Masaryk University
Faculty of Economics and Business Administration

Mark Tomass, Ph.D.

Microeconomics I

Fall Semester 2007

Masaryk University
Faculty of Economics and Business Administration

Course **Microeconomics I**
Fall Semester, 2007

Instructor **Mark Tomass, Ph.D.**
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Office Hours: Monday 10:00 – 11:00 and 17:00 – 17:30

Course Objectives:

This course objective is to provide you with tools with which you can explain and predict phenomena relevant to business decisions. It will introduce basic economic concepts that explain the behavior of economic units, such as the individual and the firm. The course will demonstrate and explain optimal production decisions, profit maximizing pricing policies, distribution of individual incomes, efficient allocation of society's resources, and public policy concerning market structure. To accomplish these tasks, the course will divide markets into specific structures, such as perfectly competitive, monopolized, monopolistically competitive, and oligopolistic structures. The course will also examine the determination of input prices and the allocation of human and non-human resources among firms. The international effects of today's increasingly globalized economies on firms will also be a concern. A central feature of this course is the constant linking of the theory being developed with applications of current interest. Thus, the course aims to cater adequately for the many students whose interest lie in applied economics, while not sacrificing theoretical standards appropriate for an undergraduate program.

Upon completion of this course, students should be able to:

1. Understand what economics is, its method and tools;
2. Understand the decision-making of a buyer (consumer);
3. Understand the decision-making of a seller (producer);
4. Understand the workings of a market;
5. Understand the differences in market structures;
6. Understand the workings of input markets;
7. Understand the principles of government intervention with the market process.

Required Text

1. Samuelson and Nordhaus. Economics. Available in the library. Any alternative text on the Principles of Economics (or Microeconomics) is also acceptable.
2. Summary of lecture notes can be downloaded from the faculty's study online system.

Course Contents

I. Introduction

1. The consequences of industrial capitalism and the emergence of the market economy as the primary mechanism for allocation.
2. The difference between markets and the market society.
3. Defining essential economic terms.
3. The substantive content of the study of microeconomics.
4. The methodological foundations of economic analysis.
5. How to read graphs (to be prepared by you).

Readings: Lecture Notes, appendix to Chapter 1, and Chapter 3.

II. Production Possibilities Frontiers and International Trade

1. The meaning of opportunity cost.
2. Long run determinants of Production Possibilities Frontiers.
3. Absolute advantage and benefits from specialization and trade.
4. Comparative advantage and benefits from specialization and trade.

Readings: Chapter 36 and Lecture Notes

III. How Do Markets Work?

1. The modern concept of markets.
2. The price determinant of demand.
3. The non-price determinants of demand.
4. The price determinant of supply.
5. The non-price determinants of supply.
6. How are prices determined in a market economy?
7. Are shortages or surpluses possible in a free market economy?

Readings: Chapter 4.

IV. Elasticities and the Determinants of Demand

1. What determines the slopes of supply and demand curves? The concept of elasticity and its applications.
    a. Price elasticity of demand.
    b. Cross elasticity of demand.
    c. Income elasticity.
    d. Price elasticity of supply.
2. The concepts of total utility and marginal utility.
3. Explaining the law of demand with the notion of marginal utility.
4. How do consumers maximize pleasure?

Readings: Chapters 5 & 6.

V. Cost of Production

1. Short-run versus long-run analysis.
2. Marginal productivity and diminishing returns.
3. Fixed cost, variable cost, average cost, and marginal cost.
4. Long run costs.
5. Economies of scale and external economies.

Readings: Chapters 7 & 8.

VI. Production and Profit under Perfect Competition

1. Economic profit versus accounting profit.
2. The characteristics of perfectly competitive markets.
3. How do perfectly competitive firms maximize profit in the short-run?
4. Long-run adjustments in perfectly competitive industries and firms.

Readings: Chapter 9.

VII. Production and Profit under Monopoly

1. The differences between a perfectly competitive firm and a monopoly.
2. The production decision of a monopoly and a natural monopoly.
3. Can monopolies be regulated to the advantage of consumers?

Readings: Chapter 10.

VIII. Production and Profit under Monopolistic Competition and Oligopoly

1. Output and price determination in monopolistic competition.
2. Output and price determination under oligopolistic markets: The price leadership model.
3. The case for a Cartel.

Readings: Chapter 11.

General Course Policies and Rules

Course Requirements:

Final Exam: The Final exam constitutes 100% of your grade. It is 90 minutes long. It is in multiple choice form. The questions are based on material covered in the text, handouts, or lectures. They are based on these materials, but they are not identical to them. Exam questions do not ask you to reproduce the same information that you find in these materials. They ask you to analyze situations with a method derived from the material that you discussed in class or which are covered in the text. Therefore, do not be surprised if I ask you to respond to a question that is not illustrated in the text or in the handouts (lecture notes).

First Attempt: **December 10**
Second Attempt: **January 28**
Third Attempt: **February 11**

Grading Scale

Letter Grade	Percent (%)	Generally Accepted Meaning
A	91-100	Outstanding work
B	81-90	Good work, distinctly above average
C	71-80	Acceptable work
D	66-70	Below average work
E	60-65	Minimum standard work
F	0-59	Work that does not meet minimum standards for passing the course

Class Participation: This class is interactive. To insure your understanding of the materials, you should try to answer questions I pose in class. It is better to make a mistake in class discussion than in an exam.

Talking in class: Talking with your colleagues in class distracts me and distracts your colleagues. Therefore, it is absolutely necessary that you control yourself and curb your impulse to chat with your colleagues in class. If you have difficulties with controlling yourself, please do not attend class.

Tardiness or leaving the class early: Try to arrive in class five minutes before it starts in order to review your latest notes and get ready for the new material. Late arrivals are distracting to me and to your fellow students. If you have a good reason to leave the class before it ends, let me know before the class starts and sit next to the nearest exit so that you cause a minimum distraction.

Etiquette of Grade Disputing: I encourage you to discuss your performance in any exam. This is done in my office during the designated office hours or by setting up an appointment with me if my office hours do not suit you. If you have a concern to debate with me, please do it in my office. You are also welcome to review your exam with me even if you have no desire to dispute your grade.

Some obvious notes on maximizing your learning potentials in this course

Economics is a science that applies deductive logic to facts to help you make efficient decision. Its complexity arises from the syntheses of many simple laws that operate simultaneously. Your success in this course depends on your ability to synthesize these laws correctly and on your familiarity with the definitions of the terms used to describe the relevant facts. I suggest that you read the section below to maximize your learning experience:

First: Read each assigned chapter before you come to class and highlight the concepts, phrases, and ideas that you had difficulties in comprehending. This is a very important part of your preparation for the course because attending class will not substitute for reading the textbook. You need to work on the material independently to become familiar with economic logic.

Second: participate in class discussion. Do not hesitate to ask about the definition of terms I use in my presentations. Key definitions are crucial to comprehending the material. Be certain to identify any possible weaknesses you may have towards any topic.

Third: concentrate on my presentation while you are in the class. Referring back and forth to the textbook may be a confusing process. After class, get back to those issues which you highlighted and see if you now have a better understanding of them. If you still have difficulties with them make sure that you ask me to clarify whatever you are unclear about in the next class. If you feel uncomfortable about asking questions in class, feel free to consult me after the class is over.

Fourth: the lectures are interdependent and will gradually become more complex. Therefore, if you do not deal with any difficulties promptly, you will fall behind the class and feel confused as the rest of the class progresses. Do not wait for the last class meeting to ask for help. It may then be too late. Always remember that my cooperation will improve your performance only if you are willing to work hard independently.

Microeconomics I
Instructor: Mark Tomass
Handout 1

Defining Key Economic Concepts

Economics: The science that identifies the sources of wealth and attempts to enhance them.
2. Production: The transformation of material objects to satisfy human desires.
3. Resources: Materials, skills, or knowledge used for the production of goods and services.
4. Economic Man: A rational person who pursues his material self-interest.
5. The basic economic questions:
- **a)** What kinds of goods to be produced?
- **b)** With what combination of resources should they be produced?
- **c)** How should income be distributed among the population.

6. Monetary Prices: The prices of goods expressed in currency.
7. Relative Prices: The price of one good in terms of another good.
8. Allocative Efficiency: to produce what people want.
9. Productive Efficiency: to produce a quantity of output by using the minimum amount of resources.
10. Distributive Efficiency: to distribute the goods to those who value them the most.
11. Opportunity Cost: That which is given up in order to live the current moment.
12. Economic versus Accounting Profit: That which distinguishes non-economic thinking from economic thinking is that the latter takes into consideration the opportunity cost of engaging in a particular enterprise. Consider the following example:

Total revenue	3000	Total revenue	3000
		Economic costs	-2400
Explicit costs	-2000	Explicit costs	2000
Wages of workers	1000	Implicit costs	400
Raw material	500	Wages of owner–manager	200
Rent and utilities	450	Return on alternative riskless investments.	200
Depreciation (% of value of fixed capital consumed)	50		
Accounting profit	**1000**	**Economic profit**	**600**

Therefore, we conclude that economic profit is lower than accounting profit if implicit costs are taken into consideration. It is also evident that whenever economic costs exceed accounting costs, accounting profit will exceed economic (true) profit. On average economic profits in perfectly competitive markets are zero, for a positive economic profit will attract more investors into the industry to capture a market share and lead to a decline in the total revenue for the firms that were experiencing a positive economic profit. Thus, from now on, it should be clear that whenever we speak about profit, we mean economic profit. And, when we say that the perfectly competitive market experiences zero economic profit, we mean that the firms composing them are making "normal" accounting profit.

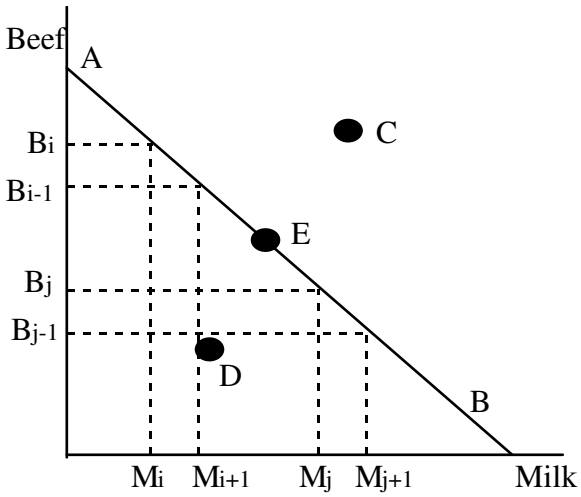
Microeconomics I
Instructor: Mark Tomass
Handout 2

The Production Possibility Frontier

We will develop below a framework with which we can clarify how a nation allocates its resources among alternative uses. Since resources are limited and wants are unlimited, we have to allocate our limited resources in a way that maximizes their use.

The production possibility frontier (PPF) is a graph showing combinations of goods or services that society can produce given its crude resources and its level of technology.

The figure below shows the PPF for two products.



We are assuming that a country uses all its resources for the production of either beef or milk or a combination of both. The points on the diagonal line (such as A) represent possible combinations of the two goods when all resources are utilized. Any point below the PPF is a possible combination of the country's production mix. A country may produce only beef and no milk, thus operate at point A. At point B, society doesn't produce any beef but only milk.

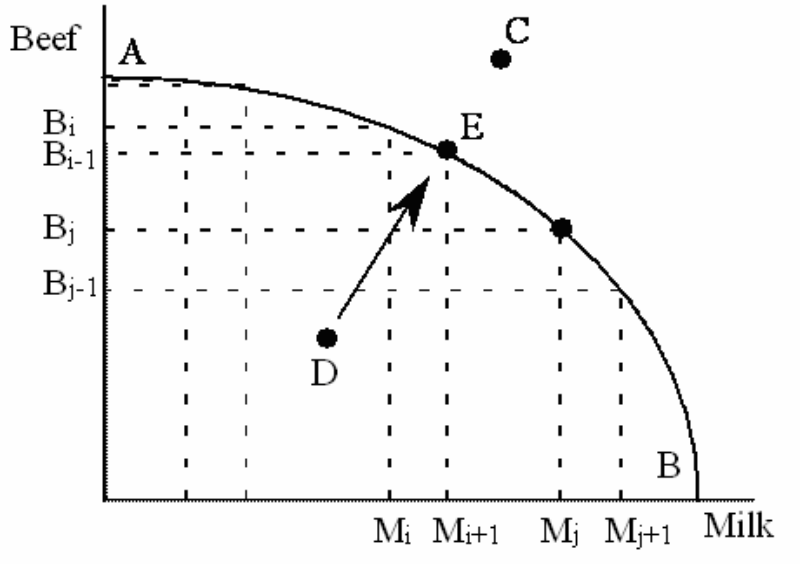
If production was at point D, there would be idle resources that could be put into production. If we utilize these resources, we move the country's production mix from point D to E or to any other point closer to the curve.

If society wants to increase the production of beef, it has to use more resources. Since total resources are fixed, these resources have to be taken away from the production of milk, thus we move upward on the curve. We therefore say that the opportunity cost of producing more beef is producing less milk.

