Original thinking... applied

# Introduction to Economics for Food Scientists

October 11th, 2021

EUCHINASAFE
中欧食品安全

# Introductions

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# Agenda and Housekeeping

October 11, 2021

Introduction to Economics for Food Scientists

1. History of Economics
2. Economics Themes and Supply and Demand
3. Market Failure and the Role of Government

October 12, 2021

Challenges in the Economic Assessment of Food Safety Incidents

1. Economic Assessment of Food Safety
2. Assessing Preferences for Food Safety
3. Global Trade and Food: Biosecurity and Ecosystem Risk

# What is the “economy”? What words come to mind?

*The purpose of studying economics is not to acquire a set of ready-made answers to economic questions, but to learn how to avoid being deceived by economists*

**Joan Robinson**

# The Economy

The "economy" → all the work (and externalities from work) performed by human beings

1. Why do we work?
2. Who does the work?
3. Where is work performed?
4. What do we produce when we work?
5. How do we distribute the benefits from what is produced from work?

**The study of allocating scarce resources**

"The mode of production of material life determines the social, political and intellectual life process in general."

Karl Marx, German philosopher and economist (1859).

"It's the economy, stupid."

James Carville, political advisor to US President Bill Clinton (1992).

# Economics is a ‘social science’

- Economics is an inherently social construct; the study of human nature.
    - Work → Owners, managers, workers; profits and consumption.
    - Could the rich billionaire have a single dollar without workers?

- Economics ↔ Religion, politics, culture…?

- Money and finance, labour economics, household consumption, business and management, international economics, environmental economics…

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# History of Economics

# Economic History

## Hunter-Gatherer

- Non-hierarchal system of cooperation
- No wages or formal currency
- Division of tasks among members (hunting, wood gathering, etc.)
- No profits, economic surplus; life and death.

# Economic History

**Modern economic thought occurs in the context of political, religious, social, and scientific relations and thought.**

- The Greeks
- The Middle Ages
- Enlightenment to classical economics
- Neo-Classical economics and John Keynes
- The current paradigm

# The Greeks

**Aristotle** - Concepts of economic justice and acquisition of wealth

*Justice*

Distributive justice: how should the spoils of war be shared – "merit"

Rectificatory justice: how should one be compensated for past injustice

Reciprocal justice: when is an economic exchange between a buyer and a seller just – "just" prices

*Wealth*

Acceptable wealth acquisition: identifying and pursuing a profitable productive activity and exchanging one's surplus product for the surplus of another.

Unacceptable wealth acquisition: wealth through commerce and usury

It was assumed that there was a socially acceptable level of consumption, anything in excess was frowned upon

# The Greeks

They established the methods of thinking that we still use today

Their emphasis was on logic, and not on revealed knowledge

They were far more suspicious of market activity and the acquisition of wealth than we are today

# The Middle-Ages

## Christianity

The love of **money is the root of all evil**.  Timothy 6:10

It is easier for a camel to go through the eye of a needle, than for a rich man to enter into the kingdom of God.  Matthew 19:24

St. Paul believed in the second coming of Christ and the end of the world.  So, economic development was a non-issue

## Islam

Koran

Income and property should be **taxed to help the poor**

Interest on loans prohibited

Inherited wealth could not go to a single beneficiary, but had to be shared

# The Middle-Ages

## Thomas Aquinas (c. 1225 – 74)

Competition between sellers, as occurs in public markets, protects buyers from exploitation

*The questions are about ethics; the answers use economic analysis*

Questions remained ethical, but the Scholastics tried to find rational arguments for their moral arguments.

To do this they had to develop and analyse economic concepts such as value, competition in markets, money, profit and loss, opportunity cost, and interest.

# Enlightenment to Classical Economics

Voyages of discovery, printing press, nation states

Expressions of power to protect trade routes

Mercantilism

- A nation's power measured by its population and its stock of precious metals that are embodied in the money in use
- Money (in the government's treasury) could pay for large armies and navies.
- Population growth and a rich treasury could only come from prosperous industry and trade.
- Need for exports to exceed imports to ensure the economy's stock of money (i.e. gold and silver) is large.
- Need a trade surplus for oneself and a trade deficit for one's rivals - primary objective of economic policy.
- Tariffs and other import restrictions effective in reducing imports. Subsidies and regulation can be effective in increasing exports.

# Enlightenment to Classical Economics

Niccolo Machiavelli: The Prince, 1513

- The interests of the state were seen as unrelated to religion
- A distinction was drawn between the science of how politics works and the ethics of how it ought to work
- Both inductive and deductive analysis were used
- It was assumed that people would behave unscrupulously, in a self-interested manner

Machiavelli → in some cases men may behave morally, but felt that his analysis would make better predictions if self-interested behaviour was assumed

**This has become the standard assumption in economic analysis.**

# Enlightenment to Classical Economics

Thomas Hobbes: Leviathan (1651)

- The pursuit of self interest was a strong motivator of people
- Society could be held together only if the people chose a sovereign who would become both the law giver and the law enforcer
- Strong central government, social contract

Hobbes's methodology became hugely influential in economic thinking

His top-down conception of society would, however, yield in time to a more benign view of the social consequences of self-interested behaviour.

# Enlightenment to Classical Economics

Cantillon: Iron Law of Wages

Example, at a minimum, a worker needs 2 tons of wheat a year to survive.

- Workers earn < 2 tons = emigration or start dying of hunger; workers become scarce and their wages will rise.
- Workers earn > 2 tons = immigration & rising birth rates; surplus of workers and wages will fall.
- In the long run workers will earn a wage of precisely 2 tons of wheat a year, not more, not less - subsistence wage the iron law of wages.

If half an acre of land is needed to make 2 tons of wheat, then the cost of a year's labour by a worker is half an acre of land.

And since the price of any commodity is in the long run equal to its cost of production, the price of a year's labour by a worker is half an acre of land.

# Enlightenment to Classical Economics

Cantillon: Land

A related idea of Cantillon is that land is the source of all wealth.

- A country's total production depends on both land and labour.
- But the availability of labour depends on the availability of land → cannot be considered an independent source of a nation's wealth.
- Without adequate land, the labour force will either starve to death or be forced to migrate.
- Therefore, a nation's prosperity depends only on its endowment of land

Government should **not** meddle!

Some economists consider Cantillon, not Adam Smith, to be the father of modern economics

# Enlightenment to Classical Economics

Adam Smith

Built a coherent and logical theory of how the economy works

The elements of Smith's theory were mostly already available in the writings of earlier writers – selected the better ones.

Combined the useful theories into a consistent and persuasive overall theory that could be used reliably to think about society.

***The Theory of Moral Sentiments***

***An Inquiry Into the Nature and Causes of the Wealth of Nations***

# Enlightenment to Classical Economics

***The Theory of Moral Sentiments***

Argued against the views that the pursuit of self-interest leads to a cruel, nightmarish society (Hobbes).

We are able to imagine what others are going through; we are able to empathize with the sufferings of others.

We can act to relieve the pain of others in order to reduce our own discomfort, if nothing else.

So, it is perfectly consistent to believe that human beings pursue self-interest and are generous towards others.

Passions, bias, moral rules, laws, peace = prosperity = enough to encourage good behaviour

# Enlightenment to Classical Economics

***An Inquiry Into the Nature and Causes of the Wealth of Nations***

The wealth of a nation derives from the **level of the technology** in use

The level of technology and its rate of improvement depend on the **division of labour**

Practice makes perfect

Less waste of time between tasks

More automation

The extent of the market increases → greater division of labour → improvements in the level of technology → greater national income → another increase in the extent of the market → another increase in the division of labour...

**Division of labour is enabled by capital**

# Enlightenment to Classical Economics

## Luxury spending

Earlier writers

- Growth of an economy depended on the luxury spending by the rich
- The poor consumed just the bare necessities
- More would not be produced unless the rich would buy the extra output.

Smith

- If the rich saved any money they would lend it to businessmen (to earn interest).
- The businessmen would borrow the money and spend it on capital equipment.
- Therefore, all income would be spent and all production would be purchased.
- The more the rich saved the greater the level of investment by businesses; faster growth.

# Enlightenment to Classical Economics

## Capitalists hold the key

Which class of people can be relied upon to save and accumulate capital?

- Not the workers; they barely earn enough to pay for necessities
- Not the landlords; they are dissolute and prone to ostentation
- **Only the capitalists who earn profits would save and accumulate capital**

The state could raise the rate of growth by redistributing income from landlords to capitalists

# Enlightenment to Classical Economics

## Free trade

Smith's support for free trade among nations was based upon the obvious desirability of trade among individuals:

"*It is the maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy*".

According to Smith, free trade expands the extent of the market and, thereby, allows greater division of labour

Free trade also increases productivity by allowing countries to specialize in what they do well.

# Enlightenment to Classical Economics

## Profits

*"In that original state of things, which precedes both the appropriation of land and the accumulation of stock [i.e., capital], the whole produce of labour belongs to the labourer. He has neither landlord nor master to share with him."*

But the worker needs equipment (which he can't afford to buy) and he needs wages to survive

The capitalist provides these out of his own savings and extracts payment for these services

**This is Smith's explanation for the emergence of profits**

# Enlightenment to Classical Economics

"The Invisible Hand"

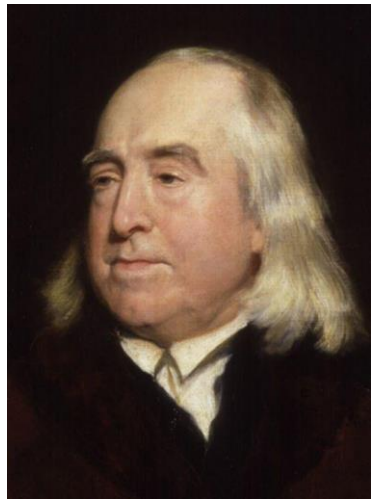
- Based upon work of Cantillon
- The pursuit of self-interest can lead to a socially efficient outcome

*"[E]very individual … generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. … he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. …"*

- Consumer sovereignty and business competition are the key components
- Without any government control, the most beneficial goods get produced, and at the lowest possible price
- Still role for government outside the market

**All without any maths!**

# Enlightenment to Classical Economics



## Jeremy Bentham (1748-1832)

- Utilitarianism: ethical choice based upon maximization of the sum of utilities – the greatest happiness of the greatest number.
- Utility maximisation – the excess of pleasure over pain
- Diminishing marginal utility

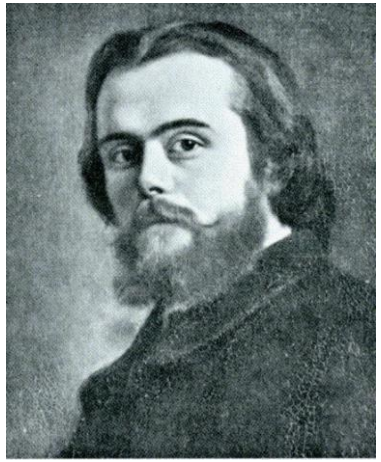
## Jules Depuit (1804-1866)

- Utility measured by willingness to pay = downward sloping demand curve
- Defined consumer surplus, deadweight loss

# Neo-Classical Economics…

*Assumptions*

- Firms aim to maximise profits
- People maximise utility
- Decisions viewed in the prism of marginal changes
- Equilibrium: Supply = demand



Antoine Cournot (1801-1877)

Introduced differential calculus from physics, price theory of profit maximising firms (still taught today), partial equilibrium analysis (one-good at a time approach), introduced the demand function and curve.

Leon Walras (1834-1910)

General equilibrium analysis – all goods at the same time (simultaneous equations) - models used today - CAPRI

# …Keynes Responds

John Maynard Keynes (1883-1946)

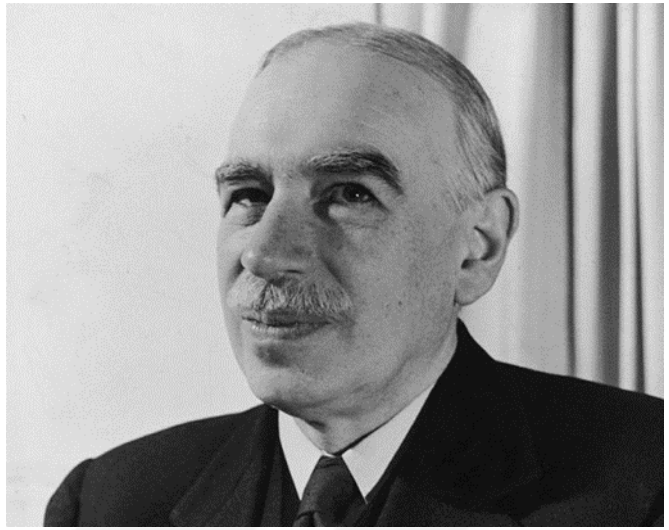
Neoclassical theory implies full employment but the Great Depression was a little inconvenient

Wages are "sticky" but futile to force down as workers would reduce spending → fall in prices → businesses cannot hire

**Argues for State involvement**

Expansionary fiscal policy

- Increase spending on infrastructure - roads, bridges etc = jobs
- Cut taxes – increase consumer spending, prices rise, businesses take on workers
- Government → spend when times are bad, tax when times are good.



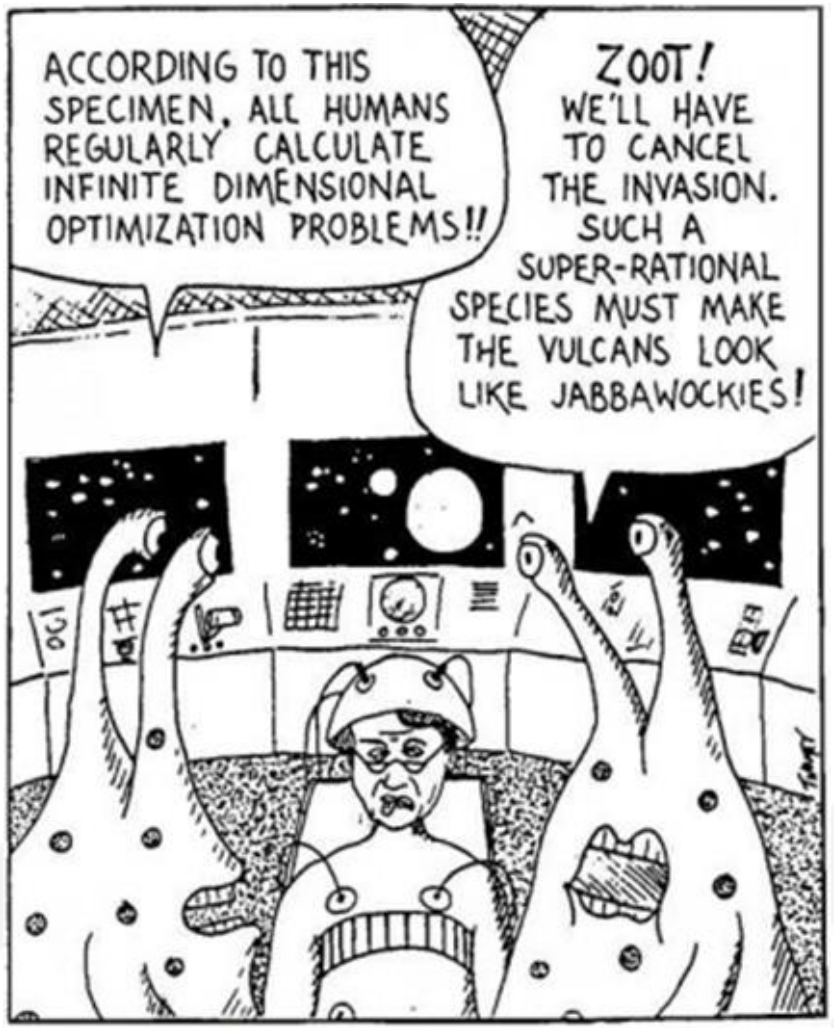
# Neoliberalism

Friedrich von Hayek: *The Road to Serfdom (1944)*

- Broadside against State involvement
- Reagan/Thatcher revolutions
- Public choice theory – self motivated public servants

Milton Friedman (1912-2006)

- Policy to target money supply, targeting unemployment below the "natural rate" will cause inflation
- Market capitalism
- Rational expectations
- Efficient market hypothesis



# Question & Coffee Break

How do you see the global economy evolving over the next 15 years?

