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## COURSE GUIDE DESCRIPTION

You must read this *Course Guide* carefully from the beginning to the end. It tells you briefly what the course is about and how you can work your way through the course material. It also suggests the amount of time you are likely to spend in order to complete the course successfully. Please keep on referring to the *Course Guide* as you go through the course material as it will help you to clarify important study components or points that you might miss or overlook.

## INTRODUCTION

BBEK1103 Principles of Microeconomics is one of the courses offered by the Faculty of Business and Management at Open University Malaysia (OUM). This course is worth 3 credit hours and should be covered over 15 weeks.

## COURSE AUDIENCE

This is a core course for all students pursuing the Bachelor of Management, Bachelor of Business Management, Bachelor of Human Resource Management, Bachelor of Accounting, Bachelor of Hospitality Management, and Bachelor of Tourism Management courses.

As an open and distance learner, you should be able to learn independently and optimise the learning modes and environment available to you. Before you begin this course, please confirm the course material, the course requirements and how the course is conducted.

## STUDY SCHEDULE

It is a standard OUM practice that learners accumulate 40 study hours for every credit hour. As such, for a three-credit hour course, you are expected to spend 120 study hours. Table 1 gives an estimation of how the 120 study hours could be accumulated.

**Table 1:** Estimation of Time Accumulation of Study Hours

STUDY ACTIVITIES	STUDY HOURS
Briefly go through the course content and participate in initial discussion	3
Study the module	60
Attend 3 to 5 tutorial sessions	10
Online participation	12
Revision	15
Assignment(s), Test(s) and Examination(s)	20
<b>TOTAL STUDY HOURS ACCUMULATED</b>	<b>120</b>

## LEARNING OUTCOMES

By the end of this course, you should be able to:

1. Discuss economic issues accurately and systematically;
2. Explain how consumers and firms make decisions to maximise unlimited wants with limited resources;
3. Construct and examine the market equilibrium of demand and supply curves for goods and services;
4. Calculate price elasticities and consolidate the answers in economic terms;
5. Apply the theories of utility and profit maximisation in decision making for individuals and firms; and
6. Differentiate and evaluate the characteristics and functions of each type of market structure.

## COURSE SYNOPSIS

This course is divided into 10 topics. The synopsis for each topic is presented below:

**Topic 1** gives a brief description of economics in general. Several economic concepts and terms, such as scarcity, choice, and opportunity cost, will be introduced besides discussion on major problems and issues that economics attempt to address.

**Topic 2** lays the foundation for understanding market economy. Almost all economic issues could be explained by applying the concept of demand and supply.

**Topic 3** is a continuation of the concepts of demand and supply. Demand and supply or price mechanism will determine as to how resources, goods and services are distributed. The main discussion will relate to demand and supply and their determinants, and the equilibrium of the market. In this context, relationship between demand and supply, and price levels and other variables will be discussed further in detail so as to understand the market behaviour. These relationships are explained with the concept of elasticity. Understanding of the concept of elasticity is useful for consumers, producers and government in the process of making decisions. The concept of elasticity discussed includes price elasticity of demand, income elasticity of demand, cross elasticity of demand, and elasticity of supply.

**Topic 4** discusses satisfaction or utility as a motive of consumption. Even though satisfaction is something abstract or subjective, numerical value is used with the aim of differentiating between total utility concept and marginal utility concept. When marginal utility concept is integrated with budget constraints, it will result in the equilibrium of consumer. From this condition and equilibrium, arises the law of demand and demand curve, and the consumption substitution concept.

The subsequent section discusses consumer behaviour without giving numerical value to satisfaction. Satisfaction is measured based on the ranking of the consumption combination. The combination that generates same level of satisfaction is integrated with the indifference curve. Consumer equilibrium is attained when the highest level of satisfaction is attained with a specific budget. From this, it can be seen that the condition for consumer equilibrium in the concept of satisfaction equilibrium is the same with the condition for the marginal utility concept. Discussion is also focused on how goods are classified according to income through income consumption curve and Engel curve. Demand curve is also produced from price consumption curve. Changes in consumer equilibrium resulting from price changes will take the form of substitution effect and income effect.

**Topic 5** provides the basis for producer behaviour. Discussion begins with concepts related to production process such as input and output, firm, plant and industry, and production time frame. Subsequently, production in the short run with a fixed input and a variable input will be discussed, together with concepts related to diminishing marginal returns and production levels. The last section examines production in the long run, involving the utilisation of two variable inputs. This production decision outcome in the long run is made based on the concepts of isoquant and isocost.

**Topic 6** discusses the concepts directly related to the production process, that is, the cost theory. The economic cost concept is the basic concept in discussion on the overall cost. Following this, the concept of cost in short run will be discussed. Long run cost will be borne when time period of production changes and becomes long-run, therefore giving rise to relationship between short run cost and long run cost. Discussion on economies of scale will be presented in the last topic.

**Topic 7** deals with the basic market structure in free market economy, that is, the perfect competition market. Here, we will be looking at how a firm makes decisions on price and output in order to maximise profit. Discussion begins by introducing the characteristics of the perfect competition market, followed by means of maximising profit. Subsequently, the discussion will focus on the equilibrium of firm and market in the short run. Finally, we will discuss on how the firm and industry achieve equilibrium in the long run.

**Topic 8** explains the market structure which contradicts the perfect competition market, that is, the monopoly market which comprises of only one seller. Discussion will highlight factors that contribute towards the existence of the monopolist, and the major characteristics of monopoly. Then, profit maximisation in the short run and long run in monopoly will be examined. Finally, the concept and theory of price discrimination will be clarified.

**Topic 9** examines the monopolistic competition, that is, a market that has the characteristics of both the perfect competition market and the monopoly market. Discussion begins with the presentation of the market characteristics, and differences of this market in comparison to the perfect competition and monopoly market. Subsequently, the equilibrium of this market structure in both the short run and the long run is analysed.

**Topic 10** presents a market structure that is more common in nature, that is, the oligopoly. In the oligopoly, there are several models, depending on the form of competition and interdependence among firms in the market. However, discussion is only focused on two major models - the Cournot Model and the Sweezy Model.

## TEXT ARRANGEMENT GUIDE

Before you go through this module, it is important that you note the text arrangement. Understanding the text arrangement should help you to organise your study of this course to be more objective and more effective. Generally, the text arrangement for each topic is as follows:

**Learning Outcomes:** This section refers to what you should achieve after you have completely gone through a topic. As you go through each topic, you should frequently refer to these learning outcomes. By doing this, you can continuously gauge your progress of digesting the topic.

**Self-Check:** This component of the module is inserted at strategic locations throughout the module. It is inserted after you have gone through one subsection or sometimes a few sub-sections. It usually comes in the form of a question that may require you to stop your reading and start thinking. When you come across this component, try to reflect on what you have already gone through. When you attempt to answer the question prompted, you should be able to gauge whether you have understood what you have read (clearly, vaguely or worse you might find out that you had not comprehended or retained the sub-section(s) that you had just gone through). Most of the time, the answers to the questions can be found directly from the module itself.

**Activity:** Like Self-Check, activities are also placed at various locations or junctures throughout the module. Compared to Self-Check, Activity can appear in various forms such as questions, short case studies or it may even ask you to conduct an observation or research. Activity may also ask your opinion and evaluation on a given scenario. When you come across an Activity, you should try to widen what you have gathered from the module and introduce it to real situations. You should engage yourself in higher order thinking where you might be required to analyse, synthesise and evaluate instead of just having to recall and define.

**Summary:** You can find this component at the end of each topic. This component helps you to recap the whole topic. By going through the summary, you should be able to gauge your knowledge retention level. Should you find points inside the summary that you do not fully understand, it would be a good idea for you to revisit the details from the module.

**Key Terms:** This component can be found at the end of each topic. You should go through this component to remind yourself of important terms or jargons used throughout the module. Should you find terms here that you are not able to explain, you should look for the terms from the module.

**References:** References is where a list of relevant and useful textbooks, journals, articles, electronic contents or sources can be found. This list can appear in a few locations such as in the Course Guide (at References section), at the end of every topic or at the back of the module. You are encouraged to read and refer to the suggested sources to elicit the additional information needed as well as to enhance your overall understanding of the course.

## PRIOR KNOWLEDGE

There is no prerequisite requirement for learners prior taking this subject.

## ASSESSMENT METHOD

Please refer to myVLE

## REFERENCES

The text book suggested for this course is:

Case, K. E. & Fair, R. C. (2007). *Principles of economics*, (8th ed.). New Jersey: Prentice Hall.

Other reference books suggested are:

McEachern, William A., (2006). *Economics; A contemporary introduction*, (7th ed.). South-Western College Publishing.