Opportunity cost is what we forgo or give up when we make a choice or a decision. The full "cost" of making a choice includes the alternative choice which we give up for making that choice.

The reason for the PPF being a straight line is that when we gain one unit of milk, we lose one unit of beef. Therefore the opportunity cost is at constant proportions. This means that if we produce one less unit of beef (B_i -> B_{i-1}), we can produce one more unit of milk (M_i -> M_{i+1}).

Therefore, the curve is usually not a straight line. A more realistic view is shown with the figure below.

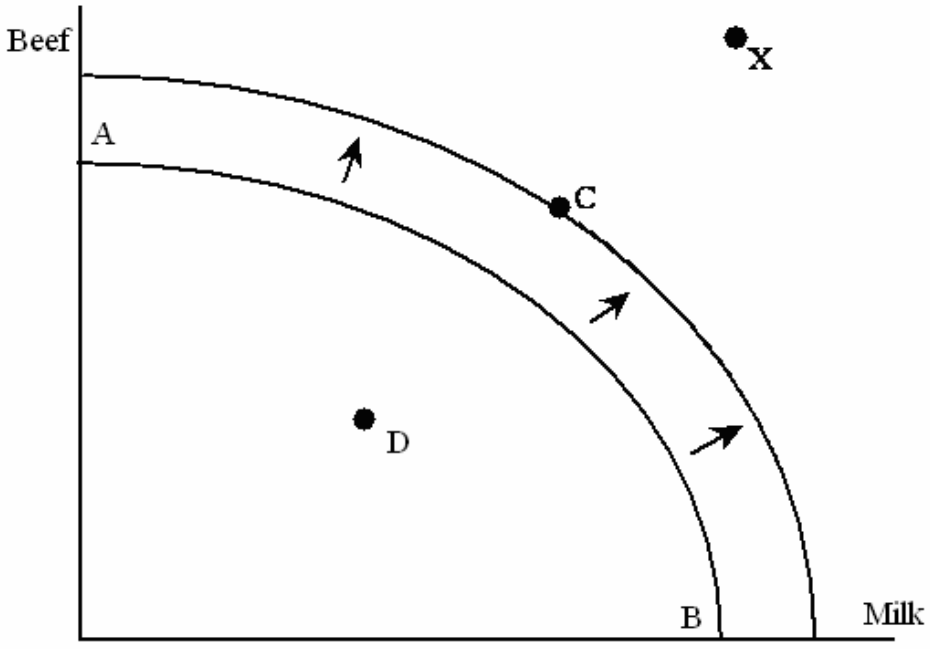


The above graph shows the more realistic case where the opportunity cost of producing more milk is increasing. If the country produces only beef and no milk (point A), it is very easy to increase production of milk. We have to give up only a small amount of beef. As the production of milk increases, the amount of beef which we have to give up gets higher. Thus, the opportunity cost of producing one more unit of milk increases (M_i -> M_{i+1}).

If we want to increase the production of milk, we have to give up some cows that we had for producing beef. If we keep on increasing the production of milk we have to allocate into this production more and more cows that are more suitable for meat. Therefore, the opportunity cost of an additional unit of milk increases. Resources are not perfect substitutes for the production of all goods. Thus shifting resources from one kind of production to another will make them less utilized.

However, it is not possible for society to operate above the curve at point C because it represents the combination of production that society is not able to reach given its technology and resources.

In the long run, with new resources and improvements of technologies, **economic growth** occurs. The production possibility frontier shifts up to the right.



Point C which was above the curve before is now reachable now. But again, there is a point (X), that is above the PPF of society. Society can't **produce** so much beef and milk. It either has to lower the production of milk, or the production of beef, or both.

However, the country can **consume** above the PPF through international trade. The country then combines its own resources with those of other countries and can gain from the benefits of trade. We will show how this would be possible in the section on international trade.

Microeconomics I
Instructor: Mark Tomass
Handout 3

Absolute Advantage versus Comparative Advantage

Since the inception of nation states in Europe during the 1500s and up to the 1750s, the prevailing thoughts regarding international trade were of the "Mercantilists." They believed that the world's economic wealth is of a fixed size. This meant to them that one nation's gain from trade came at the expense of its trading partners. Therefore, they were convinced that not all nations could simultaneously be better off by consuming more as a result of international trade. Furthermore, they believed that real wealth was embodied in gold. As a result, in order to accumulate gold, they pursued policies that encouraged a maximum amount of exports and a minimum amount of imports. In order for the country to sustain a higher level of exports than imports (trade surplus), its population had to consume less of its resources and convert them into goods for exports. However, beginning from the 1750s many practical philosophers started to refute the ideas of the Mercantilists. Among those were David Hume (1711-1776) and Adam Smith (1723-1790). Below we shall discuss the latter's views regarding one particular aspect of international trade which is now known as the theory of Absolute Advantage.

Absolute Advantage

Adam Smith's celebrated book appeared in 1776 under the title: *An Inquiry into the Nature and the Causes of the Wealth of Nations*. He showed in his book that international trade can increase the world's output and enable all trading partners to be simultaneously better off.

How do all nations benefit from international trade?

Adam Smith argued that a country should specialize in producing the product for which it uses cheaper resources than its trading partners. In other words, it should specialize in producing the goods which it produces at a lower cost than its trading partners. The cost of production, in turn, will be lower the more abundant the needed resources (inputs) are.

Example: In order to simplify our demonstration, we will make the following assumptions:
1. Australia and New Zealand are isolated from other countries in the world.
2. They produce only two goods: wheat (with which they make bread) and cotton (with which they make clothing).
3. No diminishing returns from substituting resources for the production of an alternative good (straight production possibility frontier).
4. Preferences for food and clothing are such that they imply equal consumption of bushels of wheat and bales of cotton.
5. Each country has only 100 acres of land available for cultivation.
6. Land yields of wheat and cotton are given per acre in Table 1.
7. In the absence of trade, each country divides up its land to obtain 150 bushels of wheat and 150 bales of cotton as shown in Table 2.
8. Zero transportation cost.

Table 1.

	New Zealand	Australia
Wheat	6 bushels	2 bushels
Cotton	2 bales	6 bales

Table 2.

	New Zealand	Australia
Wheat	25 acres x 6 bu/acre = 150 bu	75 acres x 2 bu/acre = 150 bu
Cotton	75 acres x 6 bales/acre = 150 bales	25 acres x 6 bales/acre = 150 bales

By looking at Table 1, we observe that New Zealand can produce three times the wheat that Australia can by using the same space. We therefore conclude that New Zealand has absolute advantage in producing wheat. We also observe that Australia can produce three times the cotton that New Zealand can in the same space. We therefore conclude that Australia has an absolute advantage in producing of cotton.

We can organize the information in a different way in order to utilize the concept of the production possibility frontier. In Figure 1, we draw a separate graph for each country. Before trade, each country is constrained by its own resources and productivity. If Australia uses all its land to produce cotton, it will obtain 600 bales of cotton and no wheat. If it uses all its land to produce wheat, it will obtain 200 bushels of wheat and no cotton. The opposite is true for New Zealand.

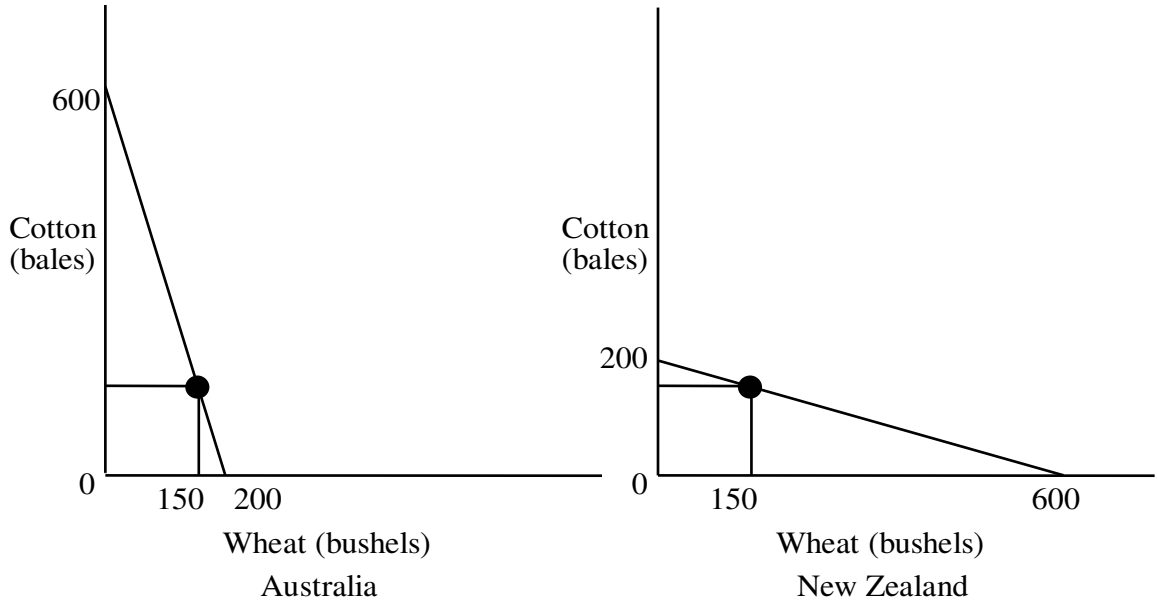


Figure 1.

Gains from Specialization and Trade:

If Australia specializes in producing 600 bales of cotton and New Zealand specializes in producing 600 bushels of wheat, an agreement between the two countries to trade 300 bushels of wheat for 300 bales of cotton will double wheat and cotton consumption in the two countries and enable both countries to consume beyond their production possibility frontiers as seen in Table 3 and figure 2.

Table 3.

	New Zealand	**Australia**
Wheat	100 acres x 6 bu/acre = 600 bu	0 acres = 0 bu
Cotton	0 acres = 0 bales	100 acres x 6 bales/acre = 600 bales

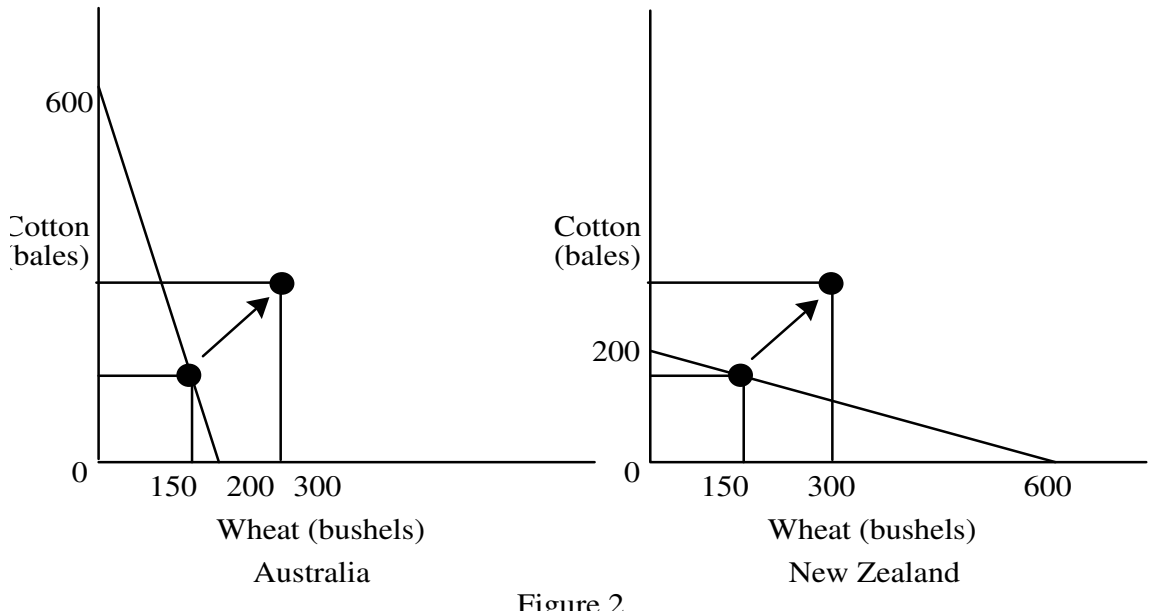


Figure 2

One may ask why a country should trade if it has an absolute advantage in all the goods. In other words, suppose that New Zealand can produce more of cotton and of wheat than Australia by using the same space; what incentive does it have to trade with Australia? In such case New Zealand has an absolute advantage in the production of cotton as well as wheat. James Mill (1773-1836) was the first economist to attempt to answer such a question. However, they were the writings of David Ricardo (1772-1823) that influenced later economists on this question and was called the theory of comparative advantage in international trade. We therefore will present it below.

Comparative Advantage

David Ricardo's *Principles of Political Economy and Taxation* appeared in 1817, in which he shows that even if a country has an absolute advantage in both goods, it will benefit from partial specialization and trade.

