Chapter 2: Supply and Demand

This chapter: Overview

- Review of basic concepts Econ 103

- But essentially builds on results of Chapters 4 and 11!

- Context: Perfectly competitive markets → consumers and firms are price takers

Organization

- The law of demand and the law of supply

- Market equilibrium, excess demand, and excess supply

- Application: The implications of taxation (tax incidence)

Market

- The buyers and sellers of a good or service
- Practice: difficult to define where market begins or ends

"The <u>market demand function</u> expresses the relationship between the total quantity demanded and the price of the product per unit of time, other things remaining the same."

❑**Prices along the demand function represent the maximum amounts buyers will pay.**

Movement Along A Demand Function:

Price

5 ⋯ A

2 ⋯ B

$Q_d=D(P)$

0   10 ⟶ 23   **Quantity per day**
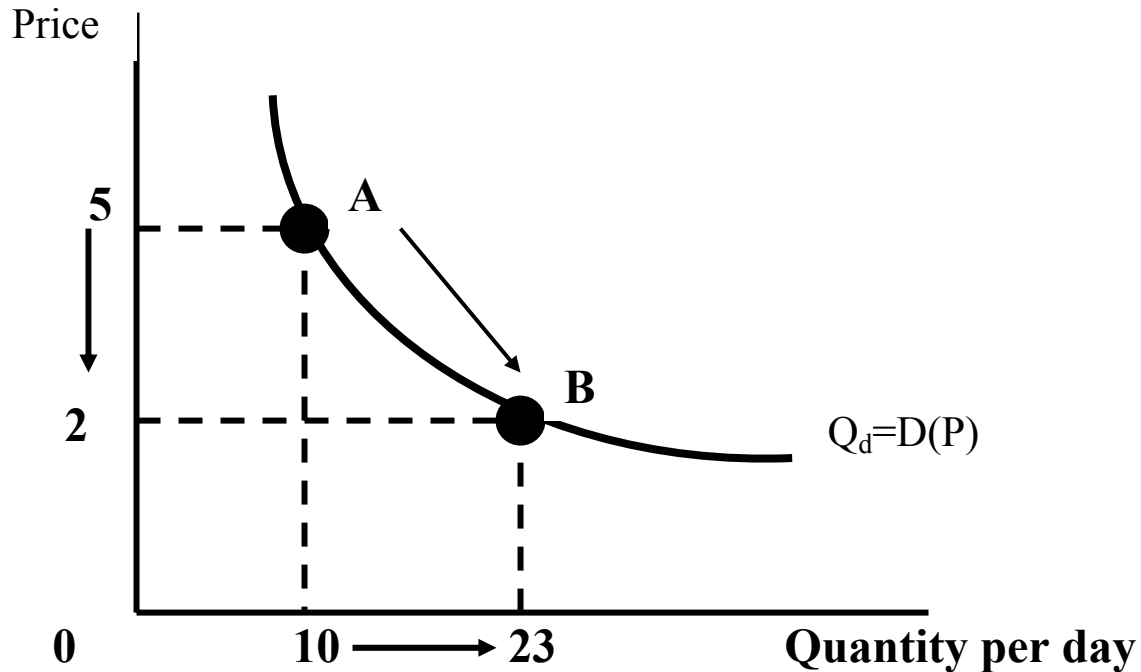
❑Generally, total quantity demanded increases when the price of the good decreases.

❑This can be illustrated graphically as a <u>movement</u> along the demand function.

❑A movement along a demand function always involves a change in the price of the good and a change in the total quantity <u>demanded</u> of that good.

This relationship between price and the quantity demanded is called the **<u>Law of Demand.</u>**

❑The increase in the quantity demanded is due to increased consumption by current consumers and new consumers.

The law of demand: "The empirical observation that when the price of a product falls, people demand larger quantities of it."

The Law of demand and the law of supply

FIGURE 2-1 The Demand Curve for Lobsters in Shediac, N.B., July 20, 2020

The demand curve tells the quantities buyers will wish to purchase at various prices. Its key property is its downward slope; when price falls, the quantity demanded increases. This property is called the law of demand.

Price ($/lobster)

D

10

8

6

4

2

D

0   1   2   3   4   5

Quantity (1000s of lobsters/c
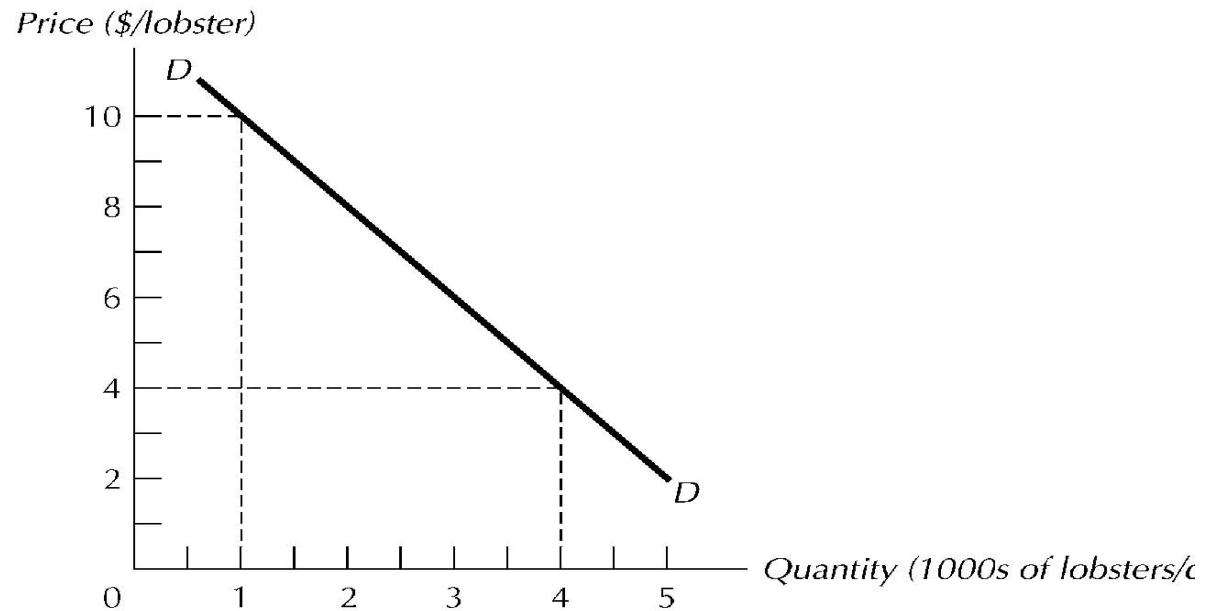
►The above example happens to be *linear*, but demand curves are usually non-linear.

►The key property is that they are downward sloping: as price of the good decreases, quantity demanded increases.

►The negative slope of the demand curve reflects how people will presumably respond to price increases.

Example: When price increases, we assume (1) individuals will switch to close substitutes and/or (2) buy less because they are not *able* to buy as much as before due to the fact there is no concurrent change in income.

Shifts in the Demand Function

Price is not the only variable that determines the total quantity demanded of a good.

However, changes in any determinant other than price cause the demand function to **shift**.

Such **shifts** are due to changes in:

❏consumer income

❏the prices of other goods - substitutes or complements
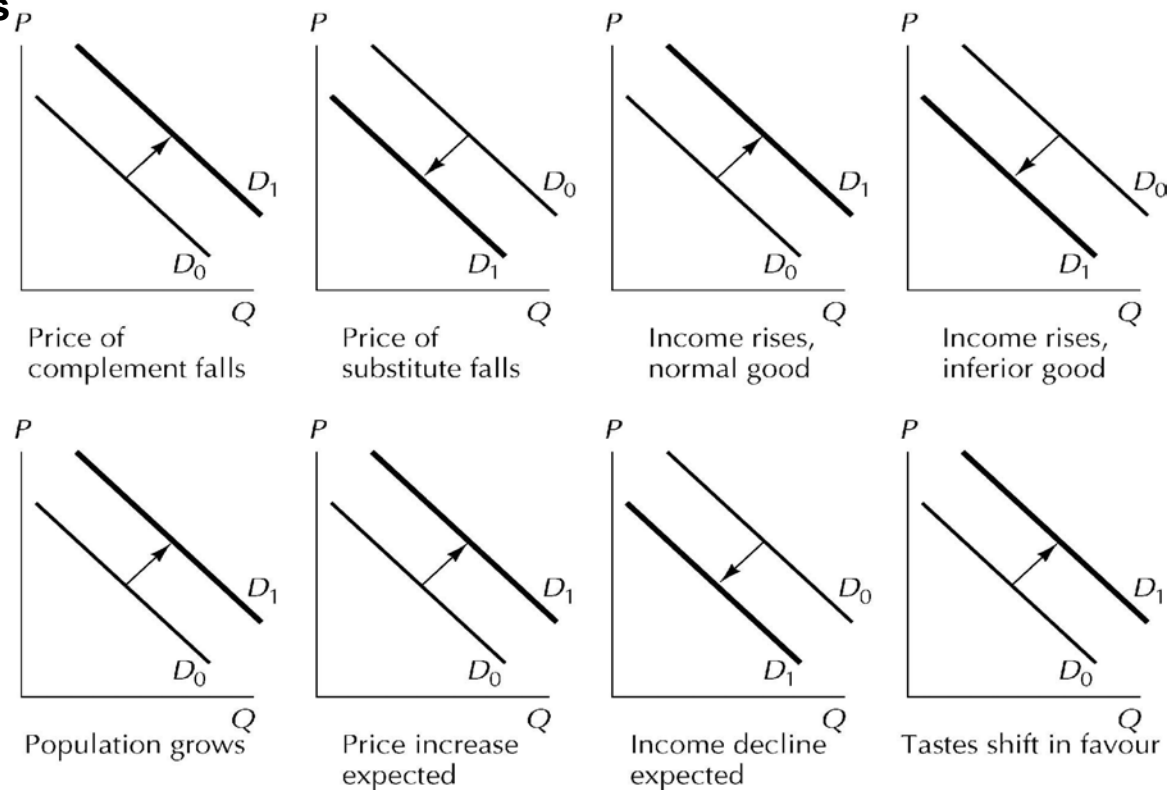
❏tastes or preferences of consumers

