer Surplus



Consumer and Producer Surplus

- Welfare Effects or net social welfare ΔW (의 변동)
- Gains and losses to producers and consumers.
- To determine the welfare effect of a governmental policy we can measure the gain or loss in consumer and producer surplus.

price ceiling 가격상한

- price ceiling 가격상한
 - government institutes a price ceiling, i.e., the price of a good can't go above that price.
 - With a binding price ceiling, producers and consumers are affected
- How much they are affected can be determined by measuring changes in consumer and producer surplus

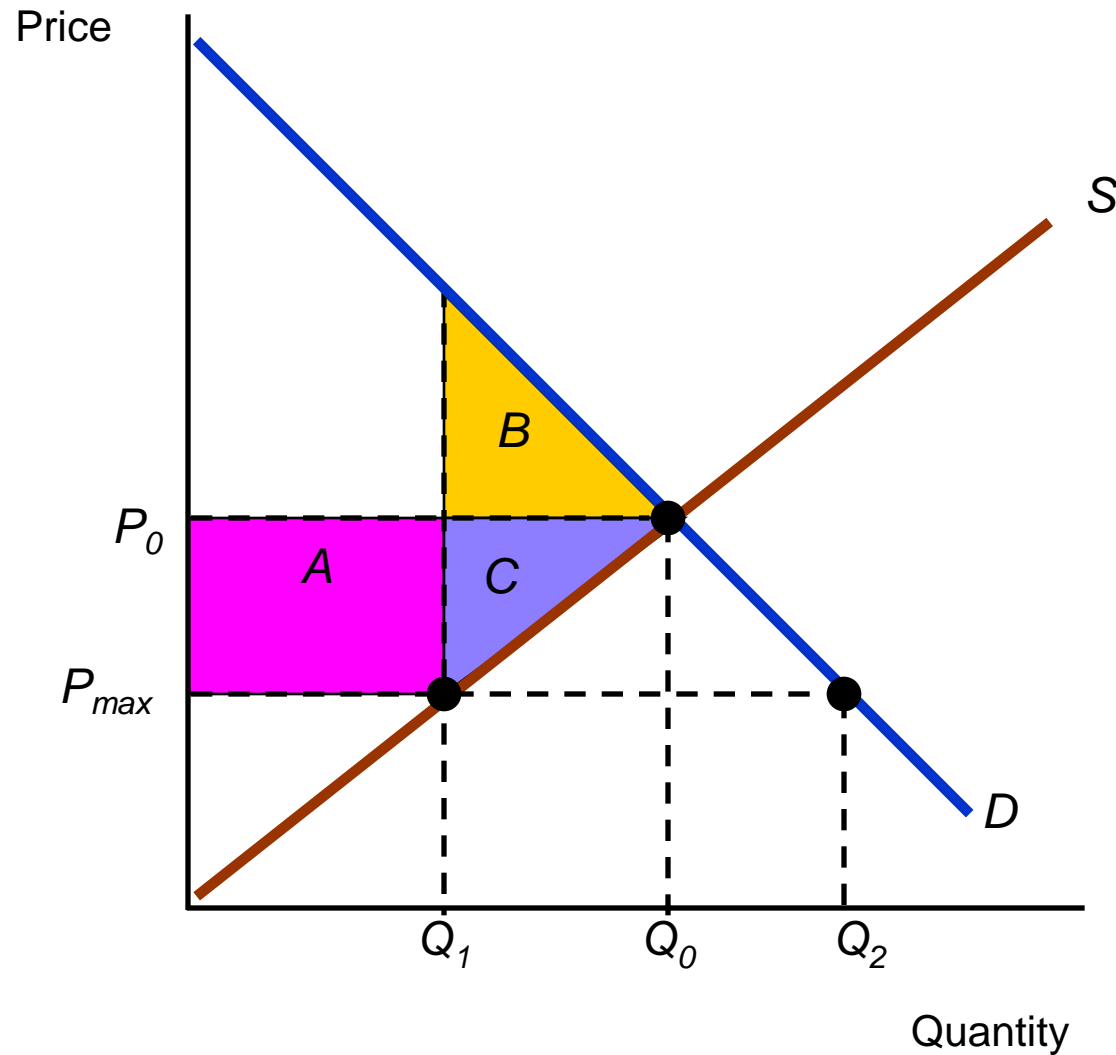
price ceiling 가격상한

- When price is held too low, the quantity demanded increases and quantity supplied decreases
- Some consumers are worse off because can no longer buy the good.
 - ▣ Decrease in consumer surplus
- Some consumers better off because can buy it at a lower price.
 - ▣ Increase in consumer surplus

price ceiling 가격상한

- Producers sell less at a lower price
- Some producers are no longer in the market
- Both of these producer groups lose and producer surplus decreases
- The economy as a whole is worse off since surplus that used to belong to producers or consumers is simply gone

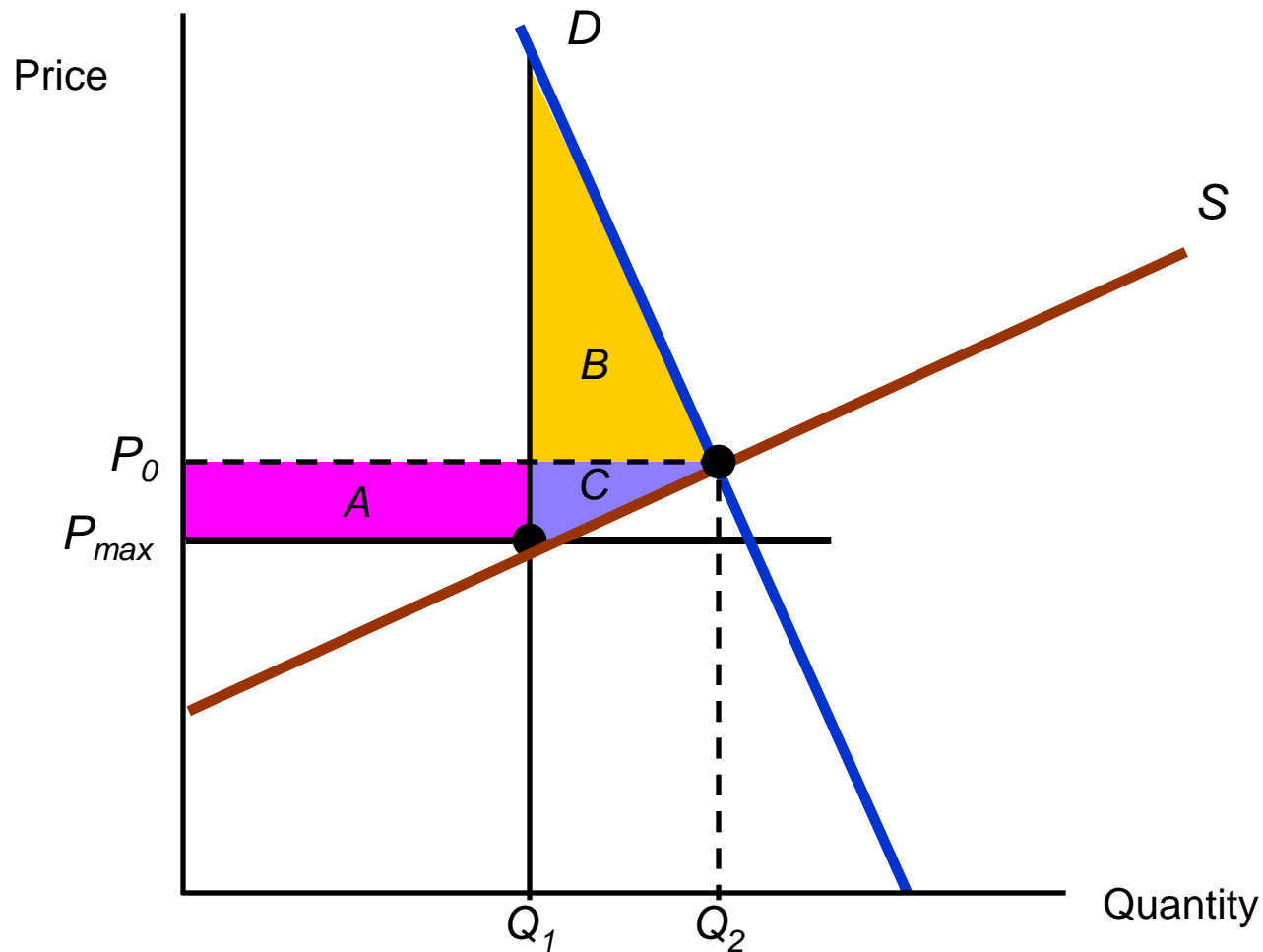
Price Control and Surplus Changes



Price controls and Welfare Effects

- The total loss is equal to area $B + C$.
- The **deadweight loss** is the inefficiency of the price controls – the total loss in surplus (consumer plus producer)
- If demand is sufficiently inelastic, losses to consumers may be fairly large
 - ▣ This has greater effects in political decisions

Price Controls With Inelastic Demand



The Efficiency of a Competitive Market

- Welfare in terms of economic efficiency
 - Evaluation of markets, in terms of **economic efficiency**
 - Maximization of aggregate consumer and producer surplus
- Dead weight losses, or reduction of economic efficiency 후생소실, 경제적 효율성의 감소
 - Policies such as price controls that cause dead weight losses in society are said to impose an **efficiency cost** on the economy

The Efficiency of a Competitive Market

- Best way to achieve economic efficiency
 - ▣ leaving markets alone is the answer
- market failures 시장실패
 - ▣ Sometimes market failures occur
 - ▣ Prices fail to provide proper signals to consumers and producers
 - ▣ Leads to inefficient unregulated competitive market