In Table 4, we assume that New Zealand has an absolute advantage in wheat and cotton because it can produce six times as much wheat and twice as much cotton as Australia by using the same space. In Table 5, we assume that New Zealand would split up its 100 acres evenly between the two crops and produce 300 bushels of wheat and 300 bales of cotton. Australia, however, would split its 100 acres into 75 acres for wheat and 25 acres for cotton, thus produce 75 bushels of wheat and 75 bales cotton.

Table 4.

	New Zealand	**Australia**
Wheat	6 bushels	1 bushels
Cotton	6 bales	3 bales

Table 5.

	New Zealand	Australia
Wheat	50 acres x 6 bu/acre = 300 bu	75 acres x 1 bu/acre = 75 bu
Cotton	50 acres x 6 bales/acre = 300 bales	25 acres x 3 bales/acre = 75 bales

Gains from specialization and trade:
In order to show how trade can be mutually beneficial, Table 6 divides this demonstration into three stages:

In **stage 1**, Australia transfers all its land into cotton production and produces 300 bales of cotton but no wheat at all. New Zealand, however, cannot completely specialize because it cannot get enough cotton from Australia. In **stage 2**, New Zealand transfers 25 acres of cotton into wheat. It now produces 150 bales of cotton and 450 bushels of wheat. In **stage 3**, they trade. After negotiations, we assume that New Zealand ships 100 bushels of wheat to Australia in exchange for 200 bales of cotton. After the trade, New Zealand has 350 bushels of wheat (50 bushels of net gain) and 350 bales of cotton (50 bales of net gain); Australia has 100 bushels of wheat (25 bushels of net gain) and 100 bales of cotton (25 bales of net gain). Both countries are therefore better off, and both have moved beyond their own production possibilities frontiers.

Table 6.

Stage 1

	New Zealand	Australia
Wheat	50 acres x 6 bu/acre = 300 bu	0 acres = 0bu
Cotton	50 acres x 6 bales/acre = 300 bales	100 acres x 3 bales/acre = 300 bales

Stage 2

	New Zealand	Australia
Wheat	75 acres x 6 bu/acre = 450 bu	0 acres = 0bu
Cotton	25 acres x 6 bales/acre = 150 bales	100 acres x 3 bales/acre = 300 bales

Stage 3

	New Zealand		Australia
Wheat	350 bu	100 bu (trade) --> (after trade)	100 bu
Cotton	350 bales	200 bales (trade) <-- (after trade)	100 bales

Why do both countries gain from specialization and trade?

The real cost of producing cotton is the wheat that must be sacrificed in order to produce it. For example, in Table 4, we observe that the opportunity cost of a bale of cotton in New Zealand is one bushel of wheat; in Australia a bale of cotton only costs one third of a bushel of wheat:

In New Zealand: 1 cotton = 1 wheat
...In Australia: 1 cotton = 1/3 wheat

Thus, Australia has a comparative advantage in the production of cotton.

Conversely, New Zealand has a comparative advantage in wheat production because one unit of wheat in New Zealand costs one unit of cotton; in Australia, one unit of wheat costs three units of cotton:

In New Zealand: 1 wheat = 1 cotton
In Australia: 1 wheat = 3 cotton

Comparative advantage, therefore, is determined by looking at the opportunity cost of producing a good within a country when compared to the other country. As a result, we conclude that New Zealand would benefit from trade if it partially specializes in wheat where its absolute advantage is the greatest (or comparatively more efficient) and if Australia specializes in the good which its absolute disadvantage is the least (or comparatively less inefficient).

Microeconomics I
Instructor: Mark Tomass
Handout 4

The Constituting Elements of Demand and Supply

The Definition of Demand:

It is the expression of the desire and the ability to buy a certain quantity of a good at each alternative price.

The Price Determinant of Demand:

Given that individuals have a budget constraint, then

a) when the price of a commodity decreases, its quantity demanded increases. The price of a commodity must decrease in order for one to buy an additional unit of it because each additional unit consumed is valued less to the individual and therefore he is willing to pay less for it; conversely,

b) when the price of a commodity increases, its quantity demanded decreases.

We therefore obtain **the law of demand** that states: *prices and quantities demanded are inversely related* given that all other circumstances do not change. This is shown graphically by a downward sloping demand curve. On such demand curve changes in prices lead to movements of quantities demanded along the same demand curve.

The Non-Price Determinants of Demand:

Given that the price of the commodity does not change, any change in the elements below will lead to changes in demand (**not** the quantities demanded). We demonstrate this graphically by shifting the demand curve to the left or to the right. If the change of any of the elements below cause more demand, then we shift the curve to the right implying that the individual will buy more of the commodity in question regardless of its price; if the change causes less demand, we shift the curve to the left implying that the individual will buy less of the commodity regardless of its price.

a) Tastes and the role of advertising
b) Income and its influence on normal goods versus inferior goods
c) Prices of other goods: The case for complementary versus substitute goods
d) Population size and its age distribution
e) Expectations of future prices or incomes
f) Regulations

The Definition of Supply:

It is the expression of the desire and the ability to produce and/or sell a certain quantity of a good at each alternative price.

The Price Determinant of Supply:

Given that producers and sellers have limited resources, then

a) when the price of a commodity increases, its quantity supplied increases. The price of a commodity must increase in order for one to produce and sell additional units of it because of the higher cost of production that has to be paid for and the higher profit incentive that has to be satisfied; conversely,

b) when the price of a commodity decreases, its quantity supplied decreases.

We therefore obtain **the law of supply** that states: *prices and quantities supplied are positively related* given that all other circumstances do not change. This is shown graphically by an upward sloping supply curve. On such supply curve changes in prices lead to movements of quantities supplied along the same supply curve.

The Non-Price Determinants of Supply:

Given that the price of the commodity does not change, any change in the elements below will lead to changes in supply (**not** the quantities supplied). We demonstrate this graphically by shifting the supply curve to the left or to the right. If the change of any of the elements below cause more supply, then we shift the curve to the right implying that producers/sellers will produce and sell more of the commodity in question regardless of its price; if the change causes less supply, we shift the curve to the left implying that producers/sellers will produce and sell less of the commodity regardless of its price.

a) Technological changes
b) The cost of land and its fertility
c) Size and skills of labor and the wage rate
d) The cost of capital
e) Prices of technologically related goods which a firm produces or can produce.
f) Expectations of future events
g) Numbers of sellers
h) Taxes, subsidies, or government regulations

Market Equilibrium

a) Equilibrium price: the price at which the quantity supplied equals to the quantity demanded

b) Equilibrium quantity: the quantity that is associated with the equilibrium price where no surpluses or shortages exist

An Example of Supply and Demand Analysis

On following figures, we will demonstrate the sequence of changes that take place in the market when either supply or demand changes.

On **Figure 1**, the market is in equilibrium, operating at equilibrium price (P_e). At this price, producers are able to supply quantity of Q_e to the market and this is the quantity that consumers are willing to buy. Therefore at Q_e, the quantity supplied equals to the quantity demanded, $Q_S = Q_d$.

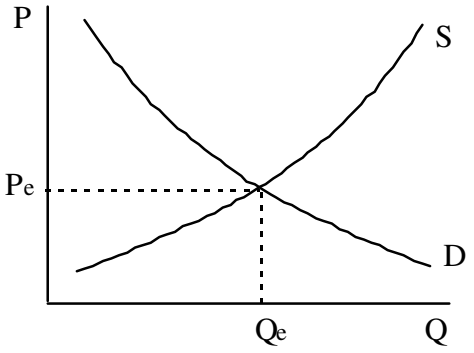


Figure 1.

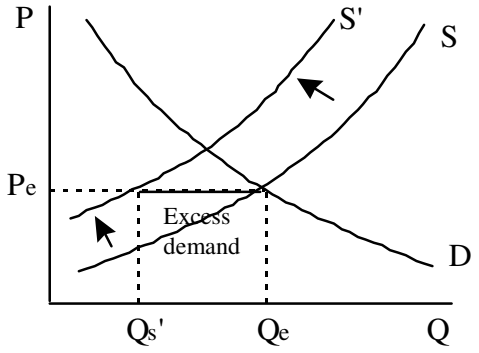


Figure 2.

Below, we will demonstrate the **sequence of change** resulting from a disturbance that affects the market:

(1) On **Figure 2**, the supply curve has shifted to the left. This may have taken place for several reasons. For example, if the good in question is grain, the supply curve may shift to the left because of bad weather. This causes excess demand (or a shortage) of the amount (Q_e - Q_s'). At the given price (P_e), people want to buy more than producers (farmers) are able to supply.

(2) On **Figure 3**, the existence of excess demand drives the price up because only a limited quantity of the good is available and it will be distributed between those buyers who are willing to pay higher prices.

(3) As the price rises, two other things happen: First, less people are willing to buy at higher prices, thus quantity demanded decreases. Second, more producers are willing to supply to the market, thus quantity supplied increases.

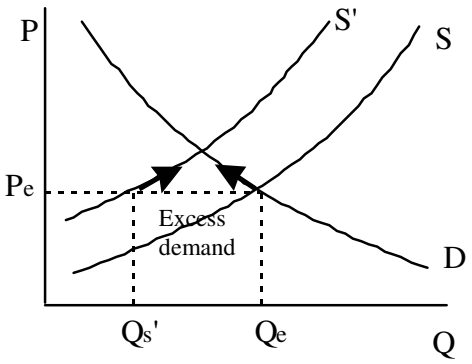


Figure 3.

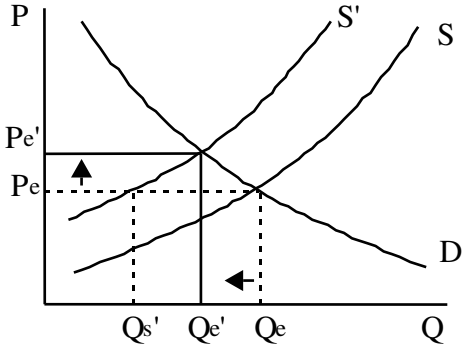


Figure 4.

This movement continues until the quantities supplied and demanded are equal, therefore a new equilibrium is reached at quantity Q_e' and price P_e', as it is shown on **Figure 4**.

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Handout 5

Elasticities

The Price elasticity of demand

Measures the responsiveness of the quantity demanded to price changes. It gives us the % change (Δ) of the quantity demanded given a 1 % change in the price of the good itself.

$$\text{Price elasticity} = E_p = \frac{\%\ \Delta Q}{\%\ \Delta P} = \frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta P}{P_1}} = \frac{P_1}{Q_1} \times \frac{\Delta Q}{\Delta P}$$

As we move down along the demand curve, P/Q falls. and since (change Q / change P) is constant, E_p goes down. This is why demand is inelastic for prices near zero. This elasticity is referred to as the **point elasticity** because it used the initial point P_1 and Q_1 to calculate the elasticity. However, when we calculate the elasticity for large changes in P and Q, E_p tends to vary from one point to another on the demand curve, thus E_p with P_1 and Q_1 will be a wrong measure. We, therefore, use the **mid-point formula** or the **arc elasticity formula** which measures the elasticity over the entire range of the price change by using the average change for % ΔQ and % ΔP as shown below:

$$\%\ \Delta Q = \frac{\Delta Q}{\frac{Q1 + Q_2}{2}} \quad \text{and} \quad \%\ \Delta P = \frac{\Delta P}{\frac{P_1 + P_2}{2}}$$

From now and on we will always use the mid-point formula to determine all the rest of the elasticities.

If the demand curve is horizontal, we call it perfectly elastic. With the perfectly elastic demand, any increase in P will cause Q_d to drop to zero. With the perfectly inelastic (vertical) demand, a change in price will cause no change in quantity demanded.

Income elasticity of demand is the % change of quantity demanded caused by a 1 % change in income.

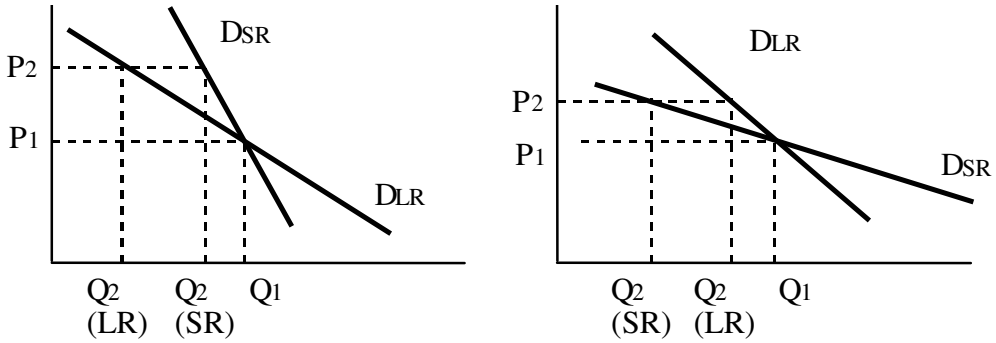
$$\text{Income elasticity} = E_I = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta I}{I}} = \frac{I}{Q} \times \frac{\Delta Q}{\Delta I}$$

Cross elasticity of demand is the % change of quantity demanded of one product caused by a 1 % change in the price of another good.

$$\text{Cross elasticity} = EP_Y = \frac{\frac{\Delta Qx}{Qx}}{\frac{\Delta Py}{Py}} = \frac{Py}{Qx} \times \frac{\Delta Qx}{\Delta Py}$$

EP_Y implies the elasticity of demand for X with respect to the price of Y. Cross elasticity is positive for substitute goods and negative for complementary goods.