Price

←

$\boxed{\textit{Price did not change}}$

shift →

P_1

D_2

D_1

Quantity

0   Q_1 Q_2
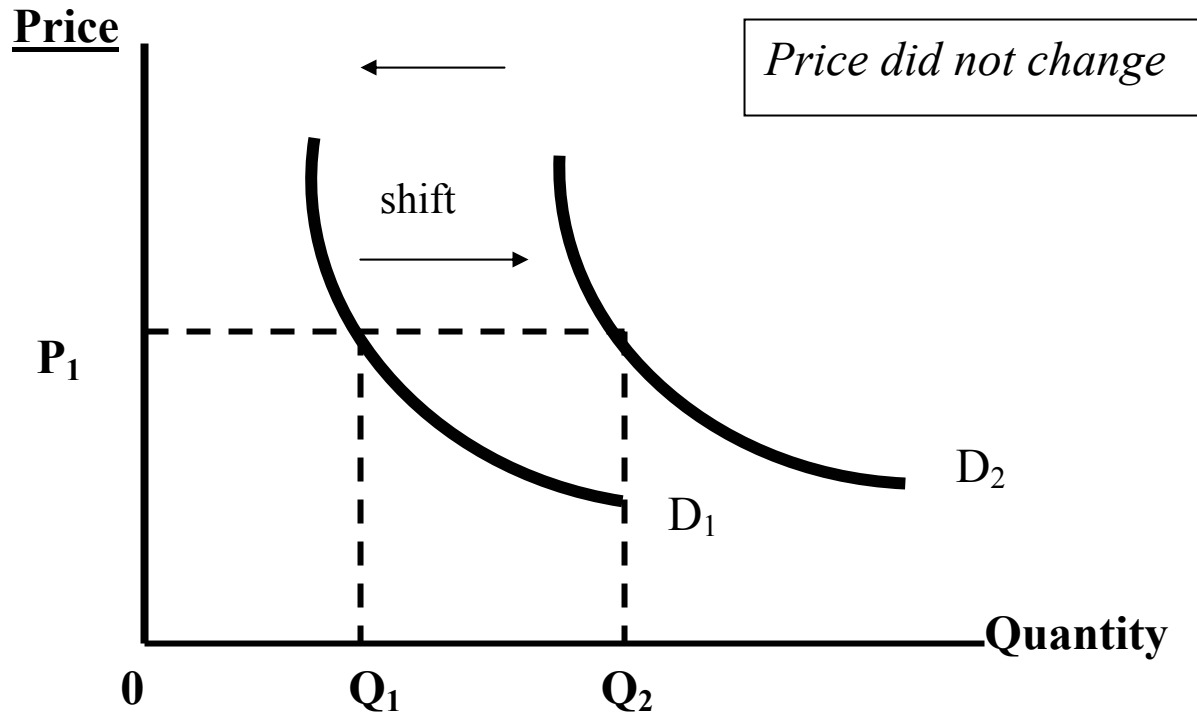
At each price, the quantity demanded increases.

Determinants of demand

FIGURE 2-8
Factors that Shift Demand Curves

Prices of substitutes and
complements, incomes,
population, expectation of
future price and income
changes, and tastes all
influence the position of
the current demand curve
for a product.

Price of
complement falls

Price of
substitute falls

Income rises,
normal good

Income rises,
inferior good

Population grows

Price increase
expected

Income decline
expected

Tastes shift in favour

Note: "*change in demand*" means "change of the demand curve", i.e. not "change in quantity demanded"

Market Supply Function

The **market supply function** represents the total quantity supplied at each price by all producers in the market per unit of time, everything else remaining the same.

The quantity supplied is not fixed by the production capabilities of the firm.

Rather a **higher price** induces the suppliers to increase production and therefore increase supply.

"The supply function expresses the relationship between the total quantity supplied and the price received by all suppliers per unit of time, holding other factors constant."

❑The market supply function illustrates how suppliers react to price changes

Movements Along the Supply Function

Price

$Q_s=S(P)$

B

5

A

2

0   10 ⟶ 23   **Quantity per day**
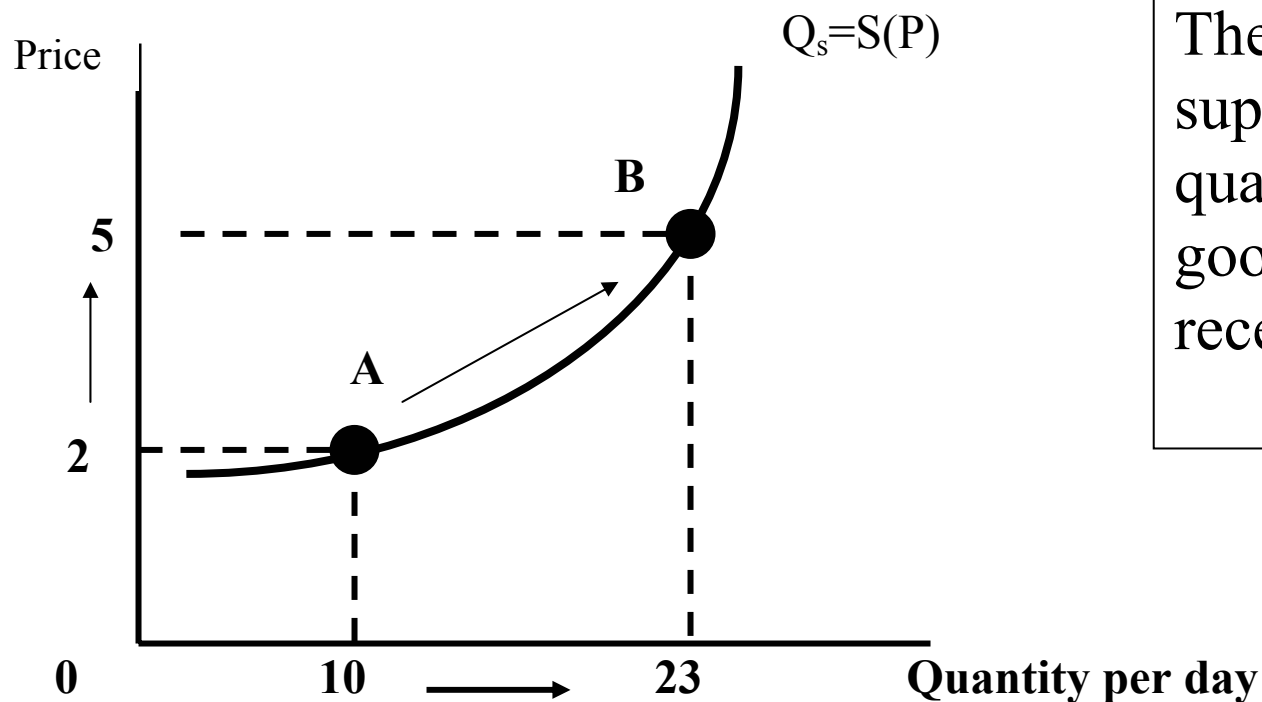
The diagram shows that suppliers will produce quantity Q_1 units of a good if the price they receive is P_1.

If suppliers can receive P_2, they will supply Q_2 units.

Changes in price and resulting quantity of the goods supplied result in a **movement** along the supply function.