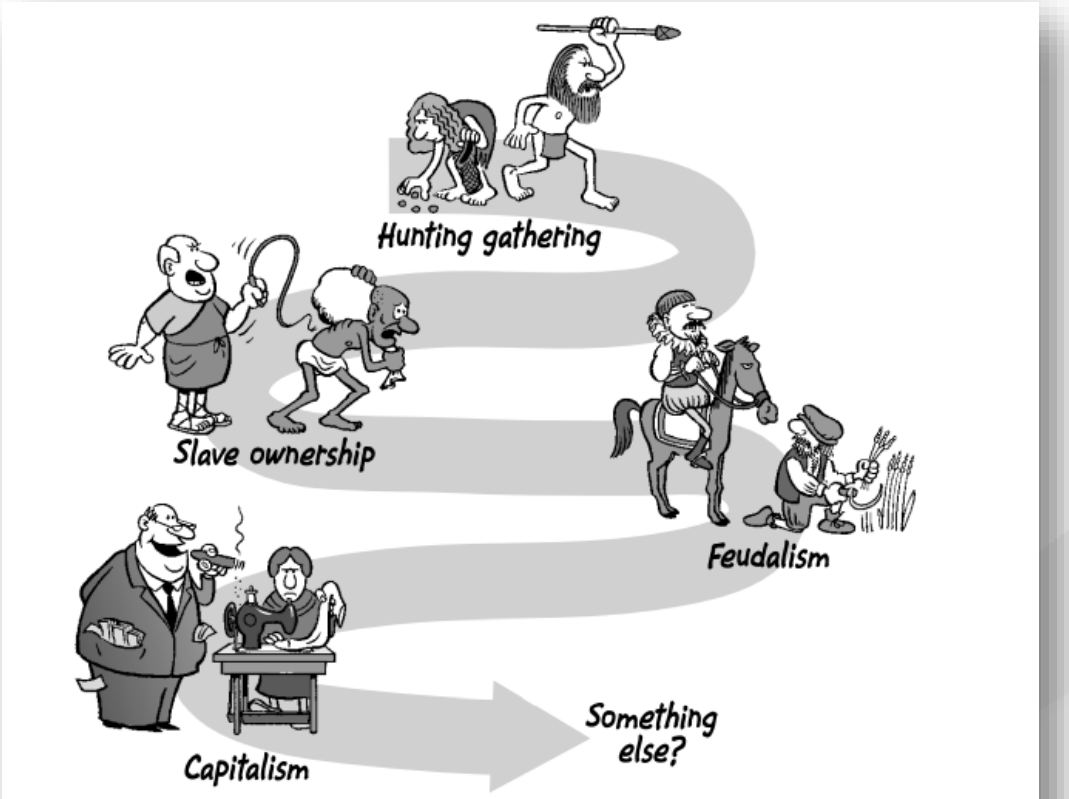



*Figure 3.1* Economic Evolution

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# Economics Themes and Supply and Demand

# Knowledge Check

Are you already an economist, but just don't know it yet?

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# Knowledge Check

Question 1: The satisfaction from eating a 5th piece of cake compared to eating a 4th piece of cake will be ____

a) More
b) I do not eat cake
c) Less
d) Exactly the same

# Knowledge Check

Question 2: Under normal circumstances, when the price of a commodity falls, the quantity demanded will ____

a) Increase
b) Remain unchanged
c) Decrease
d) Nobody knows

# Knowledge Check

Question 3: Since human wants are unlimited and available resources are limited, what will a rational consumer do?

a) Be jealous of their neighbours
b) Renounce all wants and live the lead of a minimalist
c) Satisfy their needs given their income levels
d) Be resigned to unhappiness

# Modern Economics

**Modern economics**: a social science concerned chiefly with description and analysis of the production, distribution, and consumption of goods and service.

Two main branches of economics exist:

1. Microeconomics: Behaviours of individual economic actors - consumers, firms, workers, and investors - as well as the markets in which these actors interact and exchange goods and services.
2. Macroeconomics: Aggregate economic activities, such as the level and growth rate of national output, interest rates, unemployment, inflation and international trade.

# Microeconomics

**Trade-offs in exchange for goods and services**

## Consumers

Consumers have limited incomes, which can be spent on a wide variety of goods and services, or saved for the future.

## Workers

First, people must decide whether and when to enter the workforce. Second, workers face trade-offs in their choice of employment. Finally, workers must sometimes decide how many hours per week they wish to work, thereby trading off labour for leisure.

## Firms

Firms also face limits in terms of the kinds of products that they can produce, and the resources available to produce them.

# Microeconomics

## Prices and Markets

- Microeconomics describes how prices are determined.
- In a **centrally planned economy**, prices are set by the government.
- In a **free market economy**, prices are determined by the interactions of consumers, workers, and firms.
    - These interactions occur in **markets** -collections of buyers and sellers that together determine the price of a good.
- However, markets are rarely free from external influences and constraints:
    - Government regulation and taxation

# What is a Market?

**Market**: Collection of buyers and sellers that, through their actual or potential interactions, determine the price of a product or set of products.

**Market Definition**: Determination of the buyers, sellers, and range of products that should be included in a particular market.

**Arbitrage**: Practice of buying at a low price at one location and selling at a higher price in another.

# What is a Market?

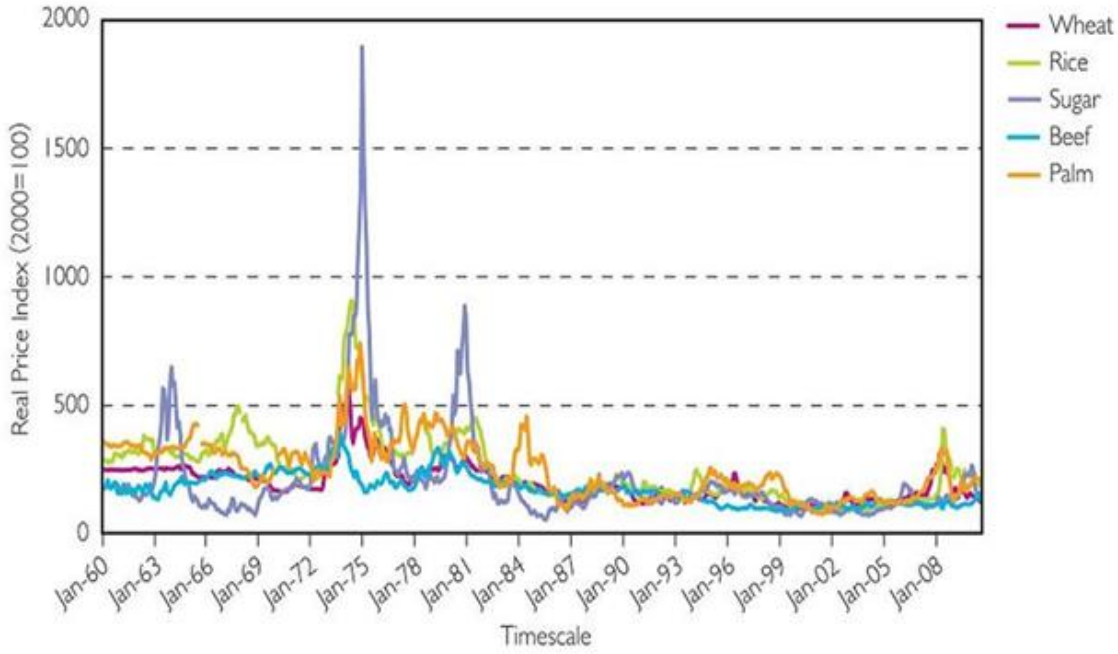
## Competitive versus Non-Competitive Markets

Perfectly Competitive Market:

Infinite buyers and sellers
Zero entry and exit barriers
Perfect factor mobility
Perfect information
Zero transaction costs
Profit maximization
Same goods

} *Any comments?*

Global real price indices for major agricultural products since 1960




Source: HMG (2010) Data sourced from UNCTAD, BEA

**Market Price:** Prevailing price in a competitive market

**Extent of Market:** The boundaries of a market, both geographical and in terms of range of products produced and sold within it.

# Why Study Microeconomics?

## Firm Decision-Making: Plant Protection Products

Objective

- Design and produce of organic and non-organic products by investing in intellectual property, labour, raw material, and other inputs.
- Sufficient returns to investment need to be generated.

**The firm has to think carefully about how the users would react to the new products in the market place.**

Approach

- How much it will cost to make? How much to price it?
- Consider the effects of existing and future government interventions in the market - tax and product standards that may affect prices.

# Economic Analysis

## Theories and Models

- Explanation and prediction are based on theories.
- Theories are developed to explain observed phenomena in terms of a set of basic rules and assumptions.
- A model is a mathematical representation, based on economic theory, of a firm, a market, or some other entity.

Theories are tested using appropriate model and data on economic variables of interest

## Positive versus Normative Analysis

**positive analysis**: Describes relationships of cause and effect. *Evidence provided by public sector economists?*

**normative analysis**: Examines questions of what ought to be done. *A political decision by ministers?*

# Supply and Demand

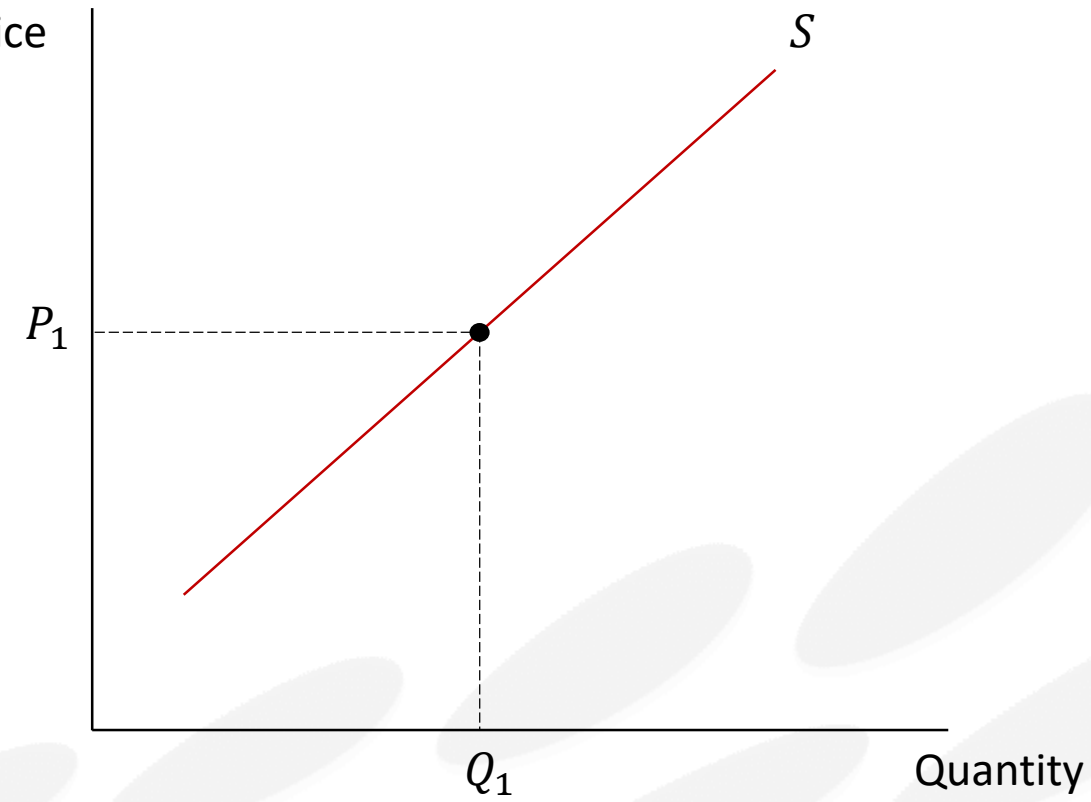
Supply-demand analysis is a fundamental tool that can be applied to a wide variety of problems:

- Understanding and predicting how changing local and world economic conditions affect market price and production
- Evaluating the impact of government price controls, minimum wages, price supports, and production incentives
- Determining how taxes, subsidies, tariffs, and import quotas affect consumers and producers

# Supply and Demand

## The Supply Curve

**Supply Curve**: Relationship between the quantity of a good that producers are willing to sell and the price of the good, $Q_s(P)$.