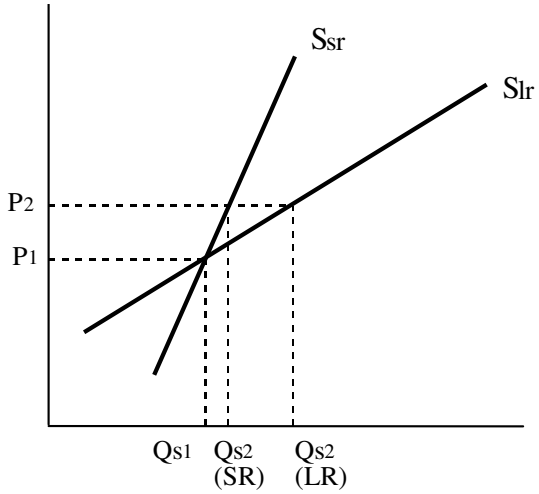
Short-run versus long-run elasticities differ for different markets. The first figure shows a demand curve for a commodity with long-run substitutes. People are able to find substitutes after longer period of time. An example would be the gasoline market. In the short-run, if the price goes up, consumption will start to go down. In the long run, people will start to buy more efficient cars and the quantity demanded for gasoline will decline even more. The second figure shows the market, where a change in the price will affect the quantity demanded greatly in the short run. For example, Q_d for cars will drop, if prices go up, but in the long run people will have to start buying again to replace their old cars, therefore, the Q_2 will increase from Q_2 (SR) to Q_2 (LR).



Price elasticity of supply

$$\text{Price elasticity of supply} = E_S = \frac{\%\ \Delta Qs}{\%\ \Delta P} = \frac{\frac{\Delta Qs}{Qs}}{\frac{\Delta P}{P}} = \frac{P_1}{Qs} \times \frac{\Delta Qs}{\Delta P}$$

Supply is generally more elastic in the long run because firms have time to expand their production capacity, build new plants, make new contracts.
The figure shows that the more elastic long-run supply allows for higher production Qs_2 (LR) than in the short run at the same price (P_2).



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Handout 6

Maximizing utility

A person maximizes utility (satisfaction) by choosing to purchase the good which delivers the most marginal utility (additional satisfaction) per dollar spent. The utility obtained per dollar is given by dividing the amount of utility obtained from consuming the additional unit of the good by its price = MU/P.

Example:

Consider that Joe Sixpack has just completed a lengthy treatment program at Alcoholics Anonymous where he also took some informal lessons in economics from a recovering economics graduate. Joe wants to know whether he maximizes utility when he purchases a sandwich or a can of non-alcoholic beer. In order to maximize his utility, Joe has to calculate the marginal utility per dollar spent on each of the two commodities. Then he will purchase the one that delivers the higher MU per dollar. How would he do that and would he explain to us why he chose either of the two goods?

First he has to know the price of each of the two goods. Then he has to ask himself how much utility would each individual good give him. He has to be able to measure within himself how much satisfaction he may get from each good and quantify this satisfaction by giving us a certain number. It is necessary for him to do this if he wants to explain to us his choice.

Suppose that he gives us the following information:

1. The price of a can of beer is $ 0.50. $P_b = 0.5$.
2. The price of a sandwich is $ 2.00. $P_s = 2$.
3. The marginal utility of the first beer is 8 utils (units of utility). $MU_{b1} = 8$.
4. The marginal utility of the first sandwich is 20 utils. $MU_{s1} = 20$.
5. He has only a budget of $ 6 to spend.
6. He will spend all his budget on these two goods.

In order for him to estimate the satisfaction that he may get from each good and compare it to the satisfaction that he may get from the other good, he has to find a common denominator for the two goods because the two goods have different prices. This common denominator is the marginal utility <u>per dollar</u>. Therefore, he calculates the marginal utility per dollar spent on the first can of beer. It equals to $MU_{b1}/P_b = 8/0.5 = 16$ utils per dollar. Likewise, he calculates the marginal utility per dollar spent on the first sandwich. It equals to $MU_{s1}/P_s = 20/2 = 10$ utils per dollar.

..

He observes that:

$$MU_{b1}/P_b = 16 > MU_{s1}/P_s = 10$$

Therefore, he buys a can of beer because consuming a can of beer gives him more satisfaction per dollar than a sandwich. He spends $ 0.5 and he has $ 5.5 left in his budget.

Now, Joe contemplates whether he should buy a second beer or a sandwich. He feels that the marginal utility of the second can of beer is 4 utils. He therefore observes that:

$$MU_{b2}/P_b = 4/0.5 = 8 < MU_{s1}/P_s = 10$$

Therefore, he buys a sandwich because it gives him more satisfaction per dollar spent. He spends $2 and has $3.5 left in his budget.

He again contemplates whether he should buy a second sandwich or a second can of beer. He feels that the marginal utility of a second sandwich is 12 utils. He therefore observes that:

$$MU_{b2}/P_b = 8 > MU_{s2}/P_s = 12/2 = 6$$

Therefore, he buys a second can of beer. He spends $0.5 and has $3 left in his budget.

He contemplates whether he should buy a third beer or a second sandwich. He feels that a third beer has a marginal utility of 2 utils. Thus he compares and observes that

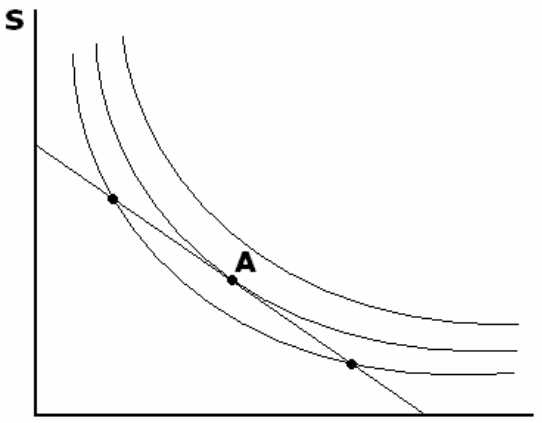
$$MU_{b3}/P_b = 2/0.5 = 4 < MU_{s2}/P_s = 6$$

Therefore, he buys the second sandwich. He spends $2 and has $1 left. He now realizes that with one dollar he can only afford to buy beer and not a sandwich. Therefore, he stops comparing and buys the third and fourth cans of beer. The fourth can of beer provided him with a marginal utility of 1 util.

We conclude that Joe reaches maximum satisfaction by buying two sandwiches and four cans of beer with his $6 budget. Point A on the consumer's budget line below will be Joe's optimal combination of consumption. By this he has a combination of the two goods with a total utility of 47 utils.

Total utility for 2 sandwiches: 20 + 12 = 32 utils
Total utility for 4 cans of beer: 8 + 4 + 2 + 1 = <u>15 utils</u>

Total of 47 utils



Microeconomics I
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Handout 7

Why does the marginal cost of production increase?

Defining Key Concepts:
The Average Product of Labor (AP_L): Output produced per-unit of labor employed =

$$AP_L = \text{Total Output/Units of Labor Employed} = Q/L$$

The Marginal Product of Labor (MP_L): The additional output produced due to the additional units of labor employed =

$$MP_L = \text{Change in Total Output/Change in Labor Employed} = \Delta Q/\Delta L$$

Diminishing MP_L or Diminishing Returns: MP_L decreases as more labor is employed with a given quantity of other fixed inputs.

Increasing MP_L or Increasing Returns: MP_L increases as more labor is employed with a given quantity of other fixed inputs.

Averaging Variable Cost (AVC): The variable cost embodied in any one unit of output, or per-unit variable cost =

$$\text{Variable Cost at a Certain Level of Output/The Units of Output Produced} = VC/Q$$

The Marginal Cost (MC): The Change in total cost or variable cost associated with a one unit increase in the level of output. The marginal cost relationship therefore shows how much additional cost a firm will incur if it increase output by one unit, or how much cost saving it will realize if it reduces output by a unit. Then,

$$MC = \Delta TC/\Delta Q = \Delta TVC/\Delta Q$$

The relationship between the cost of labor, the product of labor, and the U shaped slope of the AVC:

We know that variable cost includes raw materials, labor, and other variable expenses such as energy. Since each additional unit of output consumes an equal amount of raw materials and energy, we can conclude that such cost will be the same for each one unit of output. Therefore, when output increases the cost of raw materials and energy increase proportionally, If the cost of raw materials per unit is \$10, then producing 2 units of output will increase the cost to \$10 x 2 = \$20 and producing 10 units of output will increase the cost to \$10 x 10 = \$100. The per unit cost of raw materials and energy is therefore constant. This component of AVC can be represented in a straight horizontal line with Average cost on the vertical axis and Output on the horizontal axis. We can therefore conclude that the raw materials component of the AVC is not responsible for its U shaped slope.

The remainder of variable cost is labor cost. We would like to know what happens to the labor component of AVC. Or, in other words, how many units of labor is embodied in each unit of output produced as we increase the level of output. In order to explain the slope of AVC, we will first demonstrate the relationship between the MP_L and the MC.

$$MC = \Delta TC/\Delta Q$$

In order to derive the MC, we must first find $MC = \Delta TVC/\Delta Q$:

Since we are concerned only with the labor component of variable cost, then

$$\Delta TVC = w(\Delta L), \text{ where w is the wage rate}$$

$$\text{therefore } MC = w(\Delta L)/\Delta Q$$

Now, let us find the equivalent of $\Delta L/\Delta Q$ in terms of MP_L:

$$\text{Since } MP_L = \Delta Q/\Delta L, \text{ if we invert the expression we get}$$

$$1/MPL = \Delta L/\Delta Q, \text{ therefore } MC = w(1/MPL), \text{ or}$$

$$MC = w/MP_L$$

The law of <u>increasing</u> marginal returns dictates that at low levels of output, hiring more labor increases the MPL or that the total level of output increases at increasing proportions. Since w is constant because workers are paid equal wage rates per unit of labor, then when the MPL increases, the MC decreases (if you do not believe this, assign increasing numbers to the MPL and one given number to w and see what happens to the MC). But, the law of <u>diminishing</u> returns dictates that at higher levels of output, hiring more labor does <u>not</u> increase the total level of output in <u>equal</u> proportions but in <u>decreasing</u> proportions. As a result, the MPL decreases. Again, since w is constant, then when the MPL decreases, the MC increases.

The above explanation also applies to the relationship between the APL and the AVC.

$$\text{The labor component of } AVC = w(L)/Q$$

$$\text{since } APL = Q/L, \text{ then } 1/APL = L/Q \text{ and}$$

$$AVC = w/APL$$

This implies that the AVC and APL are inversely related for the same reasons discussed above.

Marginal and Average Relationships

All marginal curves are related to their average curves in the same way. When a marginal curve is below an average curve, the average curve will decline. If average cost is currently $20, and producing one more unit costs $10, then the average cost of all units will be brought down. This applies to the relationship between MC and AVC as well as to the relationship between MC and ATC. This is so because the MC can be derived from Total Variable Cost as well as from Total Cost.

$$MC_i = TVC_i - TVC_{i-1}$$

Where i = the units of output produced and

$$MC_i = TC_i - TC_{i-1}$$

When a marginal curve is above an average curve the average curve will rise. If average cost is currently $20, and producing one more unit costs $30, then the average cost if all units will be pulled up. Again, this applies to the relationship between MC and AVC as well as to the relationship between MC and ATC.

When average cost is at a minimum, marginal cost is equal to average cost, The marginal and the average curves therefore intersect where the average curve is at minimum. This can be observed in the graph below.