What Does *Law Of Supply* Mean?
A microeconomic law stating that, all other factors being equal, as the price of a good or service increases, the quantity of goods or services offered by suppliers increases and vice versa.
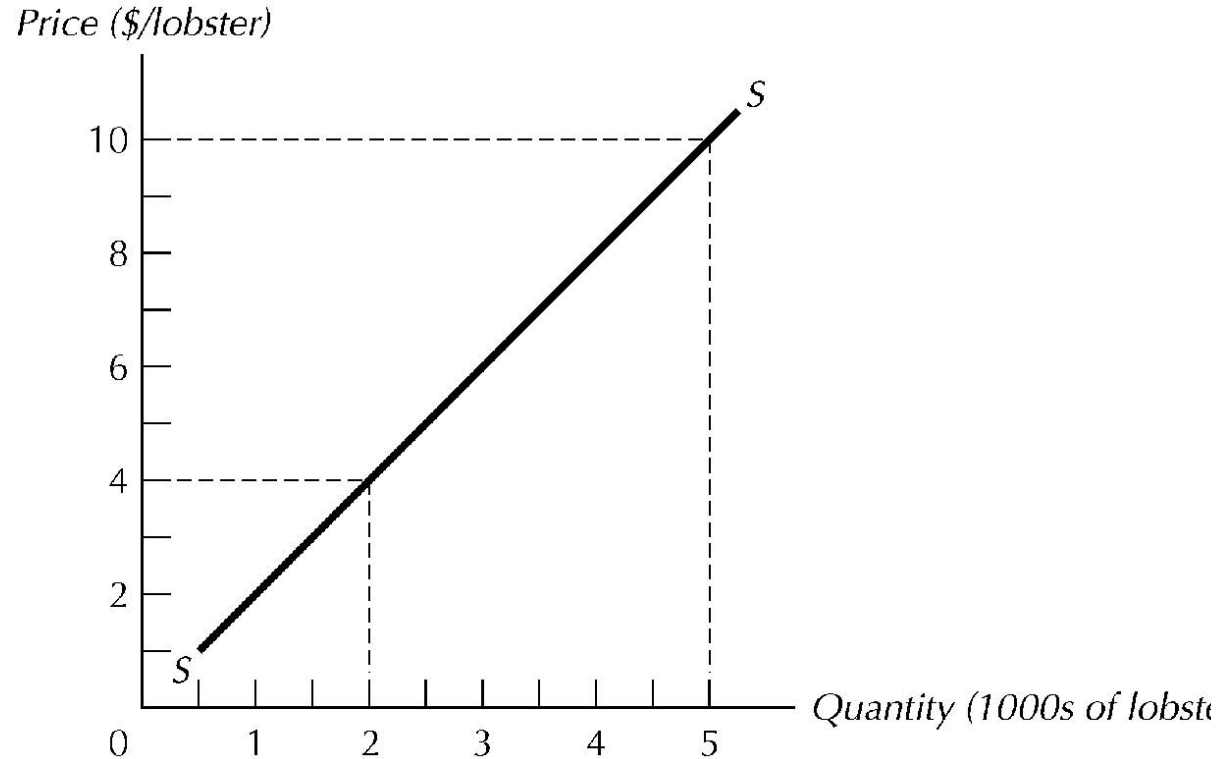

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The law of supply

FIGURE 2-2

A Supply Schedule for Lobsters in Shediac, N.B., July 20, 2020

The upward slope of the supply schedule reflects the fact that costs tend to rise when producers expand production in the short run.
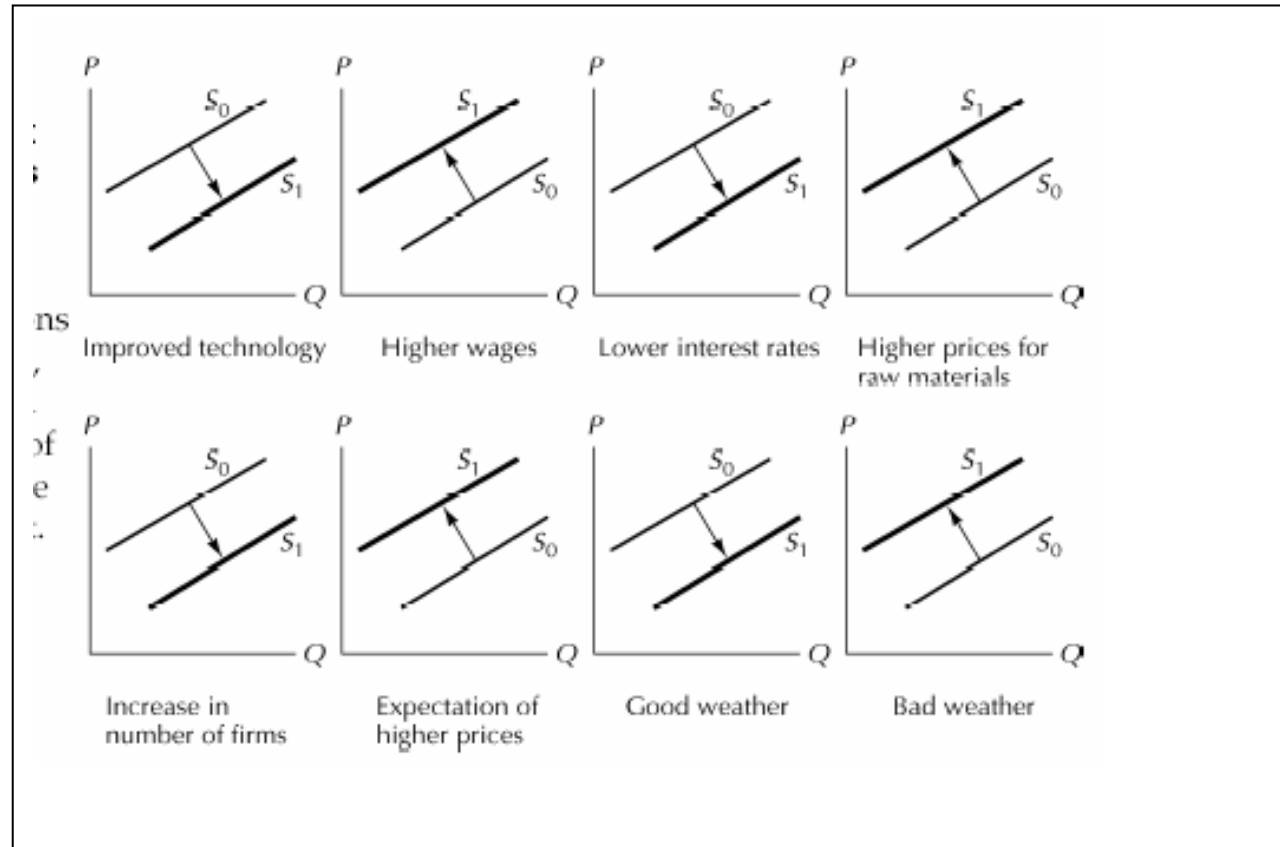

Price ($/lobster)

Quantity (1000s of lobst

# Determinants of supply

FIGURE 2-9

Factors That Shift
Supply Schedules

Technology, input
prices, the number
of firms,
expectations about
future prices, and
the weather all
affect the position
of the supply
schedule for a
given product.

Improved technology   Higher wages   Lower interest rates   Higher prices for raw materials

Increase in number of firms   Expectation of higher prices   Good weather   Bad weather

Market Equilibrium: In a *competitive market* there is only <u>one</u> point where quantity demanded **equals** quantity supplied.

"A market equilibrium exists when the quantity demanded equals the quantity supplied."
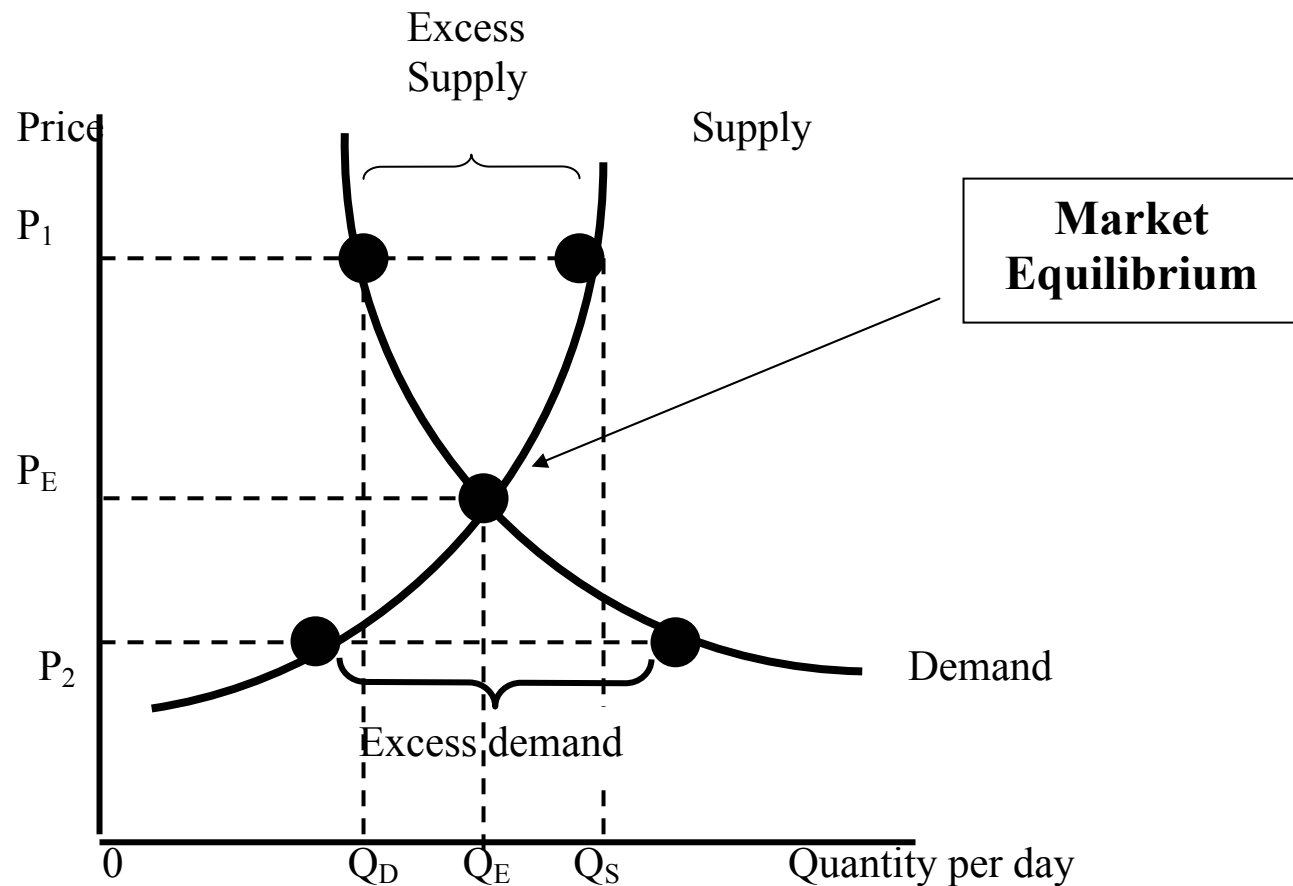
Market Equilibrium