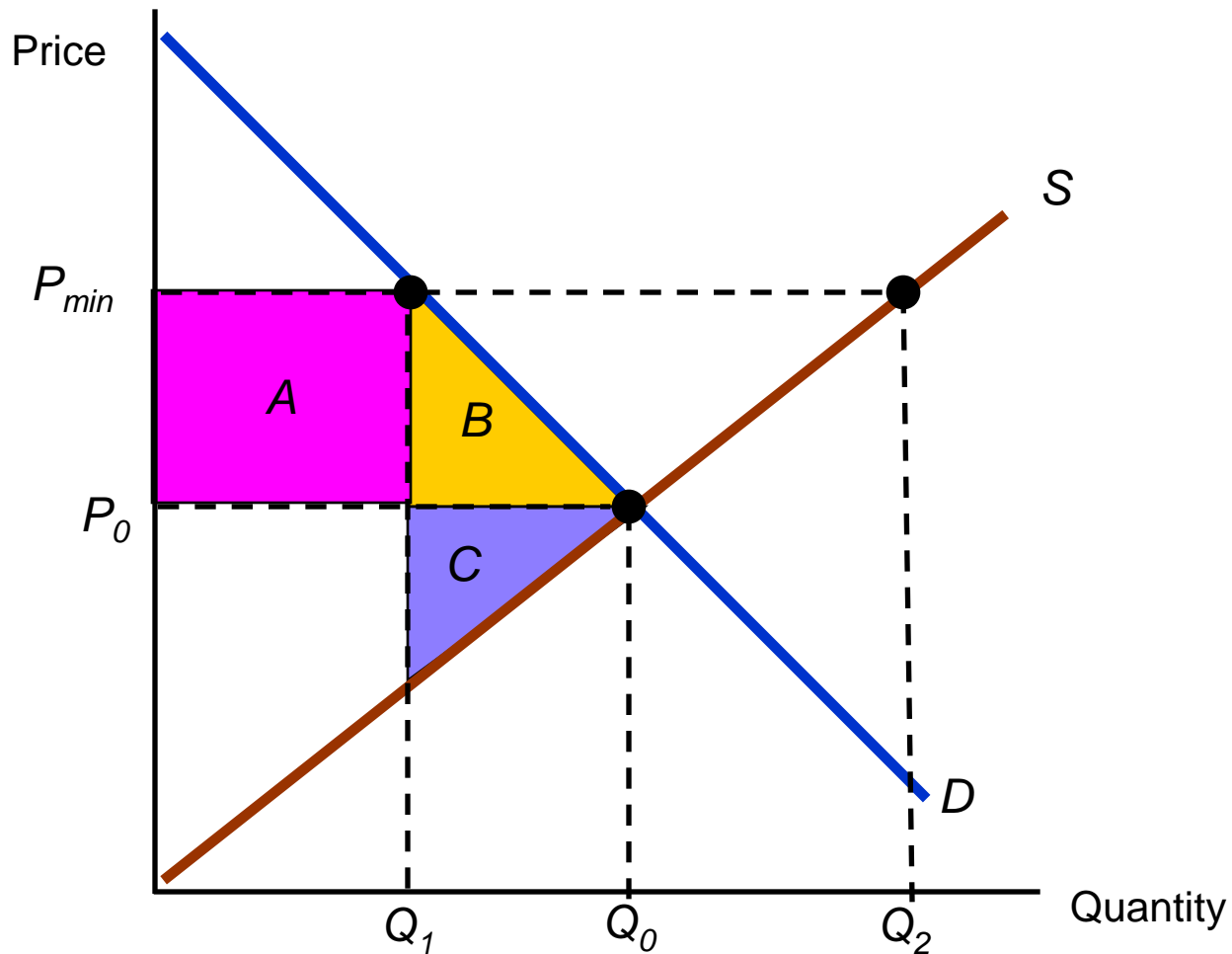
Types of Market Failures

1. Externalities 외부성 또는 외부경제
 - ▣ Costs or benefits that do not show up as part of the market price (e.g. pollution)
 - ▣ Costs or benefits are external to the market
2. Lack of Information 정보부족 (계피법)
 - ▣ Imperfect information prevents consumers from making utility-maximizing decisions.
- ▣ Government intervention may be desirable in these cases

The Efficiency of a Competitive Market

- Other than market failures, unregulated competitive markets lead to economic efficiency
- What if the market is constrained to a price higher than the economically efficient equilibrium price?

Price Control and Surplus Changes



The Efficiency of a Competitive Market

- Deadweight loss triangles, B and C, give a good estimate of efficiency cost of policies that force price above or below market clearing price.
- Measuring effects of government price controls on the economy can be estimated by measuring these two triangles

The Market for Human Kidneys

- Example:
 - ▣ The 1984 National Organ Transplantation Act prohibits the sale of organs for transplantation.
- the impact of the Act?
- We can measure this using the supply and demand for kidneys from estimated data.
 - ▣ Supply: $Q_S = 8,000 + 0.2P$
 - ▣ Demand: $Q_D = 16,000 - 0.2P$

The Market for Human Kidneys

- Since sale of organs is not allowed, the amount available depends on the amount donated
 - ▣ Supply of donated kidneys is limited to 8000
- The welfare effect of this supply constraint can be analyzed using consumer and producer surplus in the kidney market

The Market for Human Kidneys

□ Suppliers:

- Those who supply them are not paid the market price estimated at 20,000
 - Loss of surplus equal to area A = 160 million
- Some who would donate for the equilibrium price do not in the current market
 - Loss of surplus equal to area C = 40 million
- Total consumer loss of $A + C = 200$ million

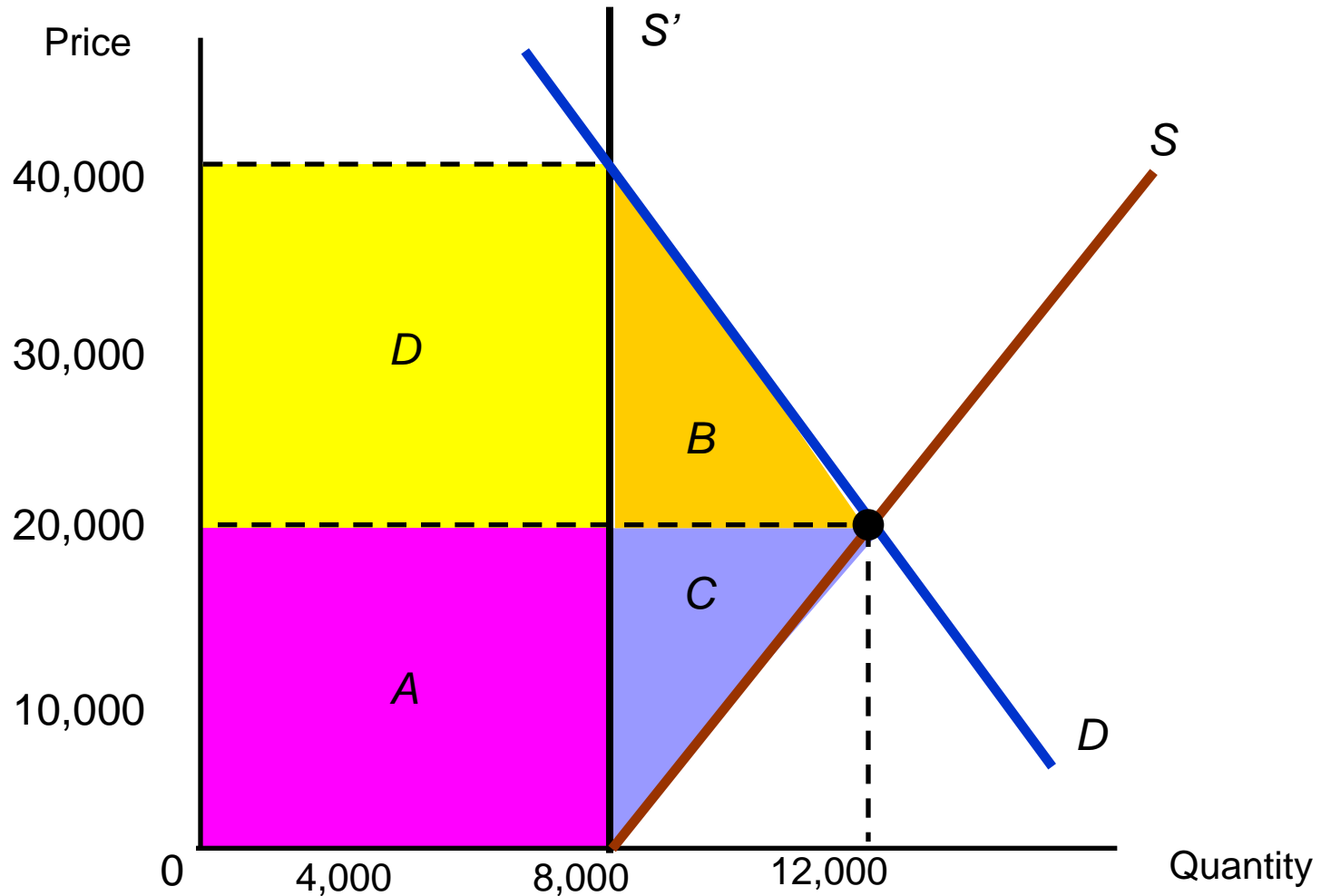
The Market for Human Kidneys

- Recipients:
 - ▣ Since they do not have to pay for the kidney, they *gain* rectangle A (140 million) since price is 0
 - ▣ Those who cannot obtain a kidney *lose* surplus equal to triangle B (40 million)
 - ▣ Net increase in surplus of recipients of $160 - 40 = 120$ million
- Dead Weight Loss of $C + B = 80$ million

The Market for Human Kidneys

- Other Inefficiency Cost
 - ▣ Allocation is not necessarily to those who value the kidney's the most.
 - ▣ Price may increase to 40,000, the equilibrium price, with hospitals getting the price.

The Market for Kidneys



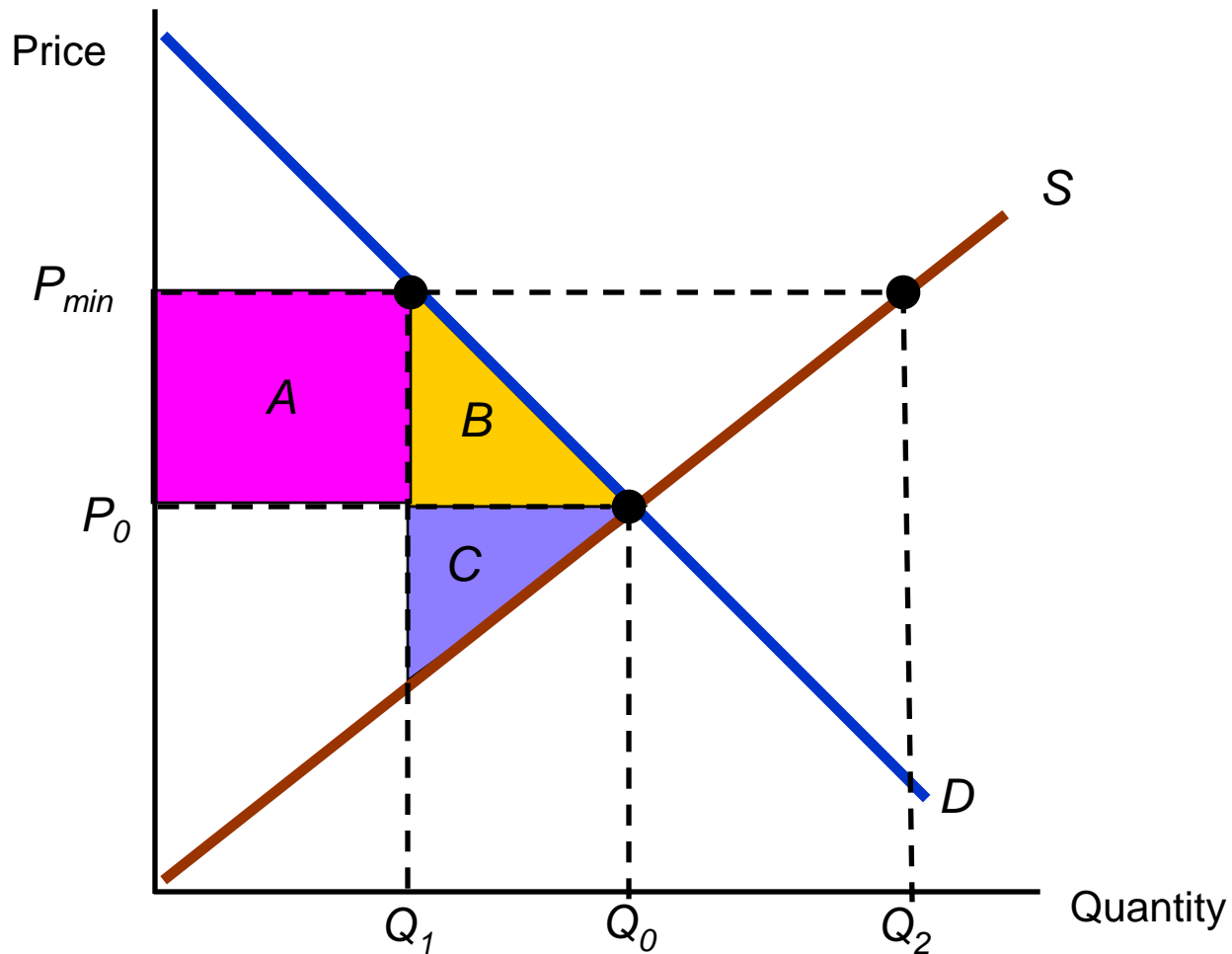
The Market for Human Kidneys

- Arguments in favor of prohibiting the sale of organs:
 1. Imperfect information about donor's health and screening
 2. Unfair to allocate according to the ability to pay
 - Holding price below equilibrium will create shortages
 - Organs versus artificial substitutes