Gregory, M. N. (2001). *Principles of economics*, (5th ed.). Harcourt College Publisher.

Sloman, J. & Sutcliffe, M. (2006). *Economics*, (6th ed.). Harvester Wheatsheaf, Hertfordshire.

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# **Topic ► Introduction 1 to Economics**

## **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Explain the term “economy”;
2. Differentiate between microeconomics and macroeconomics;
3. Discuss the three basic economic problems;
4. Explain the concepts of scarcity, choice, and opportunity cost using the production possibility curve;
5. Elaborate how an economic system answers the three basic economic questions; and
6. Assess the process of circular flow of income in an economy without governmental intervention.

## **► INTRODUCTION**

We always use the term ‘economy’ in our daily lives. What is actually meant by economy?

Economy covers a wide spectrum of areas in social life. Every area – education, religion, housing, health, transportation, defence and others, has aspects that can be discussed through the economics point of view. In short, economy is a theory that affects the lives of individuals and society as a whole.

In this topic, we will be discussing economics in terms of concept, definition and the importance of economics in decision-making of efficient resource utilisation.

## 1.1 THE SCOPE AND METHOD OF ECONOMICS STUDIES

Since the beginning of the social system, individuals have interacted with one another in order to satisfy their respective needs. Society also interacts with nature to obtain natural resources as the necessities of life. Economy is related to daily activities of society and individuals who interact with one another.

**Economy** is commonly defined as a research on how a society utilises limited resources to satisfy their unlimited wants. The basic question of economy arises from the problem of resource scarcity.

The economic field exists as a result of limited resources and unlimited human wants. Both must exist simultaneously. For example, if human wants are limited and resources are limited too, hence there will be no problem of choice and the economic field will not exist and vice-versa.



### ACTIVITY 1.1

What causes the existence of the economic field? Is it true that it is formed as a result of the unlimited human wants while resources are limited? Discuss.

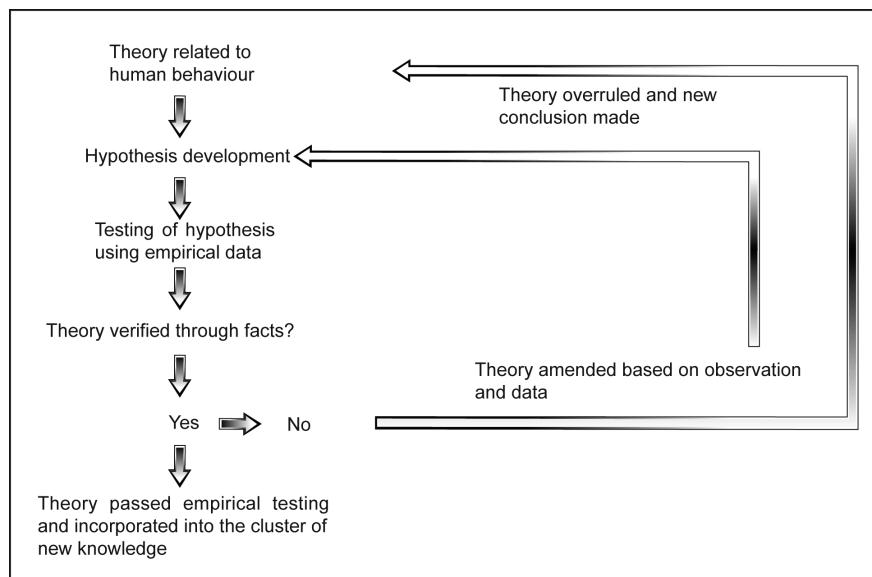
#### 1.1.1 Economic Method

**Method** is a systematic and orderly way of generating new facts which may not be explained before.

Economics is considered as a science because in economic research we apply scientific methods. As an economic researcher, we will attempt to establish a relationship between a variable or incident with another variable or other incident by developing theories.

**Theory** is the conclusion we make through general observations.

We will then verify the validity of the particular theory by using data we have collected. If the data analysed verify the validity of the theory, then our economic theory will become an economic law. This economic law will be embraced until there is a competing theory that states otherwise. Figure 1.1 shows the process of forming economic theory.



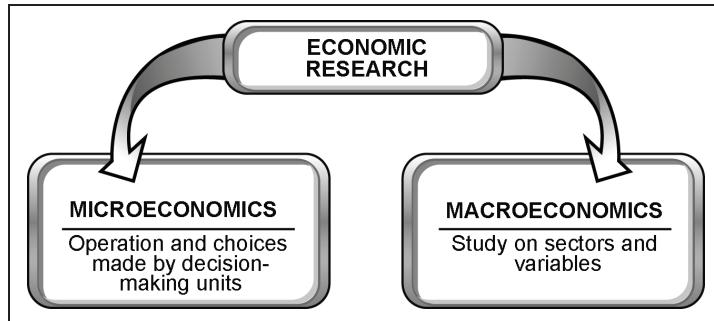
**Figure 1.1:** The process of forming economic theory

### 1.1.2 Microeconomics and Macroeconomics

Economic research is commonly divided into two general categories—microeconomics and macroeconomics. Now, let's see what it means.

**Microeconomics** focuses on the operations and choices made by the decision-making units namely household, firm and industry.

**Macroeconomics** involves study on sectors and variables with wider scopes such as national production and income, aggregate demand and supply, movement of general price level, and problems such as unemployment and inflation.



**Figure 1.2:** Categories of economic research

### Let's see an example.

Based on the particular definition, we know that the research on demand for and price of chicken in the market is a microeconomics research. Likewise, the decision you make to further studies is an outcome of microeconomic research on cost and benefits gained from completing the studies, even though it is made in an indirect way.

However, microeconomics research is not necessarily separated from macroeconomics research since both involve the social behaviour in making decisions. For example, in the case of making decision to further studies, the decision may involve an individual, but when making judgments, macroeconomic problems, such as unemployment will also be considered. You make a decision to further your studies because it was reported that the rate of unemployment for non-graduates is high.

## 1.2 SCARCITY, CHOICE AND OPPORTUNITY COST

As a student, you may sometimes face the problem of wanting more than what you can afford. This is known as the basic economic problem. You might have to postpone your plan of buying new things or not eating in your favourite restaurant in order for you to pay your tuition fees and buy text books. You may also need more time for studies, meeting friends or sleeping. Limited income and time force you to make choices on the best way to divide your income and time. It is the same with the society; they also have to choose from various feasible alternatives.

Hence, an economist observes most issues based on cost and benefits. Attention given towards cost and benefit emerges as a result of the problems of scarcity.

### 1.2.1 Problems of Scarcity

What is the 'problems of scarcity'?

Individual and societal needs for consumer goods, capital goods and others are endless and unlimited. However, the ability to fulfil all the needs, that is, the goods and services able to be produced, is limited. This is caused by scarcity of resources needed to produce the particular goods.

**Scarcity problem** emerges when our material needs exceed the ability to fulfil them due to limited resources.

**Scarcity problem** emerges when our material needs exceed the ability to fulfil them due to limited resources.

The problem of scarcity occurs due to natural conditions or choices made by past generations. Choices made by individuals and society as a response to scarcity problems is the major issue in economics.

Scarcity is a relative concept. For instance, even though the production of crude oil is high, oil is considered to be a scarce resource because all the people who need it are not able to obtain it as much as they want free-of-charge.

**Economics** is a research on how individuals and society choose to utilise limited resources to fulfil their unlimited material needs in the best or most optimum manner.

The problems of scarcity can partly be resolved by:

- (a) fully utilising all resources;
- (b) upgrading the capacity of resources and technology;
- (c) upgrading the administration efficiency for production and distribution; and
- (d) redistributing goods or income among the members of the society.

### 1.2.2 Choice and Opportunity Cost

As concluded from the definition of economics, two basic issues in economics are:

- (a) the need to make choices; and
- (b) identifying the opportunity cost for making a specific choice.

Individuals and society need to make choices among various alternatives; and **opportunity cost** is the value for the best alternative forgone.

Cost and benefit evaluation is the basis for making choices. In economics, cost and benefit evaluation is not an easy task because it requires accurate measurement. However, the concept of opportunity cost is suitable to be used as an accurate method of measuring cost and benefit in economics. The opportunity cost for carrying out a specific activity is the best benefit that had to be foregone for carrying out the particular activity. The foregone benefit is the benefit that could have been enjoyed if the best alternative was chosen.

To pursue benefit from one best activity, we have to sacrifice the other alternative which is the next best alternative. All choices with alternatives involve opportunity cost.