Equilibrium

FIGURE 2-3

**Equilibrium in the
Lobster Market**

The intersection of the
supply and demand
curves represents the
price-quantity pair at
which all participants in
the market are "satisfied":
buyers are buying the
amount they want to buy
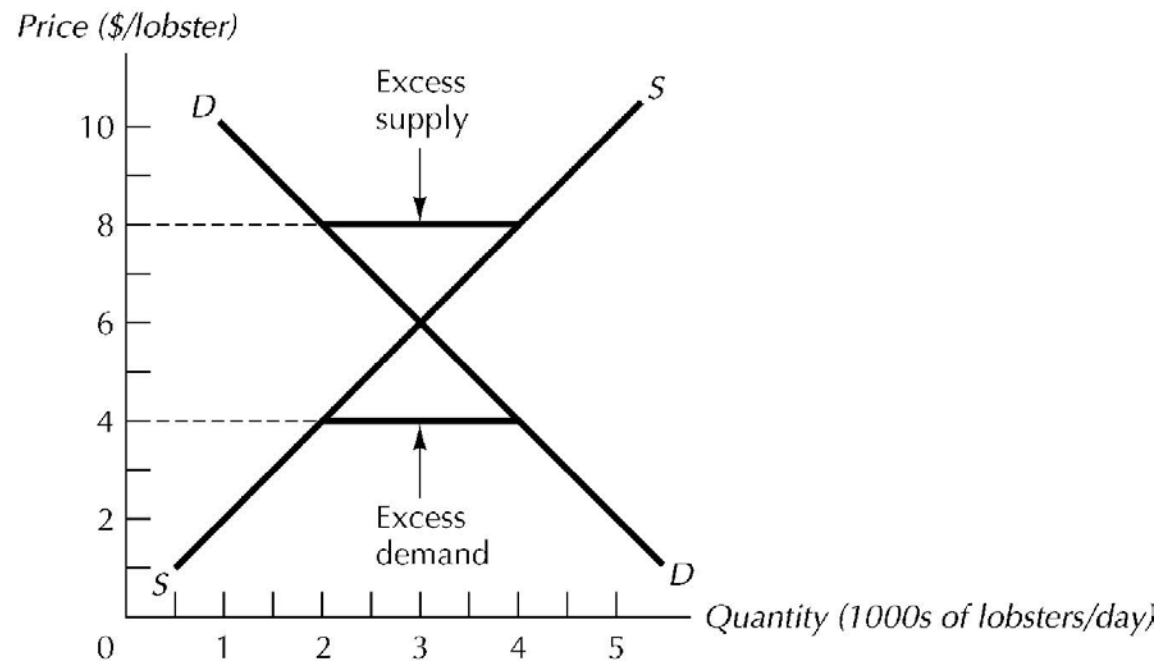at that price, and sellers
are selling the amount
they want to sell.

Price ($/lobster)

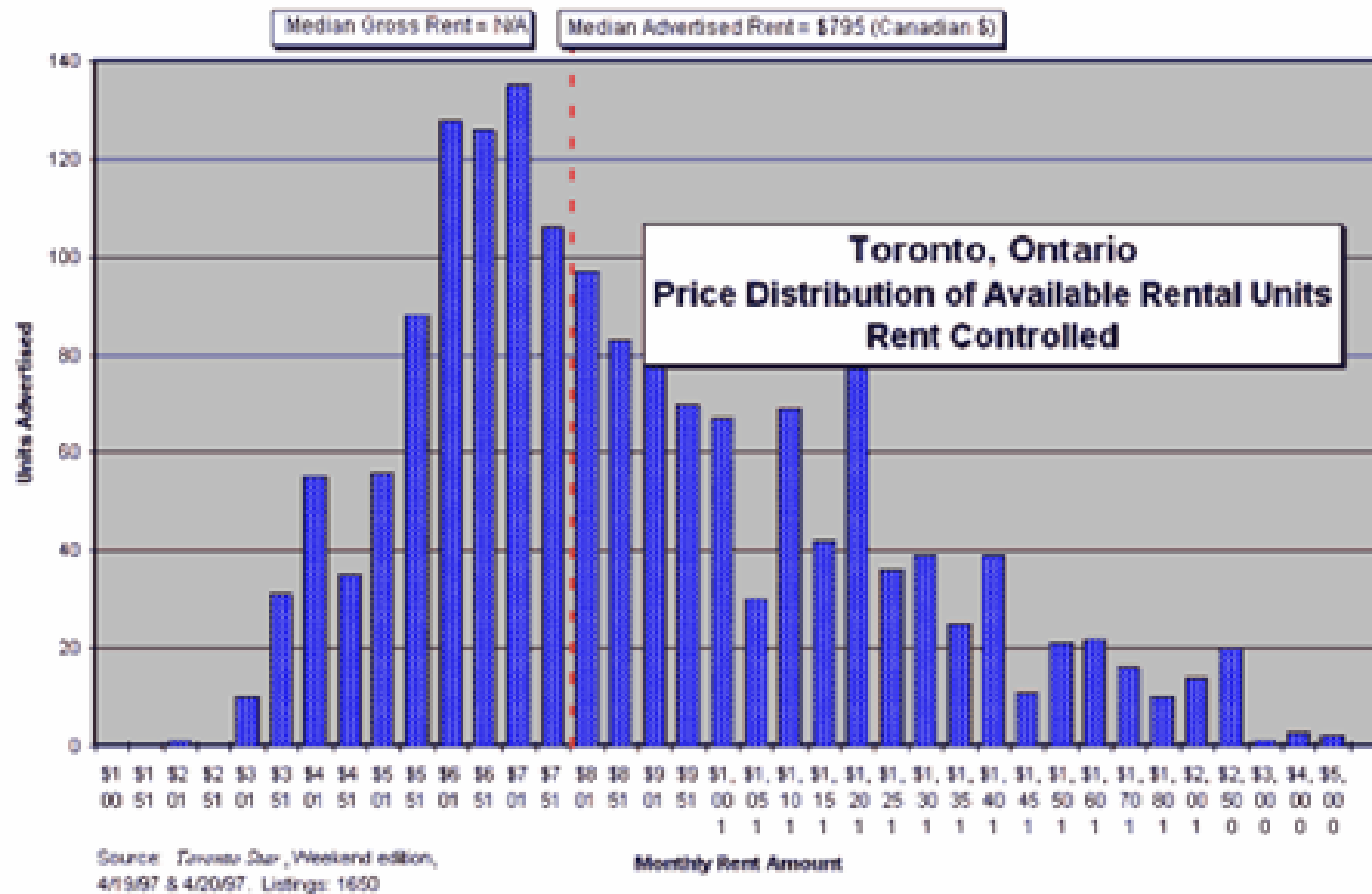*Quantity (1000s of lobsters/day)*
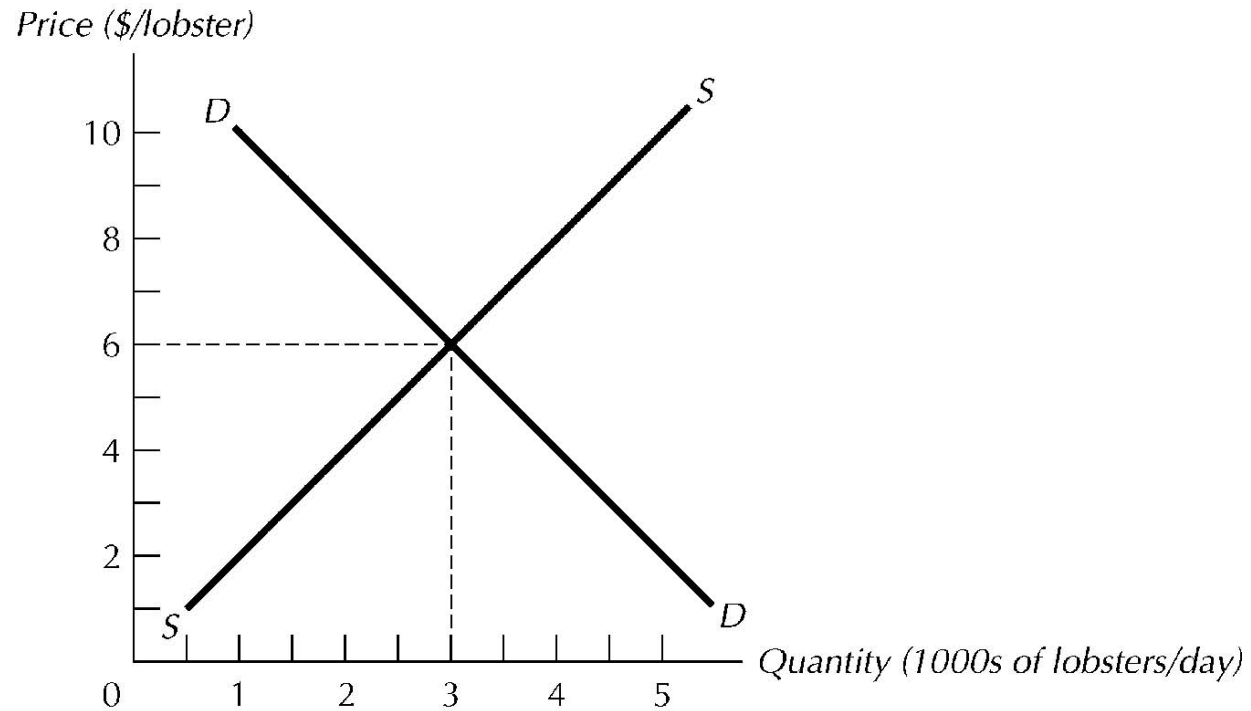
Disequilibrium