# Supply and Demand

## The Supply Curve

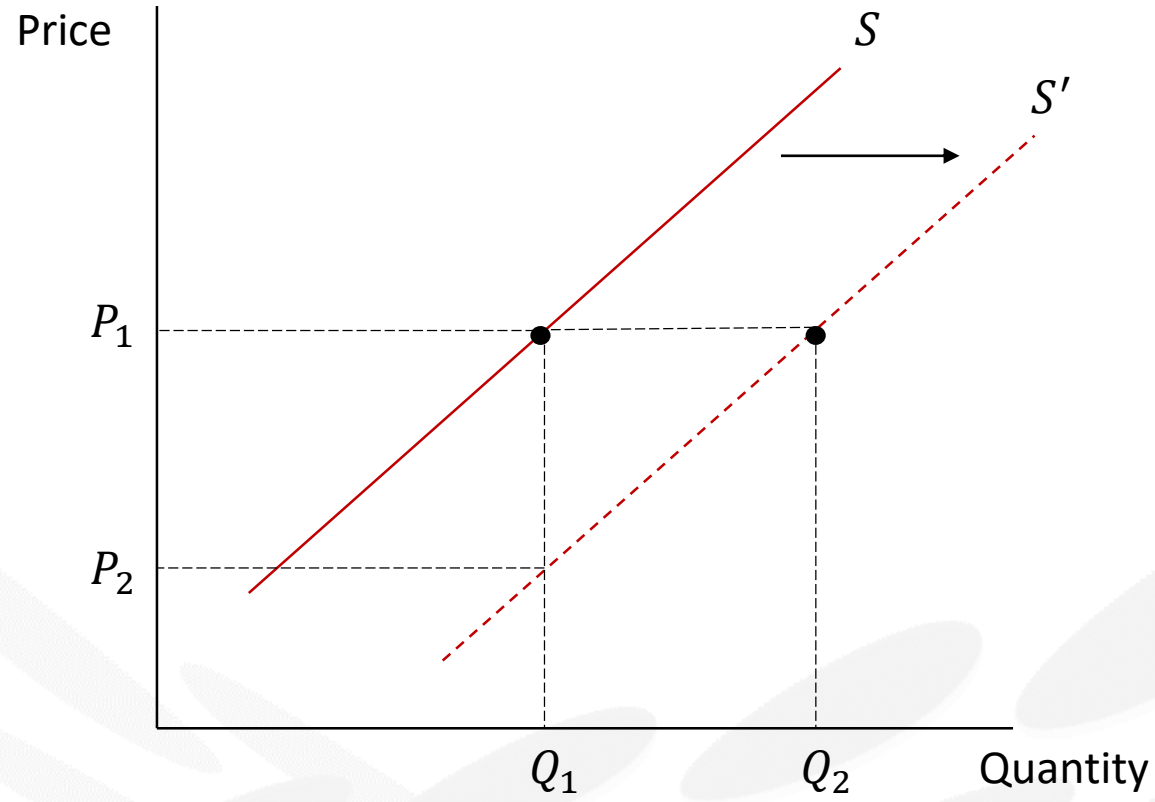
The quantity supplied can depend on other variables besides product price. For example:

- Changes in input costs (land, capital, labour)
- Changes in technology
- Profitability of other goods
- Number of sellers in the market
- Producer expectations

Changes in the quantity supplied refers to movements along the supply curve, due to price changes.

Changes in supply curve refers to shifts in the supply curve, due to non-price variables.

# Supply and Demand



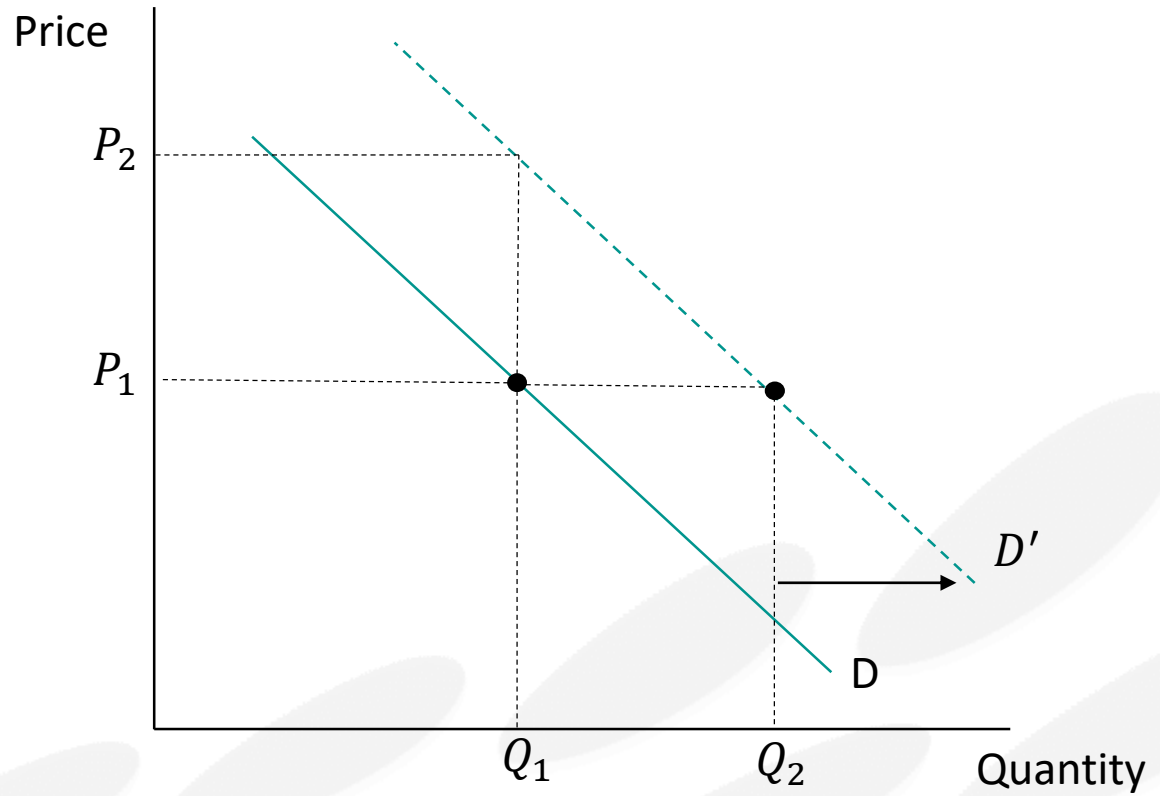
# Supply and Demand

## The Demand Curve

**Demand Curve**: Relationship between the quantity of a good that consumers are willing to buy and the price of the good, $Q_D(P)$

For most products, the quantity demanded increases when income rises → **Normal Good**

A higher income level shifts the demand curve to the right (from D to D′).



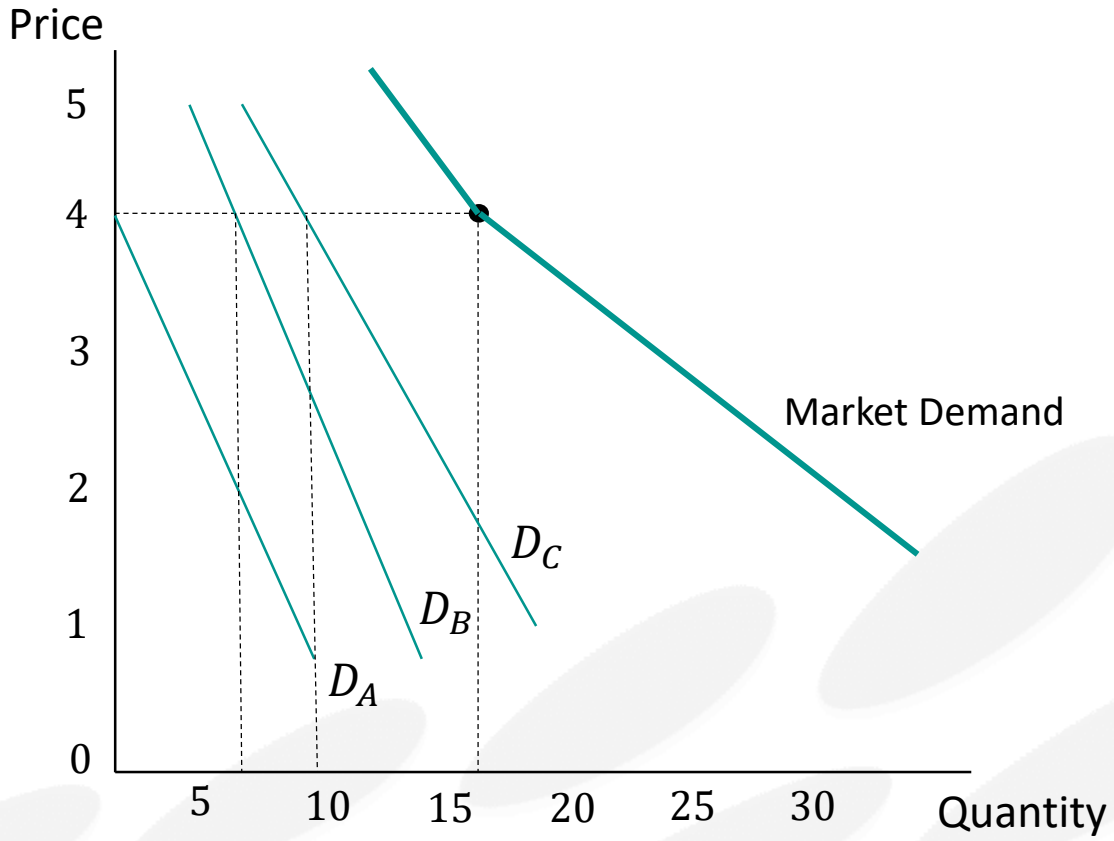
# Supply and Demand

## Summing to Get Market Demand Curve

The market demand curve is obtained by summing consumers' demand curves DA, DB, and DC.

At each price, the quantity demanded by the market is the sum of the quantities demanded by each consumer.

At a price of $4, for example, the quantity demanded by the market (16 units) is the sum of the quantity demanded by A (no units), B (7 units), and C (9 units).



# Supply and Demand

## Shifting the Demand Curve

If the market price were held constant, the following can affect quality demanded:

- an increase in consumer income
- an increase in the number of potential consumers in the market
- an increase in the price of a **substitute good** (e.g. ice cream, snow cones)
- a decrease in the price of a **complementary good** (e.g. ice cream, ice cream cones)
- an increase in perceived value of the good

The result would be a *shift to the right of the entire demand curve*.

# The Market Mechanism

## Equilibrium

**Equilibrium (or market clearing) price**: The price that equates the quantity supplied to the quantity demanded.

**Market mechanism**: tendency in a free market for price to change until the market clears.

# The Market Mechanism

## Supply and Demand

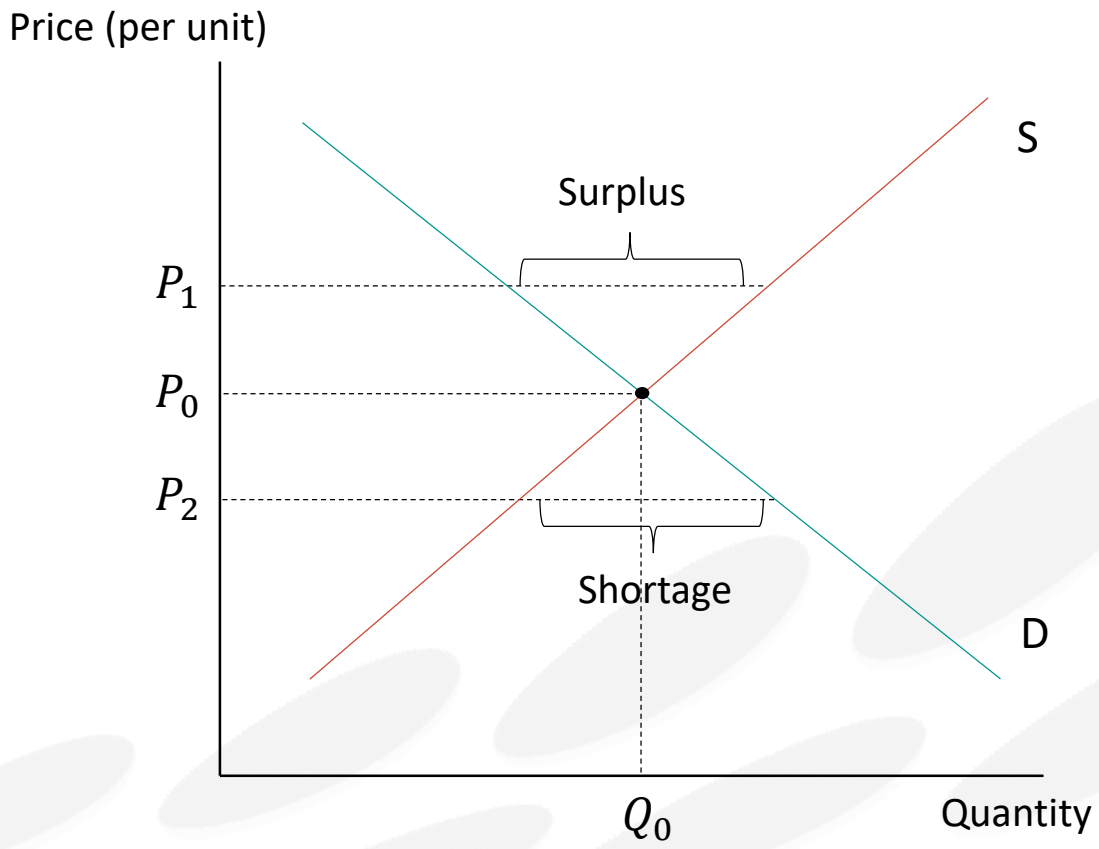
The market clears at price $P_0$ and quantity $Q_0$.

**Surplus**: When the quantity supplied exceeds the quantity demanded.

At a higher price ($P_1$) a surplus forms, so prices drop.

**Shortage**: When the quantity demanded exceeds the quantity supplied.

At a lower price ($P_2$) there is a shortage, so prices increase.



# The Market Mechanism

## When Can We Use the Supply-Demand Framework?

We are assuming that at any given price, a given quantity will be produced and sold.

This assumption makes sense only if a market is at least roughly competitive.

- By this we mean that both sellers and buyers should have little market power (i.e., little ability individually to affect the market price).

Suppose that supply were controlled by a single producer.

