

Basic Economics for Industrial Engineering

Introduction

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Introduction

Course Organisation

Course Structure

1. Introduction to economics - Topics:

- Demand and supply: Market
- Production
- Consumption

2. Introduction to economics - Tools:

- Economic Analysis
- Experiment
- Data Analysis (econometrics)

3. Seminar course :

- Readings and Case studies
- Some application (tools)

Evaluation

1. (0.15) Case Studies (October)

- Team work on a paper
- Economic analysis of a case

2. (0.15) Multiple choice Questions (Oct-Nov)

- Intermediary check of learning

3. (0.70) Final exam (8th November)

Economics and Industrial Organisation

”Technology changes, economic laws do not”

Shapiro et Varian (1999)

(Usefull handbooks: Coelli et al. 2005, Church and Ware (1999), Varian (2006), Stiglitz and Walsh (2004), Mankiw (2011))

5 Concepts in Economics

Definitions

Definition : Economic science

Economics studies how individuals, firms, governments and organisations make choices and how they allocate scarce resources.

Economy: one “who manages a household”

- Economic analysis is based on the notion that individuals **assign priorities** to their wants and choose their **most preferred** options from among the available alternatives.
- Priorities come from individual's **unlimited wants** (goods, services, time, improve the plight of others, respect, affection, etc..)
- In contrast to wants, **resources are limited**.

5 key concepts

5 concepts define the core ideas that are critical to understanding economics.

They have primary role to understand decision making and impact of choices on our societies.

- Trade-offs
- Incentives
- Exchange
- Informations
- Distribution

Trade-offs

Resources are **scarce**, hence trade-offs are elements of life and societies.

There is no free lunch. Having more of one thing requires giving up something else. (Stiglitz and Walsh 2004)

The role of the economists is to analyse the choice of economic agents in term of efficient use of these scarce ressources.

Incentives

Decision makers respond to incentives; for understanding choices, incentives matter.

- **Rational self-interest** : individuals select the choices that make them happiest, given the information available at the time of a decision.
- **self-interest vs. selfishness**
Economists do not assert that people are selfish in the sense that they care only about their own personal wealth.

Examples (Stiglitz and Walsh 2004)

Trade-offs and Incentives in Practice: Online Music Sharing Since 1999, when Napster introduced the first file-sharing program

Incentives and the Price of AOL: In 1997, AOL announced that it would change its pricing policy and move to a flat monthly fee with unlimited minutes of connect time

Exchange

Both individuals take benefit from **voluntary** Exchange.

- **markets**: the exchange places
- In market economies, **voluntary exchange** leads to **efficient allocation and use** of resources.
- This assures that one or both parties to an **exchange benefit** and no one is made "worse" off.

Concept of Pareto Efficiency :

Pareto efficiency of a situation is a condition such that there are no alternatives that will improve the welfare of any person(s) without making some one else (or others) "worse off"

Informations

Making informed choices requires information

- The structure that markets take and how well they can function **depend on the information** available to decision makers.
- Individuals are not endowed with perfect knowledge and foresight. Information comes at a cost.

Imperfect Information can interfere with incentives

Economists do not contend that individuals are supercomputers that make infallible decisions.

Distribution

Markets determine how the goods and services produced by the economy are allocated to members of society.

- **Market economy** determines not only what goods are produced and how they are produced, but also for whom.
- Efficiency vs. Equity
 - **Efficiency** means society gets the most that it can from its scarce resources.
 - **Equity** means the benefits of those resources are distributed fairly among the members of society

Balance between public and private sector

Thinking like an Economist

Thinking like an Economist

Every field of study has its own terminology

- Mathematics
 - integrals ; axioms; vector;spaces
- Psychology
 - ego; id; cognitive;dissonance
- Law
 - promissory; estoppel; torts; venues
- Economics
 - supply; opportunity cost; elasticity; consumer surplus; demand; comparative advantage; deadweight loss

Economics trains you to...

- Think in terms of **alternatives**.
- Evaluate the **cost** of individual and social choices.
- Examine and understand how certain events and issues are related.

The Economist as a Scientist

The Economic way of thinking...

- Involves thinking analytically and objectively.
- Makes use of the scientific method

The Scientific Method: Observation, Theory, and More Observation

- Uses abstract models to help explain how a complex, real world operates.
- Develops theories, collects, and analyzes data to evaluate the theories.

Economists use models to simplify reality in order to improve our understanding of the world

Demand - Experiment 1

Game rules

- You will be a **buyer** in a market,
- and you will **choose the number of units** of a commodity to purchase
- at the **going market price**, which will change from one round to the next
- The more you purchase, **the more it costs you**, but the more value you obtain from consuming units purchased.
- You **earn the difference** between the consumption values of units purchased and the prices paid.
- Your decisions are **independent** between rounds.
- Tax will be on each unit

Veconlab website

- Let configure the experiment
- Veconlab connection (*google : veconlab*)
- Session name: **irj1**
- First name and Last name
- no Password

Let's play !