To the left of point A, MC < AVC, therefore AVC decreases

To the left of point B, MC < ATC, therefore ATC decreases

and

To the right of point A, MC > VC, therefore AVC increases

To the right of point B, MC > ATC, therefore ATC increases

Also on the graph below, you can observe that the AFC = TFC/Q is falling because as the level of output increases, the numerator remains constant while the denominator increases leading to a falling average, This falling AFC is also represented by the distance between AVC and ATC at each level of output because:

since ATC = AVC + AFC, then

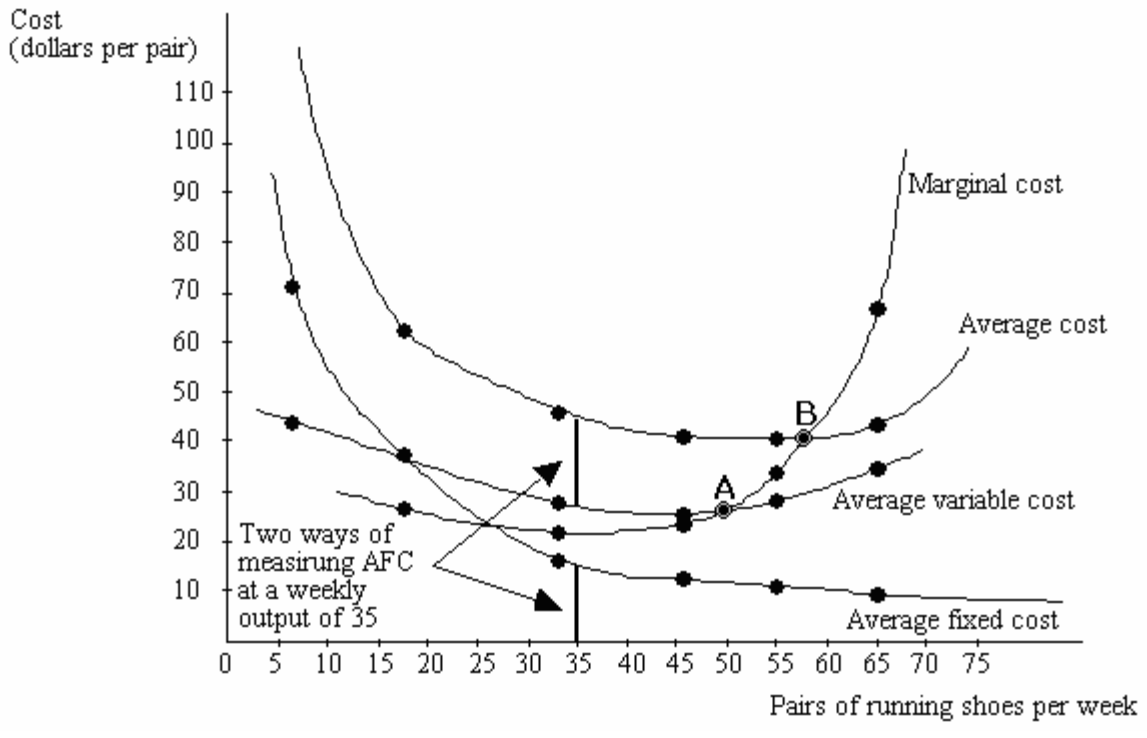
AFC = ATC - AVC at each level of output.

Calculating Average Cost

Total output (pairs of running shoes per week)	Average fixed cost	Average variable cost	Average cost
0	-	-	-
7	$71.43	$42.86	$114.29
18	27.78	33.33	61.11
33	15.15	27.27	42.42
46	10.87	**26.09**	39.96
55	9.09	27.27	**36.36**
60	8.33	30.00	38.33
63	7.94	33.33	41.27
65	7.69	36.92	44.61
66	**7.57**	40.91	48.48

Average Cost Curves

Notice that average fixed cost continually declines as output expands. Because of the law of diminishing marginal returns, both average variable cost and average cost increase at high levels of output as more output per week is produced in the plant.



Microeconomics I
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Handout 8

Pricing and Production under perfect competition

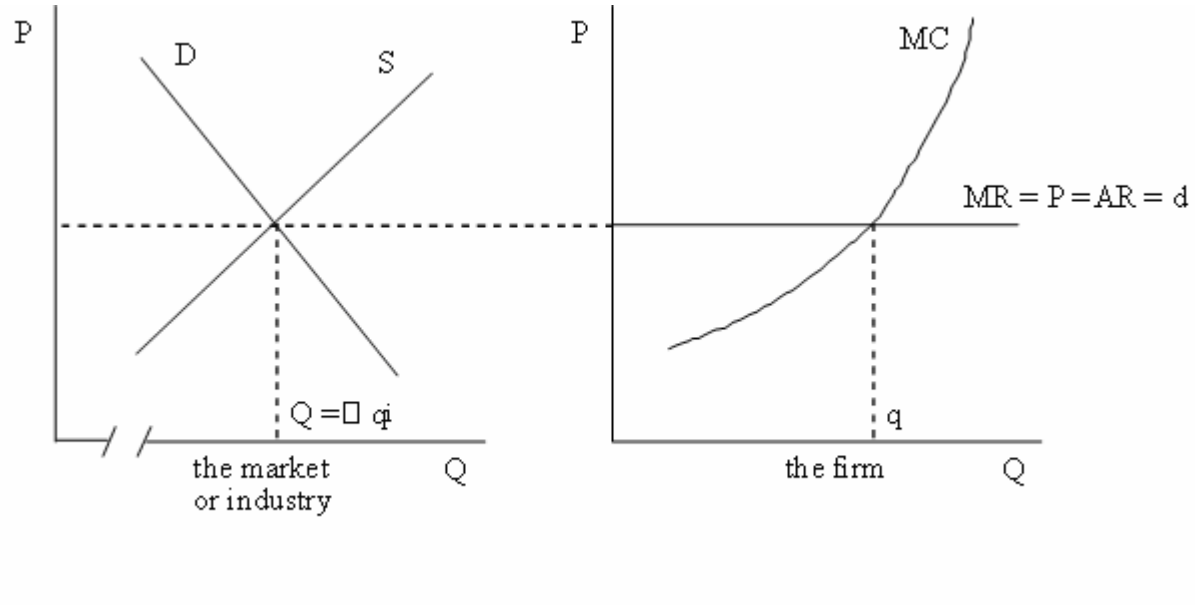
The profit maximizing rule

A firm that wants to maximize profits should not produce additional unit of output that would cost more than it brings in revenue. Therefore, the firm would not want to produce an additional unit of good if its marginal cost > marginal revenue, because if it does, it would spend more to produce an extra unit than it would get back. Consequently, total profits would decline.

The relationship between the industry and the firm

Suppose that an increase in demand appeared in the industry. Thus the demand curve will shift to the right and cause the price to go up. This will lead to economic profits for each firm, since nothing happened to the supply side — the cost of the production is still the same but the price went up and so did revenue. Economic profits will attract new firms to enter the industry. As more firms supply to the market, the supply curve shifts to the right as well and price declines.

The price in the market is at the same time the marginal revenue for each of the firms in the market. If the firm increases production, it will receive the same revenue for the next unit as it received for any unit before. Once the marginal cost of the firm exceeds the marginal revenue (the price), the profit will start to decline and the firms will stop producing. The firm is therefore the price-taker.

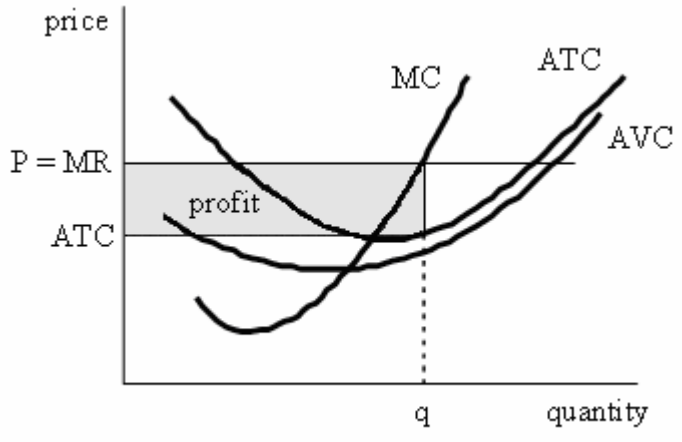


In the following table we show the profit analysis for a hypothetical firm in a perfectly competitive market. The MR curve is horizontal, thus MR stays constant and does not depend on the number of products sold. Total revenue increases with each following item produced by the value of MR. Total fixed cost stays the same and is equal to 12. Average fixed cost is the TFC divided by the number of items produced. The same is for average variable cost — it is the total variable cost divided by the production. Total cost is the sum of TVC and TFC. Marginal cost is the increase of the total cost with each next item produced. The firms in a perfectly competitive market would maximize its profit by producing at the level when it's MC = MR. In our example below, it would be at the level of output equaling to six units.

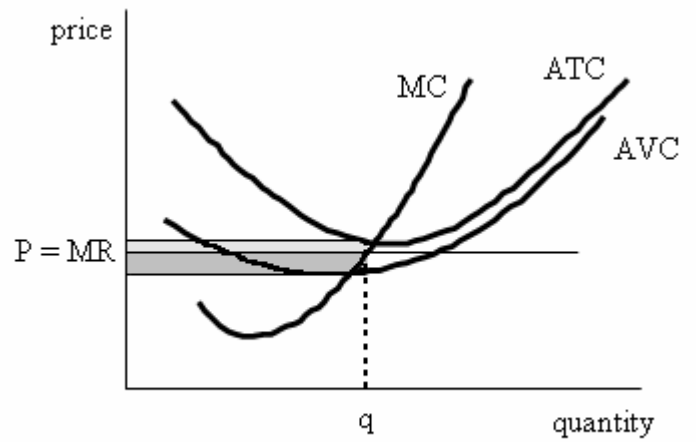
Output	Price	MR	TR	TFC	AFC	TVC	AVC	TC	ATC	MC	Total profit
0	—	—	0	12	—	—	—	12	—	—	**–12**
1	10	10	10	12	12	2	2	14	14	2	**–4**
2	10	10	20	12	6	3	1.5	15	7.5	1	**5**
3	10	10	30	12	4	5	1.7	17	5.7	2	**13**
4	10	10	40	12	3	8	2.0	20	5.0	3	**20**
5	10	10	50	12	2.4	14	2.8	26	5.2	6	**24**
6	10	10	60	12	2.0	24	4.0	36	6.0	10	**24**
7	10	10	70	12	1.7	38	5.4	50	7.1	14	**20**
8	10	10	80	12	1.5	69	8.6	81	10.1	31	**–1**

Short-run versus Long-run Supply

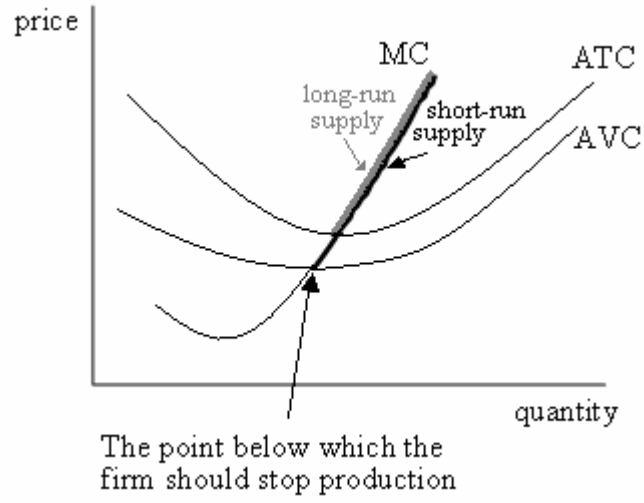
The first figure shows that the firm is experiencing economic profit. The firm is operating at the point where MC = MR, producing quantity q. At this point, the average cost per unit is lower than the cost of producing that unit. The profit is the shaded rectangular area.



Assume now that the price in the market declined, so that the firm is not earning profits, but is suffering losses. The important question appears: Should the firm continue operation or shut down? The answer is shown on the next graph. As long as the price level is above the average variable cost, the firm should continue production.



Total revenue is now below the average total cost. But it is still above the AVC curve. The firms still gets more money in revenue for one unit produced than is the variable cost of that unit of production. We call this **operating profit** (dark rectangle). However, the firm cannot fully pay all its costs (fixed costs). The fact that it pays part of its fixed costs makes the decision to continue production in the short-run rational because its loss will be the entire fixed cost if it shuts down. Once the price drops below the AVC, the firm should shut down, otherwise it would be losing money on each unit produced in variable cost as well as in fixed cost. The short-run supply curve of firms in a perfectly competitive market is thus the part of MC that is above the AVC. It is shown thick on the next figure.



The long-run supply curve of each firm depends on many factors, including technologies available in the future, cost structure at different scales of production and availability of the investment capital in the firm.

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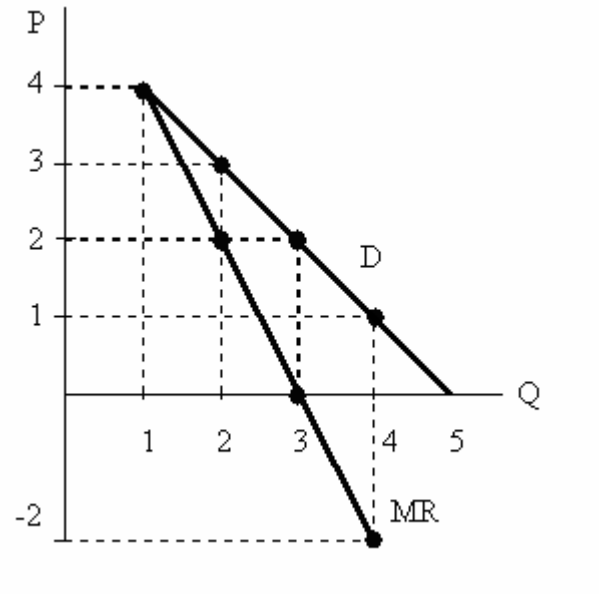
Handout 9

Why is the Marginal Revenue Curve Below the Demand Curve Under Monopoly, Oligopoly, and Monopolistic Competition?