Minimum Prices 최저가격통제

- Periodically government policy seeks to raise prices above market-clearing levels.
 - Minimum wage law 최저임금제
 - Regulation of airlines
 - Agricultural policies 농산물 가격정책

Price Control and Surplus Changes



Minimum Prices

- When price is set above the market clearing price,
 - Quantity demanded falls
 - Suppliers may, however, choose to increase quantity supplied in face of higher prices
 - This causes additional producer losses equal to the total cost of production above quantity demanded

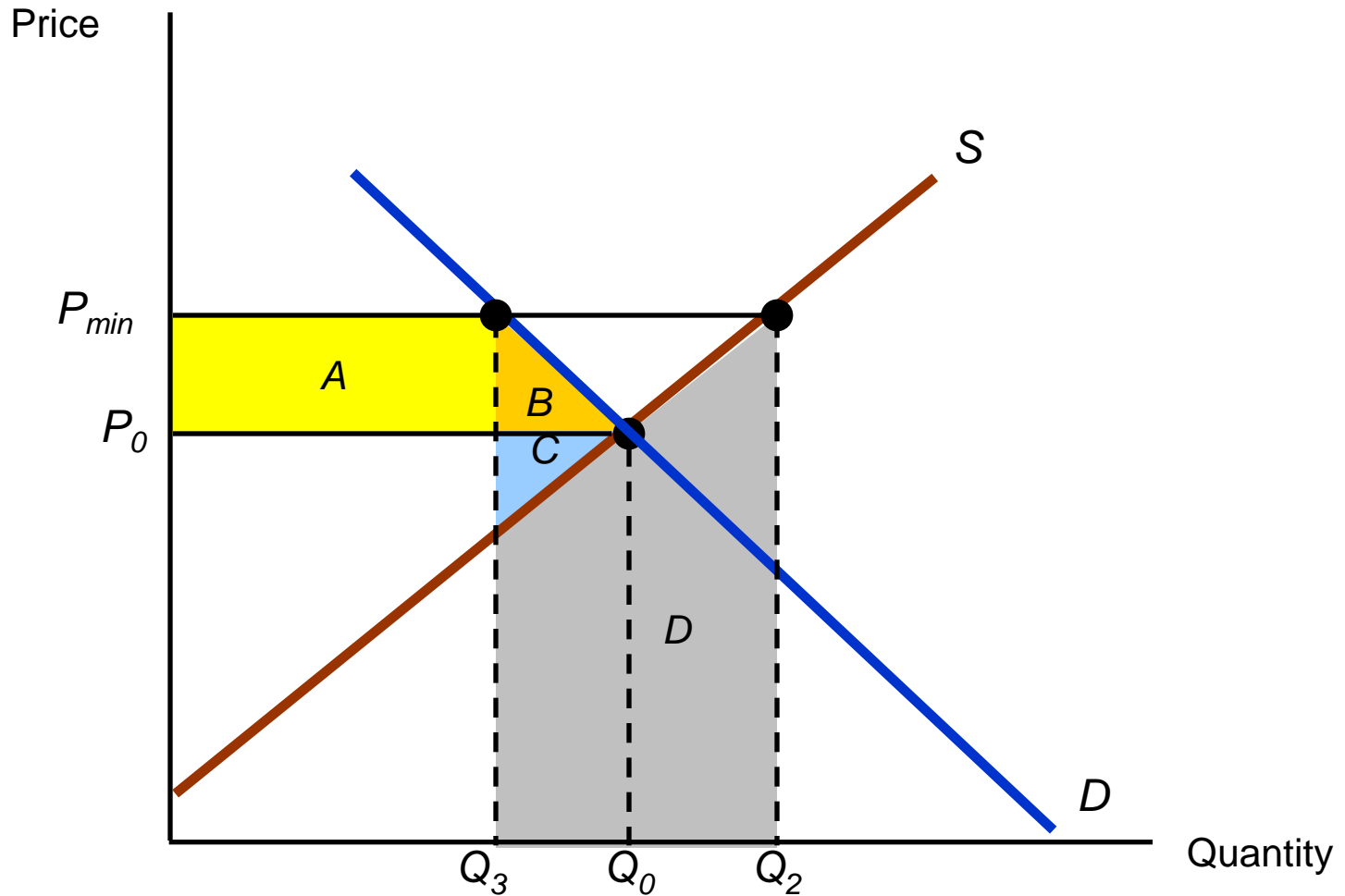
Minimum Prices

- Loses in consumer surplus are still the same
 - ▣ Increased price leading to decreased quantity equals area A
 - ▣ Those priced out of the market lose area B
- Producer surplus similar
 - ▣ Increases from increased price for units sold equal to A
 - ▣ Losses from drop in sales equal to C

Minimum Prices

- What if producers expand production to Q_2 from the increased price
 - ▣ Since they only sell Q_3 , there is no revenue to cover the additional production (Q_2-Q_3)
 - ▣ Supply curve measures MC of production so total cost of additional production is area under the supply curve for the increased production (Q_2-Q_3) = area D
 - ▣ Total change in producer surplus = $A - C - D$

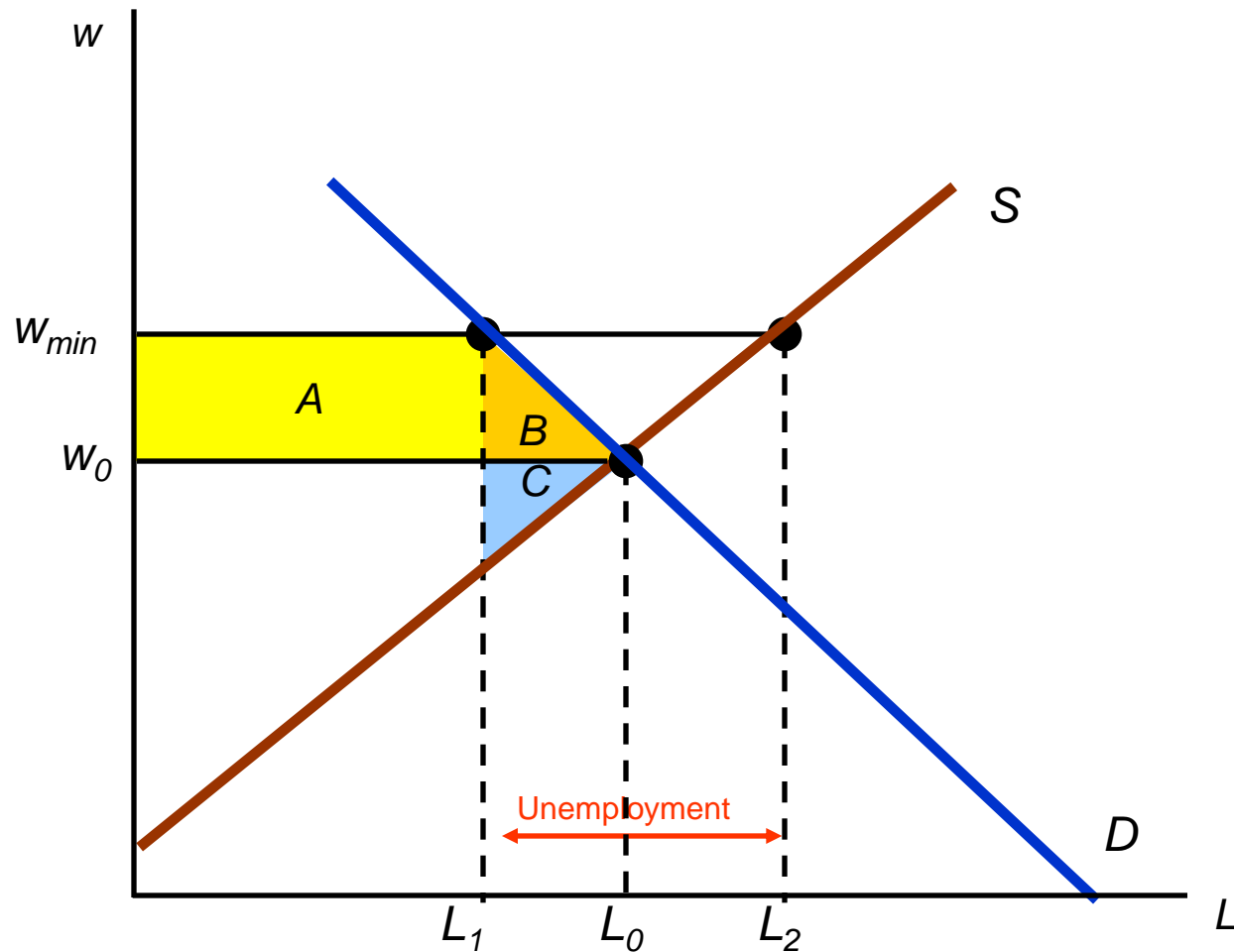
Minimum Prices



Minimum Wages

- Wage is set higher than market clearing wage
- Decreased quantity of workers demanded
- Those workers hired receive higher wages
- Unemployment results since not everyone who wants to work at the new wage can

The Minimum Wage



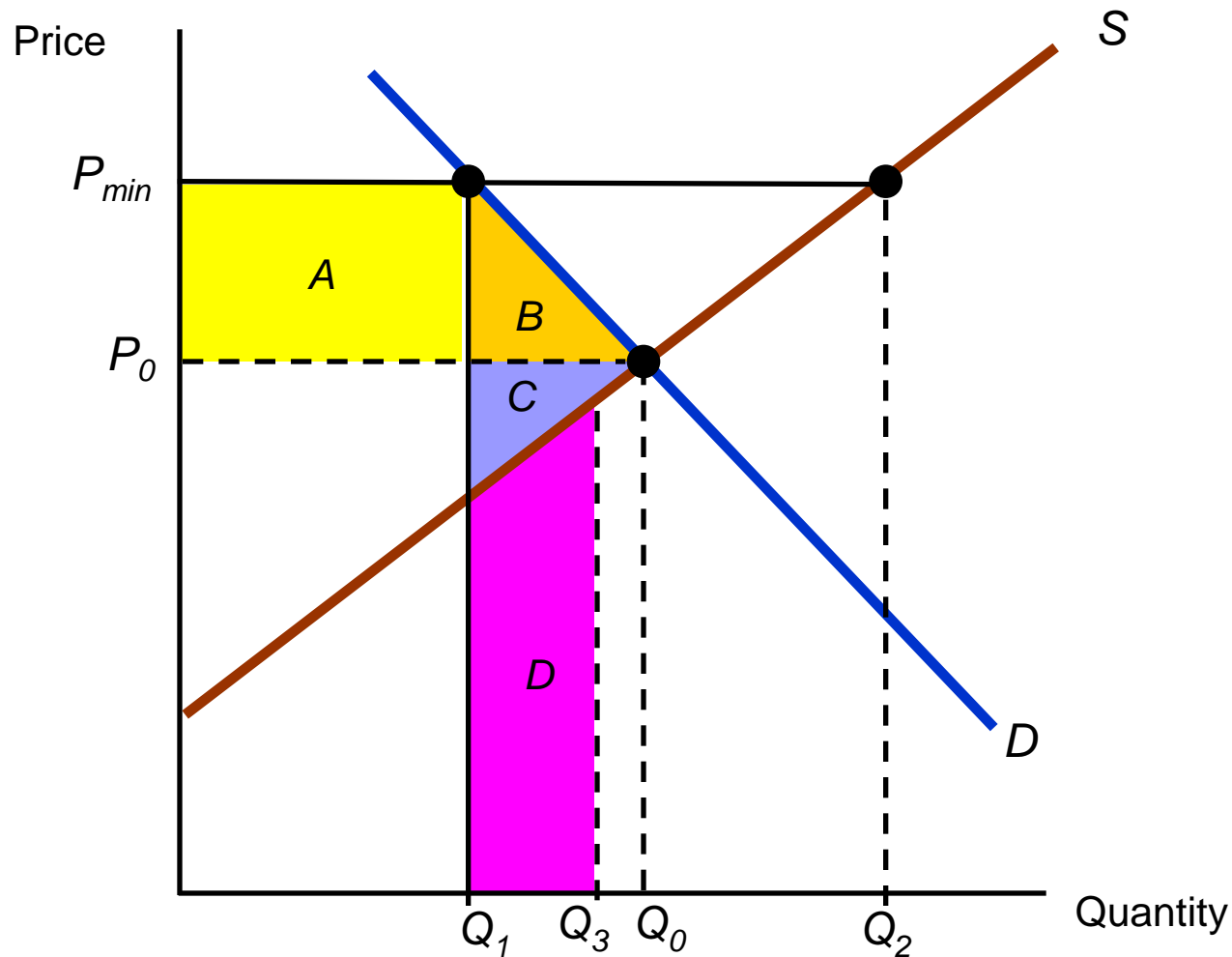
Airline Regulation

- Before 1970, airline industry was heavily regulated by the Civil Aeronautics Board (CAB)
- During 1976-1981 the airline industry in the U.S. changed dramatically as deregulation lead to major changes.
- Some airlines merged or went out of business as new airlines entered the industry.