Questions & Debrief

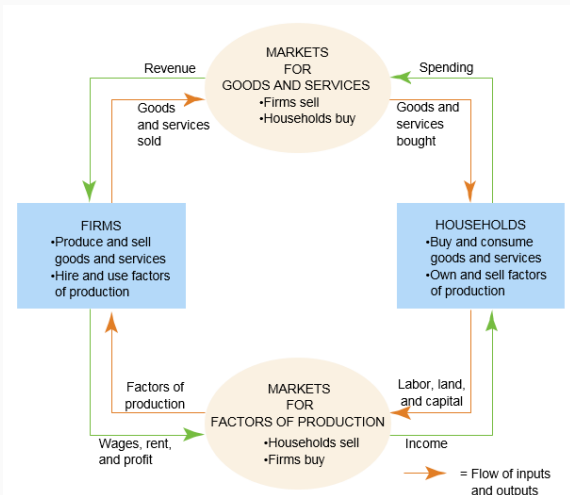
Discuss

1. Synthetic and analytic presentation of the problem
2. Definition of the marginal values at stake in the game
3. A strategy using **total values only**
4. A strategy using **marginales values only**
5. A strategy using **average values only**
6. Demand forecast: Graph of price and demanded quantity
7. Synthesis of the effect of the tax
8. Decrease of the **marginal consumption value**

First two models

First Model: Circular-flow Diagram

The **circular-flow diagram** (Mankiw 2011): visual model of the economy that shows how dollars flow through markets among households and firms.



Circular-flow Diagram

Firms

- Produce and sell goods and services
- Hire and use factors of production

Households

- Buy and consume goods and services
- Own and sell factors of production

Markets for Goods and Services

- Firms sell
- Households buy

Circular-flow Diagram

Markets for Factors of Production

- Households sell
- Firms buy

Factors of Production

- Inputs used to produce goods and services
- Land, labor, and capital

Microeconomics and Macroeconomics

Microeconomics

Microeconomics focuses on the individual parts of the economy.

How households and firms make decisions and how they interact in specific markets

Macroeconomics

Macroeconomics looks at the economy as a whole.

Economy-wide phenomena, including inflation, unemployment, and economic growth

Second model: Basic Competitive Model

Competitive Market model

- provides the point of departure for studying economy
- consists of three parts
 - assumptions about consumers
 - assumptions about firms
 - assumptions about interactions on the market
- provides **theoretical results** about the market mechanisms and output
- provides a **benchmark** to study other market situations / assumptions

Competitive Market Rules

5 Assumptions of Perfect Competition

Competitive markets are assumed to be:

- all agents are **price takers**: no negotiation power
- **free entry/exit of the market**: no cost, nor subscription
- **homogeneous product**: unique definition/specification of the product
- **perfect information**: "everyone knows you knows, he knows, etc."
- **mobility of the inputs**: all needs are covered to produce

Rational consumers and profit-maximizing firms

- **scarcity** imply choices
- assumption of **rational choice**:
People weight the costs and benefits of each possibility whenever they must make choice
- agents act consistently, knowing what they like and how to obtain it

a basic model because of strong assumptions on market rules and economic agents...

Rationality of the consumers

- self-interest, Preferences and utility
- Utility maximization...
- ... under constraints (budget, time,...)

Rationality of the firms

- Revenue, costs and profit
- Profit maximization...
- ... under constraints (costs)

Competitive Market Equilibrium

Solving the market

- Experimenting the law of demand

All else being equal on a market, as the price of a good increases, quantity demanded decreases (and conversely)

- The law of supply

Keeping other factors constant on a market, an increase in price results in an increase in quantity supplied

- Market output: market equilibrium (price, quantity)
- let experiment on veconlab
google search "veconlab login"
and wait for my instruction

Rational Choice

Basic steps of Rational Choice

- Identifying the opportunity sets
- Define the trade-offs
- Calculate the costs correctly

Opportunity sets

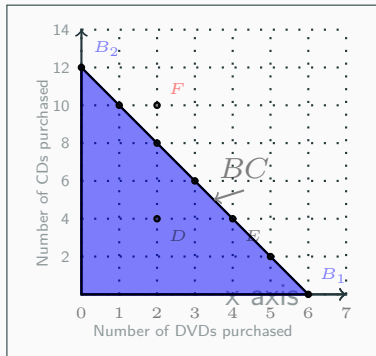
Consumer : Budget and Time Constraint

Budget constraint defines a typical opportunity set.

Example: :

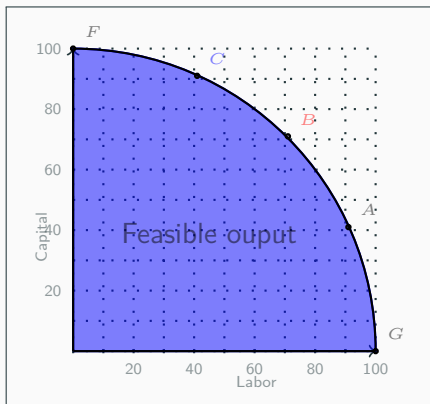
You have decided to spend 120€ on either CDs (10€) or BluRay (20€).

Represent on a graph the budget constraint and the opportunity set.