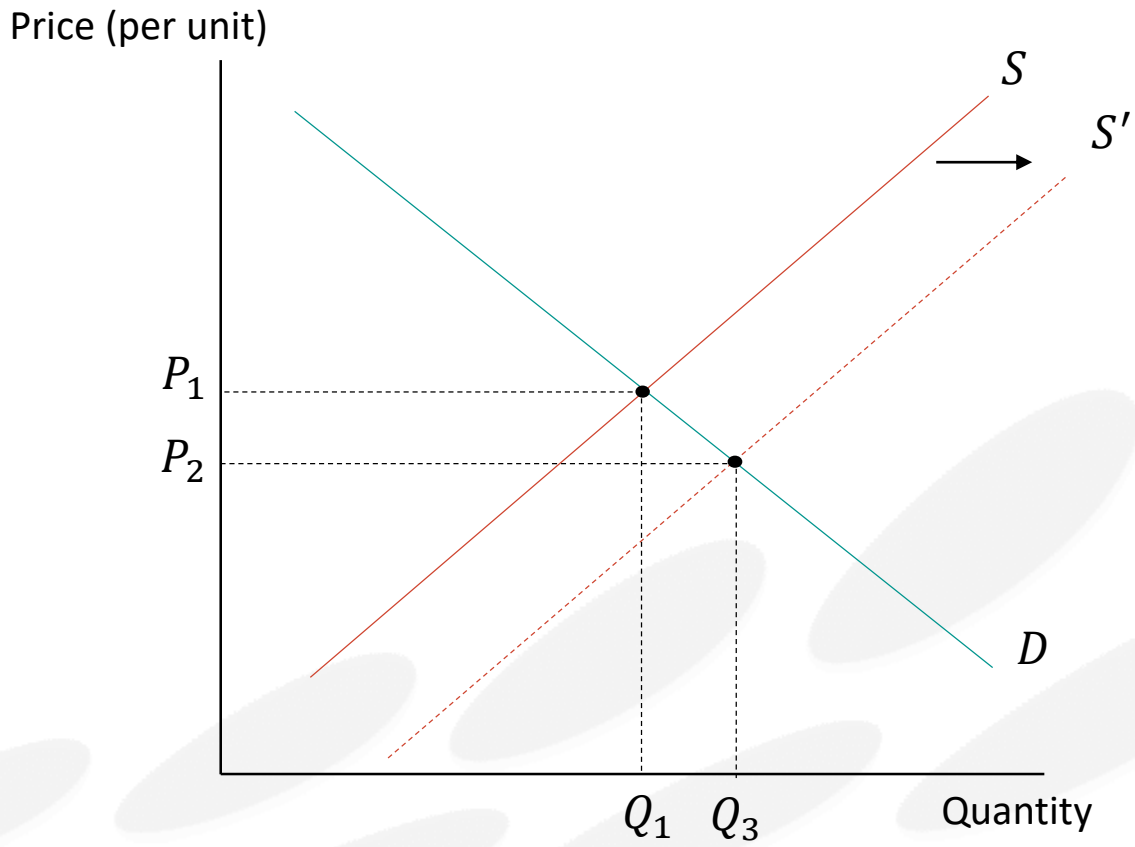
- If the demand curve shifts in a particular way, it may be in the producer's interest to keep the quantity fixed but change the price, or to keep the price fixed and change the quantity to maintain or increase revenue.

**Monopolist**: A person or enterprise that is the only supplier of a particular good or service.

# Changes in Market Equilibrium

## New Equilibrium Following a Shift in Supply and Demand

When the supply curve shifts to the right, the market clears at a lower price $P_3$and a larger quantity $Q_3$.



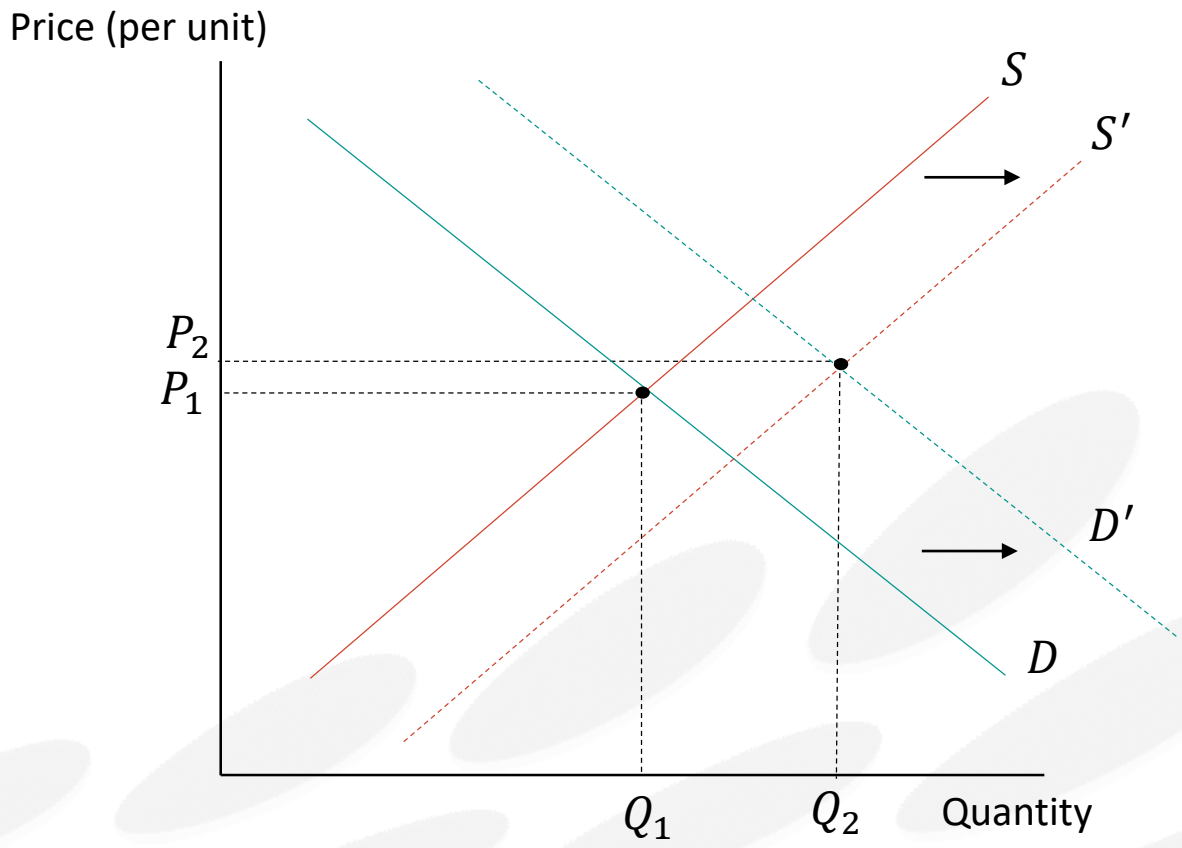
# Changes in Market Equilibrium

## New Equilibrium Following a Shift in Supply and Demand

Supply and demand curves shift over time as market conditions change.

In this example, rightward shifts of the supply and demand curves lead to a slightly higher price and a much larger quantity.

In general, changes in price and quantity depend on the amount by which each curve shifts and the shape of each curve.



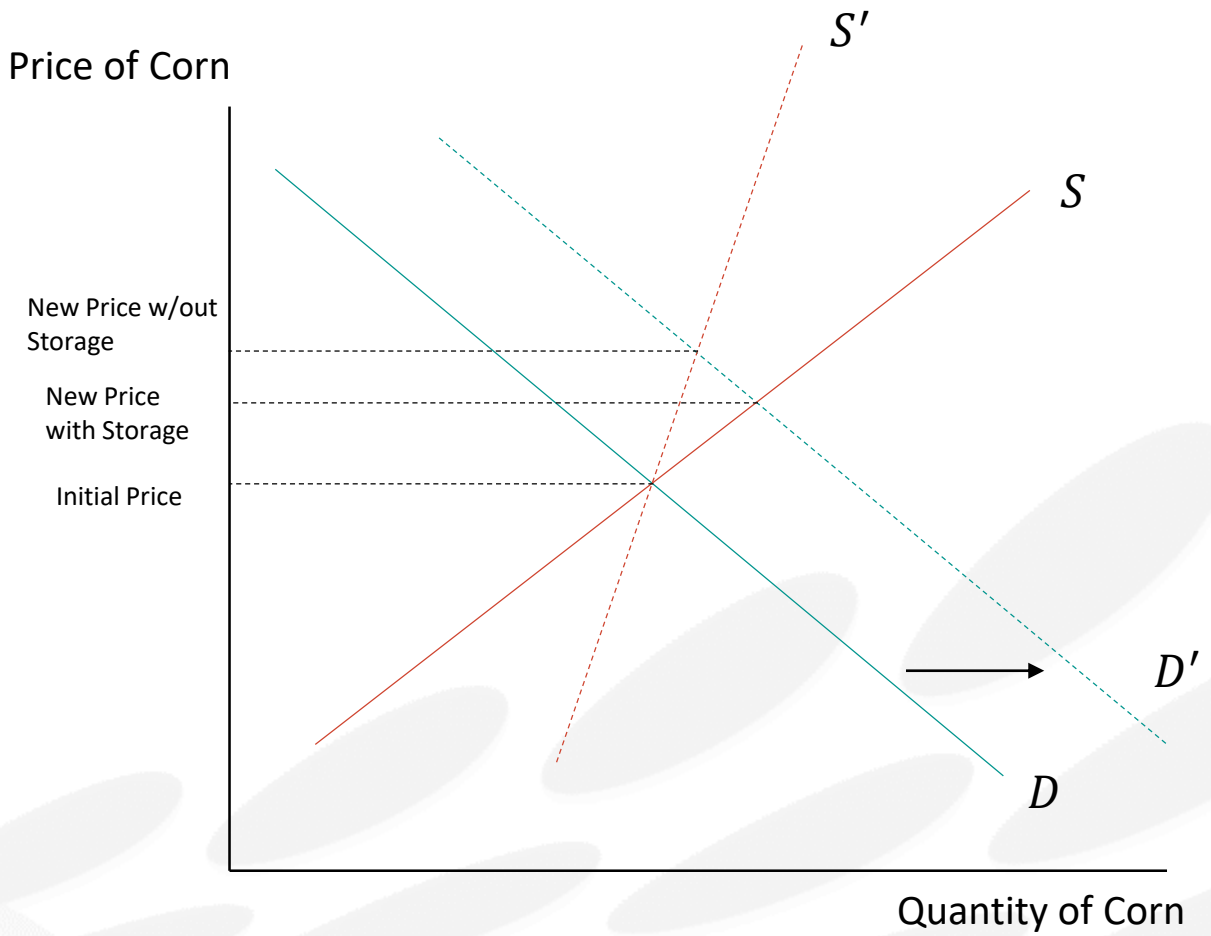
# Changes in Market Equilibrium

## An Example (env-econ.net)

Population growth, **bioethanol**,...etc.

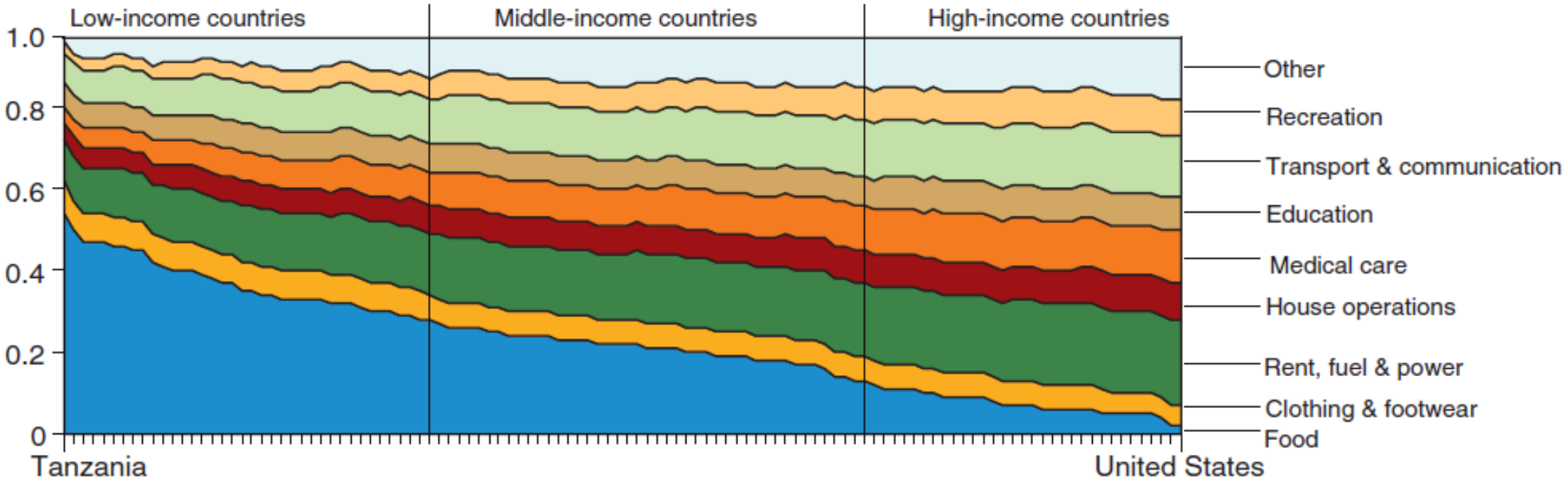
Why, then, is the increasing demand causing higher prices now?

- Supply is much less **responsive** now than it has been in recent years.
- As demand increased, **stored corn stock** was used to meet shortages.
- As storage stocks dwindle, the ability to adjust quantities supplied to demand increases is hampered.
- The only possible reaction is higher prices to effectively ration the stocks. That is, a **demand increase will result in higher price increases when supply is less responsive or ELASTIC**.



## Distribution of additional $1 of income across 114 countries[1]

Dollars




[1]Countries arranged in ascending order of affluence.

Source: Author's calculation using the 1996 ICP data.

https://www.ers.usda.gov/webdocs/publications/47558/8509_tb1925_1_.pdf?v=7488.8

# Elasticities of Supply and Demand

**Elasticity**: Percentage change in one variable resulting from a 1-percent increase in another.

**Price Elasticity of Demand**: Percentage change in quantity demanded of a good resulting from a 1-percent increase in its price.

**Price Elasticity of Supply**: Percentage change in quantity supplied of a good resulting from a 1-percent increase in its price.

# Elasticities of Supply and Demand

## Linear Demand Curve

A demand curve that is a straight line:

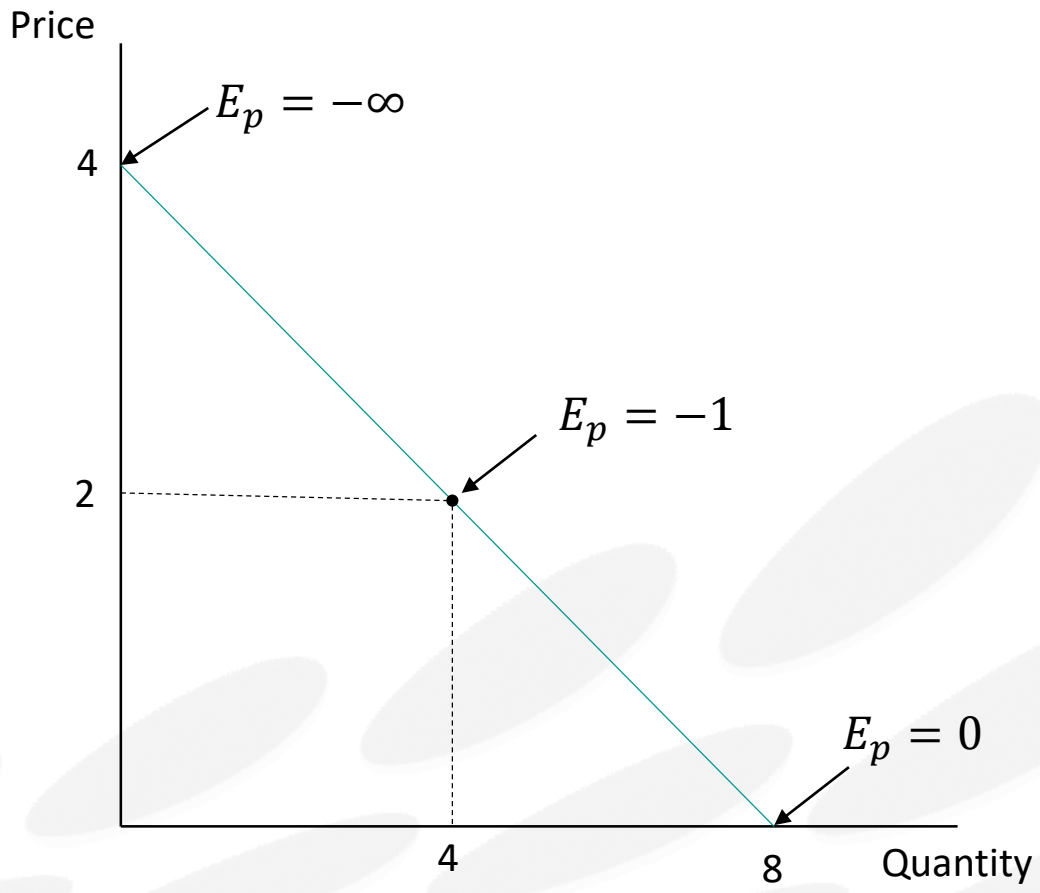
$$Q = a - bP$$

The price elasticity of demand depends on the slope of the demand curve and the price and quantity.