**For example,**

you have been given a choice by your father whether to go for an overseas tour or to have a car as a prize for your success in obtaining first-class honours degree. You consider your options as you have always craved for both alternatives. If you choose to have an overseas tour, then the opportunity cost for the overseas tour is the value of a car. On the other hand, if you choose the car, the opportunity cost is the opportunity to go on an overseas tour.



#### SELF-CHECK 1.1

What is the meaning of problem of scarcity, choice and opportunity cost?



### EXERCISE 1.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Macroeconomics focuses on aggregate variables such as national income, employment and inflation.
2. A product is said to be scarce if the total amount needed by the society exceeds the total amount that the society can obtain free-of-charge
3. Price concept will be meaningless to a society that does not use money as a medium of exchange.
4. When you make a decision to study principles of economics, you incur opportunity cost.

## 1.3 PRODUCTION LIMITATIONS

We understand that our society faces a problem of resource scarcity and needs to make choices. The concepts of scarcity and choice can be explained more clearly with the use of production possibility curve (PPC).

In the field of economics, numerous models are used to study individual behaviour. PPC is the basic model used by economists to study the concepts of scarcity, choice and opportunity cost.

Before explaining the concept of production possibility curve, we need to make a number of assumptions to facilitate the analysis. Firstly, **assume that the economy produces only two types of goods, that is, consumer goods and capital goods.** Secondly, **both goods can be produced using the same economic resources.** Thirdly, **in the short run, resource provision and level of technology remain constant.** Fourthly, **economic resources will be utilised fully and efficiently.** Figure 1.3 shows an example of production possibility curve.

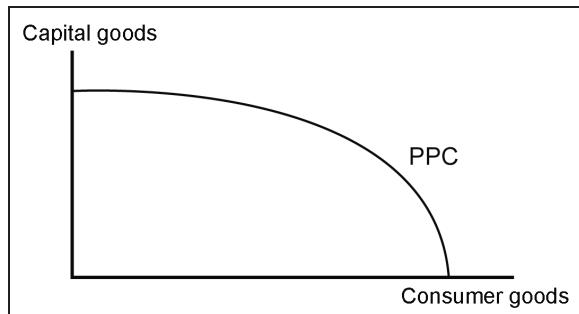


Figure 1.3: An example of production possibilities curve

### 1.3.1 Production Possibility Table

Production possibility table lists combinations of alternative outputs that can be produced with a batch of inputs. Opportunity cost can be measured from production possibility table.

Table 1.1 shows the combination of outputs able to be produced by an economy.

Table 1.1: Production Possibility Table

Combination	Consumer Goods (Unit)	Capital Goods (Unit)
A	0	15
B	4	14
C	7	12
D	9	9
E	11	5
F	12	0

As shown in the table, combination A shows that resources have been fully utilised for producing capital goods only, whereas in combination F, all the resources have been utilised for producing consumer goods only. In combinations B to E, both types of goods are produced in varying quantities. For example, if combination C is chosen, 7 units of consumer goods and 12 units of capital goods will be produced. Likewise, if combination D is chosen, only 9 units of consumer goods and 9 units of capital goods will be produced.

Assuming that society is currently positioned at the point of combination B, shifting to combination C will involve opportunity cost. The opportunity cost borne by the society when it shifts from combination B (4 units of consumer goods and 14 units of capital goods) to combination C (7 units of consumer goods

and 12 units of capital goods) is  $(12-14)/(7-4) = -2/3$ , that is, to increase 1 unit of consumer goods, capital goods must be reduced as much as  $2/3$  units. Whereas movement from combination D to combination E involves opportunity cost as much as  $(5-9)/(11-9) = -2$ , that is, increase of 1 unit of consumer goods involves reduction of 2 units of capital goods. This example explains the concept or **law of increasing opportunity cost**.

### 1.3.2 Production Possibility Curve

Production possibility curve is a diagram produced from production possibility table. Hence, the curve can be used to explain the concept of opportunity cost. Production possibility curve shows optimum output combination that can be produced from a batch of inputs.

Production possibility curve in Figure 1.4 is based on Table 1.1.

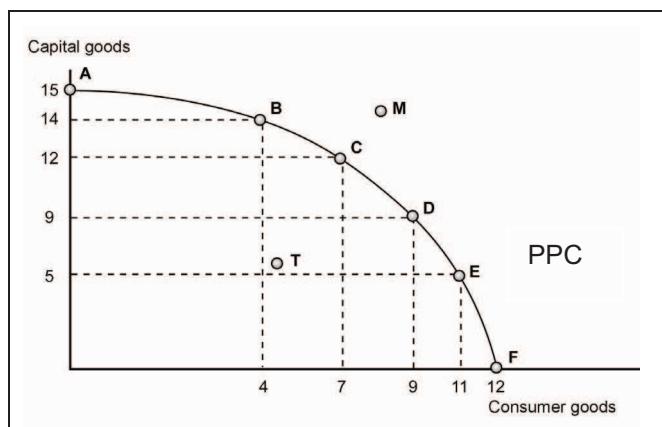


Figure 1.4: Production possibility curve

Production Possibility Curve (PPC) has the following characteristics:

(a) **PPC as a Limit or Margin**

This curve shows the production capacity margin of a society in utilising existing institution, resources and technology. A country may want to own more quantities of all goods available (as at point M in Figure 1.4) but is unable to achieve it by utilising the available resource and technology. Point M shows the scarcity problem faced by the particular country.

(b) **PPC Shows the Maximum Production that can be Achieved When All Resources are Fully and Efficiently Utilised**

Production can be carried out within PPC, but it shows that resources are not fully utilised or not used efficiently. For example, point T in Figure 1.4 shows inefficient resource utilisation in economy.

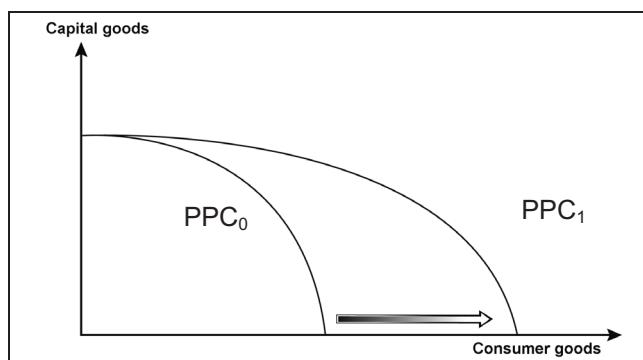
(c) **PPC with Negative Slopes or Slopes Downwards**

Negative gradient indicates that the production of one good needs to be reduced in order to increase the production of another good. The negative gradient shows that each choice made has its opportunity cost. We can obtain more units of one good by reducing the other good.

(d) **PPC Shifts or Moves When Economic Growth Occur**

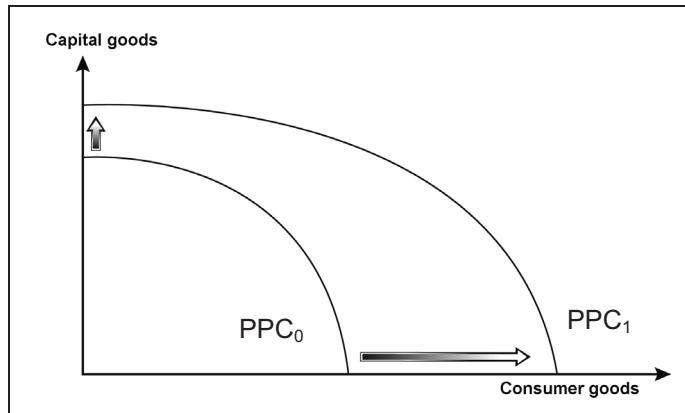
Economic growth may happen when there is an increase in resource quantity and quality or through technological upgrade. Shift in PPC depends on the type of resource change and the form of technological change.

Assuming that technology upgrading takes place in the production of consumer goods and with the existing resource available, consumer goods can be produced twice as much compared to before. This will cause a shift at the consumer goods axis as shown in Figure 1.5.



**Figure 1.5:** Shift in production possibility curve

Now, assuming that there is growth in the total workforce and that the production of consumer goods is more labour-intensive compared to that of capital goods, the form of shifting that may take place in PPC is as shown in Figure 1.6.