Producer : Production Possibilities curve (Frontier)

- In production decision, the **boundary of the opportunity set** (maximum amount of goods that can be produced for each amount of factors used) is called the **production possibilities curve**.
- The **production function** represents the relation between the *output* quantities (Y) and the *input* quantities (X_i) necessary to achieved the production.



Line or Curve ?

Graphical representation (linear or curved) of economic relation induces constant or variable substitution rate.

- Individuals face fixed trade-offs (mainly in monetary terms, with constant price ratio)
- Society and firms face **diminishing returns**: adding successive units of any input increases the output, but by less and less.

Measuring costs of options

Relative cost of options

Opportunity sets define the **rate of substitution** between the two goods (or inputs) in order to keep the constraint of budget (or production) fixed.

Agents choices and cost

- Between two equally profitable options, an option is chosen if its **relative cost** is less than the one of the other options.
- Example of relative cost is **relative price** of equally appreciated goods.

Measuring costs of options

What it cost to go to a movie ?

Opportunity cost

The **opportunity cost** of using a resource for a given purpose is its **value in its best alternative use**

The **next-best use**

*Economic agents make rational decision by taking into account **all** of the costs (the full opportunity costs), not just the direct expenditure.*

Sunk Costs

Sunk Costs

Costs and benefits that have been already incurred are sunk (nonrecoverable).

They are irrelevant in the current economic decision.

An hour into the movie: the movie is a disaster.

Should you leave the movie theater?

Your 2,000\$ computer ; the 1,000\$ new computer ;

Will you pay 400\$ to trade old for new?

Marginal Costs

Marginal costs

$MC(.)$ are the **incremental costs** that are associated with making a decision.

They are weighted against marginal benefits.

The 80km/h limit: A government marginal analysis

Rational Decision Rule

Economic decision rule

An action should be taken whenever the **marginal benefits** of that action exceed its **marginal costs**.

The Marginal Analysis !

Measuring the costs correctly

- ignoring the sunk costs
- taking into account opportunity costs
- and marginal costs

Reading Graphs

Reading Graphs

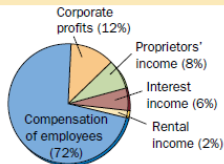
Graphs serve two purposes.

- developing economic theories: visually express ideas (complement of equations or words)
- visualizing economic data from the world
- Numerical information can be expressed graphically in many ways

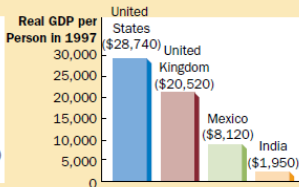
A good writer chooses words / An effective economist chooses the type of graph that best suits the purpose at hand (Mankiw 2011)