P	Q	TR	MR
4	1	4	4
3	2	6	2
2	3	6	0
1	4	4	-2

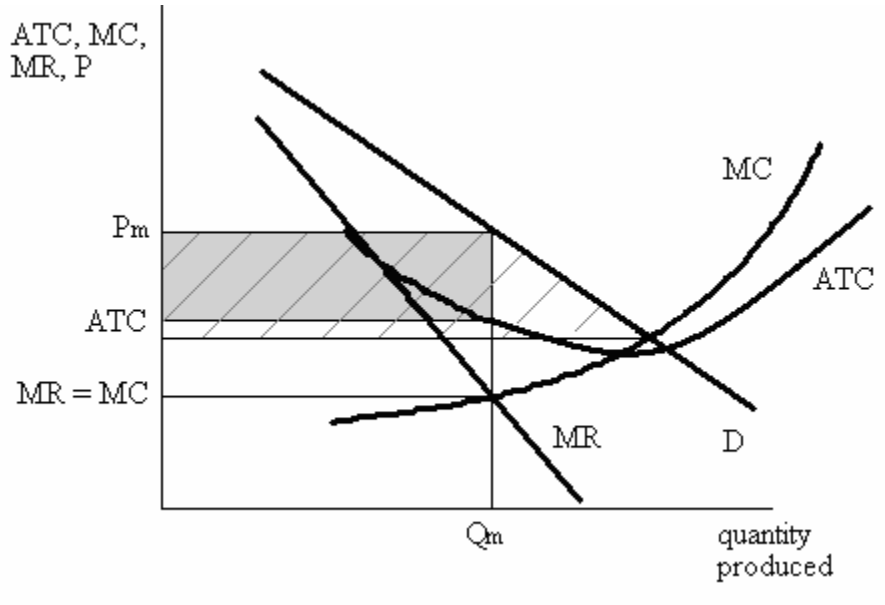
Why is the MR below the P at each level of output ?

When the price decreases from 3 to 2, the monopolist gains $2 from the sale of the third unit. But we must subtract $2 from the total gain because the price cut applied to all of the three units that the monopolist now sells, therefore the MR for selling the third = 0 (2 - 2) which is less-than the price($2). The same applies for every price cut to increase the level of output sold. The MR always declines faster than the price.



Pricing and production under monopoly

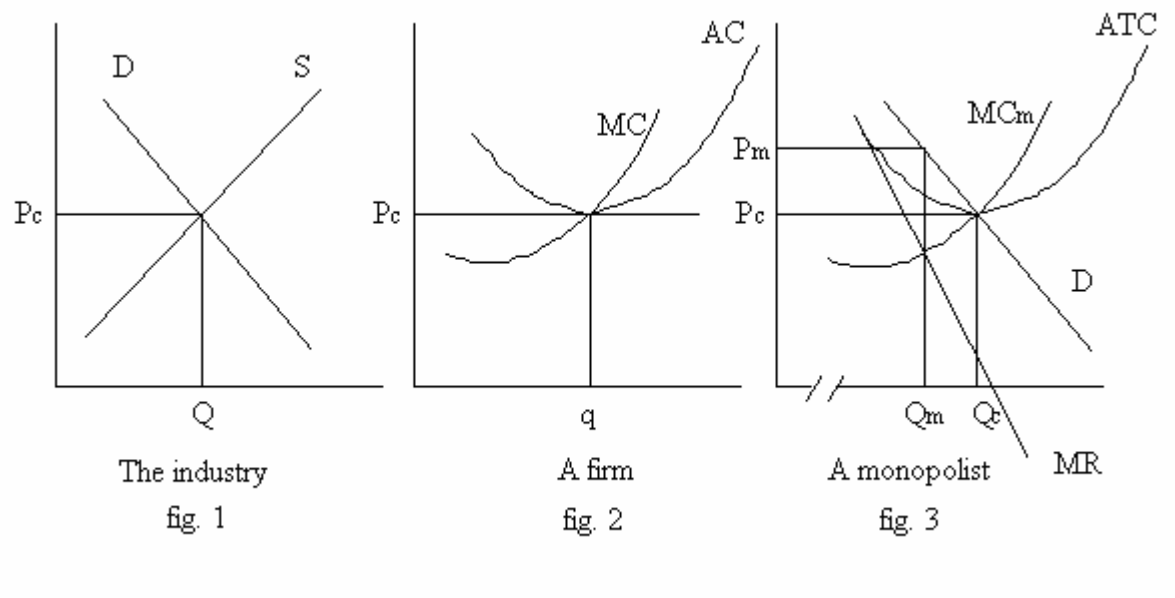
Under monopoly, the firm is the whole industry. This means that the demand curve for the whole industry is the demand curve which the monopolist is facing. For the monopolist it is profitable to increase the level of production as long as the marginal revenue of the additional unit produced is higher than its marginal cost. The optimal quantity (Q_m) for monopolist is when MC = MR, i.e., when the marginal revenue curve intersects the marginal cost curve. At that optimal quantity, the price P_m is on the demand curve.



But for a monopolist, marginal revenue is below the demand curve. So a monopolist can charge price P_m which is higher than ATC. The total profit is then the shaded area. The supply curve for a monopolist is the marginal cost curve.

Comparison with perfect competition

Below, we will compare a perfect competitive industry with large number of independent producers with the same production capacity ruled by single management.



On the first figure, there is a demand curve for the whole perfectly competitive industry and the supply curve, which is the sum of MC's of all the firms. Each of the firms will supply at the level when its marginal cost reaches its marginal revenue, which is equal to the market price (fig. 2). The sum of quantities supplied by these firms (q's) is equal to Q of fig.1.

Now let's put all these firms together into one big company — monopoly (fig. 3). The firm now is not facing a flat marginal revenue curve, its MR curve is downward sloping. The monopolist will thus produce according to its profit maximizing strategy — at the level when its MC intersects its MR. The production will be Q_m which is below Q_C, the amount of output under perfect competition. At the same time, the monopolist will charge price according to the demand, P_m, which is higher than the price P_C of the perfectly competitive industry.

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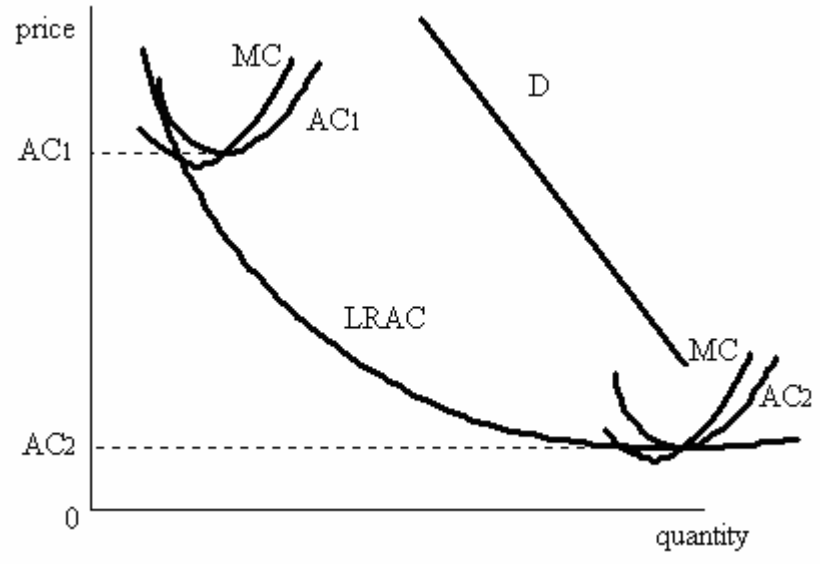
Handout 10

Natural monopoly

Now assume an industry which experiences economies of scale. That means that one large firm can produce a certain good or service cheaper than many small firms would. These are the industries with large fixed costs, such as telecommunication companies, power supply industries, or water companies.



On the figure, we distinguish short-run (AC) and long run average cost (LRAC). They show that in the short-run the firm is not very flexible, it does not have enough capital to expand the plants, while in the long run it can decrease its costs to AC_2. It is clear that it is better for society to have one large company operating near the demand curve and the minimum of the long-run average cost curve than many little firms, each operating at a very high cost.

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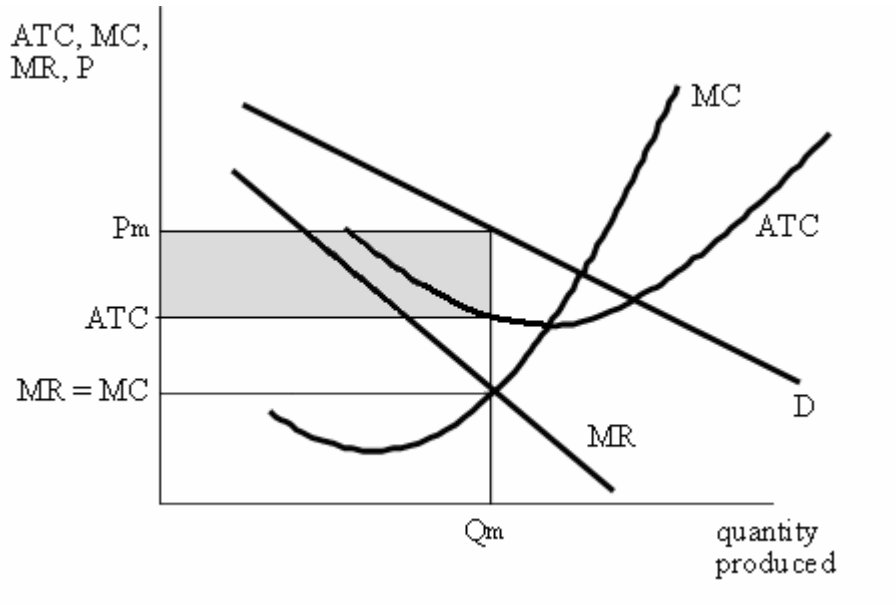
Handout 11

Pricing Under Monopolistic Competition

A monopolistically competitive industry is where there are many small firms producing differentiated products. This way they can get price under some control even if they do not rule the market. The demand curve which a monopolistically competitive firm is facing is not as flat as the perfectly competitive demand curve. Since each product is unique in a certain way, the firm can increase its price without losing all its customers. But compared to monopoly, substitutes exist (even if not so close as with perfect competition), so the demand curve is more elastic than it is in the case with monopoly.

In the short run, the firm can earn some economic profits, its position is similar to the monopoly. The firm increases production until its marginal cost meets its marginal revenue curve (Q_m). Then it charges the price that is on the demand curve (P_m).



In the long- run, however, new firms will enter the industry to earn some of the economic profit. As they start to produce, the demand for the products of the other firms goes down (they shift to the left). These shifts continue, until all economic profits are eliminated. This happens at the point where the demand curve gets tangential to the average cost curve of the firm.

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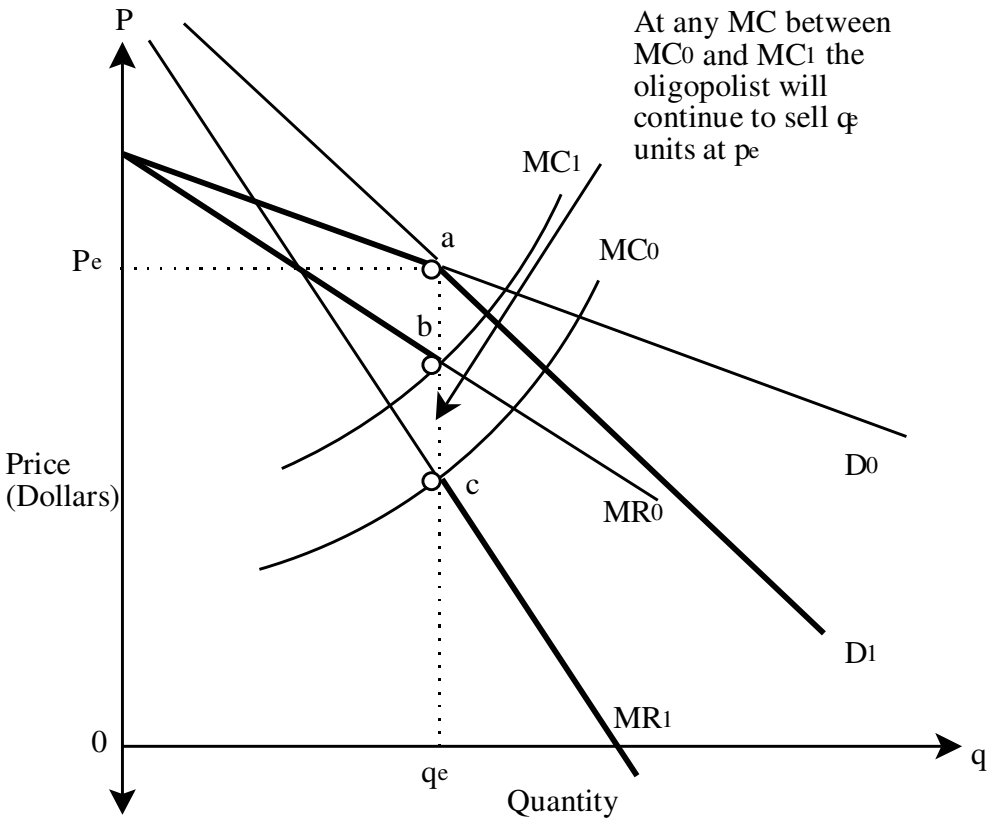
Handout 12

Pricing and Production under Oligopoly

The Kinked Demand Curve Model:
This model represents a case where few firms operate in a particular industry, they have similar shares of the market, and produce differentiated products.