The elasticity varies along the curve as price and quantity change.

The elasticity is large in magnitude at the top because price is high and quantity is small.

The elasticity becomes smaller as we move down the curve.

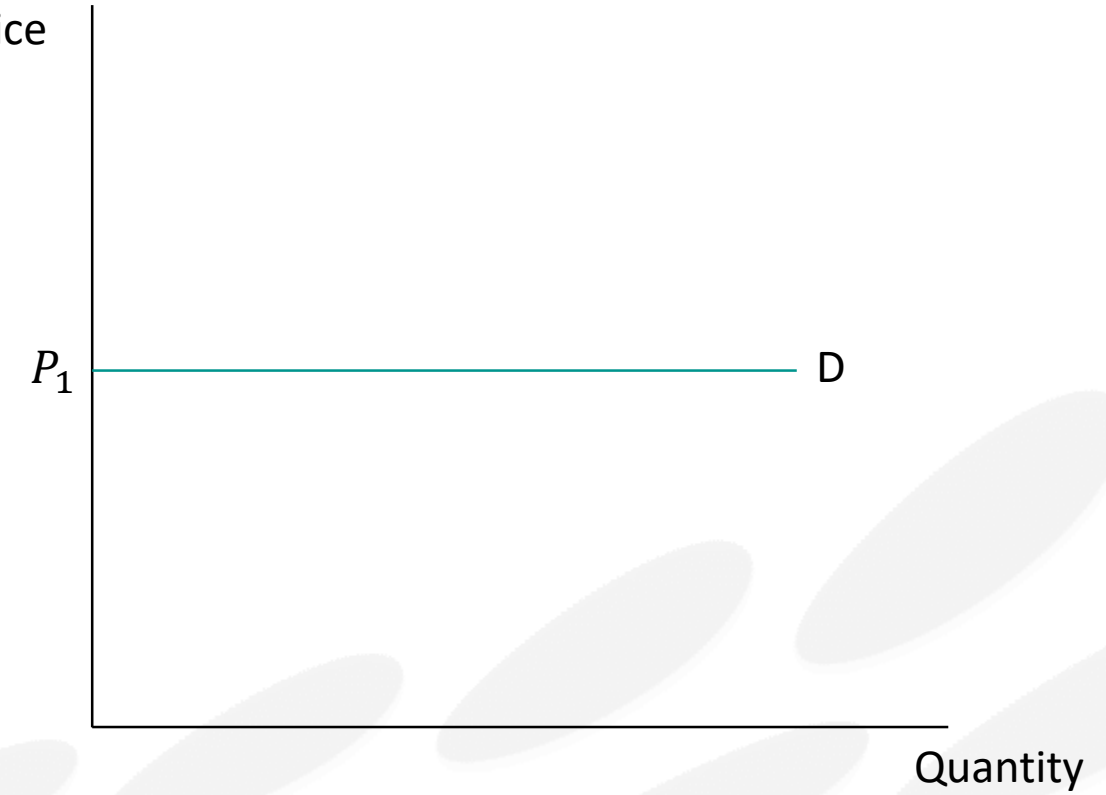


# Elasticities of Supply and Demand

## Infinite Elastic Demand

**Infinitely elastic demand**: consumers will buy as much of a good as they can get at a single price, but for any higher price the quantity demanded drops to zero, while for any lower price the quantity demanded increases without limit.

https://www.euronews.com/green/2021/07/02/world-s-most-expensive-burger-unveiled-at-5-000-but-does-it-cost-the-planet



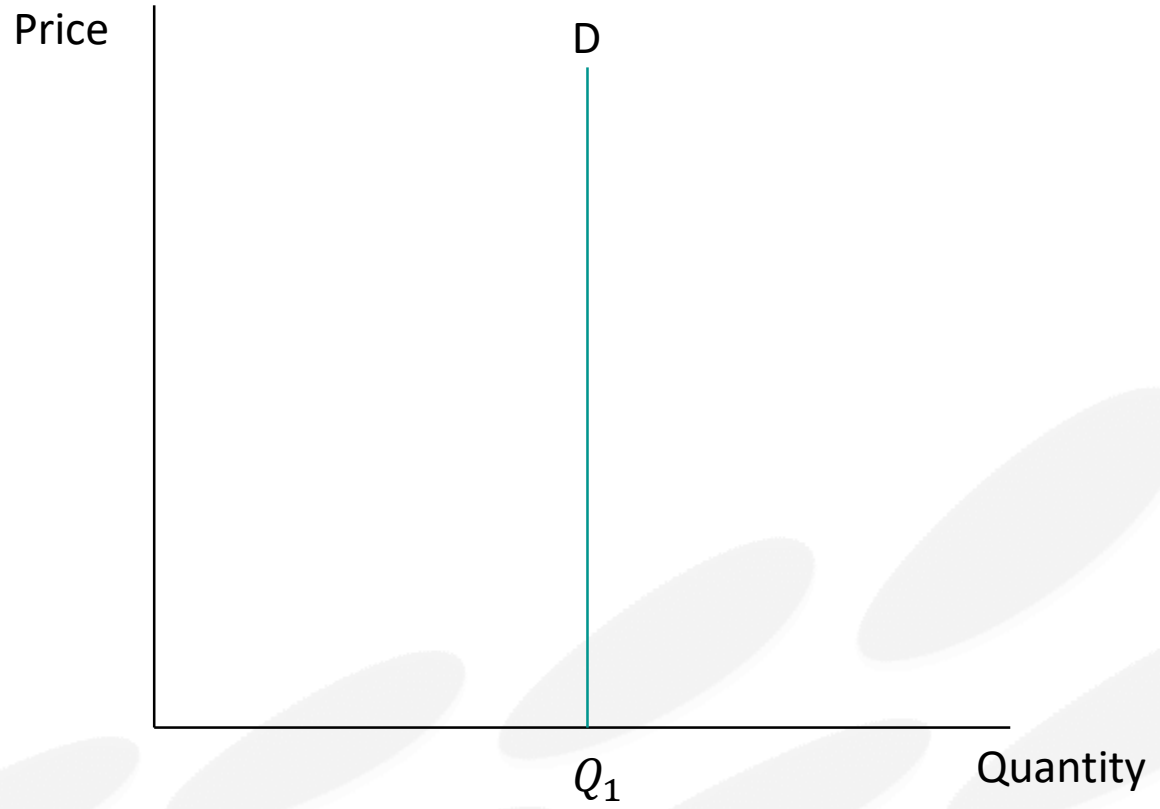
# Elasticities of Supply and Demand

## Completely Inelastic Demand

The slope of the demand curve is completely vertical

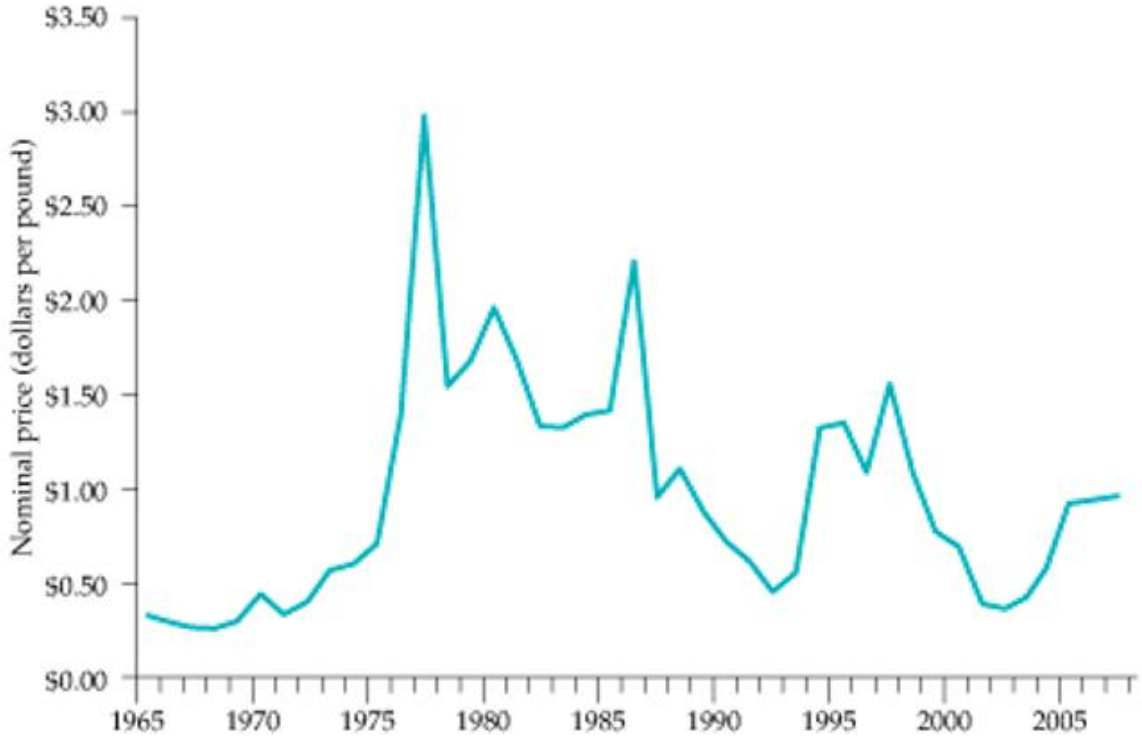
**Completely elastic demand**: consumers will buy a fixed quantity of a good regardless of its price.

*Example: Most basic food commodities (corn, rice)*



# Short-Run Versus Long-Run Elasticities

The weather in Brazil and the price of coffee




- Droughts or freeze damage can cause prices to soar
- Prices usually fall after some time, after supply and demand adjust

# Short-Run Versus Long-Run Elasticities

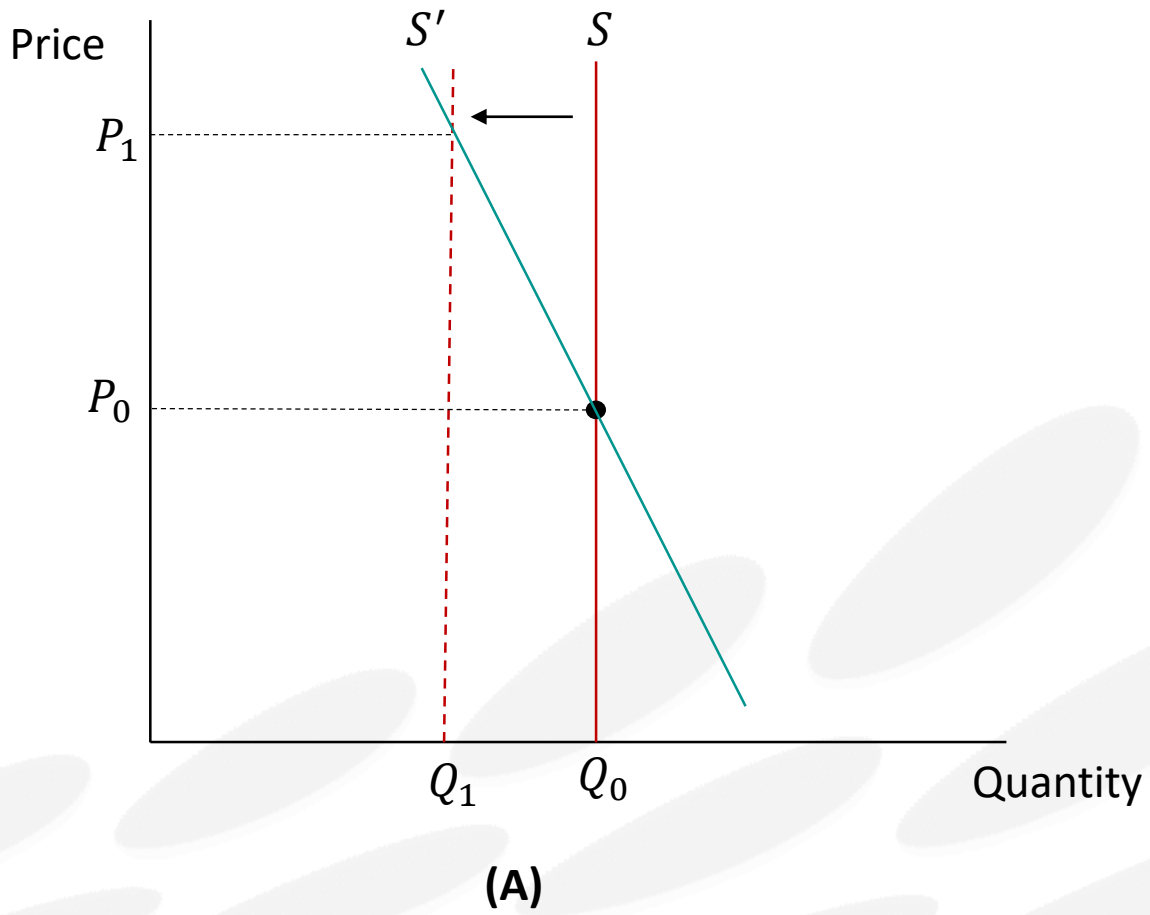
The weather in Brazil and the price of coffee

**(A)** Drought/freeze shifts supply to the left

Supply is completely inelastic in the short run; only a fixed number of coffee beans can be harvested.

Demand is also inelastic; consumers change their habits slowly.