Graphs of a Single Variable

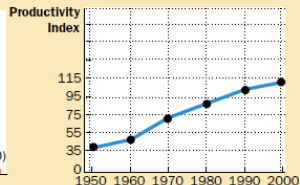
(a) Pie Chart



(b) Bar Graph

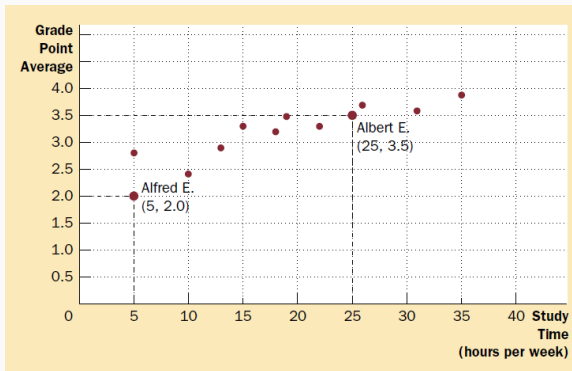


(c) Time-Series Graph



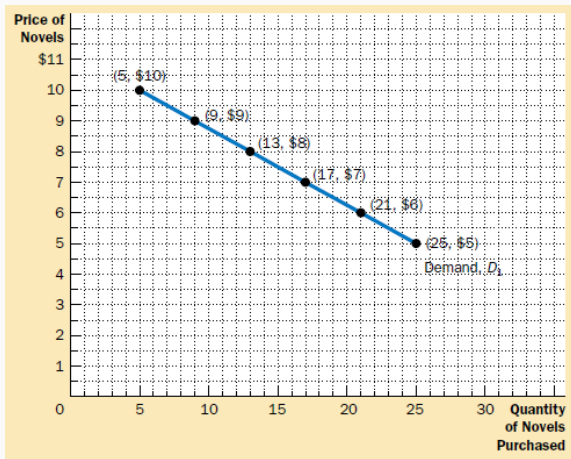
Graphs of Two Variables

In coordinate system, searching or showing **correlation**

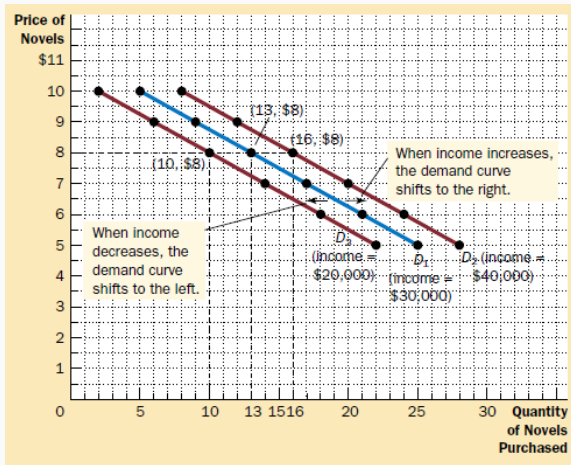


Curves in the Coordinate System

Linear curve



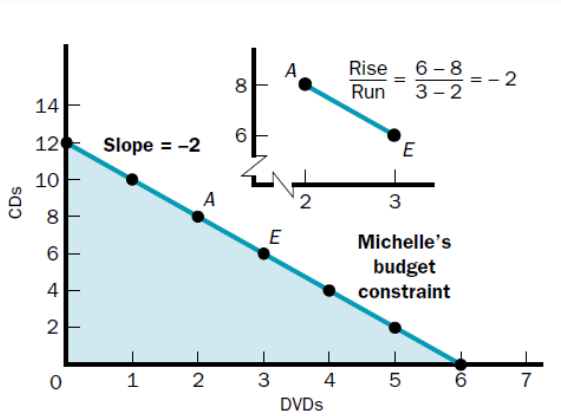
Shifting the curve



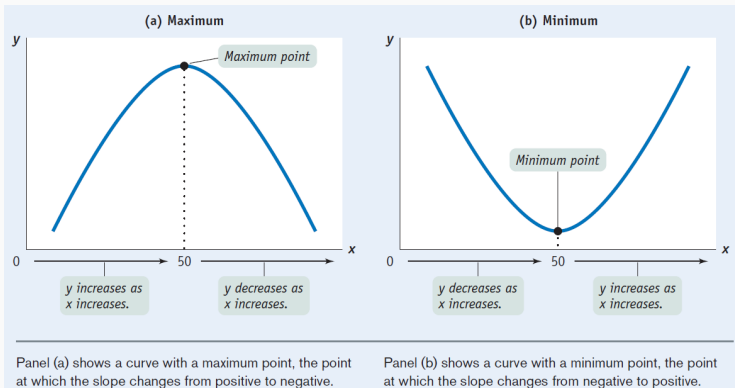
Reading Slopes

Slope:

$$\text{slope} = \frac{\Delta y}{\Delta x}$$



Minimum and Maximum



Cause and Effect

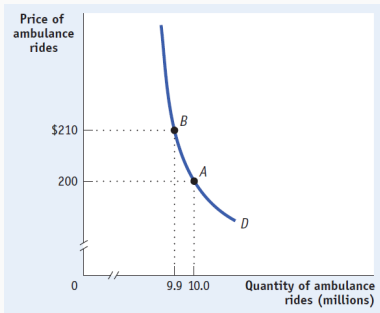
In the $Y = \alpha X + \beta$ relationship. The model assumes X causes Y , but:

- difficult to establish how one variable affects another
- difficult to hold everything else constant
- omitted variable
- reverse causation

Slope and Margin

- Economists analyse a function and its derivative
- For example: a production function $Y = f(X)$, describe the output Y linked to the input X .
- Hence, $f'(X) = \frac{\partial f(X)}{\partial X}$, describe the incremental output associated to a incremental input: **the marginal output**
- The same for utility function and marginal utility, etc.
- **Linear Case:** for $y = \alpha \cdot x + \beta$, the margin is constant α .

Elasticity



- Fig. tells us the change in the quantity demanded for a particular change in the price.
- Price elasticity of demand: measure of price responsiveness?

The price elasticity of demand

The price elasticity of demand is the ratio of the percent change in quantity demanded to the percent change in price as we move along the demand curve.

Price Elasticity of Demand

Price Elasticity of Demand

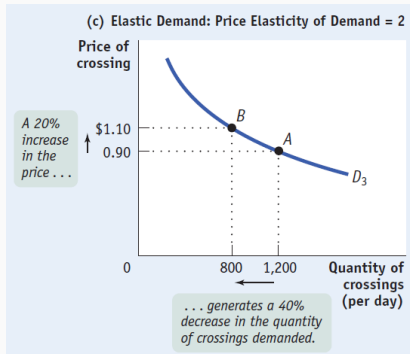
$$\epsilon_{Y/X} = \frac{\% \text{ change } y}{\% \text{ change } x} = \frac{\Delta y / y}{\Delta x / x} = \frac{\Delta y}{\Delta x} \cdot \frac{x}{y}$$

Interpreting Price Elasticity

Elastic Demand

When the price elasticity of demand is greater than 1, economists say that demand is elastic

When the price elasticity of demand is **large** compared to the percent change in the price-economists say that demand is **highly elastic**