FIGURE 2-4

Excess Supply and Excess Demand

When price exceeds the equilibrium level, there is excess supply, or surplus. When price is below the equilibrium level, there is excess demand, or shortage.

Question: Compute the excess demand or excess supply at prices P=4 and P=10 if demand and supply and given by P=12-2Q and P=4Q, respectively.

Median Gross Rent = N/A   Median Advertised Rent = $795 (Canadian $)

Toronto, Ontario
Price Distribution of Available Rental Units
Rent Controlled

Source: Toronto Star, Weekend edition, 4/19/97 & 4/20/97. Listings: 1650

Monthly Rent Amount

Rent control is a disease of the mind that soon becomes a disease of the market. Those cities that resist infection --merely by having a healthy tolerance for the rights of others--are rewarded with a normal competitive housing market in which housing is available at every price level. Those cities that succumb to the disease of rent control are doomed to never-ending, house-to-house warfare over an everdiminishing supply of unaffordable housing. Public policy creates its own rewards.

Properties of market equilibrium:

- Pareto-efficiency (efficiency): it is not possible to *reallocate* (find trades) that make all agents better off.

    → Efficiency is not equal to Equity or Fairness

Properties of disequilibrium:

- Not Pareto-efficient: it is always possible to reallocate and make some agents better off without harming others

- Consequence: Intervention in markets that lead to disequilibrium imply an efficiency loss (deadweight loss)

►Examples: Price ceiling or price supports

→A solid defense for such measures should therefore hinge on some form of market failure, such as externalities, imperfect competition, or incomplete markets

An example of a price ceiling / maximum price

FIGURE 2-6

Rent Controls

With the rent control level set at $400 a month, there is an excess demand of 40,000 apartments a month.

Rent ($/mo)

$R_c = 400$

Excess demand

Quantity (1000s of apts/mo)
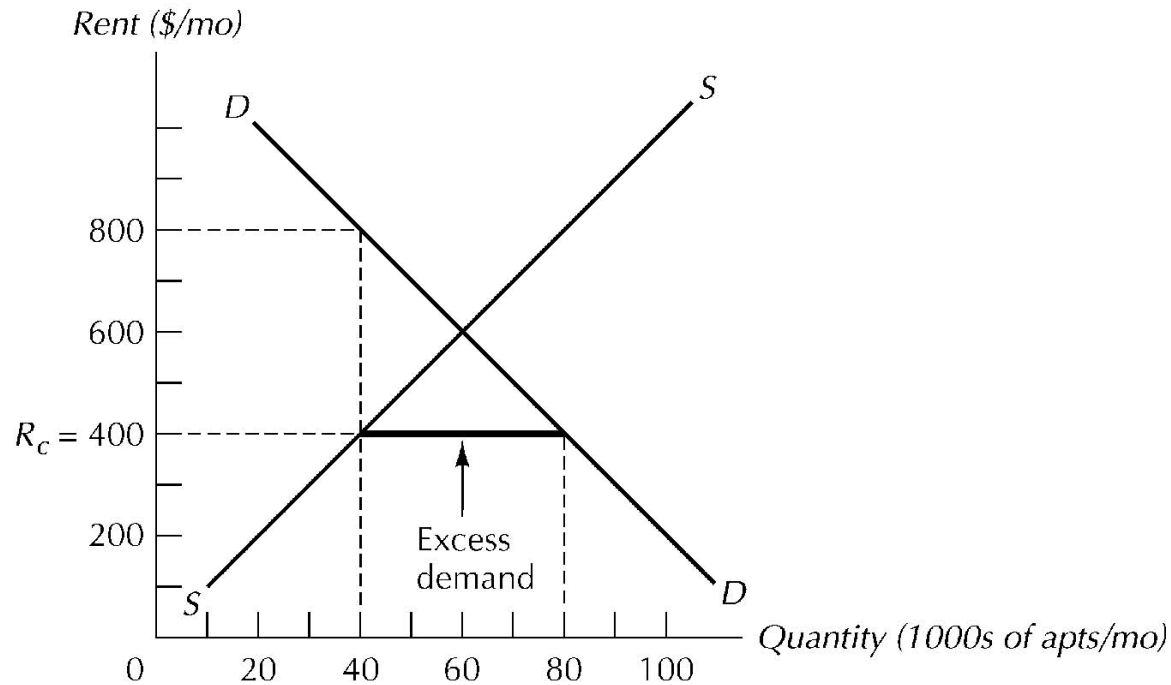
Question: prove that the rent control implies an inefficiency

An example of price support / price floor / minimum price

FIGURE 2-7

A Price Support in the Butter Market

For a price support to have any impact, it must be set above the market-clearing price. Its effect is to create excess supply, which the government then purchases.

Price ($/kg)

Excess supply

$P_s = 4$

Quantity (million kg/yr)
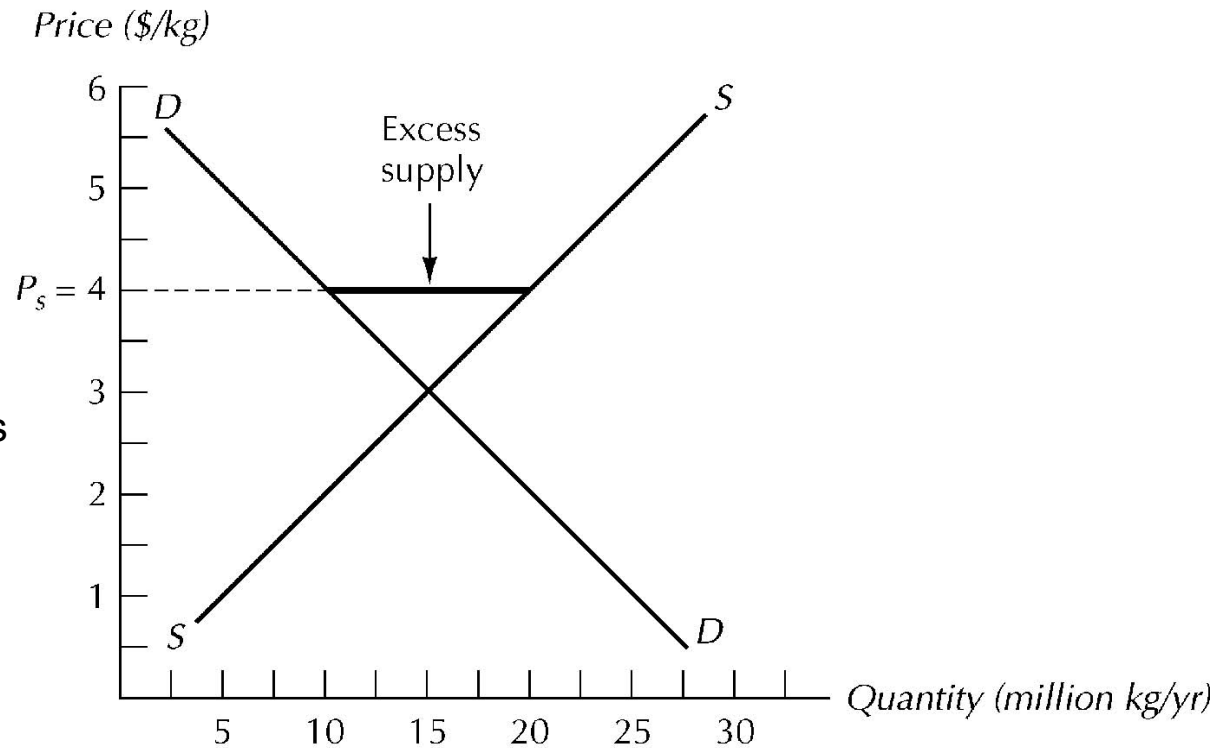
Question: prove that the price floor implies an inefficiency

- This question boils down to saying the price support leads to a *welfare loss* (also termed *deadweight loss*)

The Implications of Taxation

Example 1: Tax per unit sold (GST/PST, gas, alcohol, etc.)