**Figure 1.6:** Shift in production possibilities curve

(e) **PPC that Convex Upwards**

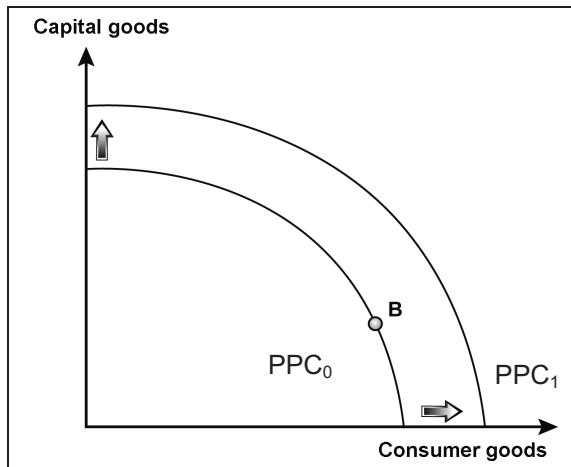
When PPC slopes upwards, the gradient increases. The increase of gradient indicates that the law of increasing opportunity cost takes place. Increasing opportunity cost occurs when the total unit of one good that has to be foregone so as to obtain an additional unit of other good increases. In Table 1.1, shifting from combination A to combination B and combination C shows an increase of opportunity cost for the production of consumer goods, whereas shifting from combination C to combination B and to combination A indicates the increasing opportunity cost for the production of capital goods.

The increase in opportunity cost is caused by the nature or characteristic of the resource that is not standardised. Some resources are more productive for a specific use compared to other forms of utilisation. In measuring opportunity cost, we cannot compare the points in the curve, such as point T in Figure 1.4 (see page 9) with the point that exist throughout the curve, because production at point T does not utilise resources efficiently, thus it cannot become the best alternative for combinations along the curve.

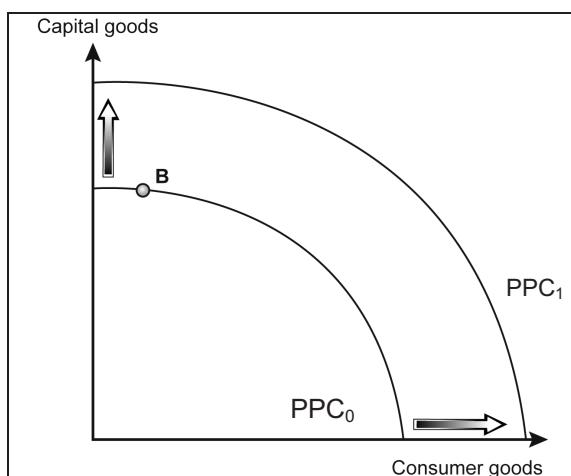
(f) **The Choice between Two Types of Goods, that is, the Capital Goods and Consumer Goods is Important in Determining the Level of National Economic Growth**

Figure 1.7 shows that the society chooses combination B where production of consumer goods is more than that of capital goods. On the other hand, Figure 1.8 shows that the society chooses to produce more capital goods rather than consumer goods. After a certain period of time, economic growth is greater in Figure 1.8 compared to Figure 1.7 because in

comparison to consumer goods, capital goods contribute more towards economic growth. Hence, production possibility curve shows that the society faces difficulty in making decisions related to the choice of producing these two types of goods.



**Figure 1.7:** Choice of production combination



**Figure 1.8:** Effects on the choice of production combination



### SELF-CHECK 1.2

How can the concepts of scarcity, choice and opportunity cost be illustrated by production possibility curve?



### EXERCISE 1.2

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. If an economy operates within a specific production possibility curve, additional output can be produced without incurring any cost.
2. Production possibility curve can explain the concepts of scarcity, opportunity cost, efficiency and choice
3. A society can move along the production possibilities curve without



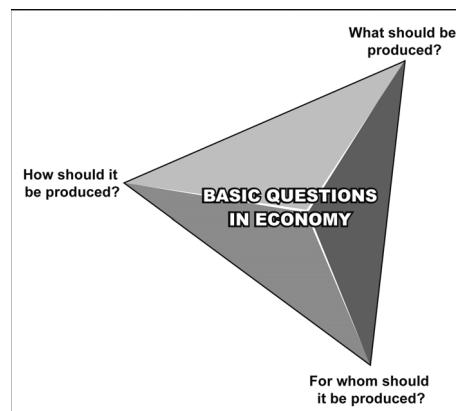
### ACTIVITY 1.2

In your opinion, how does opportunity cost influence the convex shape of production possibility curve? Discuss with your classmate.

## 1.4

### BASIC ECONOMIC QUESTIONS AND ECONOMIC SYSTEMS

The problem of resource scarcity forces the society to make choices. There are three basic questions to be answered in the process of making choices. These basic questions are shown in Figure 1.9 below.



**Figure 1.9:** Basic questions in economy

### 1.4.1 Basic Economic Questions

(a) **What Should be Produced?**

The society needs to determine the types of goods and services to be produced using limited resources to maximise their satisfaction. The selected combination must be in PPC as it is the efficient production combination.

When the type of output required has been identified, the society has to determine the production amount for every output chosen. The indifference curve of the society indicates the relative importance for every product in the society's point of view. If the society chooses to produce more consumer goods, then the consumer goods for current use will give more satisfaction compared to the capital goods that can increase production in the future.

(b) **How Should it be Produced?**

After deciding on the type and quantity of the output to be produced, then comes the question of how it should be produced. Here arises the need for a mechanism that can transfer resources from low-demand industry to the industry with higher demand. In free-market economy, this task is carried out by the market mechanism.

Resources are distributed through the process of demand and supply. In this process, resources will shift into the industry that offers the highest pay. Meanwhile firms in the industry have to utilise resources efficiently to avoid wastage.

(c) **For Whom Should it be Produced?**

After being produced, goods and services have to be distributed. Consumer goods will be disseminated to consumers while capital goods to firms. A mechanism should be available for this purpose. In the free-market economy, this task is carried out by the price mechanism. All consumers and producers who can afford to buy the economic product at the stated market price will be able to obtain what they require.

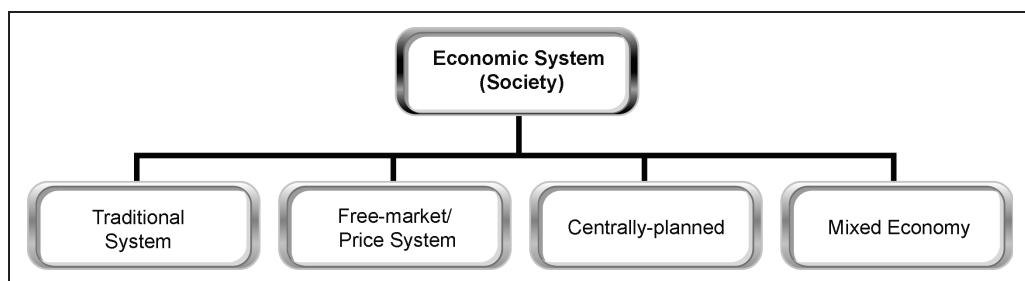


#### ACTIVITY 1.3

Economic system is a regulated way practiced by a particular country in managing its economy. Is it true that the weaknesses in the free-market economy have led to government intervention in economic activities? Discuss this in your tutorial

## 1.4.2 Economic Systems

We have stated before that society needs to answer three basic economic questions of **what to be produced**, **how** and **for whom it should be produced**. These questions are answered based on the economic system chosen by the particular society. Here we will look at the four basic economic systems. Even though most society may not be clearly included into any of the systems, we can categorise them depending on the main characteristics that they possess. Figure 1.10 shows the society's choice of four economic systems.



**Figure 1.10:** Society's choice of economic systems



**(a) Traditional System**

This is the oldest and most influential system. The world's early civilisations are mostly characterised by this system. In today's modern economic system, it is almost unnoticed that the three basic economic questions are resolved based on the traditional system.

In the state of Kedah for example, why is it that the paddy planting activity is still the main source of income for most of the local people whereas other sectors have developed rapidly? Why is it that there are still many people replanting rubber trees even when they know that the price of rubber is unstable most of the time? These situations are connected to tradition. Possibly, many paddy and rubber planters prolong their activities due to tradition, not the market needs.

It is the same with usage, why many of us have to consume rice at least once daily though other food sources may provide us the same or even better nutrients? Thus, without realising, the traditional system still plays an important role in resolving society's economic questions.

**(b) Free Market or Price System**

Free market system or price system is a system where decisions are made based on market needs. Matters such as labour, land, goods and services, including time, have its own value or market price. It is also through the

market that decision to the three basic problems of economy is made: what, how and for whom. Even though there is no organisation or central coordinator making these decisions, this system does not create chaos but becomes organised instead.

Society uses price as an indication to producers on what should be produced. Price competition ensures production to answer the question of 'how?' by using efficient production method to face competition. The question of 'to whom' also can be resolved by price because those with money and willingness to spend are the ones who will acquire what they want.

Most economic research that you will encounter from this point on, such as the producer and consumer theory, is the study of the price system. However, in most macroeconomics studies, governmental roles have been included due to its importance in the real situation.