Airline Regulation

- Although price in the industry fell considerable (helping consumers), profits did not.
 - ▣ Regulation caused significant inefficiencies and artificially high costs
- We can show the effects of this regulation by looking at the effects on surplus from the controlled prices

Effect of Airline Regulation



Price Supports 가격지원정책

- Much of agricultural policy is based on a system of price supports.
 - ▣ Price set by government above free-market level and maintained by governmental purchases of excess supply
- Government can also increase prices through restricting production, directly or through incentives to producers

Price Supports

- What are the impacts on consumers, producers and the federal budget?
- Consumers
 - ▣ Quantity demanded falls and quantity supplied increases
 - ▣ Government buys surplus
 - ▣ Consumers must pay higher price for the good
 - ▣ Loss in consumer surplus equal to $A+B$

Price Supports

□ Producers

- Gain since they are selling more at a higher price
- Producer surplus increases by $A+B+D$

□ Government

- Cost of buying the surplus which is funded by taxes so indirect cost on consumers
- Cost to government = $(Q_2 - Q_1)P_S$

Price Supports

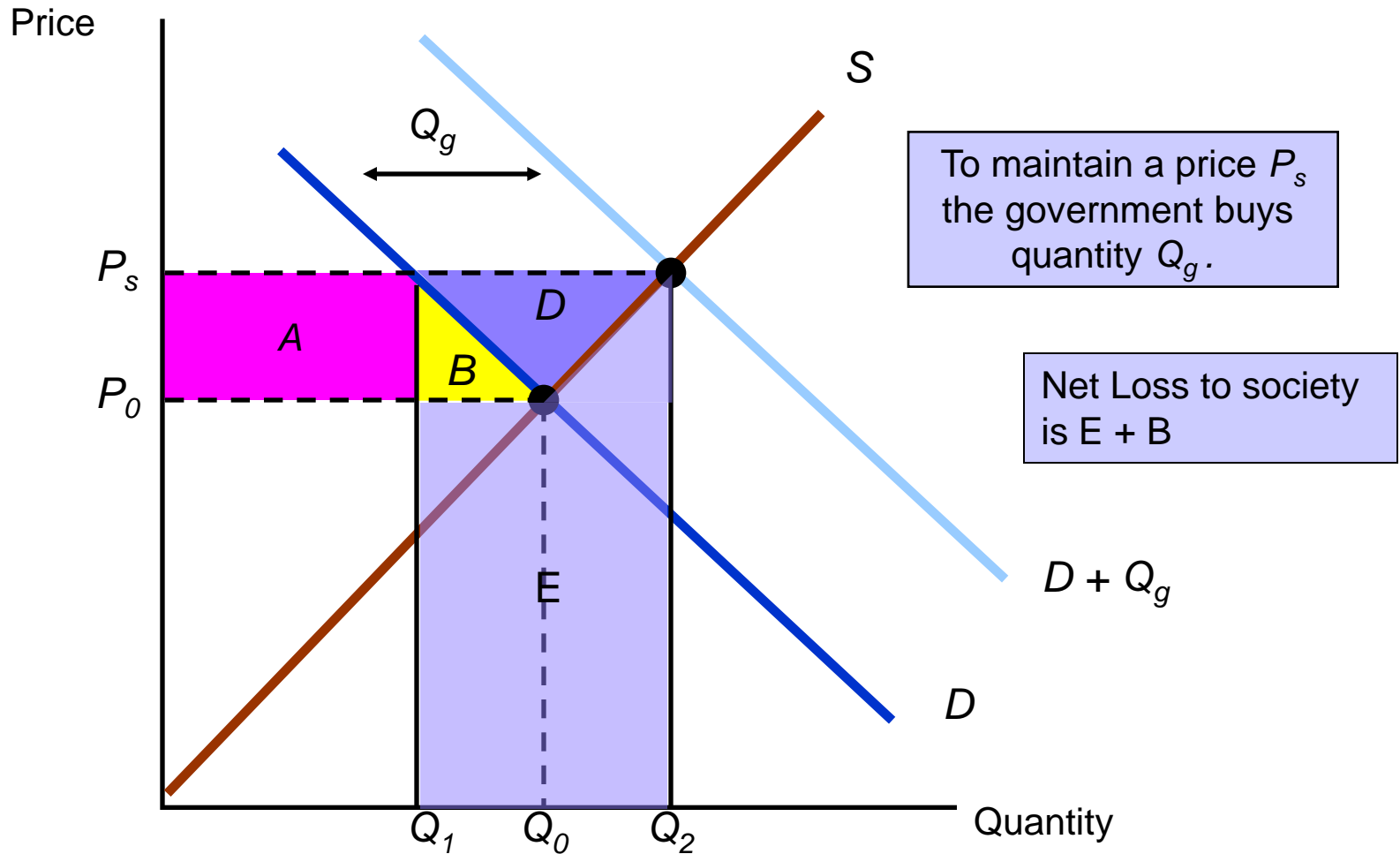
- Government may be able to “dump” some of the goods in the foreign markets
 - ▣ Hurts domestic producers that government is trying to help in the first place

- Total welfare effect of policy

$$\Delta CS + \Delta PS - \text{Govt. cost} = D - (Q_2 - Q_1)P_S$$

- Society is worse off over all
- Less costly to simply give farmers the money

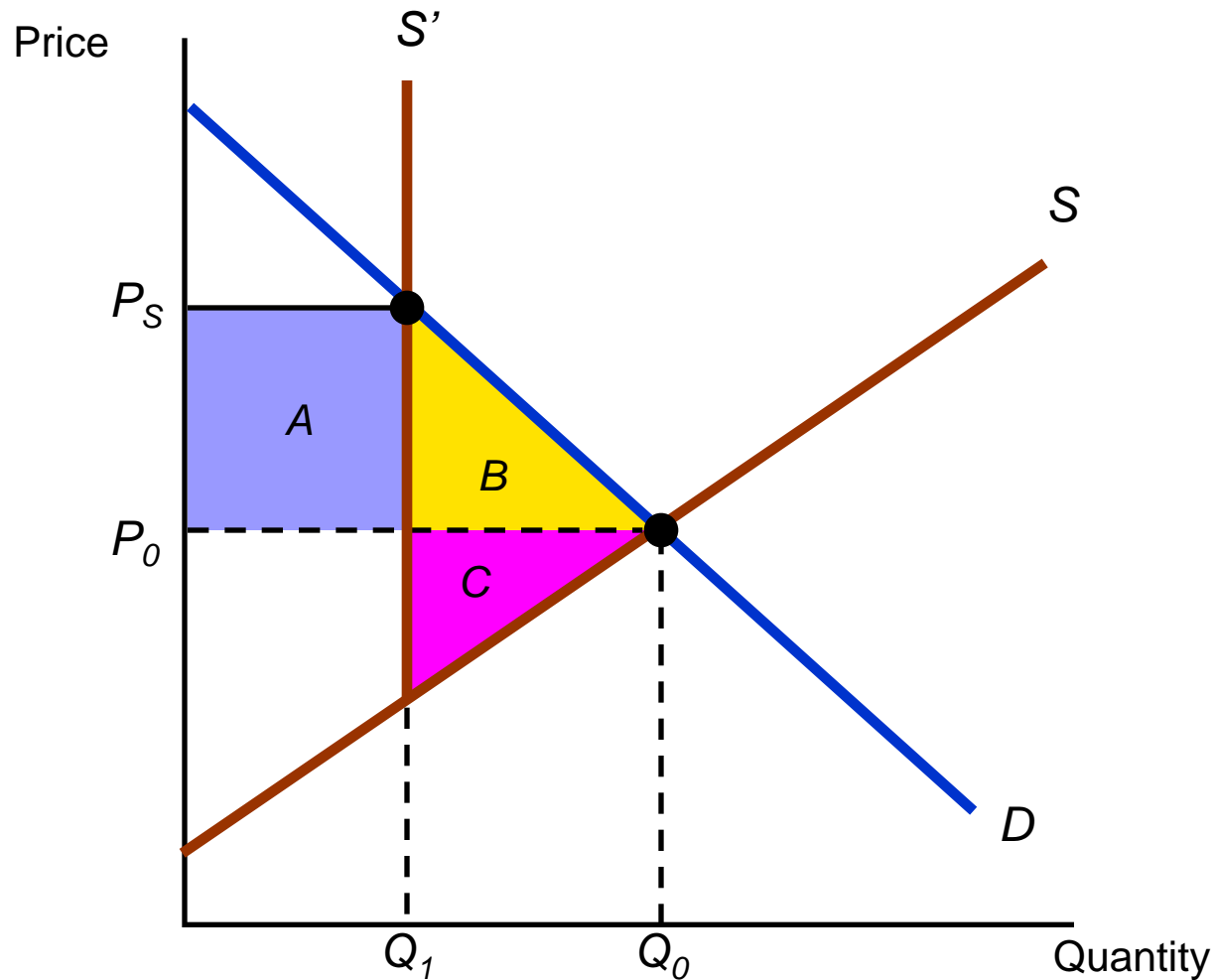
Price Supports



Production Quotas

- The government can also cause the price of a good to rise by reducing supply.
 - ▣ Limitations of taxi medallions in New York City
 - ▣ Limitation of required liquor licenses for restaurants