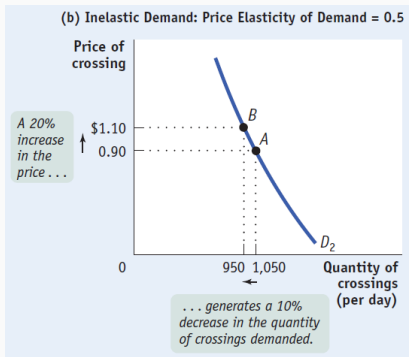


Interpreting Price Elasticity

Inelastic Demand

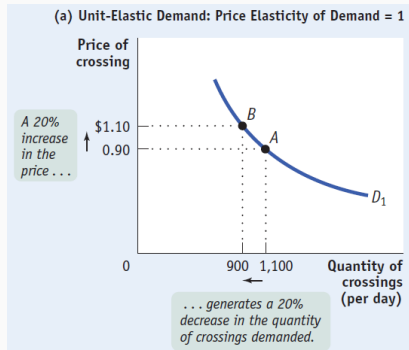
When the price elasticity of demand is less than 1, they say that demand is **inelastic**.

the quantity demanded will fall by a **relatively small** amount when price rises. This is what economists call **inelastic demand**



Unit Elasticity

The borderline case is **unit-elastic** demand, where the price elasticity of demand is exactly 1.



Why does it matter whether demand is unit-elastic, inelastic, or elastic?

how changes in the price of a good will affect the total revenue,

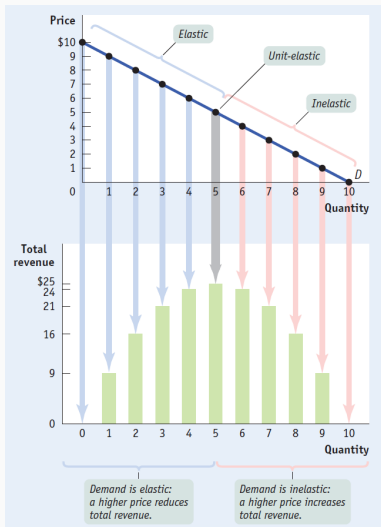
$$\text{Total revenue} = \text{Price} \times \text{Quantity sold}$$

When a seller raises the price of a good, two countervailing effects are present:

- A price effect: After a price increase, each unit sold sells at a higher price, which tends to raise revenue.
- A quantity effect: After a price increase, fewer units are sold, which tends to lower revenue.

- When demand is unit-elastic, the two effects exactly balance; so a fall in price has no effect on total revenue.
- When demand is inelastic, the quantity effect is dominated by the price effect; so a fall in price reduces total revenue.
- When demand is elastic, the quantity effect dominates the price effect; so a fall in price increases total revenue.

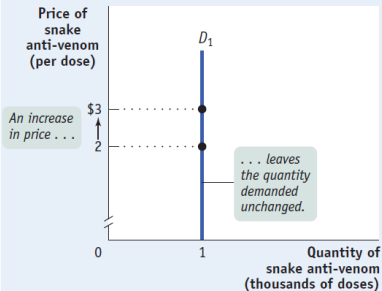
Price Elasticity Along the Demand Curve



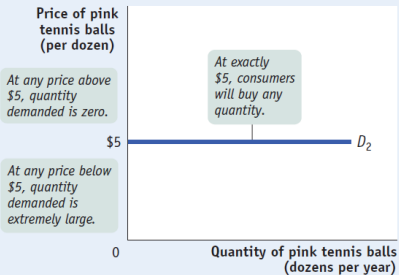
- In majority of demand curves, the price elasticity at one point along the curve is different from the price elasticity at other points along the same curve
- So whenever you measure a good's elasticity, you are really measuring it at a particular point or section of the good's demand curve.

Perfect Elasticity

(a) Perfectly Inelastic Demand:
Price Elasticity of Demand = 0



(b) Perfectly Elastic Demand:
Price Elasticity of Demand = ∞



What Factors Determine the Price Elasticity of Demand?

- Whether the Good Is a Necessity or a Luxury
- The Availability of Close Substitutes
- Share of Income Spent on the Good
- Time Elapsed Since Price Change

The Cross-Price Elasticity of Demand

Cross-price elasticity of demand between goods A and B

$$\epsilon_{A/B} = \frac{\% \text{ change in quantity of A demanded}}{\% \text{ change in price of B}}$$

Complements and Substitutes

- When two goods are **substitutes**, the cross-price elasticity of demand is **positive**
- When two goods are **complements**, the cross-price elasticity is negative

The Income Elasticity of Demand

Income elasticity of demand

$$\epsilon_{Y/Inc} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$

- When the income elasticity of demand is **positive**, the good is a **normal good**.
- When the income elasticity of demand is **negative**, the good is an **inferior good**.

Demand, Supply and Price

Market Economy

Every economic entity (national, economy, firm, household) is confronted with 3 basic issues:

- What to produce,
- How to produce it,
- How to allocate the final output.

Given the alternatives, what is the best way to organize economic activities?

We need some criterion for comparing alternative systems.

Pareto Efficiency

Economists focus on a relatively uncontroversial but narrow criterion : Pareto efficiency

Economic objective

A distribution of resources is said to be Pareto-efficient if there is no alternative allocation that keeps all individuals at least as well off but makes even one person better off.

Role of Prices

Role of Prices

The **price** of a good is what must be given in exchange for the good.

- It **includes** the costs in money and other factors
- The price conveys all the **relevant information**
- Prices are determined by supply and demand.
Changes in price are determined by changes in demand and supply.

The price level defines the **gains from trade** for each buyers and sellers.