The main characteristics of free market system are:

- (i) private ownership;
- (ii) self-interests;
- (iii) without government intervention; and
- (iv) price system

The advantage of free-market system is in terms of resource allocation. Free-market gives rise to efficiency of resource allocation because resources will be distributed to the sector that gives the highest evaluation towards resource.

Whereas the downside of it is that, it causes unequal distribution of wealth, since those who are unable to compete will be left behind. This system also hardly promotes the production of public goods because public goods do not maximise personal profit.

**(c) Centrally-planned System**

In the centrally-planned economic system, the answers to the three basic economic questions are done by the central planning coordinator. All economic and social activities of the people are controlled and regulated by the particular body.

The main characteristics of this system are:

(i) **Property Ownership by the Government**

All economic resources such as land, natural resources and public facilities like transportation, industrial communication and bank system are owned by the government.

(ii) **Centrally-planned Economy**

All economic plans are determined by the government to ensure mutual well-being. Planning will determine what will be produced by the economy, how production will be carried out and ensuring equality of distribution.

(iii) **Limited Freedom**

Producers do not have the freedom in choosing goods and services to be produced because the use of resources controlled by the government has been determined. However, consumers are free to choose products and services that have been produced.

(d) **Mixed Economy System**

Mixed economy system is commonly practiced by most countries today. However, the level of mixture varies depending on the level of government intervention in the economic system. Even though the United States of America is considered as a free-market country or capitalism, its government also has its own roles due to the existence of tax and social welfare systems.

For example, the terrorist attack on 11 September 2001 gave rise to a lot of government intervention and this proved that in reality, they do not practice true capitalism.

The purpose of government intervention in economic system is to patch up weaknesses of the free-market system. The government applies directive power and rules such as collecting tax and providing subsidies. The same applies with the production of public goods that are less appealing to private bodies such as electricity supply, water supply and transportation. Besides that, the government also plays a role in stabilisation and economic growth.



### **ACTIVITY 1.4**

Write a brief description on the differences between the two economic systems mentioned below:

- (a) Traditional system with free-market/price system.
- (b) Centrally-planned Economy system with Mixed Economy System



### **EXERCISE 1.3**

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. in the free-market economy, all economic decisions are made in the market where price and productivity are the main factors in determining what should be produced, how to produce and for whom should it be produced.
2. In centrally-planned economy, production resources are owned by individuals.
3. The decreasing opportunity cost causes the production possibility curve to have a concave shape.

## **1.5**

## **CIRCULAR FLOW OF INCOME AND EXPENDITURE**

In market economy, the society is divided into two main groups - the **consumers** and **producers**.

If you still remember the definition of 'economy' as what we have gone through before ( at page 2), we can describe users as a group of people having unlimited wants and needs while producers are the group that utilises limited resources in the production process in order to fulfil those unlimited needs. However, both groups are not separate entities since a consumer may be a producer at the same time and vice-versa.

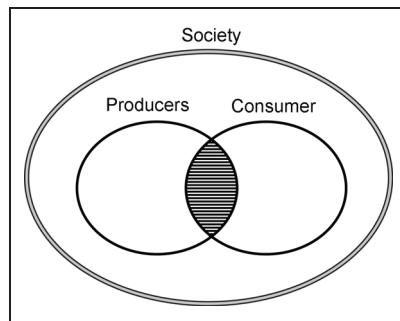


Figure 1.11: Groups within the society in the market economy

The concept of consumers and producers are related to the circular flow of utilisation that is, the utilisation of end products and the utilisation of resources. On the other hand, in the circular flow of income, household is classified as resource supplier and firms as the supplier of consumer goods. Households will earn income from the sales of resources such as labour, land and capital to firms and use their earnings to buy goods and services produced by the firms. While firms will use the earnings from the sale of goods and services to pay for the resources utilised. Figure 1.12 depicts both the circular flow.

In a nutshell, households make two main decisions. Firstly in determining the total amount of production factor owned that will be sold in the factors market to earn income, and secondly, determining the quantity of goods and services that will be bought using the earnings. Firms instead, will make decision on the goods and services to be produced and determine the amount of inputs that will be bought from household.

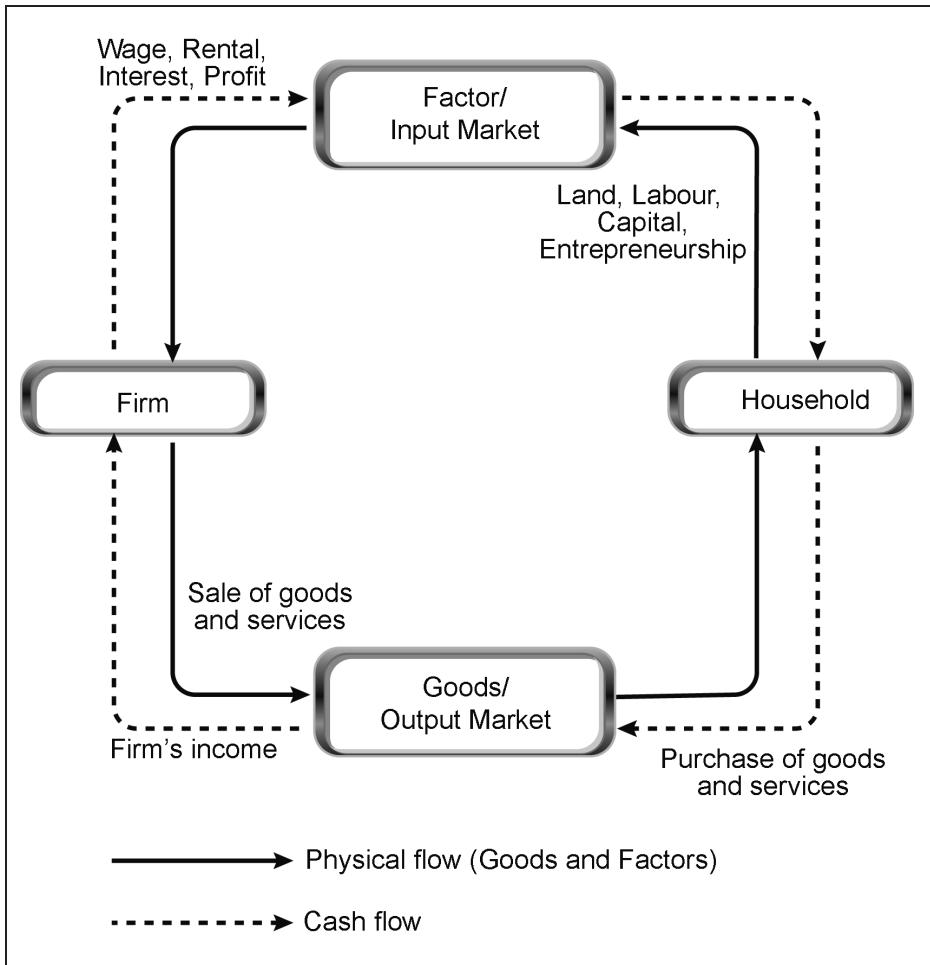


Figure 1.12: Circular flow of production and goods factors



### EXERCISE 1.4

#### Fill in the blanks

1. Scarcity occurs when \_\_\_\_\_ wants faces \_\_\_\_\_ resource.
2. Three main questions caused by scarcity and have to be resolved by the economic systems are: \_\_\_\_\_ should be produced, \_\_\_\_\_ resources used in production and \_\_\_\_\_ will be obtaining the goods produced.
3. When an economist states about price or cost, he actually means the value of best \_\_\_\_\_ forgone when a choice is made. This concept is known as \_\_\_\_\_ or alternative cost. This cost is implicit in all choices.
4. \_\_\_\_\_ is a study related to employment, inflation, money, tax, exchange rates, national income and other aggregate variables. \_\_\_\_\_ is more specified to the study of how consumers and firms make decisions and interact with one another.
5. Interaction among household, business firms and the government is shown by the \_\_\_\_\_ model.
6. If the combination of output being produced is in the production possibility curve, part of the resource is \_\_\_\_\_; while the point outside the production possibility curve is \_\_\_\_\_.
7. A normal production possibility curve has a convex shape because opportunity cost is \_\_\_\_\_. The cost of producing goods increases when production level increases due to the problem of \_\_\_\_\_ return.
8. The government's role in the capitalism system is minimum and follows the \_\_\_\_\_ policy. There are no societies practicing true capitalism or centrally-planned system, most of us live in the \_\_\_\_\_ economy.