Supply Restrictions



Supply Restrictions

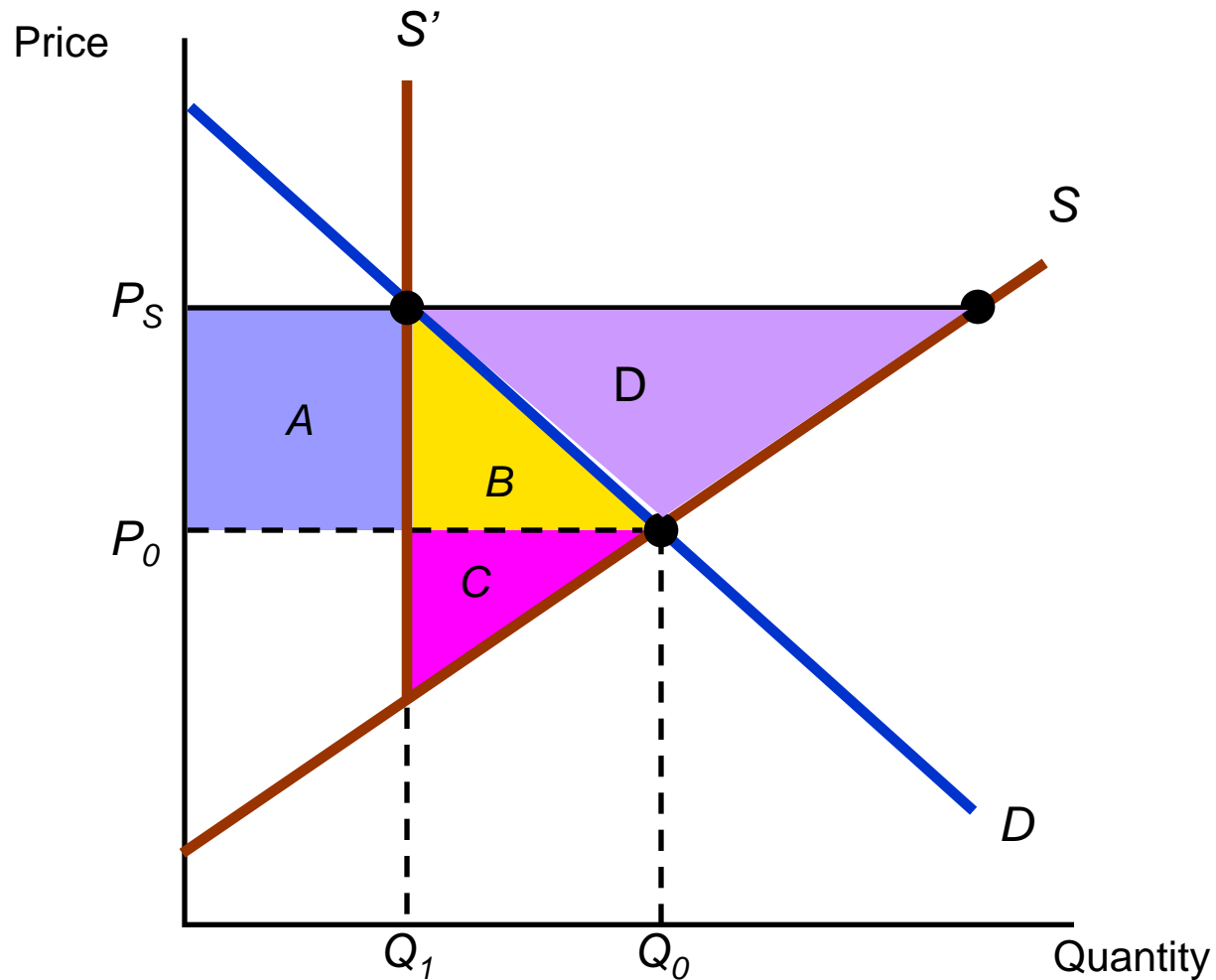
□ Incentive Programs

- US agricultural policy uses production incentives instead of direct quotas
- Government gives farmers financial incentives to restrict supply
 - Acreage limitation programs
- Quantity decreases and price increases for the crop

Supply Restrictions

- Incentive Program
 - ▣ Gain in PS of A from increased price of amount sold
 - ▣ Loss of PS of C from decreased production
 - ▣ Government pays farmers not to produce
 - ▣ Total $\Delta PS = A - C + \text{payments from Govt.}$
 - ▣ Government must pay enough to keep producers from producing more at the higher price
 - ▣ Equals $B+C+D$

Supply Restrictions



Supply Restrictions

- Which program is more costly?
 - ▣ Both programs have same loss to consumers
 - ▣ Producers are indifferent between programs because end up with same amount in both
 - ▣ Typically acreage limitation program costs society less than price supports maintained by government purchases
 - ▣ However, society better off if government would just give farmers cash

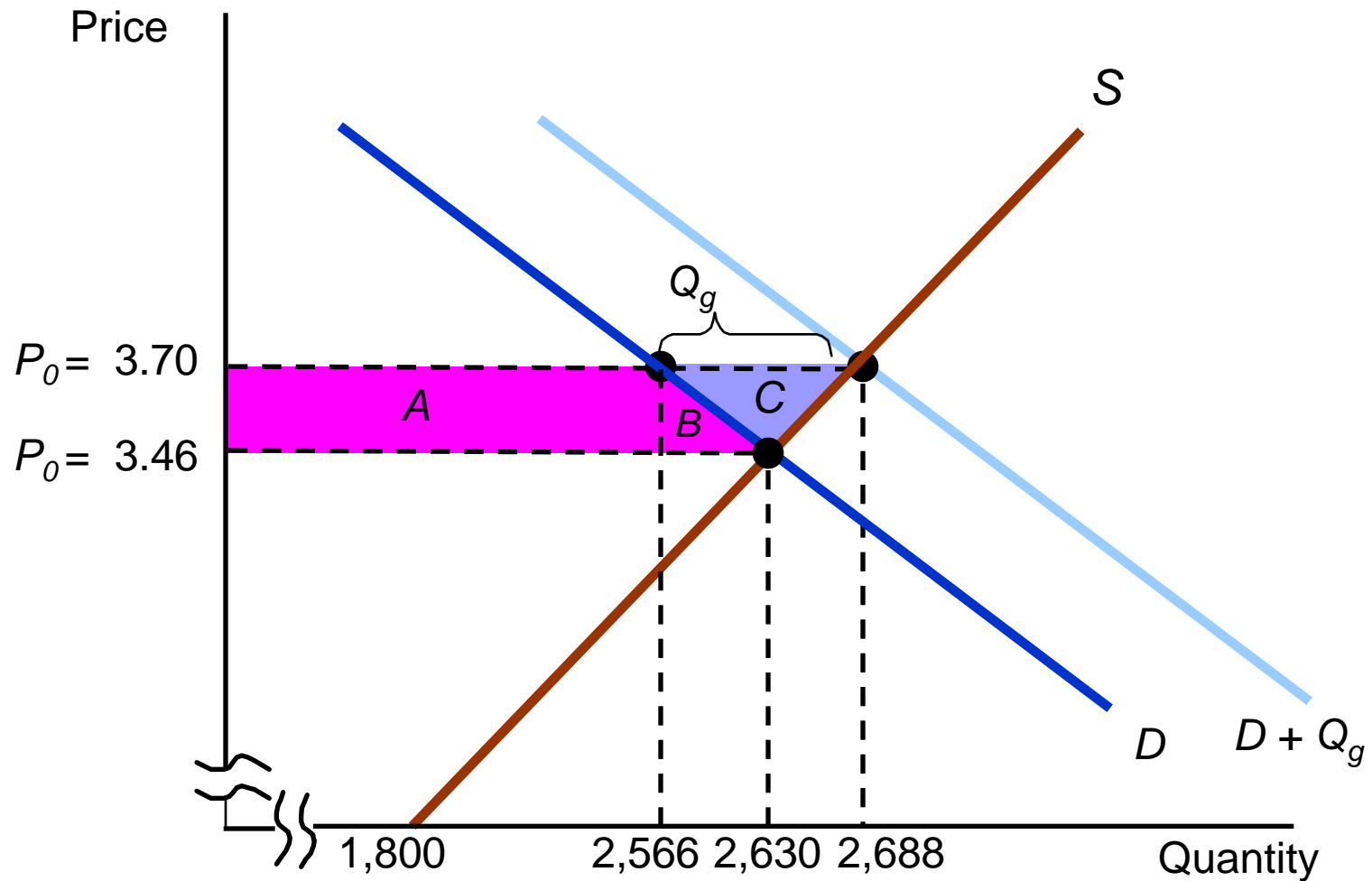
Supporting the Price of Wheat

- From previous example, the supply and demand for wheat in 1981 was
 - ▣ Supply: $Q_s = 1,800 + 240P$
 - ▣ Demand: $Q_D = 3,550 - 266P$
 - ▣ Equilibrium price and quantity was 3.46 and 2,630 million bushels
- Government raised the price to 3.70 through government purchases

Supporting the Price of Wheat

- How much would the government had to buy to keep price at 3.70
 - ▣ $Q_{D\text{Total}} = Q_D + Q_G = 3,550 - 266P + Q_G$
 - ▣ $Q_S = Q_{DT}$
 - $1,800 + 240P = 3,550 - 266P + Q_G$
 - $Q_G = 506P - 1,750$
 - At a price of 3.70, government would buy
 - $Q_G = (506)(3.70) - 175 = 122$ million bushels

The Wheat Market in 1981



Supporting the Price of Wheat

- We can quantify the effects on CS
 - ▣ The change in consumer surplus = (-A -B)
 - $A = (3.70 - 3.46)(2,566) = 616$ million
 - $B = (1/2)(3.70-3.46)(2,630-2,566) = 8$ million
 - ▣ $\Delta CS = - 624$ million.

Supporting the Price of Wheat

- Cost to the government:
 - ▣ $3.70 \times 122 \text{ million bushels} = 451.4 \text{ million}$
 - ▣ Total cost of program = $624 + 451 = 1,075 \text{ million}$
- Gain to producers
 - ▣ $A + B + C = 638 \text{ million}$
 - ▣ Government also paid 30 cents/bushel = 806 million