Concept of Demand

Demand is used to describe the **quantity of a good or service** that a household or firm chooses to buy at a given price.

- Economists are concerned with what people choose to buy given the spending limits imposed by their budget constraint and the prices of various goods.

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- Demand on the market is the sum of all the individual demand.
- Market demand curve gives the total quantity of the good that will be demanded at each price.

Individual Demand

The more expensive, the less a person will buy.

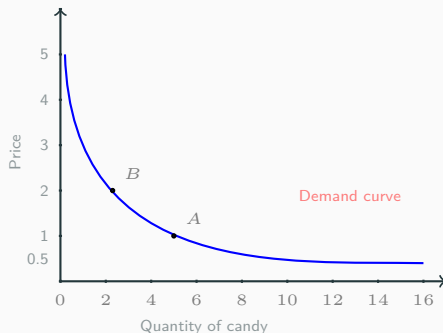


Figure 1: An individual demand curve

Market Demand

The market demand curve is constructed by adding up, at each price, the total of the quantities consumed by each individual.

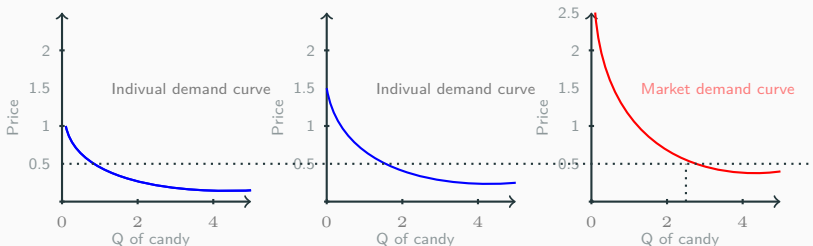


Figure 2: Deriving the Market Demand Curve

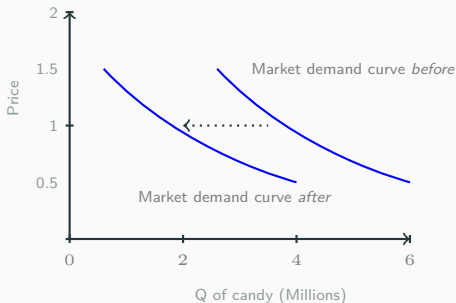
- The market demand curve is downward sloping, for 2 reasons:
 - at a higher price each consumer buys less
 - at high enough prices, some consumers exit the market.
- We hypothesised continuous quantities for graphical convenience.

Shifts in Demand

Shifts in Demand

- When the price of a good **increases**, the demand for that good **decreases** - when everything else is held constant.
- Any changes other than in the price **shift** the whole demand curve.

For example reduction of the taste for candy.



Two factors shift the demand curve :

Changes in income

- Rising incomes shifts the demand curve to the right,

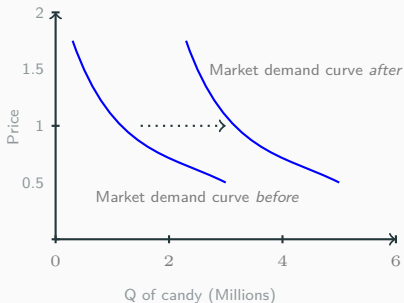


Figure 4: Rightward Shifts if the Demand Curve

Changes in price of other goods - Substitutes and Complements

- Two goods are **substitutes** if an **increase** in the price of one **increases** the demand for the other.
- Two goods are **complements** if an **increase** in the price of one **decreases** the demand for the other.

Increase in the price of a substitute or a decrease in the price of a complement can cause a rightward shift in the demand curve.

Many other sources of shifts in market demand curves:

- a change in income,
- a change in the price of a substitute / complement
- a change in the composition of the population
- a change in tastes or cultural attitudes
- a change in information
- a change in the availability of credit
- a change in expectations.

Supply

Firm's Supply

The supply describe the quantity of a good or service that a household or firm would like to sell at a particular price.

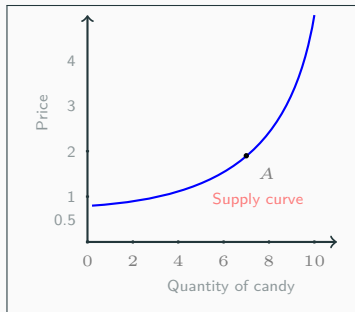


Figure 5: One firm's supply curve

Market Supply

Market Supply

The **market supply** is the total quantity that all the firms in the market are willing to supply at a given price.

Market supply curve is calculated from the supply curve of each firm.

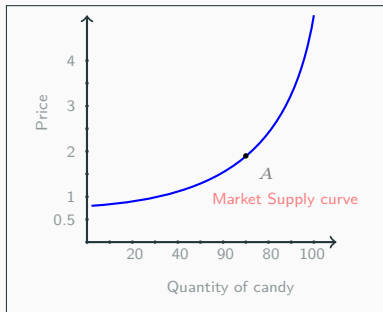


Figure 6: Market supply curve

Market Supply Curve

The *market supply curve* is upward sloping :

- each firm is willing to supply more of the good at a higher market price,
- higher prices entice new firms to produce.