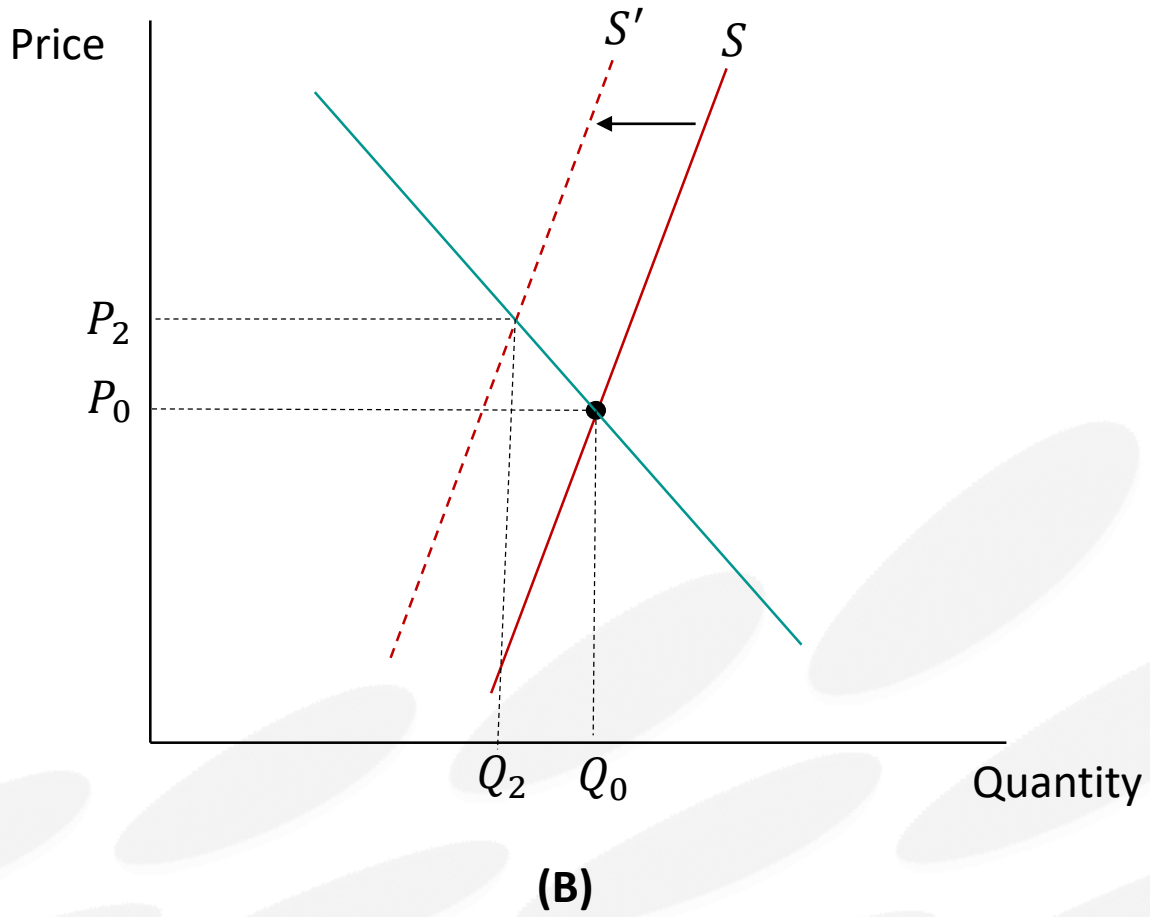
The initial effect is a sharp increase in price from $P_0$ to $P_1$.



# Short-Run Versus Long-Run Elasticities

The weather in Brazil and the price of coffee

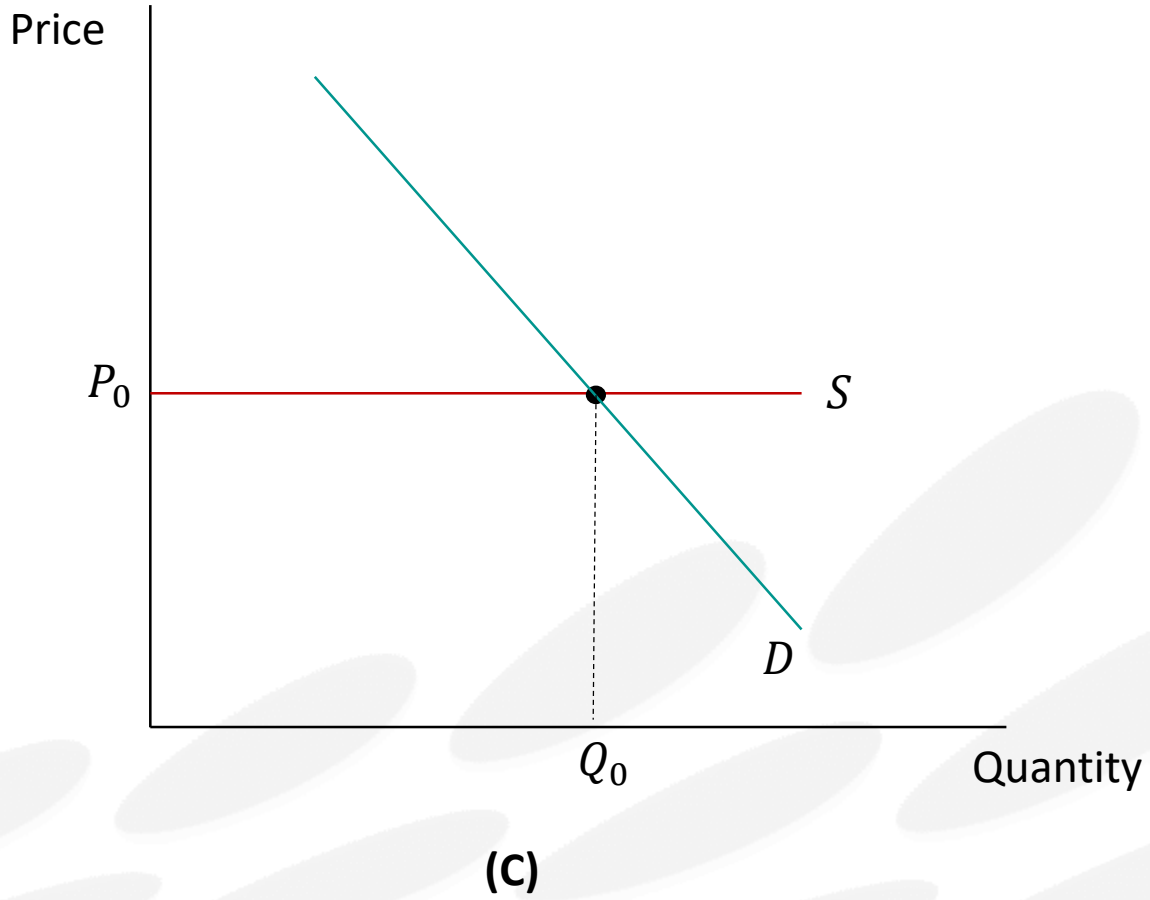
**(B)** In the intermediate run, supply and demand are more elastic; price falls part way back to $P_2$.



# Short-Run Versus Long-Run Elasticities

Example: The weather in Brazil and the price of coffee

**(C)** In the long run, supply is extremely elastic; new coffee trees would have matured, so the effect of the freeze disappears. Prices return to $P_0$.



# Introducing Consumer Surplus

## Consumer Surplus

**Consumer surplus**: the difference between the price a consumer is prepared to pay and the actual price paid.

- Related to the value we place on items, linked to the degree of utility
- Useful concept in analysing welfare gains and losses as a result of resource allocation
- Emphasis on MARKET demand – of those in the market there are some who are willing to pay higher prices than the market price.
- Used a lot in environmental valuation methods

**Producer surplus**: difference between the market price received by the seller and the price they would have been prepared to supply at.

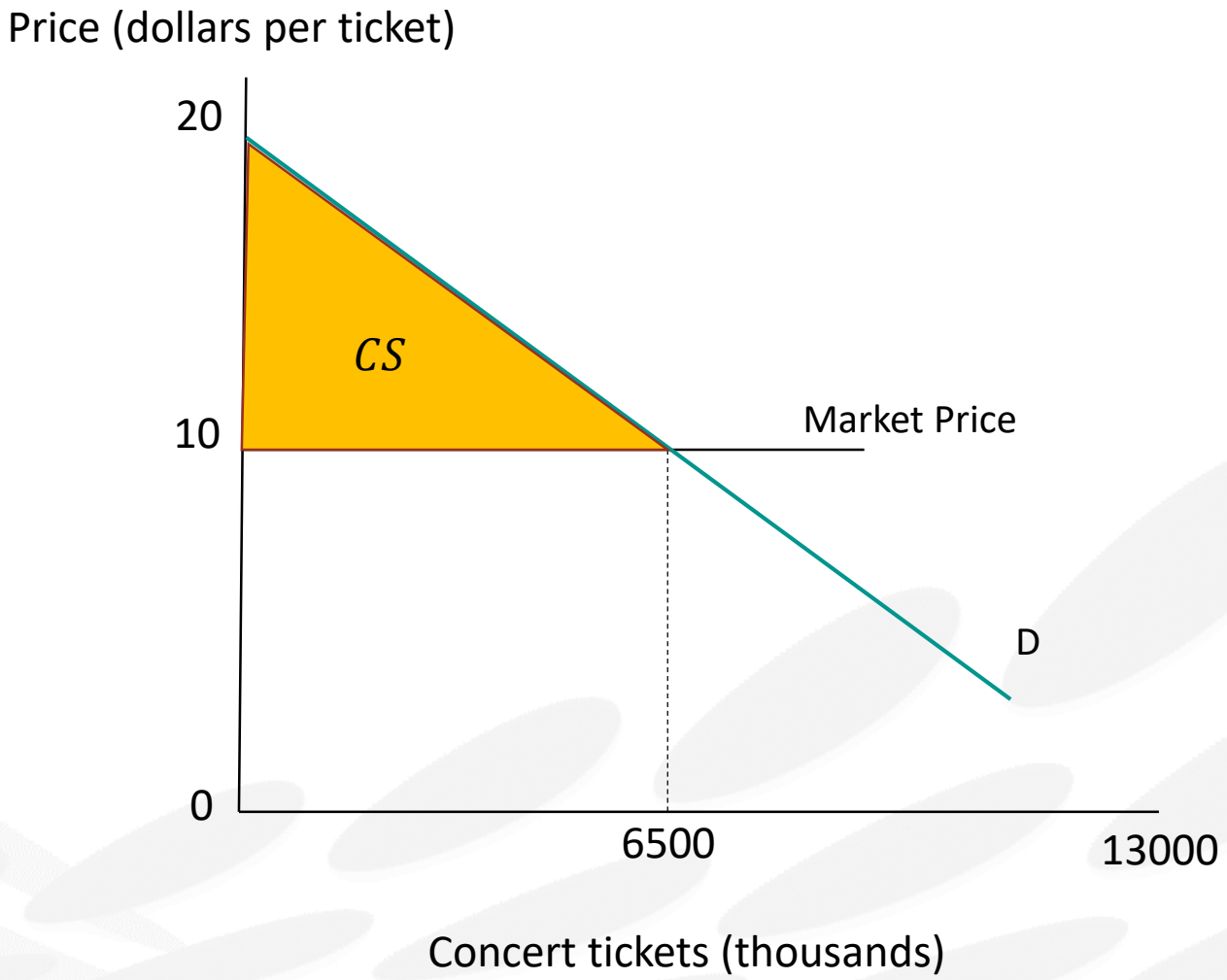
# Introducing Consumer Surplus

## Measuring Consumer Surplus

Measured by the area under the demand curve and above the line representing the purchase price of a good.

Here, consumer surplus is given by the yellow triangle.

$$CS = \frac{1}{2} * (\$20 - \$10) * 6500 = \$\mathbf{32,500}$$



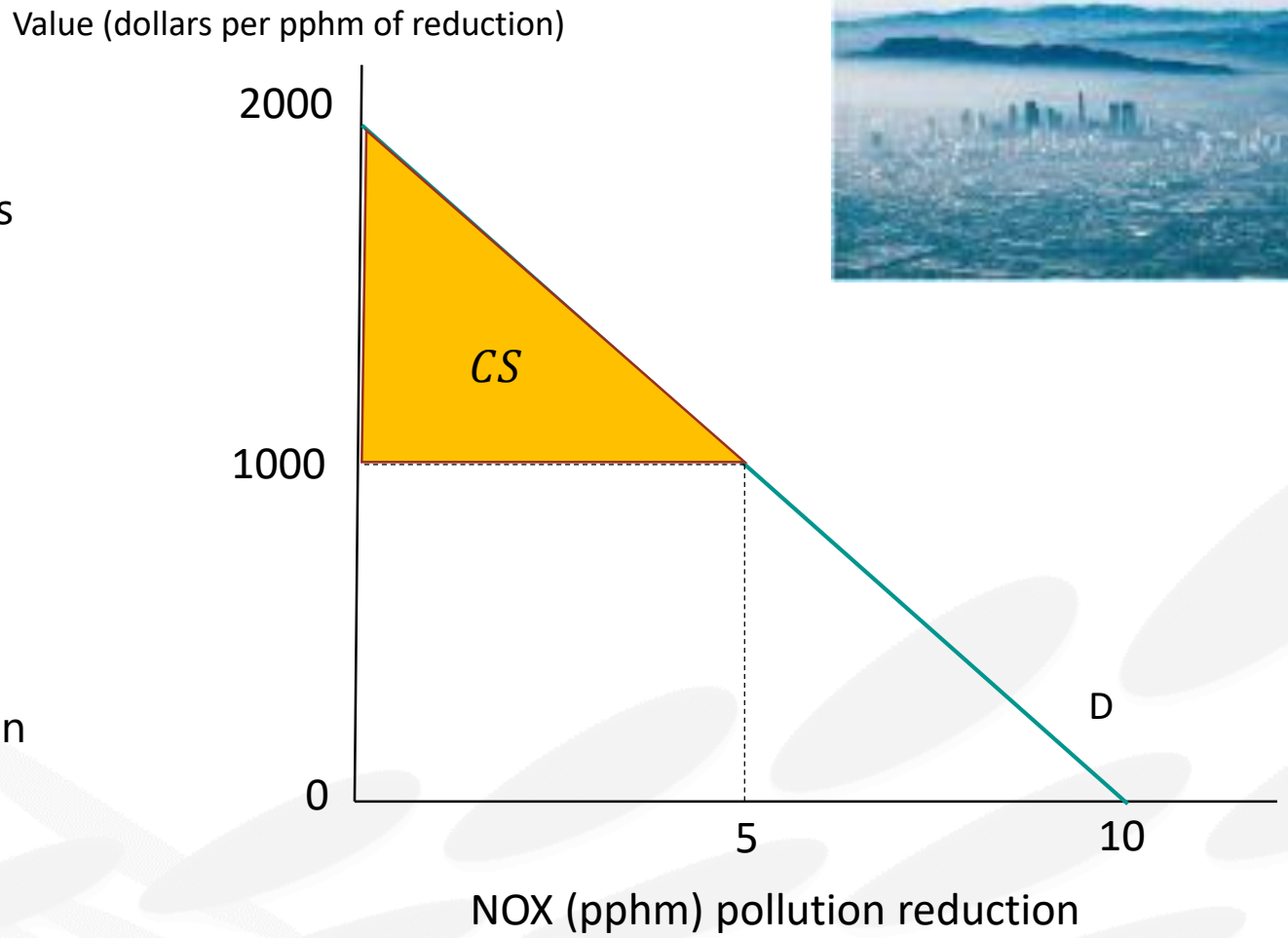
# Introducing Consumer Surplus

## Valuing Cleaner Air

To encourage cleaner air, US Congress passed the Clean Air Act in 1977 and has since amended it several times.