### **EXERCISE 1.5**

#### **Structured Questions**

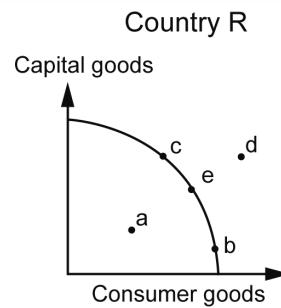
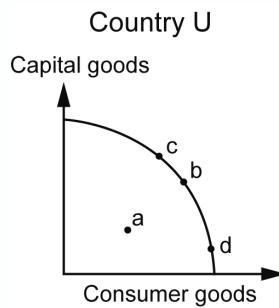
Assume that Country A produces two types of goods, consumer goods and agricultural goods. Assume too that the production possibilities curve of Country A has a normal convex shape. By placing the consumer goods at the Y-axis and the agricultural goods at the X-axis, illustrate the effects of conditions stated below to the production possibility curve of Country A. Draw the curve for every condition in separate diagrams with the assumption that the original curves are the same before any changes take place.

- (a) Technology growth occurs in the agricultural field only.
- (b) Technology growth occurs in the production of consumer goods only.
- (c) Education level of all labour increases in a period of three years.
- (d) Investment in capital goods decreases throughout a decade.
- (e) A few million acres of agricultural land are gained by sea embankment.



### EXERCISE 1.6

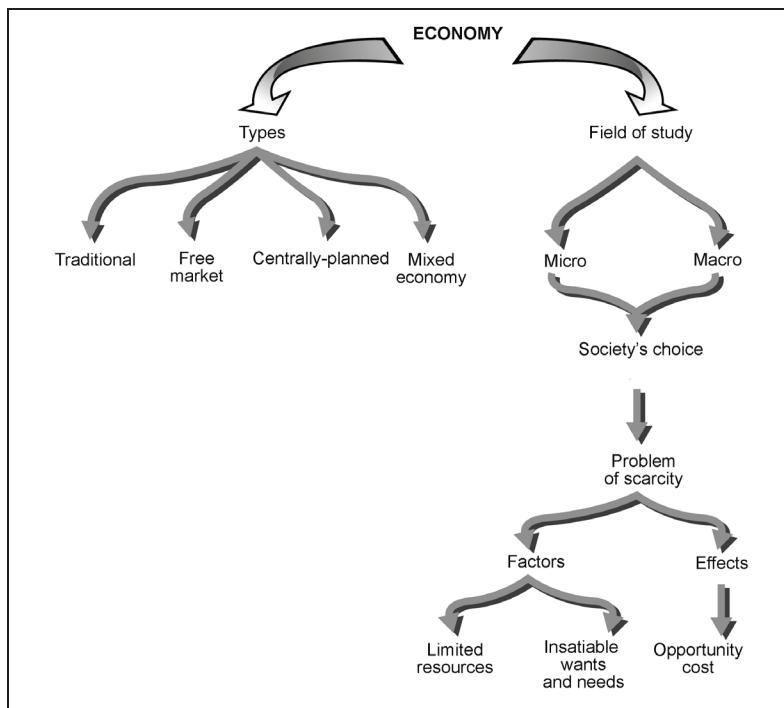
Determine whether these statements are **TRUE (T)** or **FALSE (F)** based on the figures below.



- (a) If both countries are having the same resources, Country U will have a more advanced technology compared to Country R.
- (b) Both countries face decreasing returns in the production of both goods.
- (c) Investment of Country R is higher at point d compared to point c.
- (d) If Country R is at point a, it can move to point d.
- (e) Point a for both countries illustrates inefficiency and waste of resources.
- (f) Opportunity cost is constant along the production possibility curve of Country U.
- (g) Consumption in Country R exceeds investment at point d.
- (h) Each country can experience rapid growth when moving along the curve towards capital goods.
- (i) Country U can move from point e to point c without incurring cost.
- (j) If both countries use the same level of technology, Country R will have more resources compared to Country U.

## SUMMARY .....

- Below is a concept map to help you visualise the content scope of this topic.



- Economics is a study of how individuals and society distribute limited resources to fulfil unlimited wants. Economic research focuses on choices made by the society.
- Choices have to be made as a result of the problem of scarcity. Thus, choices involve opportunity cost. Opportunity cost is the value of the best alternative foregone.
- Problem of scarcity arises because of limited resources and insatiable wants and needs. Thus, emerges the questions of what should be produced, how the production process is being carried out and who will obtain the goods. These three questions are resolved based on the economic system chosen by the society.
- Economic research consists of micro and macro researches. Microeconomics involves the study towards individual units while macroeconomics view the economy as an aggregate.

- There are four main types of economic system; the traditional system, free market system, centrally-planned system and mixed economy system. However, most economies are based on the mixed economy system due to the intervening roles of the government.

### KEY TERMS

Centrally-planned System	Mixed Economy System
Economics	Opportunity Cost
Economy	Production Possibility Curve
Free-market/Price System	Scarcity
Macroeconomics	Traditional System
Microeconomics	

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# Topic ▶ Supply and Demand

## 2

### LEARNING OUTCOMES

By the end of this topic, you should be able to:

1. Explain the law of demand and supply;
2. Sketch due demand and supply curve;
3. Describe demand and supply curve
4. Apply four demand and supply determinants; and
5. Compare between the shifts of demand and supply curve with the movement along a particular curve.

### ▶ INTRODUCTION

In Topic 1, you have learnt about the free market economy. In a free market economy, there is no central body responsible for making decisions on production and utilisation. Instead, each individual has the freedom in making purchase decision that can provide maximum satisfaction, and producers have the freedom to sell based on the needs to maximise profit. A complex market system will regulate the decisions of both parties to determine market equilibrium.

The concept of demand and supply is the basic concept in market economy. The price system will determine how resources, products, and services are distributed. Distribution is made based on wants and the ability to pay. Anyone who has wants and is willing to pay will obtain what is required.

In this topic, we will look at the operation of market system through the concept of demand and supply. We will also try to understand factors involved in moving the market.

## 2.1 DEMAND

In economic analysis, the concept of demand is used to describe, analyse and predict behaviour of buyers in market.

**Demand** can be defined as the total amount of goods required and able to be purchased by consumers at various price levels in a particular period of time.

Demand can be described by using tables or curves that relates the quantity of a product required and can be afforded by consumers in a particular period of time at various price levels, while other variables remain unchanged (you will find that some authors refer to other determinant variables as *ceteris paribus*).

Two important facts you have to understand about the definition above are the relationship between demand quantities with:

- (a) price; and
- (b) related variables (*ceteris paribus*)

Demand does not solely mean quantity but also refers to the relationship between demand quantity and price. Therefore, demand can be described in the form of tables or curves that connects a set of variables with another variable, that is, quantity with price.

In measuring the changes in demand quantity, it is assumed that other variables affecting consumption do not change at the same time good's price changes. Other variables are those that can influence the demand of the particular goods, such as income, consumer preferences, price of other related goods and consumers' predictions towards the future.



### ACTIVITY 2.1

How is the price of a particular product or service determined in the market? Why do same goods have different price at different times? Discuss in your class.

### 2.1.1 Law of Demand

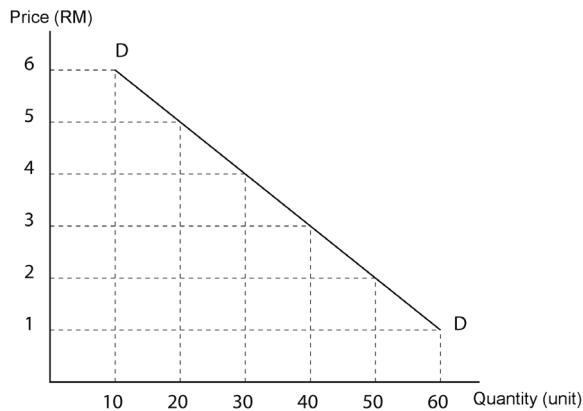


Figure 2.1: Demand curve

A demand curve with negative gradient indicates an inverse relation between demand quantity and price level. When price increases, demand quantity decreases, and when price decreases, demand quantity increases. This inverse relationship is referred to as the Law of Demand. There are two explanations for this law of demand, which are:

- (a) Substitution Effect
- (b) Law of Diminishing Marginal Utility

Substitution effect occurs when price change causes consumers to substitute the scarce goods with other goods with lower price but still able to give the same amount of satisfaction. Law of Diminishing Marginal Utility explains this negative relation by using the concept of utility or satisfaction.

Table 2.1 and Figure 2.1 illustrate the demand table and demand curve respectively, that is, the relationship between price level and quantity demanded.