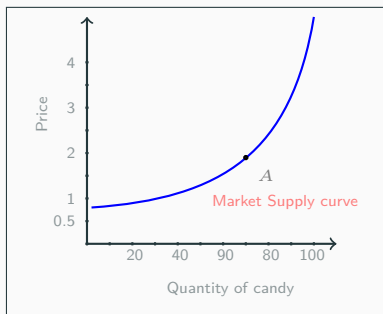


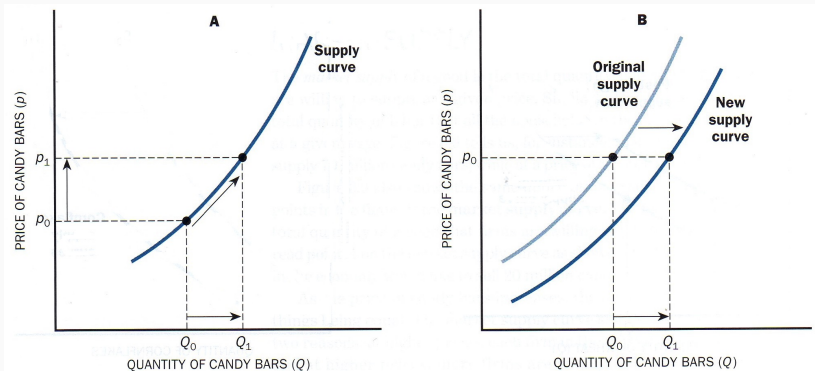
Figure 7: Market supply curve

Shifts in Supply

Several factors shift the supply curve :

- changes in prices of the inputs used to produce a good,
- changes in technology: technological improvement leads to a rightward shift,
- Nature (weather, disease, etc.),
- changes in interest rate,
- changes in expectations.

Remark: Do not confuse shift of the curve and movements along the curve.



Market Equilibrium

Market Equilibrium

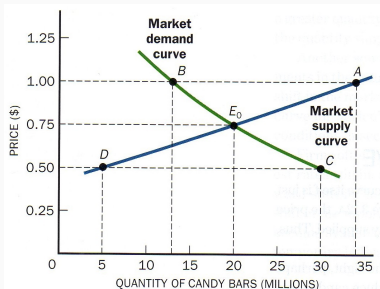
- Competitive Market mechanisms determine price and quantities exchange on a given market.
- We call equilibrium price and equilibrium quantity the exchanged quantities at the resulting price.

Equilibrium

Equilibrium describes a situation where there are no forces (reasons) for change. No one has an incentive to change the result.

- At the equilibrium price, consumers get the quantity they are willing to buy at that price,
- Producers sell the quantity they are willing to sell at that price.
- The market clears at the market clearing price.
- In equilibrium neither producers nor consumers have any incentive to change.

Market Equilibrium



At price of 1 or price of 0.5,

- there is no equilibrium quantity.

At price of 1:

- There is *excess of supply*.
- Producers can not sell as they would like. Some of them will lower their prices.

As price goes down,
consumers will buy more.

Market Equilibrium

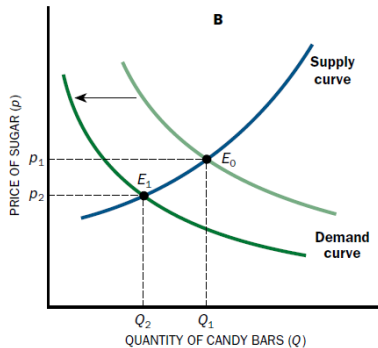
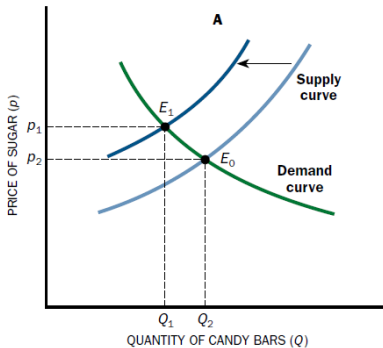
- at price of 0.5:
 - There is *excess of demand*.
 - Consumers ...
As price goes...

Law of supply and demand

In competitive markets, actual prices tend to be the equilibrium prices at which demand equals supply.

Using Demand and Supply curves

- On a market, when costs of production increase, the market equilibrium price increases and the equilibrium quantities decreases.



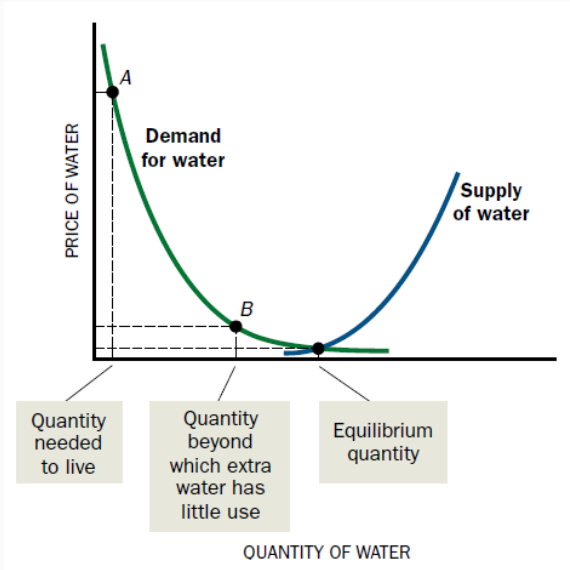
*What are the effects of: technological improvement;
change in taste; change in income?*

Price, Value, and Cost

Price and Value

- Price is what is given in exchange for a good or service. Price is determined by the forces of supply and demand.
- Adam Smith (1776) called it "**value in exchange**" and contrasted it to the notion of "**value in use**".
- Let explain the diamond-water paradox ¹
Draw the Demand and Supply curves for the market of water.