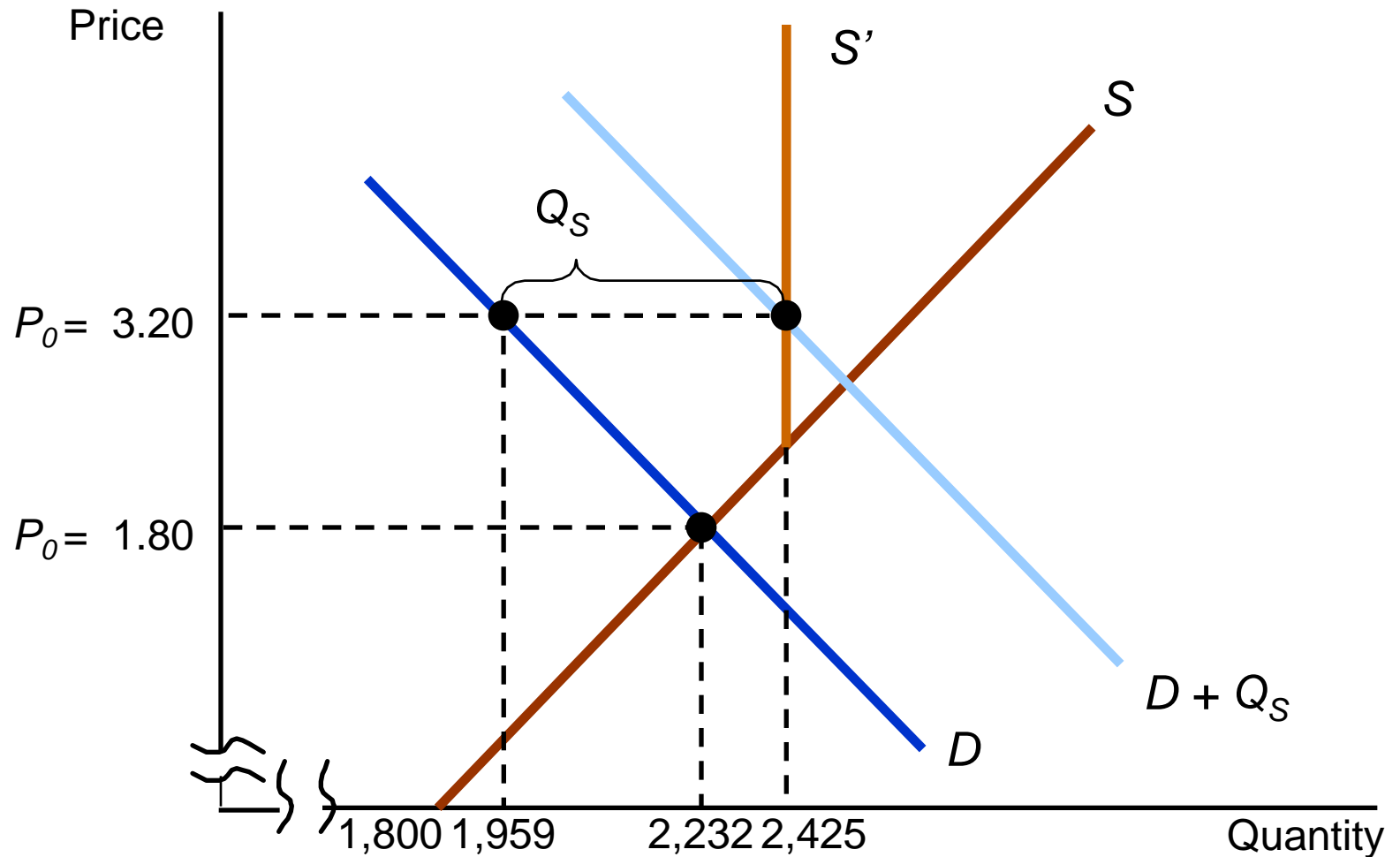
Supporting the Price of Wheat

- In 1985, the situation became worse
 - ▣ Export demand fell and the market clearing price of wheat fell to 1.80/bushel.
 - ▣ Equilibrium quantity was 2231
 - ▣ The actual price, however, was 3.20
 - ▣ To keep price at 3.20, the government had to purchase excess wheat
 - ▣ Government also imposed a production quota of about 2425 million bushels

Supporting the Price of Wheat

- 1985 Government Purchase:
 - $2,425 = 2,580 - 194P + QG$
 - $QG = -155 + 194P$
 - $P = 3.20$ -- the support price
 - $QG = -155 + 194(3.20) = 466$ million bushels

The Wheat Market in 1985



Supporting the Price of Wheat

- 1985 Government Cost:
 - ▣ Purchase of Wheat = $3.20 \times 466 = 1,491$ million
 - ▣ 80 cent subsidy = $.80 \times 2,425 = 1,940$ million
 - ▣ Total government program cost = 3.5 billion

Supporting the Price of Wheat

- 1996 Congress passed the Freedom to Farm law
 - ▣ Goal was to reduce the role of government and make agriculture more market oriented
 - ▣ Eliminated production quotas, gradually reduced government purchases and subsidies through 2003.

Supporting the Price of Wheat

- In 2002 Congress and Pres. Bush reversed the effects of the 1996 bill reinstating subsidies for most crops.
 - Calls for “fixed direct payments”
 - New bill would cost taxpayers almost 1.1 billion in annual payments to wheat producers alone
 - 2002 farm bill expected to cost taxpayers 190 billion over 10 years
 - Estimated 83 billion over existing programs

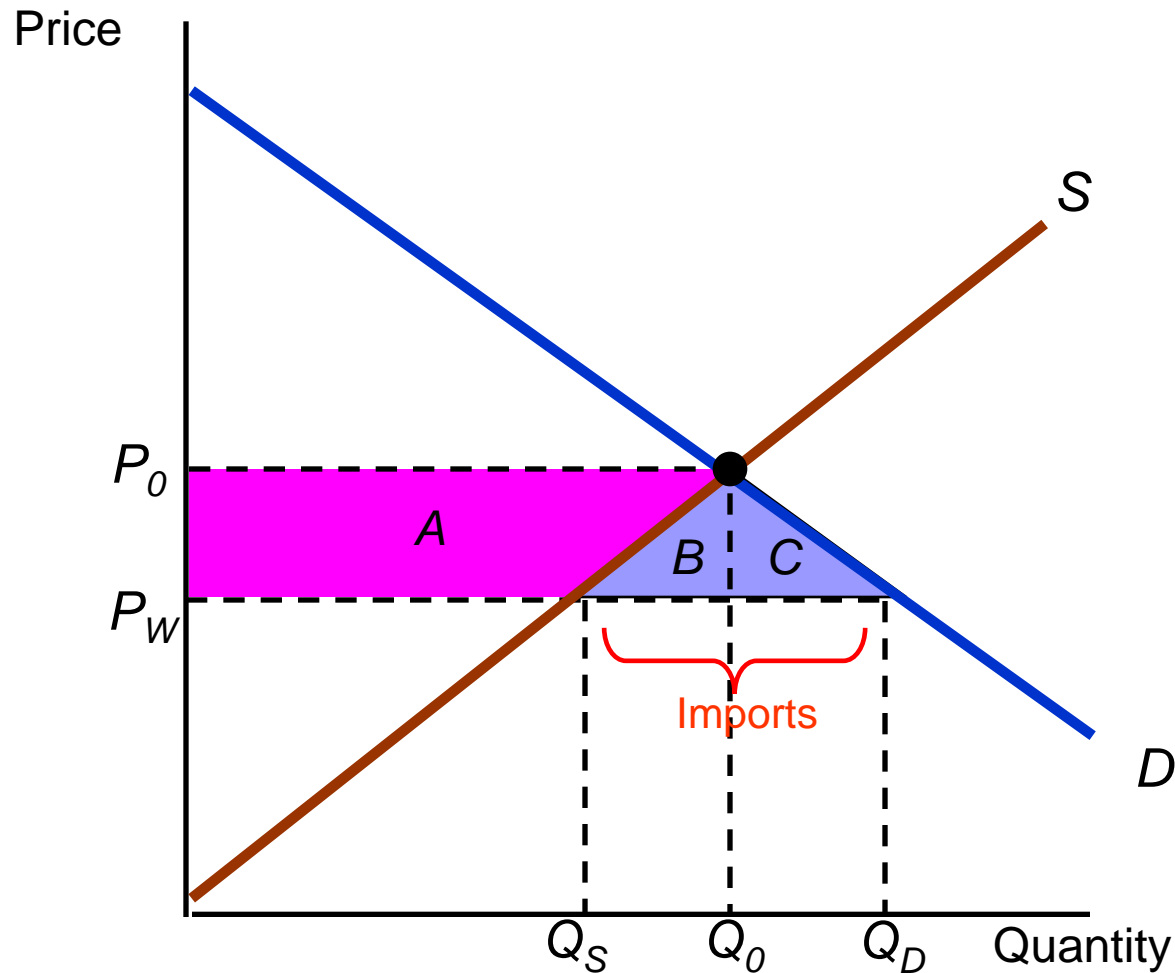
Import Quotas and Tariffs

- Many countries use import quotas and tariffs to keep the domestic price of a product above world levels
 - ▣ Import quotas: Limit on the quantity of a good that can be imported
 - ▣ Tariff: Tax on an imported good
- This allows domestic producers to enjoy higher profits
- Costs to consumers is high

Import Quotas and Tariffs

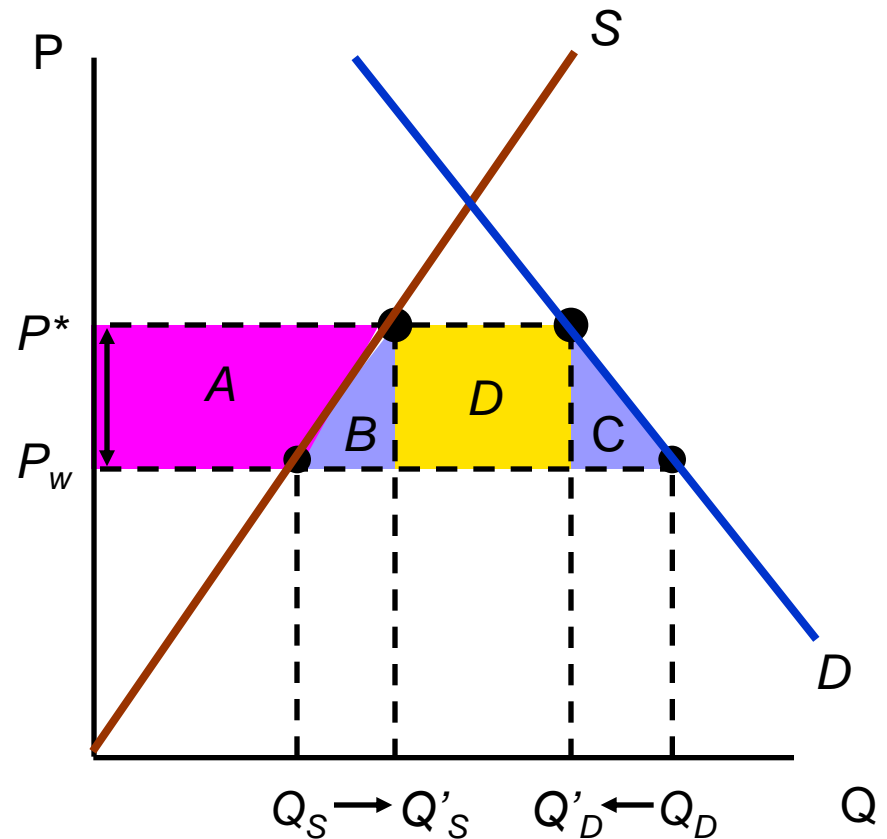
- With lower world price, domestic consumers have incentive to purchase from abroad.
 - ▣ Domestic price falls to world price and imports equal difference between quantity supplied and quantity demanded
- Domestic industry might convince government to protect industry by eliminating imports
 - ▣ Quota of zero or high tariff

Import Tariff To Eliminate Imports



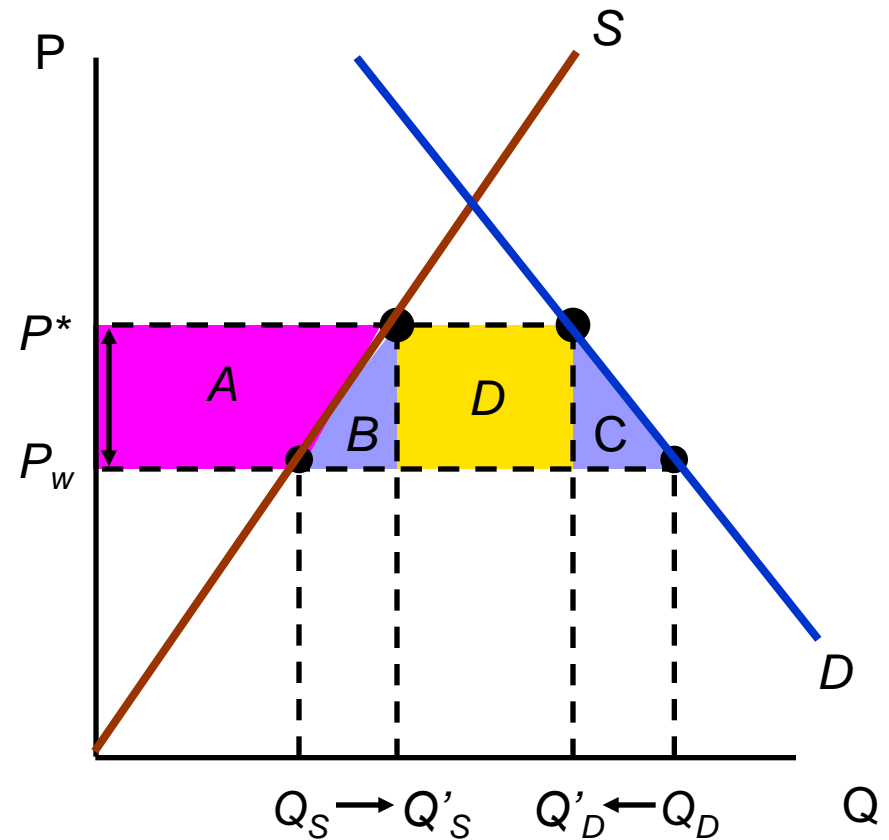
Import Tariff (general case)

- The increase in price can be achieved by a tariff.
- Q_S increases and Q_D decreases
- Area A is the gain to domestic producers.
- The loss to consumers is $A + B + C + D$.
- $DWL = B + C$
- Government Revenue is $D = \text{tariff} * \text{imports}$



Import Quota (general case)

- If a quota is used, rectangle D becomes part of the profits to foreign producers
- Consumers lose $A+B+C+D$
- Producers gain A
- Net domestic loss is $B + C + D$.