Table 2.1: Demand Table

Price (RM)	Demanded Quantity (Unit)
1	60
2	50
3	40
4	30
5	20
6	10



### SELF-CHECK 2.1

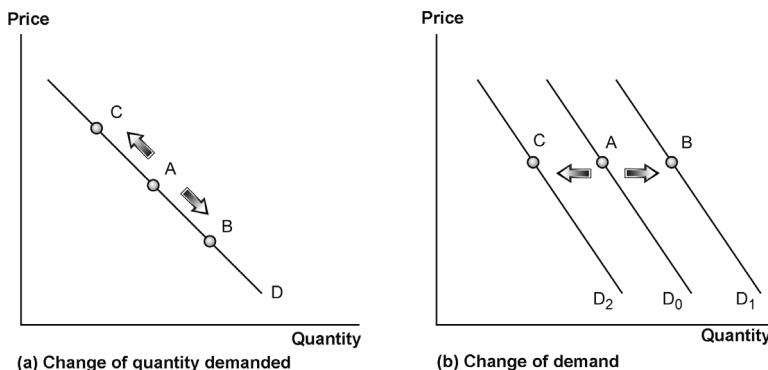
How does the price level of a particular good affect the demand quantity?

## 2.1.2 Demand and Quantity Demanded

It is important for us to understand the difference between these terms: **demand**, **demanded quantity**, **demand curve shifts**, and **movement along the demand curve**.

- (a) **Demand curve** illustrates the relationship between price and quantity at a certain point of time only; with the assumption that other factors remain unchanged. However, it cannot show the relationship for a longer period of time due to the changes in other demand determinants.
- (b) **Movement along the demand curve** indicates the changes of demanded quantity caused by the goods' own price change. This movement is related to the law of demand. When price changes, buyers will make changes to the quantity of the goods willing to be purchased.
- (c) Shifts in demand curve caused by changes in other determinant variables (such as price of particular goods, consumer opinions and preference) are known as **demand change**. The right shift of demand curve indicates increase in **demand** while shift to the left indicates decrease in **demand quantity**.

Figure 2.2(a) shows the concept of changes in quantity demanded. The shift from point A to point B indicates **increase in quantity demanded**, while shift from point A to point C shows **decrease in quantity demanded**. Figure 2.2(b) shows demand change. Shift from point A to point B indicates increase in demand, while shift from point A to point C indicates decrease in demand.



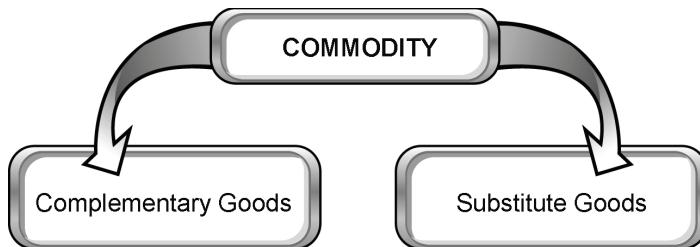
**Figure 2.2:** Change of quantity demanded and change of demand

### 2.1.3 Demand Determinants

After knowing the difference between demand change and change of quantity demanded, we will now look at demand determinants in more detail.

(a) **Price of Related Goods**

The change in price of goods that are related to a commodity will cause shifts in the position of demand curve. There are two types of goods related to a commodity, namely substitute goods in use and complementary goods in use.

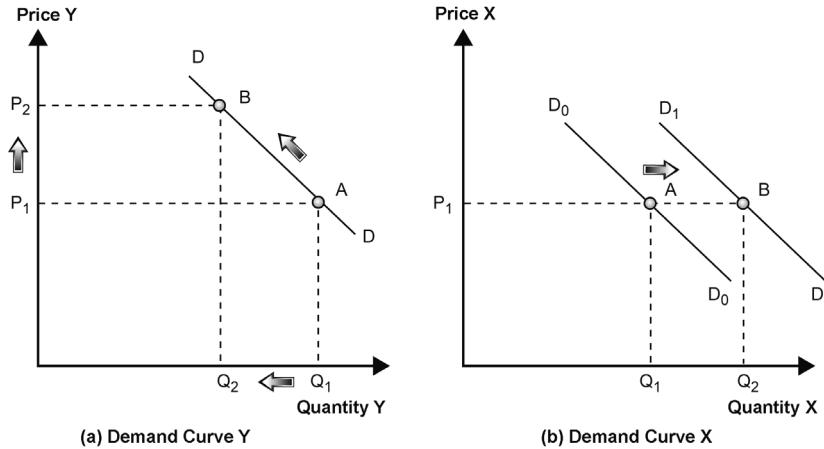


**Figure 2.3:** Two types of goods related to a commodity

**Substitute goods** are goods that can be used as substitutes in the use of a commodity. Examples of substitute goods are: butter to margarine or meat to fish.

Assume that product Y is the substitute for X, when price of Y increases, consumers will reduce the purchase of Y and substitute it by increasing the purchase of X. As a result, quantity demanded for Y decreases while demand for X increases. The opposite happens when the price of Y decreases. Figure 2.4 shows the specified position. In both diagrams, A is the original point and B is the point after the change of price.

Price increase of margarine (Y), that is, from  $P_1$  to  $P_2$  will result in consumers reducing the use of margarine , and substituting it with butter (X). With that, even though the price of butter remains unchanged, demand on butter had increased as a result of the increase in margarine price.

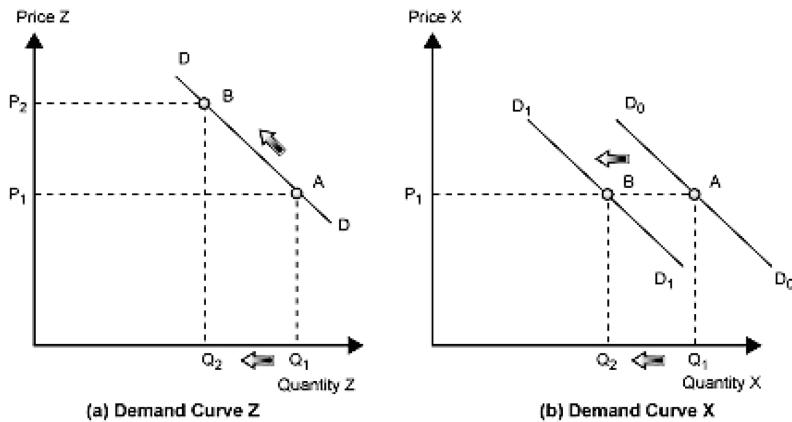


**Figure 2.4:** Changes in the price of substitute goods

**Complementary goods** are goods that can be consumed together to get satisfaction. Examples of complementary goods are: car with petrol and pen with ink.

Now assume goods Z as the complement for goods X. The price increase of goods Z leads to decreased quantity demanded for both, Z and X. The opposite happens if price Z decreases. Figure 2.5 illustrates the position.

Let's say the price of petrol ( $Z$ ) increases from  $P_1$  to  $P_2$ . This will cause quantity demanded for petrol to decrease. As a result of the increase of petrol price, consumers will reduce demand for cars ( $X$ ); even if the price of cars remains unchanged.



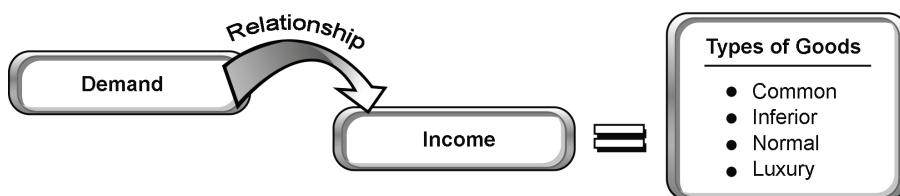
**Figure 2.5:** Change in the price of complementary goods

When the use of a particular good does not affect the use of another good, it is known as unrelated goods. For example, a change in the price of sugar, which has no relationship to cars, does not affect the demand for cars.

(b) **Income**

Normally, income is positively related to demand. When income increases, demand also increases and vice-versa.

However, this relationship only applies to normal goods. Sometimes the increase in income will decrease demand for a particular product. This situation happens for inferior goods. Therefore, the relationship between demand and income will give indication on the type of goods. The types of goods are luxury goods, normal goods, common goods and inferior goods.



**Figure 2.6:** The function of relationship between demand and income

Even though classification of goods depends on the income level of the consumers, we can categorise goods generally, such as cracked rice which is considered as inferior goods by most consumers. Similarly, consumer goods bearing international brands are considered as luxury goods, such as prestige cars, clothes with international designers' brands and others. Common goods are goods that have no changes in use with price change, such as salt and normal rice for most consumers in Malaysia.