¹A. Smith, 1776, The Wealth of Nations, Book One, ChIV.



To an economist, the observations that the price of diamond is high and the price of water is low are statements about the supply and demand conditions.

Price, Value, and Cost

Price and Value

- Prices say nothing about whether diamonds are "better" or "more important" than water.
They are not statements about value in use.
- Price is related to the **marginal** value of an object: value of additional unit.
- **Total value** of water is high! But its **marginal value** is low.

Price, Value, and Cost

Price and Cost

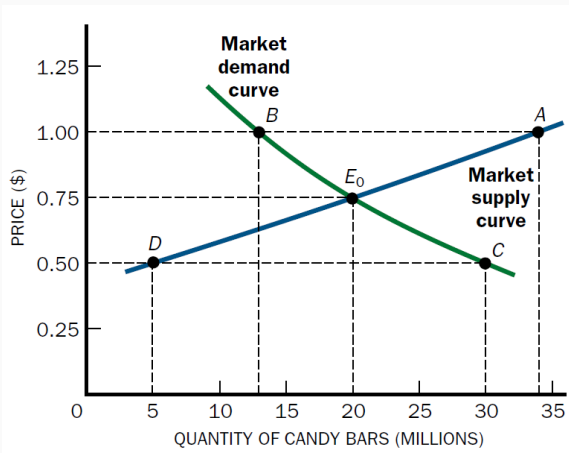
- Price of an object is what it sells for, whereas cost is the expense of making the object.
- Costs of producing affect the price at which firms are willing to supply that good.
- In the competitive model, at equilibrium, the price of an object will normally equal its marginal cost of production (including the amount needed to pay a firm's owner to stay in business rather than seek some other form of employment).

Competitive Market Results

Reminder

Competition mechanism of the competitive market

- In competitive market, there are many suppliers and many buyers for a given product.
- Because each is small relative to the size of the market, each **takes prices** as given.
- The market price is an equilibrium price.
- Sellers can not set a price higher than the market price.
- Buyer can not propose a price lower than the market price.

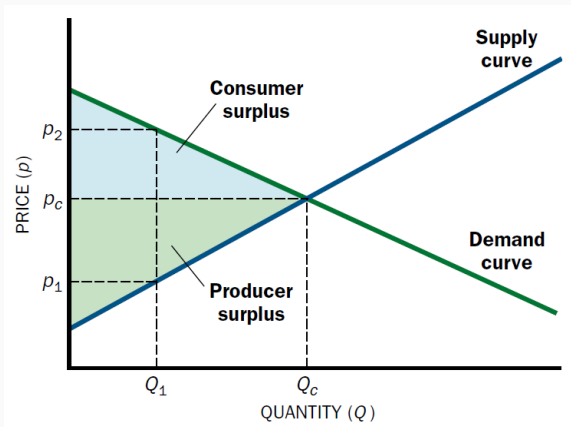


Theoretical Results

Economic Evaluation

Competitive Market maximizes total surplus

- When the market clears, firms are able to sell the quantity that maximizes their profit at the market price,
- and households are able to purchase the quantity that maximizes their utility at the market price.
- At the equilibrium price, marginal cost equals consumer's willingness to pay.



Theoretical Results

- Prices below or above the equilibrium price are not prices equilibrium.
- In the conditions of the basic competitive model are satisfied, markets do allocate society's resources efficiently.
- Basic competitive model provide a benchmark to how markets fail when the assumptions do not hold.
- Efficiency is better than inefficiency, but competition may result in an efficient economy with an unequal distribution of resources.

Exercises

Exercise international trade

Suppose 2 countries N and S, using 2 inputs L and K to produce PC and Tshirt, following:

Country	L	K	PC	T-Shirt
N	100	fixed	5	100
S	100	fixde	1	50

- Define the opportunity cost of one unit of T-Shirt for each country
- Can a trade system between the two countries improve the situation (i.e. increasing the total production and the nombre of the 2 output simultaneously in the 2 countries) ?

Elasticities

1. After Chelsea's income increased from \$12,000 to \$18,000 a year, her purchases of album downloads increased from 10 to 40 downloads a year. Calculate Chelsea's income elasticity of demand for albums using the midpoint method.
2. Expensive restaurant meals are income-elastic goods for most people, including Sanjay. Suppose his income falls by 10% this year. What can you predict about the change in Sanjay's consumption of expensive restaurant meals?
3. As the price of margarine rises by 20%, a manufacturer of baked goods increases its quantity of butter demanded by 5%. Calculate the cross-price elasticity of demand between butter and margarine. Are butter and margarine substitutes or complements for this manufacturer?

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