  • Seller usually transfers the tax to the government

FIGURE 2-15

Equilibrium Prices and Quantities When a Tax of T = $10/Unit Is Levied on the Seller

The tax causes a reduction in equilibrium quantity from Q* to Q . The new price paid by the buyer rises from P* to P . The new price received by the seller falls from P* to P – 10.
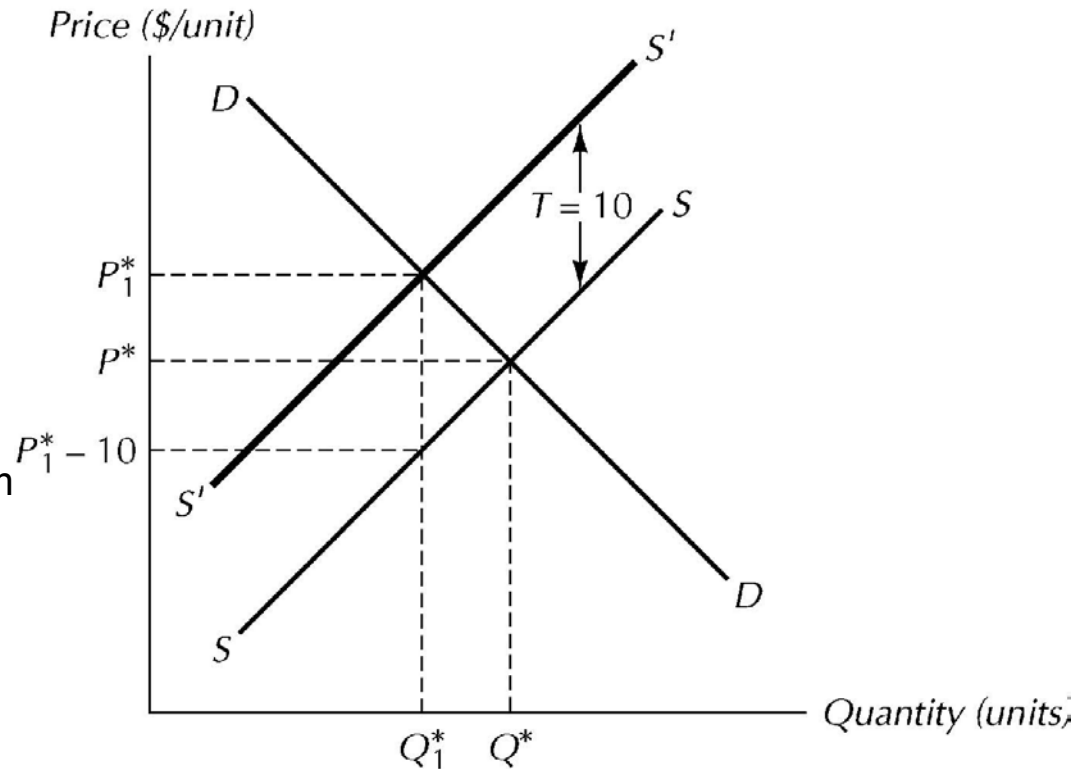

  • Who effectively carries the tax burden? ("tax incidence")

Example 2: buyer transfers the tax (examples?)

FIGURE 2-17

**Equilibrium Prices and Quantities After Imposition of a Tax of T = $10/Unit Paid by the Buyer**

The tax causes a reduction in equilibrium quantity from Q* to Q . The new price paid by the buyer rises from P* to P +10. The new price received by the seller falls from P* to P.

Price ($/unit)

$P_2^* + 10$

P^*

P_2^*

D

D'

S

$T = 10$

D

S

D'

Q_2^* Q^*

Quantity (units)
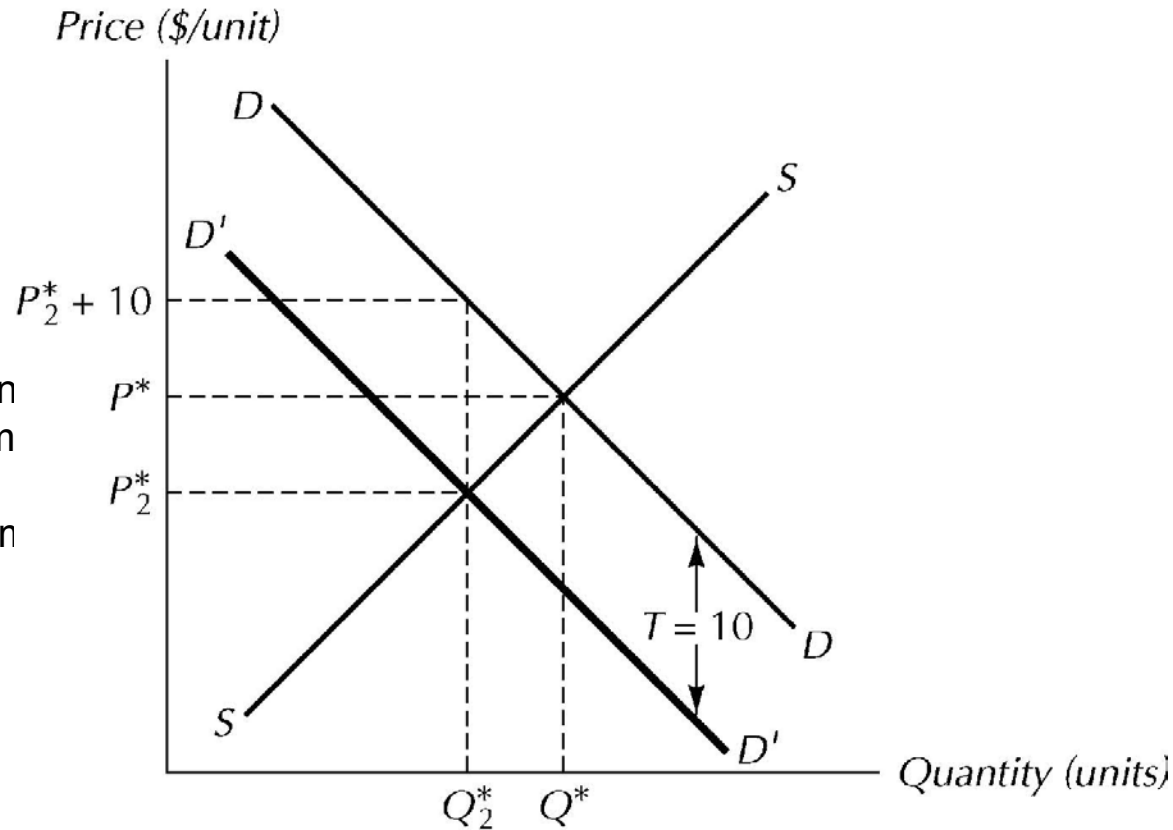
- Question: Does the decision who has to transfer the tax to the government affect the tax incidence?

FIGURE 2-18

A Tax on the Buyer Leads to the Same Outcome as a Tax on the Seller

The price received by sellers (net of the tax), the price paid by buyers (including tax), and the equilibrium quantity will all be the same when the tax is collected from sellers (panel a) as when it is collected from buyers (panel b).
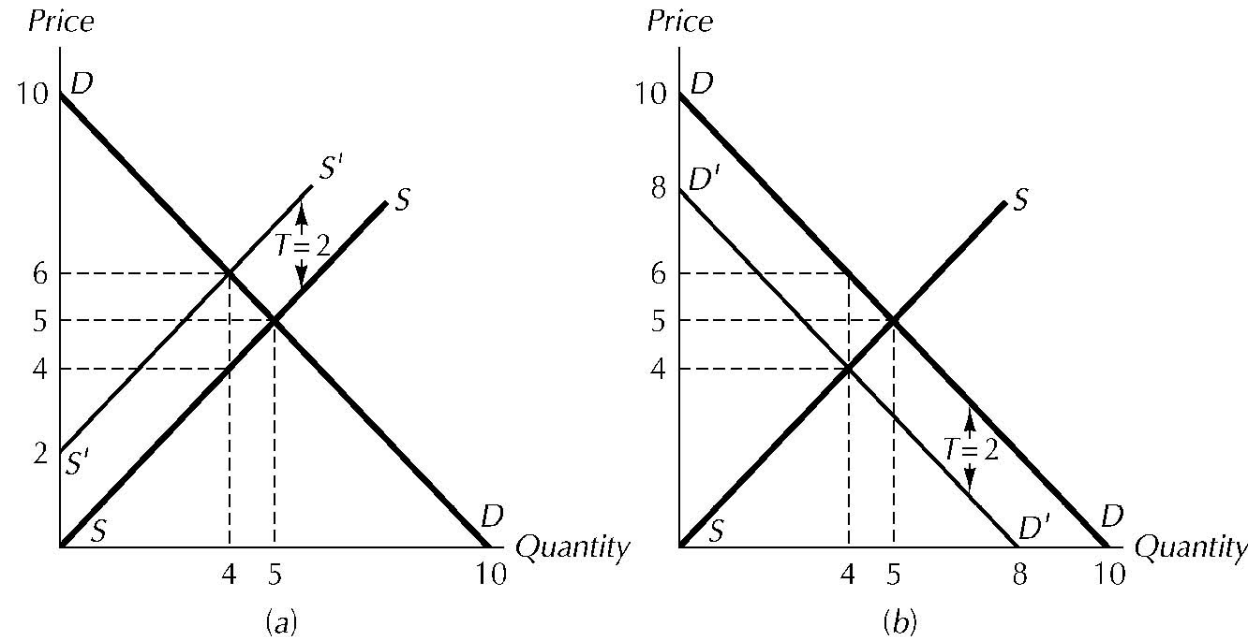
- Answer: No, our analysis shows tax incidence is unaffected
- Why then, do firms usually transfer the GST to the govt?