D0 is a relatively elastic curve which means that if the firm increases the price above Pe, other firms do not follow this action. As a result, the firm loses a large share of the market.

D1 is <u>less</u> elastic than **D0** which means that if the firm decreases the price below Pe, other firms do the same. As a result, the firm does not gain more market share than other firms because its price <u>relative</u> to the prices of other firms remains constant since all competing firms also reduced their prices. The firm's gains therefore are based on the elasticity of the industry's total demand rather than on gaining market share at the expense of its competitors.

This means that the thick sections of **D0** and **D1** are relevant to Oligopoly because with them we want to say that price increases above Pe will not be matched by competitors (thus the relevant thick section of **D0**) and price reductions below Pe will be matched by competitors (thus the relevant thick section of **D1**).

Once we thicken the relevant sections of the marginal revenue curve that correspond to each demand curve, we notice that there is a discontinuity at the equilibrium quantity q_e. This discontinuity implies that changes in the cost of production a represented in shifts in the marginal cost from MC0 to MC1 will not alter the profit maximizing price or quantity. This explains why prices may not respond to changes in costs.

The Price Leadership Model:
This model is based on the following assumptions:

(1) it assumes an industry that is made up one large firm and many small competitive firms,

(2) it assumes that the dominant firm maximizes profits by taking into consideration the behavior of small firms, and that

(3) the dominant firm allows the small firms to sell as much as they want at the price it sets.

Let's draw a graph that would describe this model. First, we will draw the supply curve of the small firms, S_S.

Then we will add the total market demand, D_{market}.

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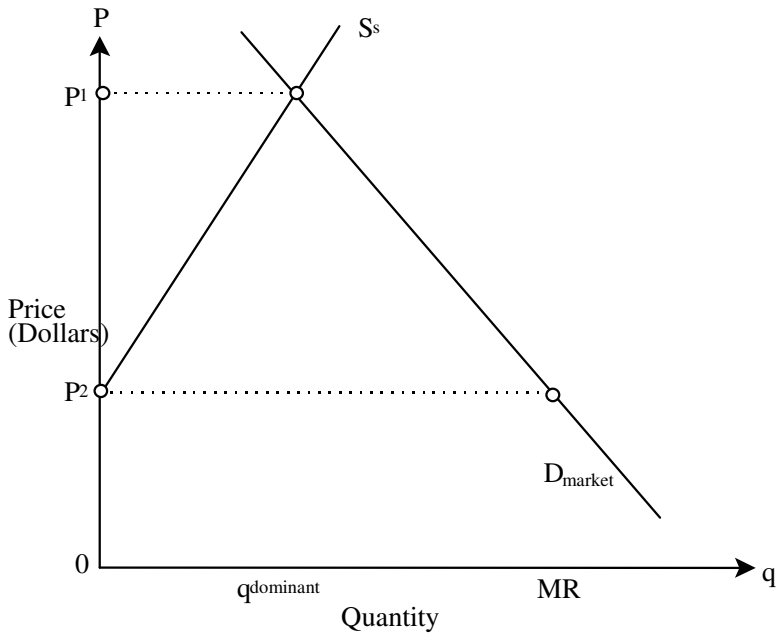
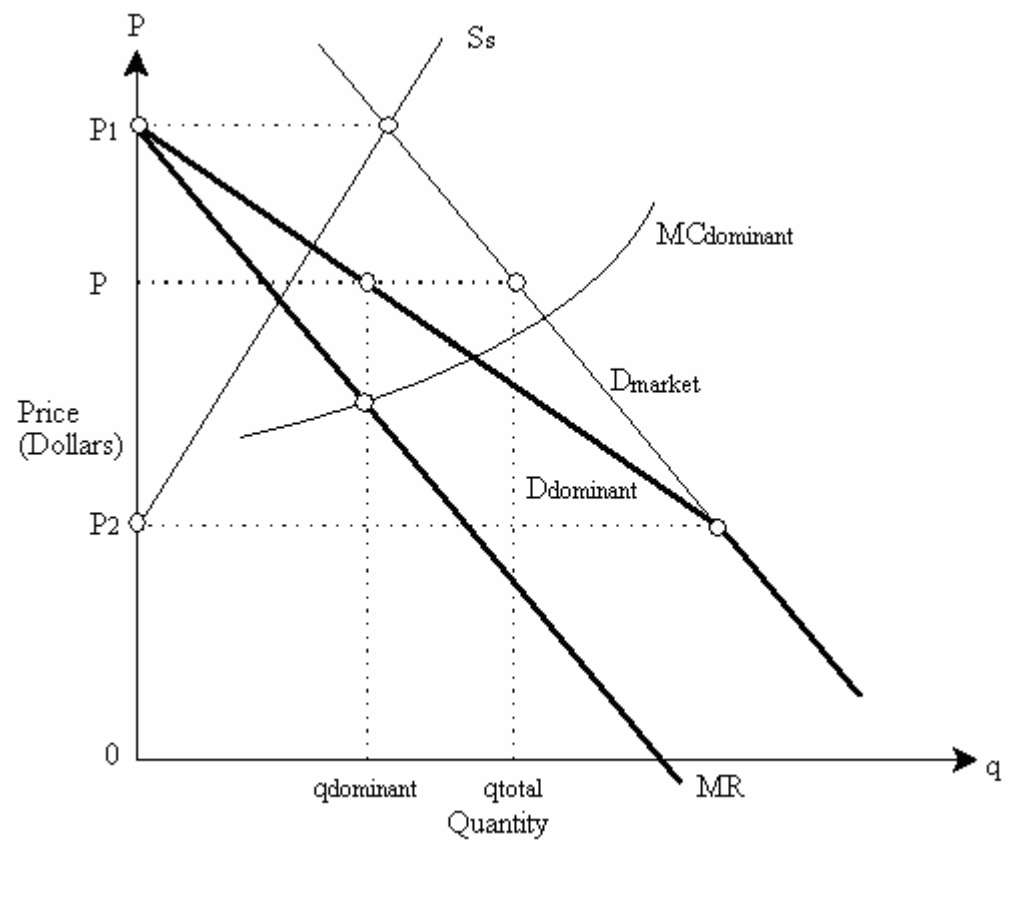


From here we will deduce that the demand curve for the goods produced by the dominant firms is

$D_{dominant} = D_{market} - S_S$ at each price.

At point P_2, $D_{dominant.} = D_{market} - 0$, therefore $D_{dominant} = D_{market}$.

At point P_1, $D_{dominant} = D_{market} - S_S$, but since $D_{market} = S_S$, therefore $D_{dominant} = 0$.



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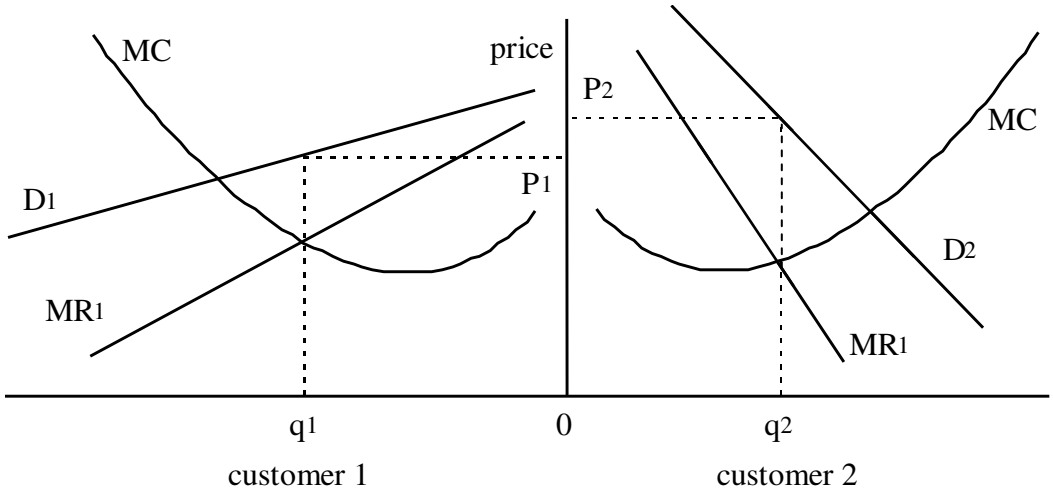
Handout 13

Price Discrimination

Price discrimination occurs when a producer charges different consumers different prices. It may appear if one of the customers uses its size and position in the market to require a lower price than the prevailing price in the market. A very common form of price discrimination is when producers divide customers into groups and charge different prices to each group. These may be the special discounts for students, senior citizens, members of various organizations or clubs. This kind of price discrimination works only with goods that cannot be resold. Otherwise customers offered lower price would buy and sell to others for more. A good example of a product that cannot be resold is services.

Perfect price discrimination occurs when a different price is charged to each single customer. That would typically be the highest price that he/she is still willing to pay. In the real world this situation cannot happen since it requires too much information about each customer that would be too expensive to gather. The most common way of price discrimination occurs when two markets are segregated and each market has a different elasticity of demand, where producer charge a higher price in the market where the demand curve is more inelastic.



The figure shows one producer (MC curves are the same) and two markets, each having a different demand curve. If the producer knew their demand curves, he could charge them different prices.

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Handout 14

Production and Trade Under Imperfect Competition:

The Case of Cartels

Nations may restrict their trade multilaterally. Governments, or even private corporations located in various countries, may form an international cartel, that is, agree to effectively restrict competition among themselves in an effort to exploit their joint monopoly power.

The world economy has a long history of international cartels in many goods and services, such as bauxite, coffee, diamonds, tobacco, and airline and railway services. The majority of cartels tend to disintegrate rapidly. The most notable exception is the Organization of Petroleum Exporting Countries (OPEC), which, since 1973, has maintained the most lucrative monopoly in world history. This section deals briefly with the economic principles that govern such international monopolies.

Maximization of Monopoly Profits

The formation of an international cartel is in the first instance an attempt to reap greater profits. How can the cartel members maximize their aggregate profits? Merely by acting as a single profit-maximizing monopolist.

Figure 1 illustrates the maximization of the cartel's profits. Schedule SS' shows the willingness of the cartel members as a group to supply (or export) to the rest of the world alternative quantities of the cartelized commodity (such as oil) at alternative prices. As the reader may recall from a course in price theory, this supply schedule is nothing but the marginal cost curve of the cartel members as a group (that is, schedule SS' is the horizontal summation of the marginal cost curves of the cartel members).

Demand schedule DD' shows the willingness of the rest of the world to import alternative quantities from the cartel at alternative prices. Thus, demand schedule DD' shows, at each price, the excess of the total domestic consumption over the total domestic production (of the cartelized commodity) of all nonmember countries as a group.

Apparently, under perfect competition, international equilibrium occurs at point E, where demand schedule DD' intersects supply schedule SS'. Accordingly, under perfectly competitive conditions, the cartel members as a group export to the rest of the world amount Q_1 at equilibrium P_1.

Suppose now that the cartel acts like a single monopolist. Draw the marginal revenue curve, as shown by broken curve DJ, and let it intersect the cartel's marginal cost curve at F. To maximize profits, the cartel must curtail its exports to Q_0 and raise its price to P_2. (monopoly output is determined by the intersection of the marginal cost curve and the marginal revenue curve, that is, point F; and the monopoly price is determined from the demand curve at the monopoly output, that is, point G).

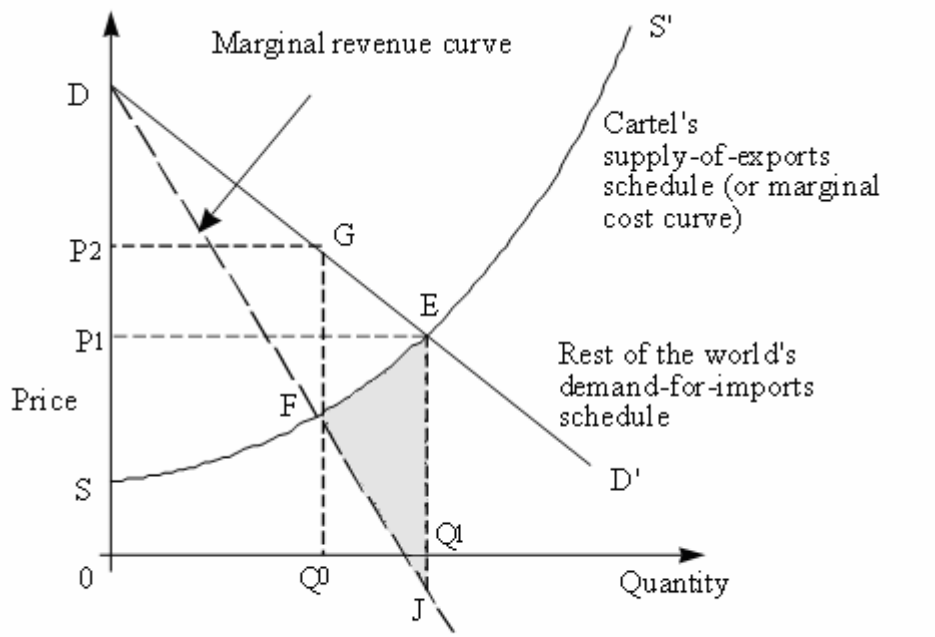

Figure 1.