The Sugar Quota Example

- The world price of sugar has been as low as 4 cents per pound, while in the U.S. the price has been 20-25 cents per pound.
- Sugar quotas have protected the sugar industry but driven up prices
- Domestic producers have been better off and so have some foreign producers that have quota rights
- Consumers are worse off

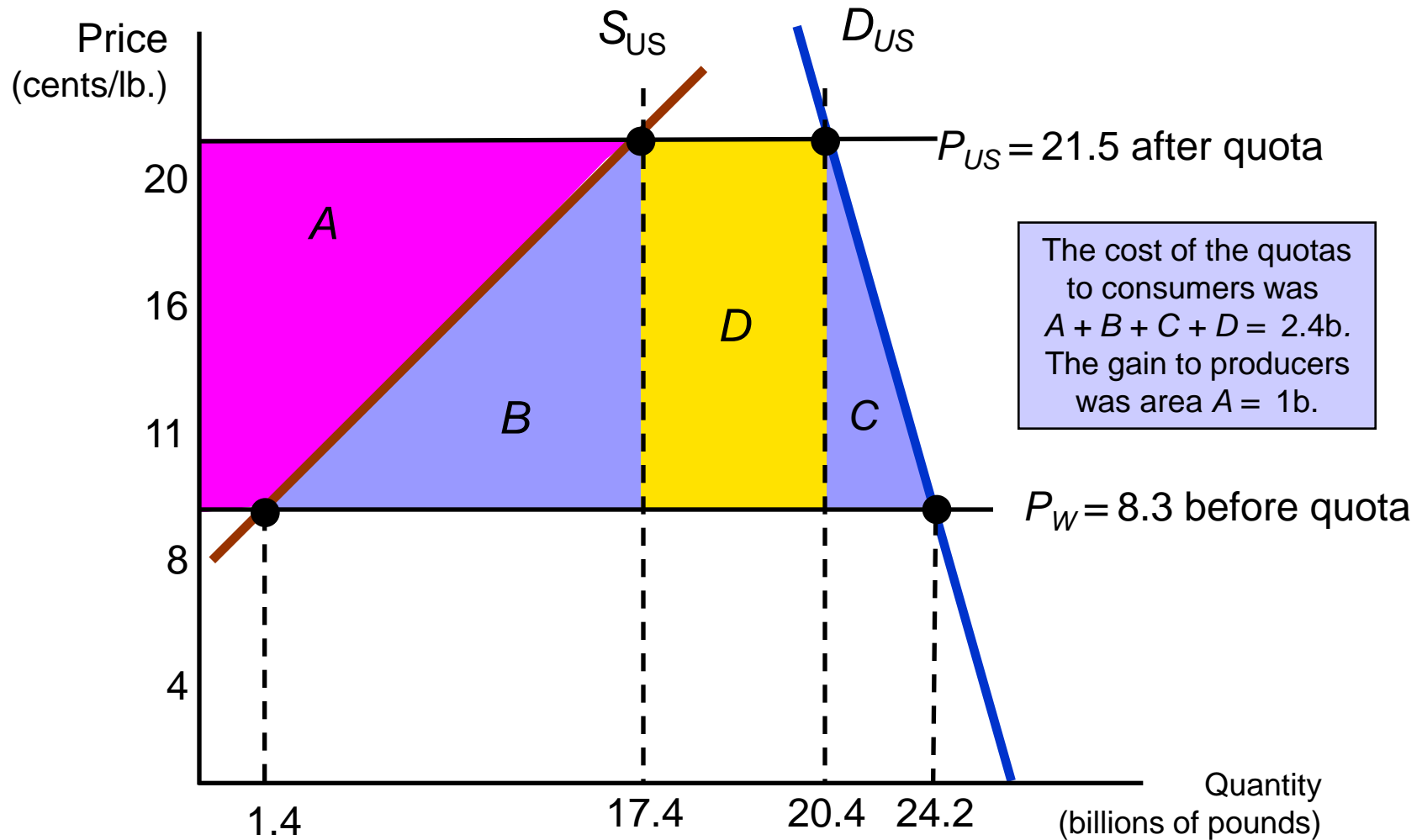
The Sugar Quota Example

- The Impact of a Sugar Quota in 2001
 - U.S. production = 17.4 billion pounds
 - U.S. consumption = 20.4 billion pounds
 - U.S. price = 21.5 cents/pound
 - World price = 8.3 cents/pound
 - Price elasticity of US supply = 1.5
 - Price elasticity of US demand is -0.3

Impact of Sugar Quota

- The data can be used to fit the US supply and demand curves
 - $QS = -8.70 + 1.21P$
 - $QD = 26.53 - 0.29P$
 - World price was 24.2 million pounds leading to little domestic supply and most domestic consumption coming from large imports
 - Government restricted imports to 3 billion pounds raising price to 21.5 cents/pound

Sugar Quota in 1997



The Impact of a Tax or Subsidy

- The government wants to impose a 1.00 tax on movies. It can do it two ways
 - ▣ Make the producers pay 1.00 for each movie ticket they sell
 - ▣ Make consumers pay 1.00 when they buy each movie
- In which option are consumers paying more?

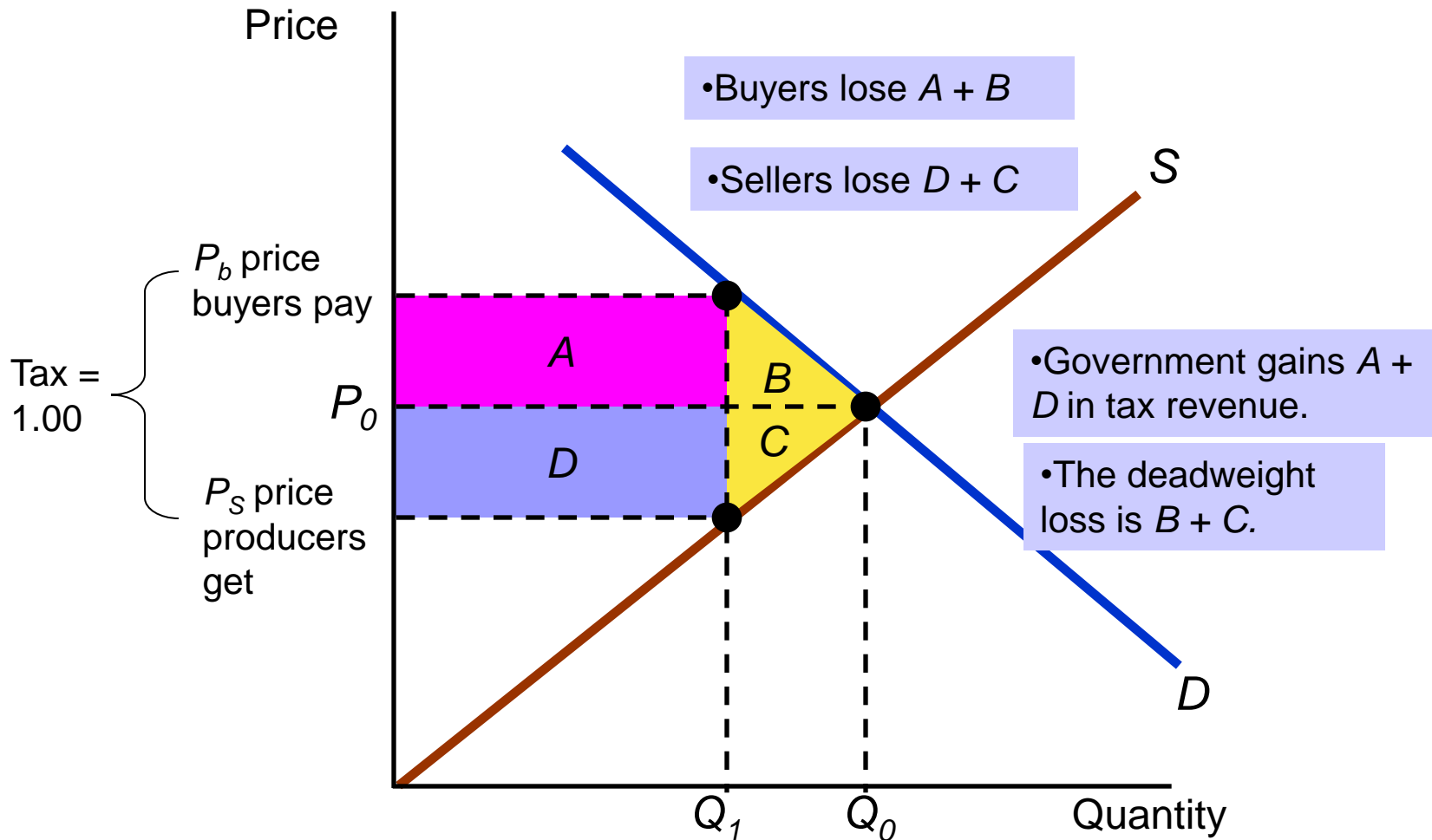
The Impact of a Tax or Subsidy

- The burden of a tax (or the benefit of a subsidy) falls partly on the consumer and partly on the producer.
- How the burden is split between the parties depends on the relative elasticities of demand and supply.