Taxes, Trade Limitations and Market Restriction On Total Surplus

Total Surplus = consumer surplus + producer surplus

A Per Unit Tax on A Competitive Firm

When a per unit tax is imposed on the firm, the firm's profit function becomes:

Total profit = total revenue - total long-run cost - total taxes
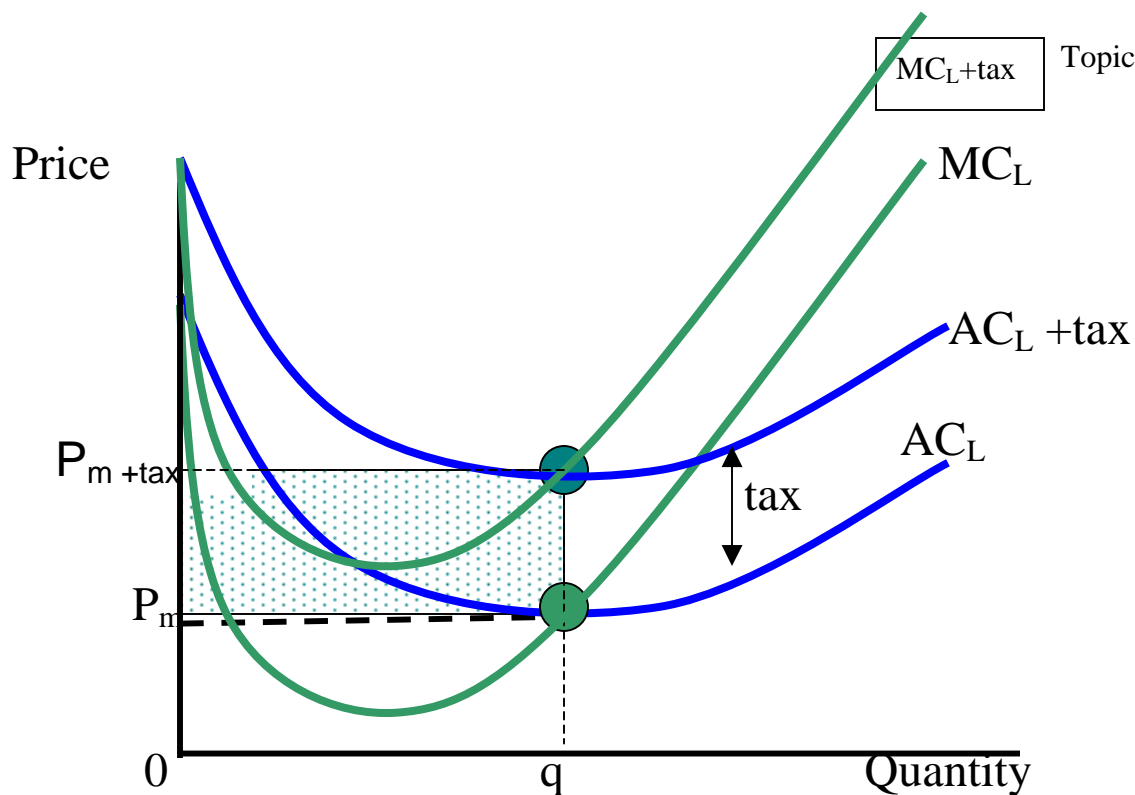
$$\pi(q) = Pq - C_L(q) - tq$$

where tq are total taxes paid by the firm to the government.

(t=tax; q= quantity produced)

In order for the firm to maximize profits, it must produce an output such that it must satisfy:

$$P = \frac{\Delta C_L(q)}{\Delta q} + t$$

The firm considers the per unit tax a cost of doing business. It determines output where price equals the sum of long run MC and t.

For the firm, when it considers the tax as another cost, the long run average cost of the firm becomes AC_L + tax.

The curve is exactly the same as the pre tax LAC curve, only shifted up by the amount of the per unit tax.

The MC function also shifts up by the amount of the tax and becomes MC_L + tax.

Since the average and marginal cost functions shift upward by the amount of the 'tax', the new and old long-run average cost functions reach a minimum at the same quantity produced.

Both long run average cost curves reach a minimum at q.
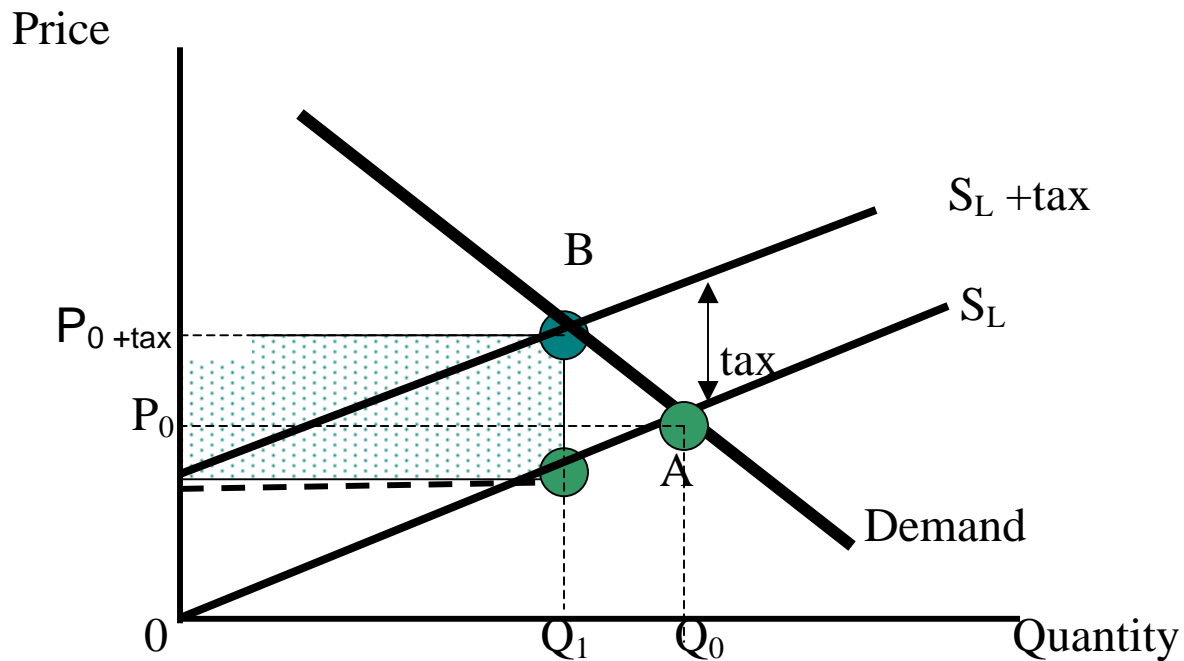
Price

The green box represents the total amount of tax revenue collected by the government.

For the industry, the long-run equilibrium price increases from P_0 to P_0+tax.

The equilibrium quantity produced decreases from Q_0 to Q_1.

By raising the per unit tax, the government increases the price of the product and decreases the quantity demanded.

Before tax, industry output at point A at price P_0.

The amount by which the price increases depends on the price elasticity of demand and of supply.