The shaded triangular area FEJ shows the increase in the total profits of the cartel members as a group. Thus, at competitive equilibrium point E, the cartel's marginal cost(Q_1E) is much higher that the marginal revenue. (Actually, in Figure 1 the marginal cost is higher than marginal revenue for all units between Q_1 and Q_0. By curtailing its exports, the cartel "saves" each unit's marginal cost but "loses" the marginal revenue. Since between Q_1 and Q_0 each unit's marginal cost is higher than its marginal revenue, it follows that the cartel's profits continue to increase by the difference between marginal cost and marginal revenue until the cartel reduces its output to Q_0. The shaded triangular area FEJ merely shows the total increase in profits that results from the reduction in exports from Q_1 to Q_0.

The cartel markup is given by the formula:

$$\text{Cartel markup} = k / (e_C + (1 - k)\, e_S)$$

This last formula is important, because it summarizes for us the factors that determine the optimal cartel markup. Thus, a high markup requires a low demand elasticity for total consumption (e_C), a low supply elasticity by nonmembers (e_S), and a high cartel share (k) in the world market.

The Conditions Necessary for the Success of an International Cartel

Economic theory identifies two conditions that are necessary for the success of an international cartel. They are:

a) The elasticity of demand for imports by the rest of the world must be low in the relevant price range.

b) The cartel members should adhere to the official set of policies (with respect to price and output) voted by the cartel members.

We will examine each of these conditions briefly.

The first condition (**a**) is obvious from equation (**1.**), which shows that the monopoly markup is equal to the reciprocal of the elasticity of demand for imports by the rest of the world at the monopoly price. To be able to achieve a substantial markup, the cartel must face a low elasticity of demand. This condition is actually a combination of the following three conditions:

1. The elasticity of demand for total consumption (not imports) by the rest of the world must be low.
2. The elasticity of supply of the cartelized commodity by the rest of the world (that is, nonmembers of the cartel) must also be low.
3. The cartel must control a very large share of the world market for the cartelized commodity.

The significance of these three conditions becomes obvious when we look at equation (1): A high cartel markup requires a low elasticity of demand for total world consumption (e_C), a low supply elasticity by nonmember countries (e_S), and a high cartel share (k) of the world market.

It is interesting to note that the above three conditions are satisfied in the case of OPEC and that this actually explains its success. OPEC controls over 50 percent of the world crude-oil production, and in addition, the rest of the world is unable, at least in the short run, to respond to high prices by increasing substantially its own production of oil. More importantly, however, in the short run there are no good substitutes for oil. The development of alternative energy sources, such as solar energy, is painfully slow. Of course, it is hoped that sooner or later the world will develop alternative energy sources, and perhaps much more efficient automobiles, and thus end its strong dependence on OPEC oil. In the meantime, however, the world is trying to learn how to live with an ever-rising cost of oil.

Turn now to condition **b**. An international cartel can maintain a high monopoly price if individual cartel members do not selfishly attempt to capture more profits for themselves by behaving competitively. Each cartel member does face such a temptation. The reason is simple: At the monopoly equilibrium, the marginal cost (which presumably is the same for all cartel members) is much lower than the price. Hence, each individual cartel member has the illusion that he can increase his own profits by raising his own output --- an illusion based on that naive assumption that other members will not attempt to cheat in the same manner. When greedy cartel members behave in this manner, it becomes obvious that the cartel will not be able to effectively restrict output and raise the price. Experience shows that this is a most important reason for the eventual collapse of a cartel.

Why Do Cartels Provide the Incentive for the Participating Members to Cheat?

Suppose that there are 15 members in the cartel. There will be a temptation for each seller to exceed its quota, even though cartels try to set penalties for sellers that cheat on their assigned quotas. At the cartel price of $30/barrel, each individual seller can increase its profits by selling more than its assigned quota. In fact, if each seller assumes it won't appreciably lower the market price below $30 by selling more, it will tend to expand output until its marginal cost increases. In Figure 2, this occurs when the firm sells 1,200 barrels per day. By selling more than its quota, it increases its profit by the shaded area provided the price of a barrel doesn't fall.

One firm may be able to get away with exceeding its quota without reducing market price appreciably. Suppose, however, all 15 countries exceed their quotas by increasing daily production to 1,200 just as the first firm did to earn more profits. If this happens, total output will be 18,000 barrels/day. But industry output must be restricted to 10,000 barrels/day to keep the price at $30. The increase in quantity supplied will put downward pressure on price as all of the firms exceed their quotas. Price will fall until the surplus 8,000 barrels/day at the $30 price is eliminated. As price falls, quantity demanded will increase and quantity supplied will decreases until there is no longer a surplus. If all firms cheat on their quotas, it is likely they will find themselves right back where they started with a price of $20/barrel, just equal to the minimum possible average cost of production. If all cheat, the cartel breaks up because economic profits fall to zero.

Cartels usually try to set penalties for countries that cheat on their assigned quotas. The fundamental problem is that once a cartel price is established, individual countries maximizing profits at that price can make more by cheating.

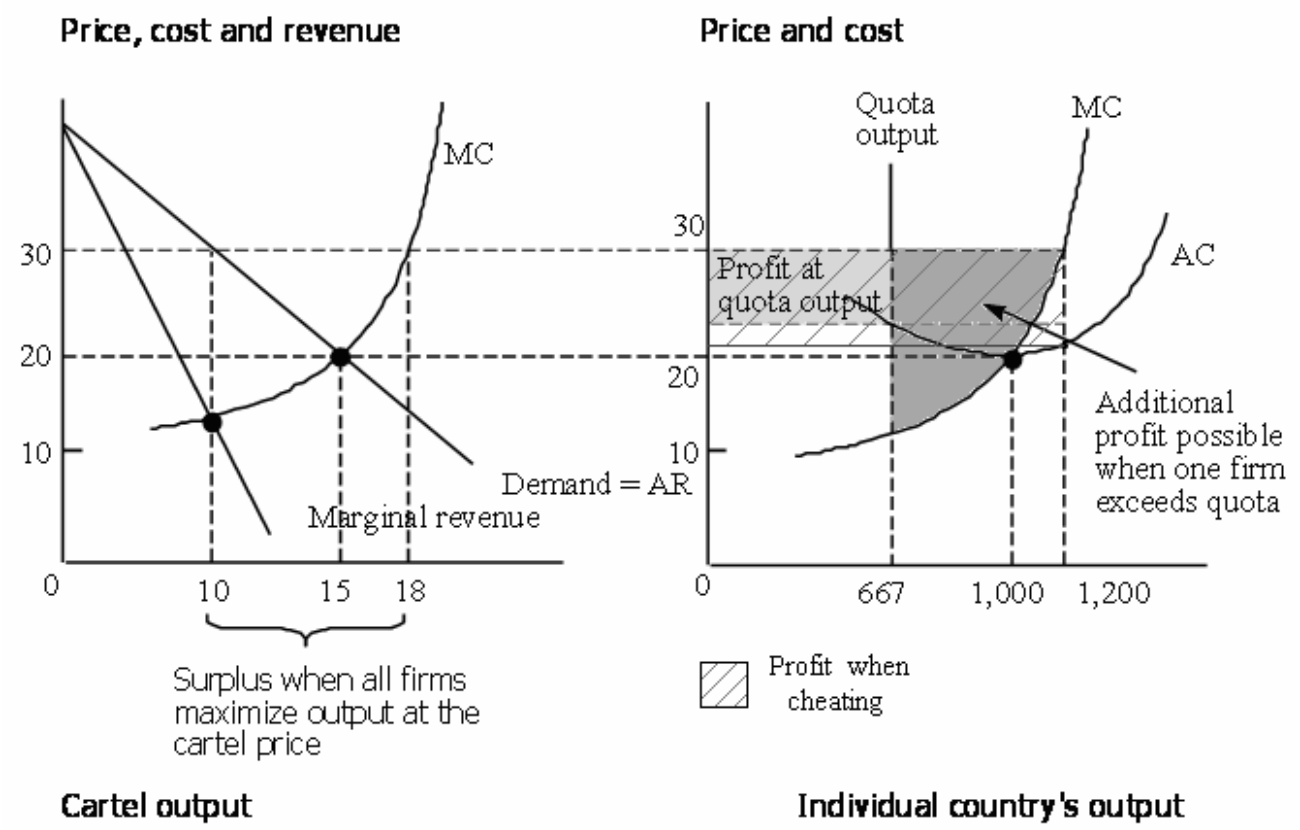

Figure 2.

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Homework 1

Homework 1

1) Prices for precious metals are set on worldwide commodity exchanges and are influenced by the values of major currencies, investors' inflationary expectations, and the state of international relations. These price changes clearly affect the quantities of gold and silver ingots sold, as well as the amounts of jewelry sold. Gold is also used extensively by dentists for bridges, inlays, and crowns. The *Wall Street Journal* reported that when gold prices jumped from $415 to $875 per ounce in the late 1970's, gold consumption by dentists fell from 706,000 ounces to 341,000. Compute the price elasticity of demand for gold as used by dentists for bridges, inlays, and crowns.

2) Suppose you are the State Tax Commissioner, and your state legislature decides to raise $120 million in annual tax revenues by imposing a $1 tax per case of beer. They have looked at the figures, and 10 million cases of beer are sold monthly at $3 per case in your state. If you were called to testify before the Legislative Tax Committee, what would you have to say about their prospects for $120 million in new revenues? Suppose that you estimate that the price-elasticity of the demand for beer equals one and that supply is perfectly elastic. How high would the tax need to be to yield the desired revenues?

Microeconomics I
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Homework 2

Homework 2

1. Which of the following tend to be fixed costs, and which are probably variable costs? Why does the time period considered matter for each case?

a) Silk is purchased by a Parisian 'haute couture' dress designer.

b) The guaranteed salary of NBA all-star Shaquille O'Neal.

c) A $1,000,000 contract signed by a speculator who buys a building after foreclosure by the bankruptcy referee of a savings-and-loan institution.

d) A magazine subscription for a doctor's office.

e) Student loans taken out to pay a student's tuition.

f) Payments to migrant workers for harvesting ripe plums.

2. Describe the force that, as more and more labor is hired, cause output to rise at an increasing rate, and then at a decreasing rate, and that may ultimately cause output to fall as more labor is employed. How do these forces affect marginal and average costs in a similarly systematic fashion? Why? Can you think of any production process that would not operate in accord with these general principles? What are they?

3. Suppose that you offered to buy pizza and cold drinks to bribe your friends to help you move your belongings into a new apartment and were deluged with offers of help. What problems would you encounter if too few actually showed up? How would this affect your 'average cost' per box or stick of furniture moved? What are some possible 'fixed factors' that would decrease the efficiency of your move and drive up its fixed costs if too many helpers volunteered? How would this raise the cost of your move? How many big strong friends do you think would be the ideal number to accomplish this task?

Microeconomics I
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Homework 3

Homework 3

1. Rank these firms according to the extent of their market power (control over price).
   a) A grocery store in the suburbs of Prague.
   b) A daily newspaper in Brno.
   c) The gas company in Prague.
   d) The biggest wheat farm in the United States.
   e) A New York City taxicab owner.

2. How is the price elasticity of demand a firm faces related to the extent of its market power?

3. Why is it easier for a surgeon to price-discriminate than it is for a company that makes patent medicines?

4. Give two examples of each of the three basic types of entry barriers.

5. How do theaters gain by offering discounts to students and senior citizens? How are the price elasticities of demand for theater tickets different for typical students and seniors than for other population groups?

Microeconomics I
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Homework 4

Homework 4

Suppose a perfectly competitive industry can produce Roman candles at a constant marginal cost of $10 per unit. Once the industry is monopolized, marginal costs rise to $12 per unit because $2 per unit must be paid to lobbyists to ensure that only this firm receives a Roman candle license. Suppose the market demand for Roman candles is given by

$$Q_D = 1000 - 50P$$

and the marginal revenue curve by

$$MR = 20 - Q/25.$$

a) Calculate the profit maximizing level of output and price if the industry was a perfectly competitive one.

b) Calculate the profit maximizing level of output and price if the industry was a monopoly.

c) Graph your results.

b) Calculate the total loss of consumer surplus from the monopolization of Roman candle production.