The yellow-shaded triangle gives the consumer surplus generated when air pollution is reduced by 5 parts per 100 million of nitrogen oxide at a cost of $1000 per part reduced.

The surplus is created because most consumers are willing to pay more than $1000 for each unit reduction of nitrogen oxide.



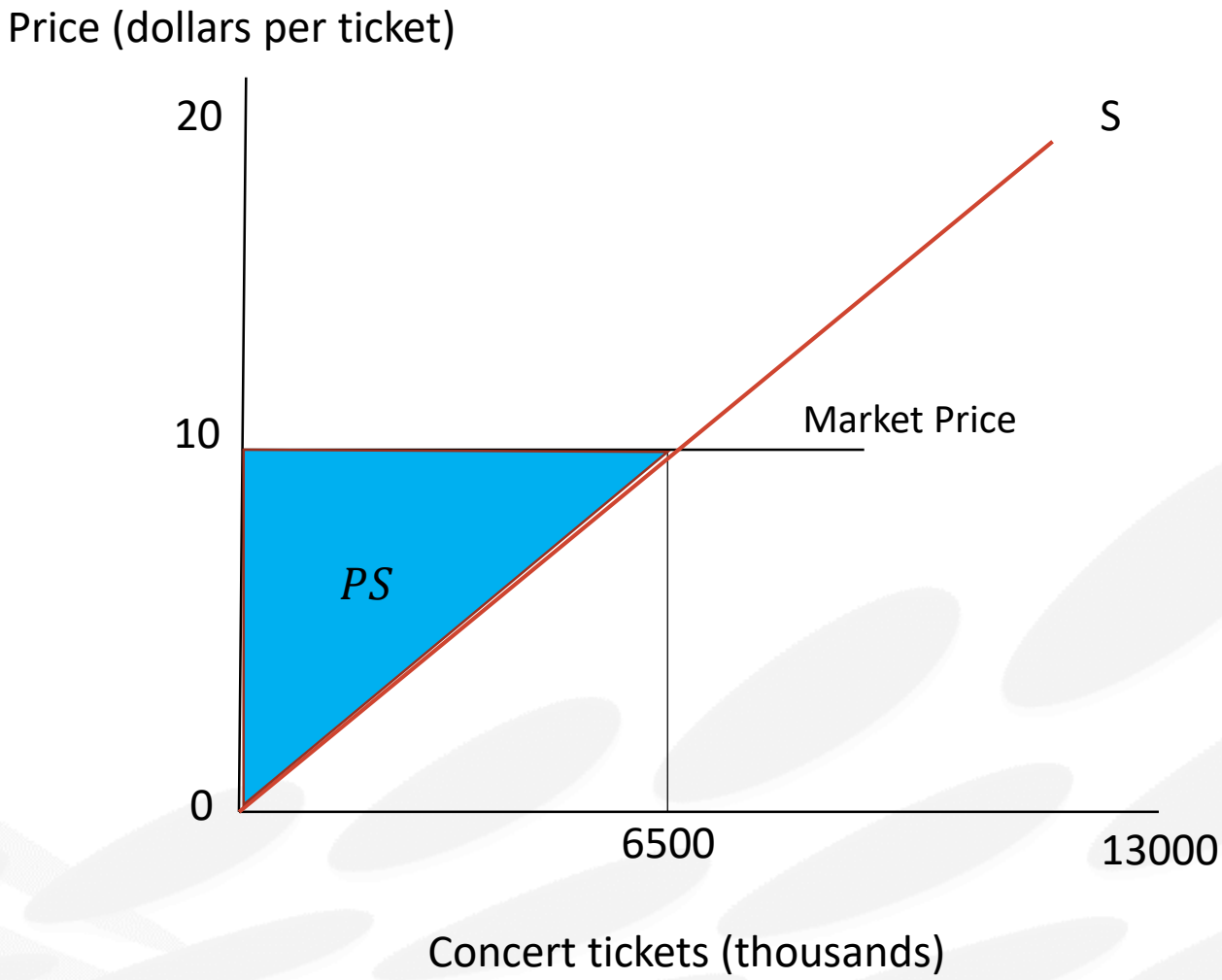
# Introducing Producer Surplus

## Measuring Producer Surplus

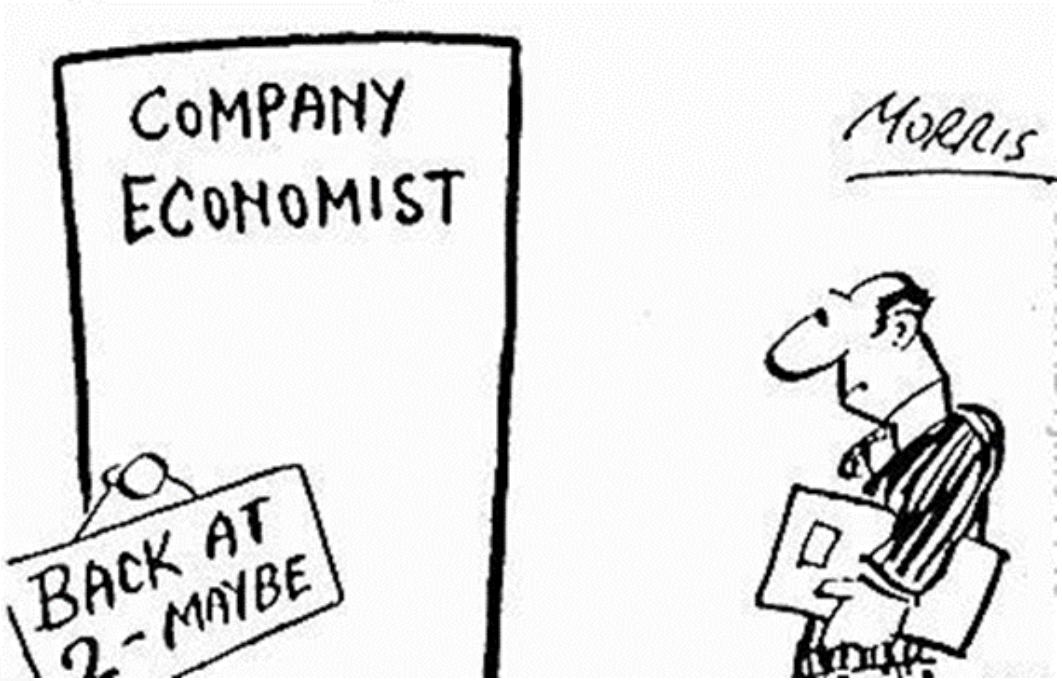
Measured by the area above the supply curve and below the line representing the purchase price of a good.

Here, producer surplus is given by the blue triangle.

$$PS = \frac{1}{2} * (\$10 - \$0) * 6500 = \mathbf{\$32,500}$$



# Coffee Break



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Original thinking... applied

# Market Failure and the Role of Government

# Why Markets Fail

Infinite buyers and sellers
Zero entry and exit barriers
Perfect factor mobility
Perfect information
Zero transaction costs
Profit maximization
Same goods

} Remember these?

# The Economic Efficiency of Competitive Markets

**Welfare economics**: normative evaluation of markets and economic policy

*If everyone trades in the competitive marketplace, all mutually beneficial trades will be completed and the resulting equilibrium allocation of resources will be economically efficient.*

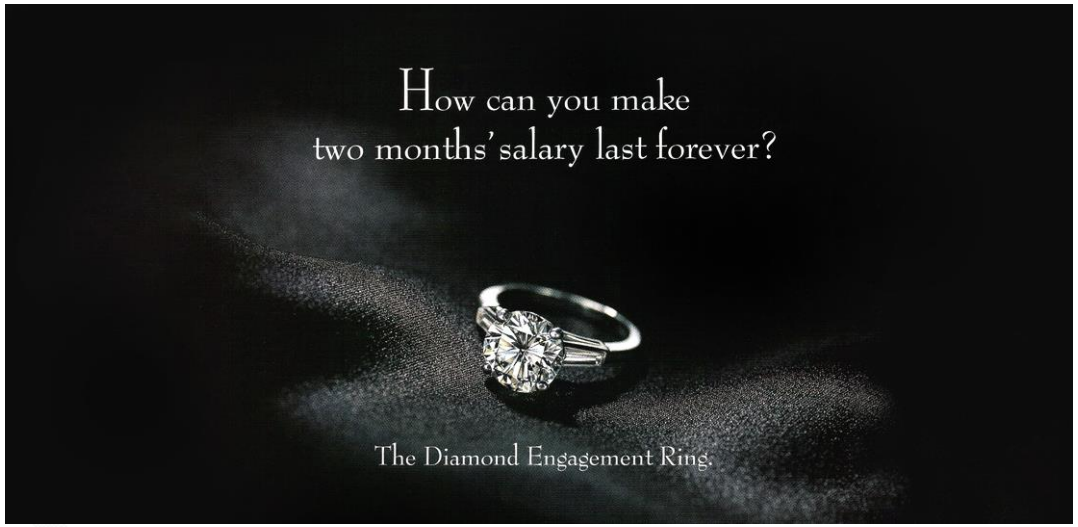
**Social welfare function**: measure describing the well-being of society as a whole in terms of the utilities of individual members.

Four views of equity:

1. Egalitarian – all members of society receive equal amounts of goods
2. Rawlsian – maximize the utility of the least-well-off-person
3. Utilitarian – maximize the total utility of all members of society
4. Market-oriented – the market outcome is the most equitable

# Concentrated Market Power

- Firms protected from competition are expected to have more control over prices.




- ➢ Seller market → benefit from higher prices, since buyers can not substitute away to other options.
- ➢ Buyer market → benefit from lower prices, since seller has no other choice to sell its products.

# Public Goods

Market failure arises when the market fails to supply goods that many consumers value.

**Public good**: Nonexclusive, nonrival good that can be made available cheaply but which, once available, is difficult to prevent others from consuming.

*e.g. flood control systems, street lights, public bridge, lighthouse*

# Public Goods

| Degree of Publicness | | | |
|---|---|---|---|
| **Low** | **Medium** | | **High** |
| **Private Good** | **Club Goods** | **Impure Public Good** | **Pure Public Good** |
| Rival | Non-rival for a small user group | Non-rival | Non-rival |
| Excludable | Excludable | Excludable only at high costs | Non-excludable |
| Excludable and rival. | Excludable, but subject to congestion as the number of users increase. | Exclusion - even if technically feasible - is costly, therefore there is a high risk of congestion. | Exclusion technically impossible. Very high degree of non-rivalry in consumption, with a certain degree of congestion possible. |
| Examples:<br>• Wheat<br>• Timber | Examples:<br>• Private parks<br>• Golf course | Examples:<br>• Public access to farmland<br>• Landscapes and landscape features | Examples:<br>• Stable climate<br>• Air of high quality<br>• Biodiversity<br>• Non-use values of landscape |

# Incomplete Information

If consumers do not have accurate information about market prices or product quality, the market system will not operate efficiently.

This lack of information may give producers an incentive to supply too much of some products and too little of others.

In other cases, while some consumers may not buy a product even though they would benefit from doing so, others buy products that leave them worse off.

# Incomplete Information

Different kinds of quality characteristics in food safety

1. Search characteristics → quality can be ascertained by buyer at the time of purchase
2. Experience characteristics → quality can only be ascertained after purchase (i.e., 'lemons problem').
3. Credence characteristics → consumer can not ascertain the quality on their own; relies on the judgement of others

Market solutions may alleviate these (i.e., repeat purchases to maintain company reputation)

# Quality Uncertainty

**Asymmetric information**: situation in which a buyer and seller possess different information about a transaction

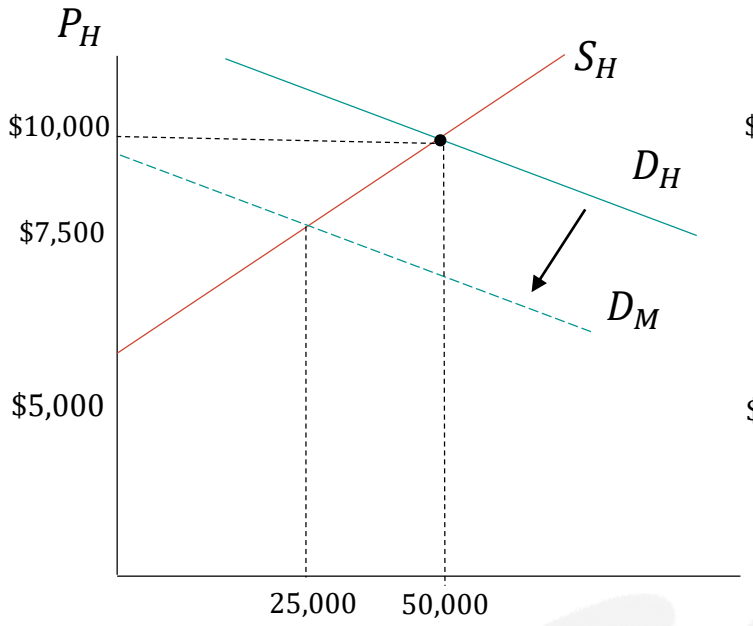
*The Market for Used Cars*

Sellers have better information → low quality goods drive out high quality goods: "lemon problem"

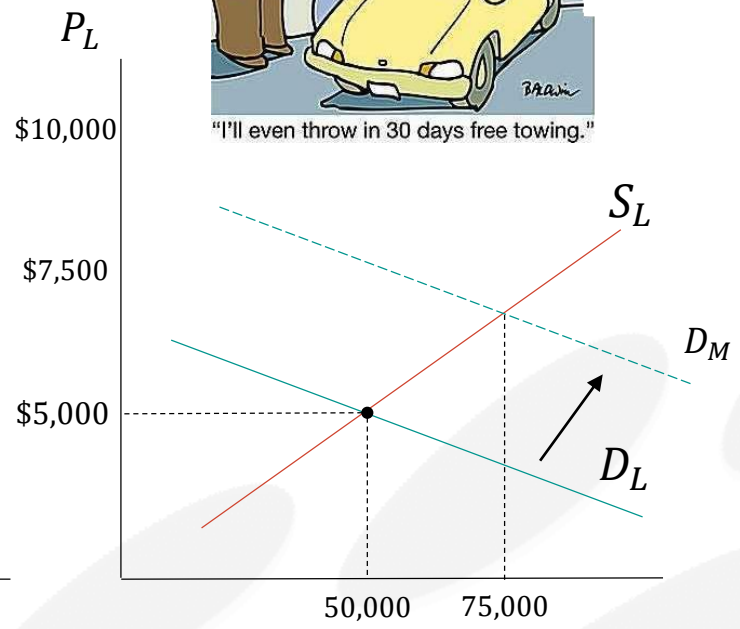
In (a), as buyers have low expectations about the average quality of cars on the market, perceived demand shifts from $D_H$ to $D_M$

Likewise, in (b) the perceived demand curve for low-quality cars increases from $D_L$ to $D_M$.