The greater the price elasticity of demand function, the smaller the price increase caused by a per unit tax.
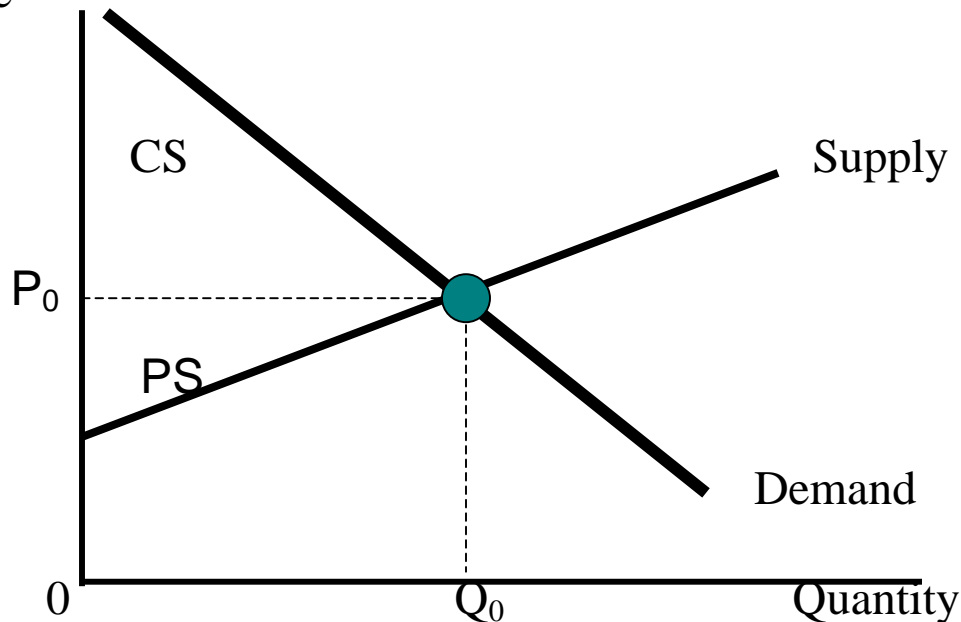
The greater the price elasticity of supply function, the greater the price rise caused by a per unit tax.

Price

S_L +tax

S_L

$P_{0\ +tax}$

B

tax

P_0

A

Demand'

Demand

0   Q_1 Q_0 Quantity
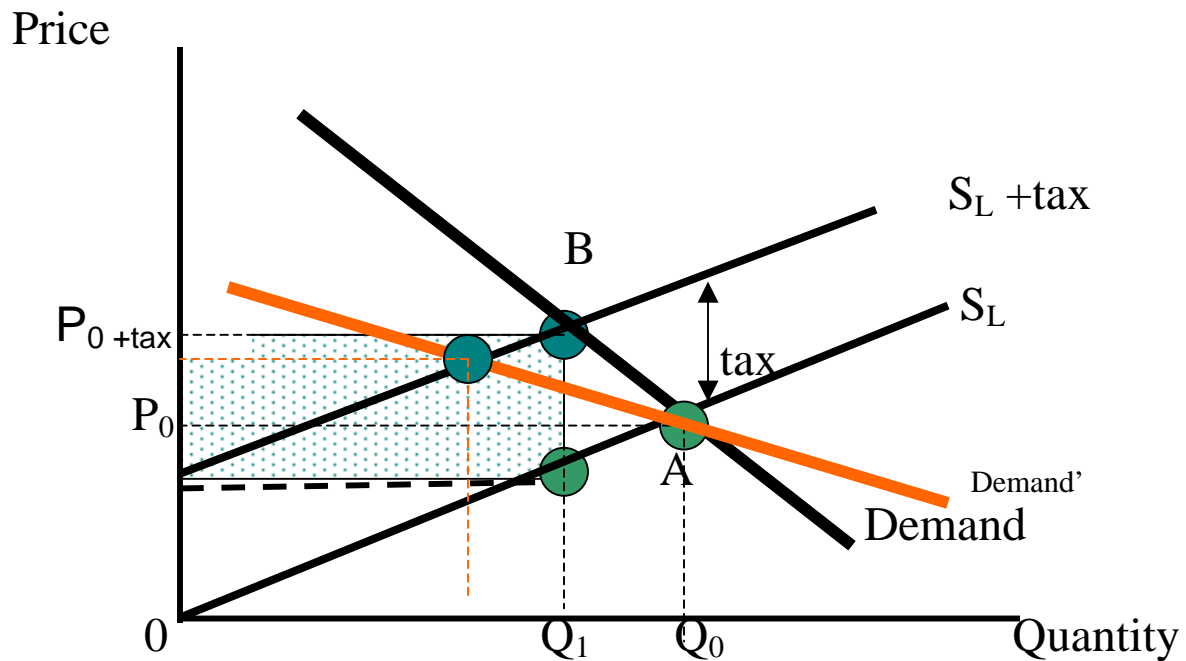
The Effect of A Per Unit Tax on Consumer and Producer Surplus

It has been shown that the behaviour of consumers and producers change when a tax is imposed. Taxes have social consequences.
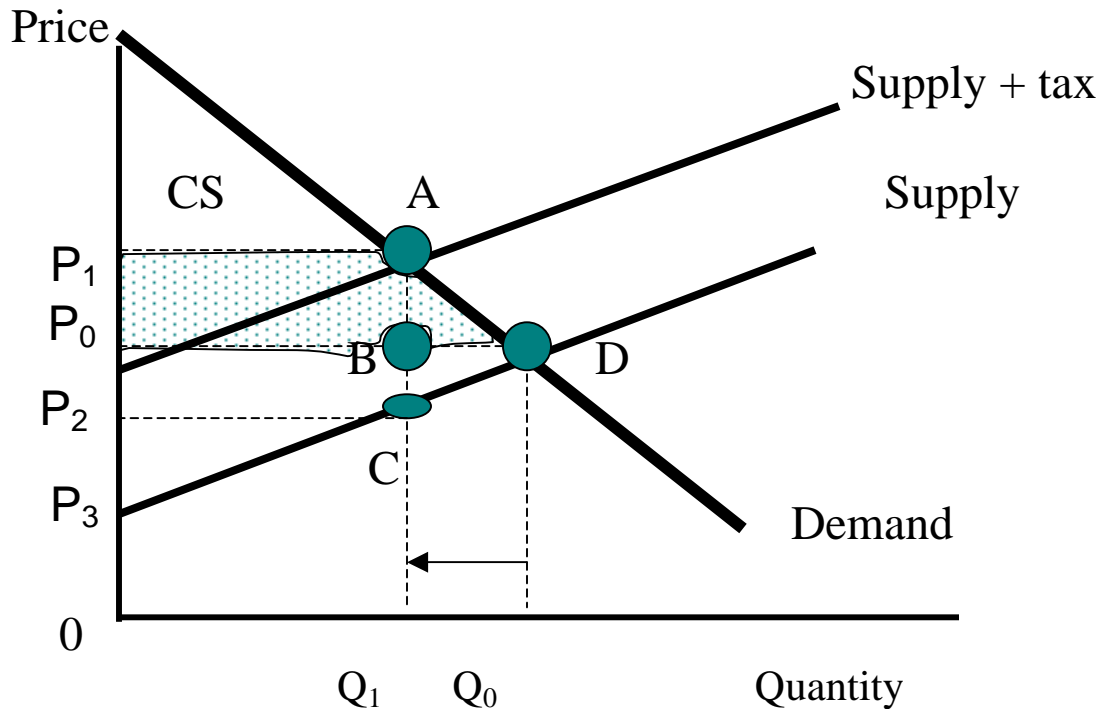
Price

Before the government imposes a per unit tax, the long-run equilibrium price and quantity in a competitive industry are P_0 and Q_0.

Consumers benefit because they are willing to pay more than P_0 for each unit up to the Q_0^{th}. The area between the demand curve and the price measures consumer surplus.

Producers receive P_0 for all the units they sell, even though they are willing to supply all units up to the Q_0^{th} unit at lower prices. The area between the price line P_0 and the industry supply function represents <u>producer surplus</u> when producers sell Q_0 units are price P_0.

Now impose the Per Unit Tax:

The sum of consumer and producer surpluses **decreases** when the government imposes a per unit tax on a competitive industry.

The market price increases to P_1 and equilibrium quantity decreases to Q_1 when the tax is imposed.

Consumer surplus decreases by area $P_0 P_1$ AD.
Consumer surplus is now $P_1 P_4$ A.
Producer surplus in now area $P_3 P_2$C.

Although producers receive P_1 for Q_1 units, they must pay the government the tax of area $P_2 P_1$ AC.

Producer surplus has decreased by area $P_2 P_0$ DC.

Dead weight loss= ADC (loss of consumer and producer surplus that is not offset by an increase in value to some other group.

Deadweight loss

In economics, a **deadweight loss** (also known as **excess burden** or **allocative inefficiency**) is a loss of economic efficiency that can occur when equilibrium for a good or service is not Pareto optimal. In other words, either people who would have more marginal benefit than marginal cost are not buying the product, or people who would have more marginal cost than marginal benefit are buying the product.

Causes of deadweight loss can include monopoly pricing (see artificial scarcity), externalities, taxes or subsidies (Case and Fair, 1999: 442), and binding price ceilings or floors. The term deadweight loss may also be referred to as the "excess burden" of monopoly or taxation.
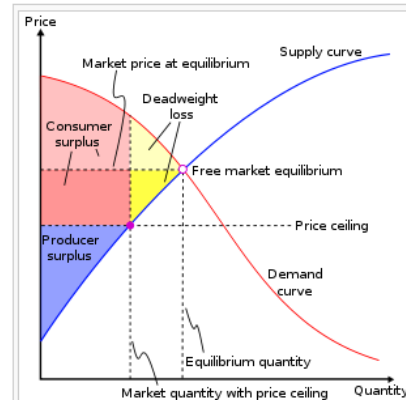
Deadweight loss created by a binding price ceiling. Producer surplus is necessarily decreased, while consumer surplus may or may not increase; however the decrease in producer surplus must be greater than the increase (if any) in consumer surplus.