The Effects of a Specific Tax

- For simplicity we will consider a **specific tax** on a good
 - ▣ Tax of a particular amount per unit sold
 - ▣ Federal and state taxes on gas and cigarettes
- For our example, consider a specific tax of t per widget sold

Incidence of a Specific Tax



Incidence of a Specific Tax

- Four conditions that must be satisfied after the tax is in place:
 1. Quantity sold and buyers price, P_b , must be on the demand curve
 - Buyers only concerned with what they must pay
 2. Quantity sold and sellers price, P_s , must be on the supply curve
 - Sellers only concerned with what they receive

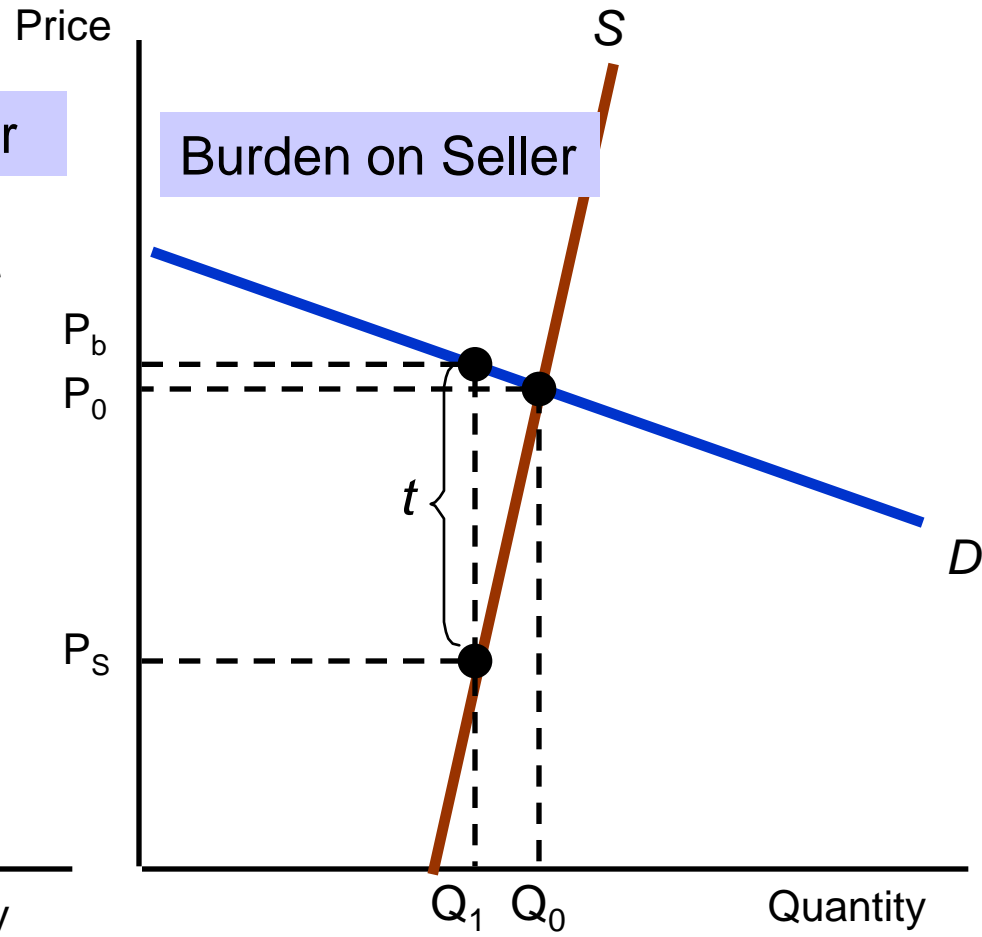
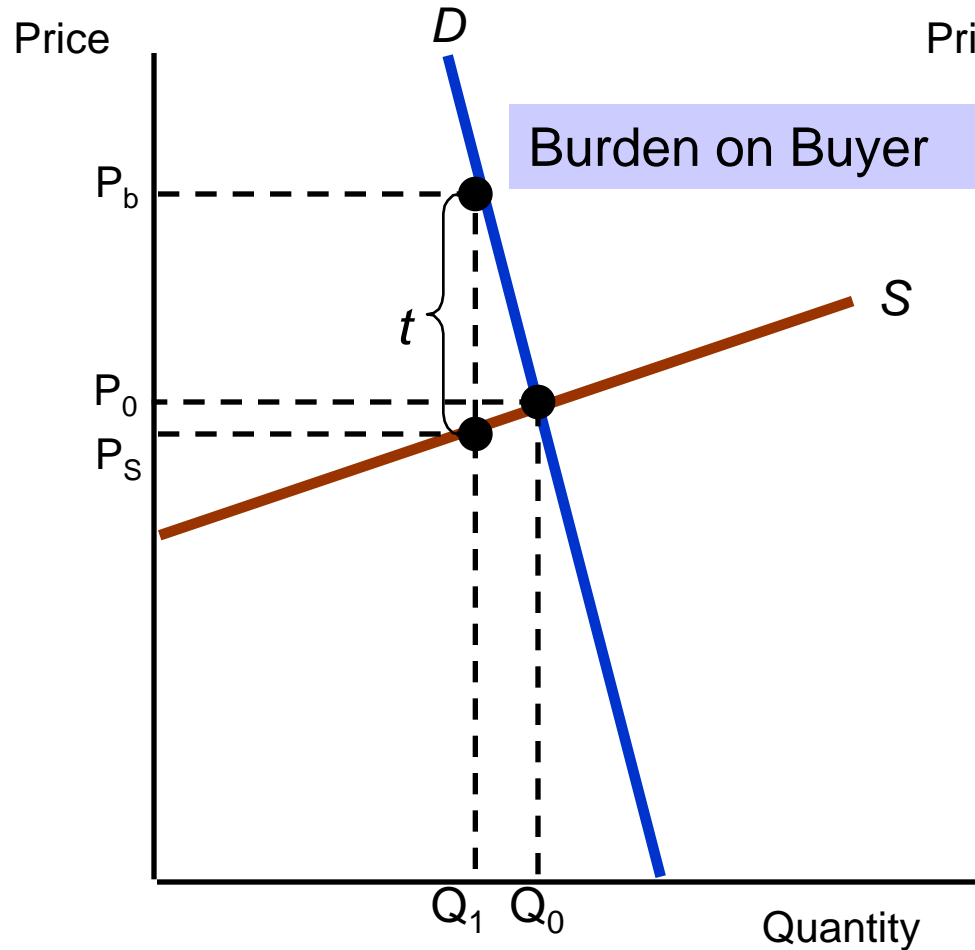
Incidence of a Specific Tax

- Four conditions that must be satisfied after the tax is in place (cont.):
 3. $Q^D = Q^S$
 4. Difference between what consumers pay and what buyers receive is the tax
- If we know the demand and supply curves as well as the tax, we can solve for P_B , P_S , Q^D and Q^S

Incidence of a Specific Tax

- In the previous example, the tax was shared almost equally by consumers and producers
- If demand is relatively inelastic, however, burden of tax will fall mostly on buyers
 - ▣ Cigarettes
- If supply is relatively inelastic, the burden of tax will fall mostly on sellers

Impact of Elasticities on Tax Burdens



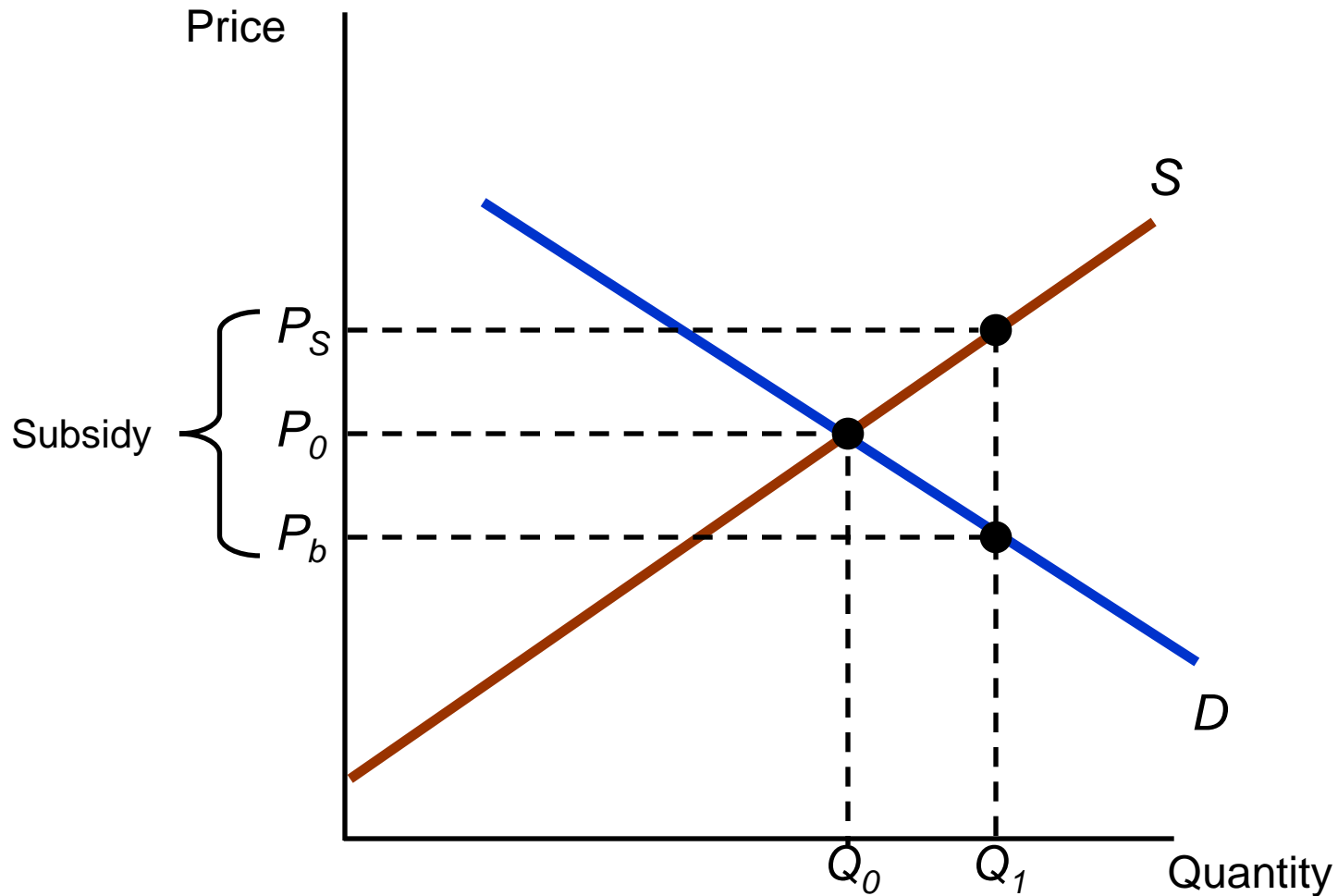
The Impact of a Tax or Subsidy

- We can calculate the percentage of a tax borne by consumers using pass-through fraction
 - $E_s / (E_s - E_d)$
 - Tells fraction of tax “passed through” to consumers through higher prices
 - For example, when demand is perfectly inelastic ($E_d = 0$), the pass-through fraction is 1 – consumers bear 100% of tax.

The Effects of a Tax or Subsidy

- A **subsidy** can be analyzed in much the same way as a tax.
 - ▣ Payment reducing the buyer's price below the seller's price
- It can be treated as a negative tax.
- The seller's price exceeds the buyer's price.
- Quantity increases

Effects of a Subsidy



Effects of a Subsidy

- The benefit of the subsidy accrues mostly to buyers if E_d / E_s is small.
- The benefit of the subsidy accrues mostly to sellers if E_d / E_s is large.
- As with a tax, using supply and demand curves, and the size of the subsidy, one can solve for resulting prices and quantities.

A Tax on Gasoline

- We can measure the effects of a tax by looking at an example of a gasoline tax
- The goal of a large gasoline tax is
 - ▣ Raise government revenue
 - ▣ Reduce oil consumption and reduce US dependence on oil imports
- We will consider a gas tax in the market during mid-1990's

A Tax on Gasoline

- Measuring the Impact of a 50 Cent Gasoline Tax
 - Intermediate-run E_p of demand = -0.5
 - $Q^D = 150 - 50P$
 - E_p of supply = 0.4
 - $Q^S = 60 + 40P$
 - $Q^S = Q^D$ at 1 and 100 billion gallons per year (bg/yr)

A Tax on Gasoline

- With a 50 cent tax

$$Q_D = Q_S$$

$$150 - 50P_b = 60 + 40P_S$$

$$150 - 50(P_S + 0.50) = 60 + 40P_S$$

$$P_S = .72$$

$$P_b = P_S + 0.50 = 1.22$$

$$Q_D = Q_S = 89 \text{ bg/yr}$$

A Tax on Gasoline

- With a 50 cent tax
 - Q falls by 11%
 - Price to consumers increase by 22 cents per gallon
 - Producers receive about 20 cents per gallon less
 - Both producers and consumers were opposed to the tax
 - Government revenue would be significant at 44.5 billion per year

Impact of a 50 cent Gasoline Tax