"I'll even throw in 30 days free towing."




(a) High-Quality Cars




(b) Low-Quality Cars

# Quality Uncertainty

## Cadmium in Chinese Rice

- High cadmium levels in rice from Hunan province, May 2013
- Guangzhou Municipal Food and Drug Administration (FDA) did not reveal the origin of the tainted rice.
- Guangzhou residents refused to buy any rice from Hunan province
- Rice production halted, even from sources that had tested safe

https://sinosphere.blogs.nytimes.com/2014/04/25/after-cadmium-rice-now-lead-and-arsenic-rice/

# The Principal-Agent Problem

**Principal-agent problem**: when agents (e.g., a firm's managers) pursue their own goals rather than the goals of principals (e.g., the firm's owners).

**Agent**: Individual employed by a principal to achieve the principal's objective (e.g. a firm's manager).

**Principal**: Individual who employs one or more agents to achieve an objective (e.g. the firm's owners).

# The Principal-Agent Problem

## The Principal–Agent Problem: The Enron Scandal

- Enron was once one of the most powerful businesses on Wall Street
- Enron's leadership fooled regulators with fake holdings and off-the-books accounting practices.
- Enron hid its mountains of debt and toxic assets from investors and creditors.
- The price of an Enron share went from about $90 at its peak to $0.25 at bankruptcy.

# Moral Hazard

# Moral Hazard

**Moral hazard:** a tendency to take undue risks because the costs are not borne by the party taking the risk

## The Effects of Moral Hazard

No house insurance? → You will bear the loss at the time of a mishappening like fire or burglary.

Hence you will show extra care and attentiveness. You will install high tech burglar alarms and hire watchmen to avoid any unforeseen event.

House insurance? → If anything happens you do not really lose anything, the insurance firm bears the losses. Therefore, you have **less incentive to protect against any mishappening**.

*E.g. Large US insured farmers using less chemical inputs* (Crop Insurance, Moral Hazard, and Agricultural Chemical Use Vincent H. Smith and Barry K. Goodwin. *American Journal of Agricultural Economics* Vol. 78, No. 2 (May, 1996), pp. 428-438)

# Moral Hazard

## Moral Hazard and Food Safety

- Many food attributes that may be difficult to identify/evaluate
  - Can a buyer in a grocery store see if spinach is contaminated?
- Buyers must trust that suppliers put in the effort to produce food responsibly
- Avoid moral hazard → expose producers to the costs of unsafe food
  - Traceability
  - Better litigation procedures → Buzby (2001); 30% of foodborne illness lawsuits (1988-97) resulted in compensation
  - Social media and consumer voices

# Externalities

**Externality**: Action by either a producer or a consumer which affects other producers or consumers, but is not accounted for in the market price.

- Poor food safety imposes external costs; who bears those costs?


**Marginal external cost**: Increase in cost imposed externally as one or more firms increase output by one unit.

**Marginal social cost**: Sum of the marginal cost of production and the marginal external cost.

# Externalities

## Negative Externalities and Inefficiency

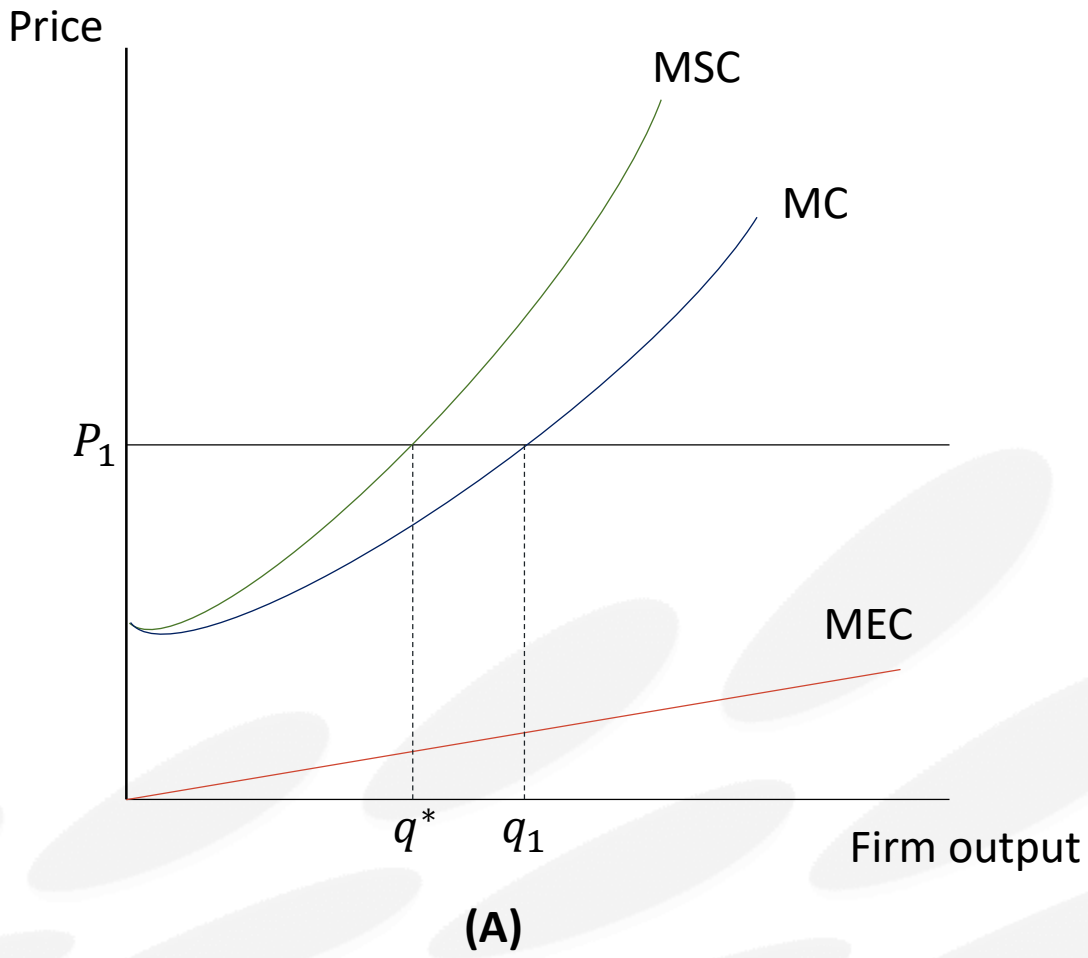
In **(A)**, a profit-maximizing firm produces at $q_1$, where price is equal to the **marginal cost** (MC).

**Marginal Cost**: The change in total production costs from a one-unit increase in production.

When there are negative externalities, the marginal social cost (MSC) is higher than the MC.

The difference is the marginal external cost (MEC).

The efficient output is $q^*$, at which price equals MSC.

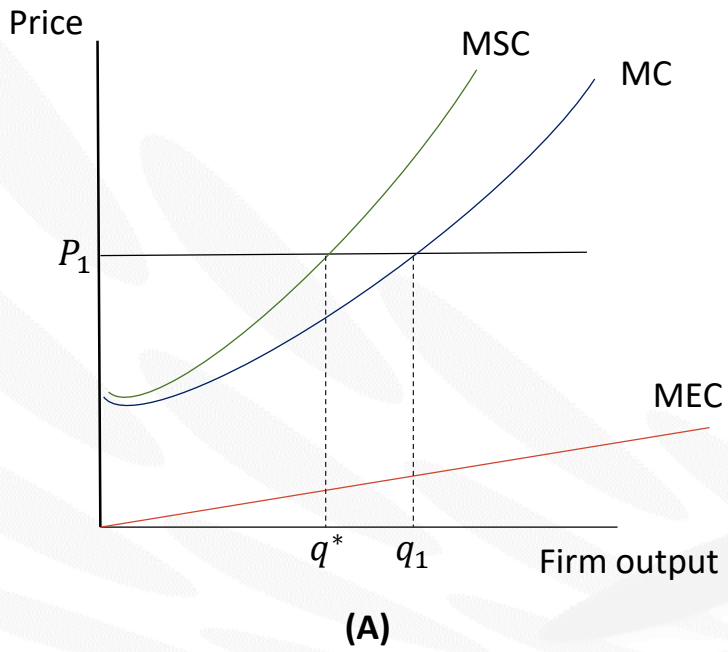


# Externalities

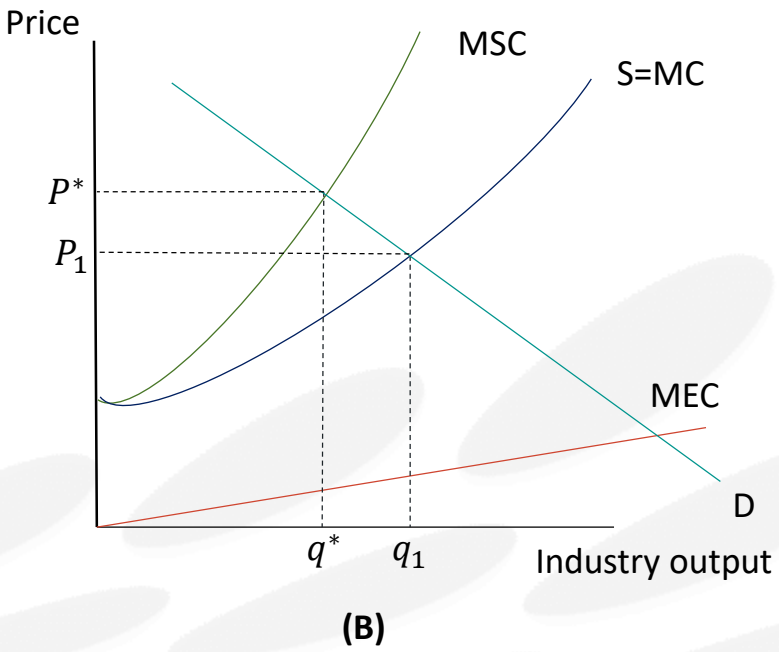
## Negative Externalities and Inefficiency

In **(B)**, the industry's competitive output is $q_1$, at the intersection of industry supply MC and demand D.

However, the efficient output $q^*$ is lower, at the intersection of demand and marginal social cost MSC.




**(A)**




**(B)**

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Original thinking... applied

## TOTAL COST OF FOODBORNE ILLNESS IN THE UNITED STATES

| | Cases | Cost Per Case[a] ($) | Total Cost to U.S. Residents ($ Millions) | Confidence Interval 5% | Confidence Interval 95% |
|---|---|---|---|---|---|
| **Bacterial** | | | | | |
| *Bacillus cereus* | 29,439 | 226 | **7** | <1 | 16 |
| *Botulism*, foodborne | 62 | 726,362 | **45** | 17 | 74 |
| *Brucella* spp. | 818 | 70,698 | **58** | 14 | 101 |
| *Campylobacter* spp. | 2,112,302 | 8,901 | **18,803** | 4,388 | 36,695 |
| *Clostridium perfringens* | 267,403 | 510 | **136** | 33 | 239 |
| *E. coli* O157:H7 | 66,905 | 14,838 | **993** | 296 | 1,689 |
| *E. coli*, Non-O157 STEC | 5,368 | 1,339 | **7** | 2 | 13 |
| *E. coli*, Other | 4,422 | 1,368 | **6** | 1 | 11 |
| *Listeria monocytogenes* | 5,205 | 1,695,143 | **8,823** | 2,277 | 15,365 |
| *Salmonella*, Typhi | 536 | 62,509 | **34** | 16 | 51 |
| *Salmonella*, nontyphoidal | 1,597,411 | 9,146 | **14,609** | 3,185 | 29,091 |
| *Shigella* spp. | 96,686 | 7,092 | **686** | 124 | 1,519 |
| Staphylococcus | 199,121 | 818 | **163** | 54 | 271 |
| Streptococcus, foodborne | 54,789 | 2,288 | **125** | 31 | 220 |
| *Vibrio cholerae*, toxigenic | 52 | 5,428 | **<1** | <1 | <1 |
| *Vibrio vulnificus* | 51 | 3,045,726 | **154** | 33 | 275 |
| *Vibrio*, other | 5,511 | 21,810 | **120** | 25 | 215 |
| *Yersinia enterocolitica* | 93,321 | 7,227 | **674** | 150 | 1,369 |
| **Parasitic** | | | | | |
| *Cryptosporidium parvum* | 46,978 | 4,424 | **208** | 44 | 421 |
| *Cyclospora cayetanensis* | 32,322 | 1,531 | **49** | 11 | 88 |
| *Giardia lamblia* | 175,033 | 3,675 | **643** | 96 | 1,423 |
| *Toxoplasma gondii* | 121,048 | 29,429 | **3,562** | 855 | 6,273 |
| *Trichinella spiralis* | 56 | 11,864 | **1** | <1 | 1 |
| **Viral** | | | | | |
| Norwalk-like viruses | 9,899,026 | 586 | **5,802** | 1,691 | 9,885 |
| Rotavirus | 41,963 | 1,155 | **48** | 14 | 86 |
| Astrovirus | 41,963 | 1,268 | **53** | 9 | 119 |
| Hepatitis A | 906 | 11,193 | **10** | 2 | 18 |
| **Unknown agents** | 67,012,102 | 1,430 | **95,806** | 25,242 | 166,564 |

| | Cases | Cost Per Case[a] ($) | Total Cost to U.S. Residents ($ Millions) | Confidence Interval 5% | Confidence Interval 95% |
|---|---|---|---|---|---|
| **All Illnesses** | 81,910,799 | 1,851 | **151,626** | 38,987 | 264,825 |

http://www.publichealth.lacounty.gov/eh/docs/ReportPublication/HlthRelatedCostsFromFoodborneIllinessUS.pdf

# Coming up

Challenges in the Economic Assessment of Food Safety Incidents

1. Economic Assessment of Food Safety
2. Assessing Preferences for Food Safety
3. Global Trade and Food: Biosecurity and Ecosystem Risk