(c) **Preferences**

Consumers have a variety of preferences that change from time to time. When consumers' preference towards a commodity increases, consumers will tend to make more purchases at every price level. Demand curve for the particular commodity **will shift to the right**. For example, change in preferences can be seen in the fast food market such as fried chicken. People in the earlier days would have never imagined consuming chicken without having to incorporate them as a dish to go with their rice. However, due to change in time and advertisements through media, the preference towards such food has increased.

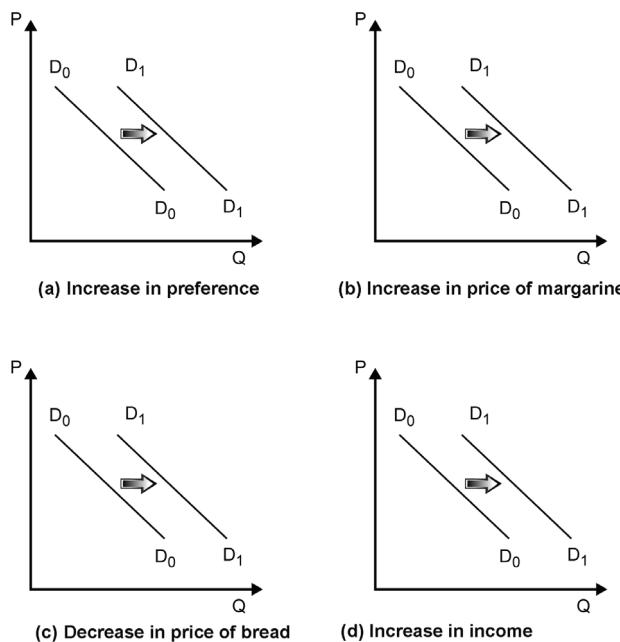
(d) **Predictions on Change of Price and Income in the Future**

Consumers may be able to predict future changes in price and income, for example during the festive seasons. If price is expected to increase in future, current demand will increase. On the other hand, current demand will decrease if price and income is expected to decrease in future.

To explain further about the demand determinants we have discussed before, let us look at the example of demand for butter. We will look at what increases the demand for butter and shifts the demand curve for butter to the right.

We know that butter is not a traditional food in our country. However, with the exposure of our people to foreign food, butter has been accepted by a large population of the society, especially to be served with bread or as an ingredient to prepare cakes. **This change in preferences shifts the demand curve for butter to the right.**

Margarine is the substitute for butter. Therefore, if the price of margarine increases, demand for butter will also increase. Bread is considered as the complement for butter, therefore, for those who increase their bread consumption due to price decrease or other reasons, will also increase the demand for butter. Likewise, if the income of consumers increases, there will be those who substitute margarine with butter because margarine is considered by some consumers as inferior good. Figure 2.7 illustrates the shift of demand curve for butter which is caused by various factors.



**Figure 2.7:** Shifts in demand curve of margarine



### ACTIVITY 2.2

To upgrade your understanding, explain the effects of the factors listed below towards the demand for coffee:

- (a) preference
  - (b) price of related goods (substitute goods and complementary goods)
  - (c) income
  - (d) prediction of price and income changes in future
- Present your answer in your tutorial.

#### 2.1.4 Individual Demand and Market Demand

Market consists of many individuals. Therefore, market demand table or curve is the total sum or aggregate of demand table or curve of all individual buyers present in the market. We can obtain the market demand table or curve by summing up quantities demanded by all individual buyers at each price level. The relationship between price and quantity in the market is influenced by the same determinant variables that influence individual demand.

Table 2.2 and Figure 2.8 illustrate how we can derive market from individual demand curve. Assume that there are only two consumers in the market. At the price of RM2 per unit, quantity demanded by consumer 1 is 25 units and 50 units for consumer 2. Therefore, the market demanded quantity at the price of RM2 per unit is 75 units and so on for other price levels.

**Table 2.2:** Derivation of Market Demand

Price (RM)	Quantity Demanded (Unit)		Market Demand (unit)
	Consumer 1	Consumer 2	
1	30	60	90
2	25	50	75
3	20	40	60
4	15	30	45
5	10	20	30
6	5	10	15

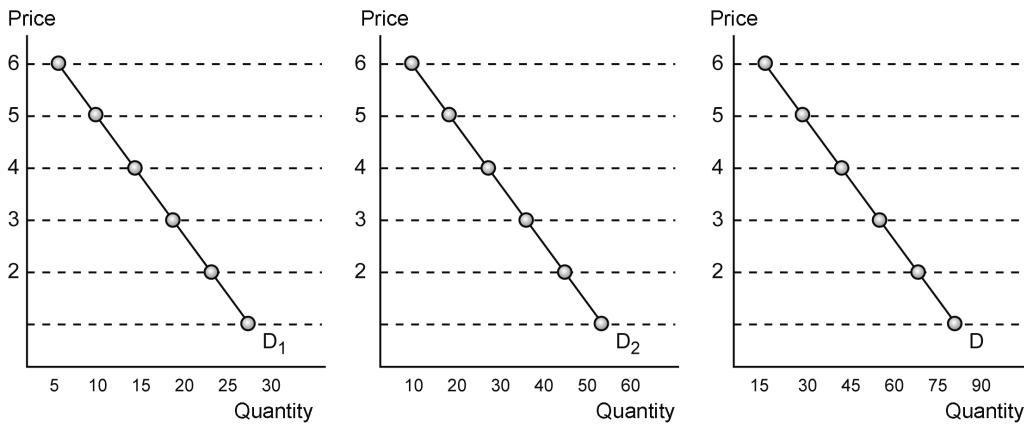


Figure 2.8: Derivation of market demand curve



### EXERCISE 2.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Demand is the total of a good or commodity that is willingly purchased and affordable for an individual at a certain price.
2. Demand curve will shift to the right if all other determinants, excluding the price of the good itself, remain unchanged.

## 2.2 SUPPLY

What is meant by supply?

According to the demand theory, we have seen the behaviour of consumers in the market. However, market not only consists of buyers, but also sellers or producers. Therefore, we will now look at the behaviour of sellers in market. In economic analysis, behaviour of sellers in market is analysed and predicted using the concept of supply.

Hence, **supply** can be defined as table or curve that relates various quantities of goods to be sold at a certain time at various price levels, while other variables remain unchanged.

In measuring the change in quantity supplied, other variables that can influence the amount of goods willing to be offered by sellers, are assumed to be unchanged. The other determinant variables referred to includes production input price, price of other goods, technology, and predictions of suppliers about the future.



### ACTIVITY 2.3

You must have frequently heard the saying, “if there is no demand, there will be no supply”. Do you agree if it is said that supply is closely related to demand?

If price decreases, what will happen to demand quantity? Do you agree if it is said that demand will increase if price decreases?

How about supply? Will supply increase if there is a decrease in price?

#### 2.2.1 Law of Supply

If you are a seller or a producer of a commodity, you may earn a higher profit if selling price increases, and the opposite if the price decreases. Therefore, the quantity of goods you sell will increase with the increase in price and the contrary if the price decreases. The positive relationship between price and supply quantity is known as the Law of Supply.

Table 2.3 is a supply table, that is, a table that shows the quantity offered by sellers or producers at various price levels. Figure 2.9 is the supply curve derived and sketched based on Table 2.3. Figure 2.9 shows a supply curve with positive gradient.

**Table 2.3:** Supply Table for Good X

Price (RM)	Quantity Supplied (Unit)
1	10
2	20
3	30
4	40
5	50
6	60

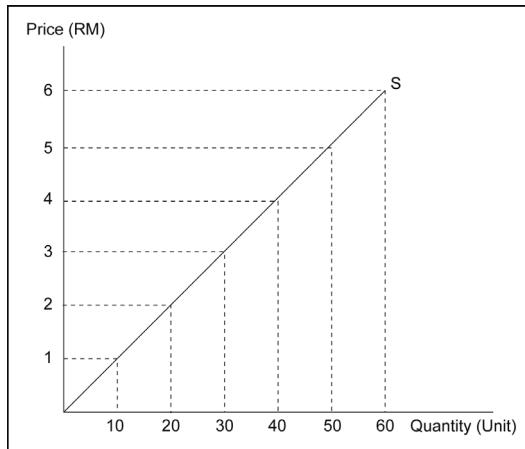


Figure 2.9: Supply curve for Good X

There are three reasons why supply has a positive relationship with price:

- (a) increase in production may bring about the increase in cost due to the problem of decreasing returns. This concept will be discussed further in the production topic in Topic 5;
- (b) the increase in price may cause increase in profit, therefore, firm will be encouraged to increase production; and
- (c) if price remains at a high level for a long period of time, new producers will be attracted to enter market, giving rise to total market supply. This theory will be discussed further in Topic 8.

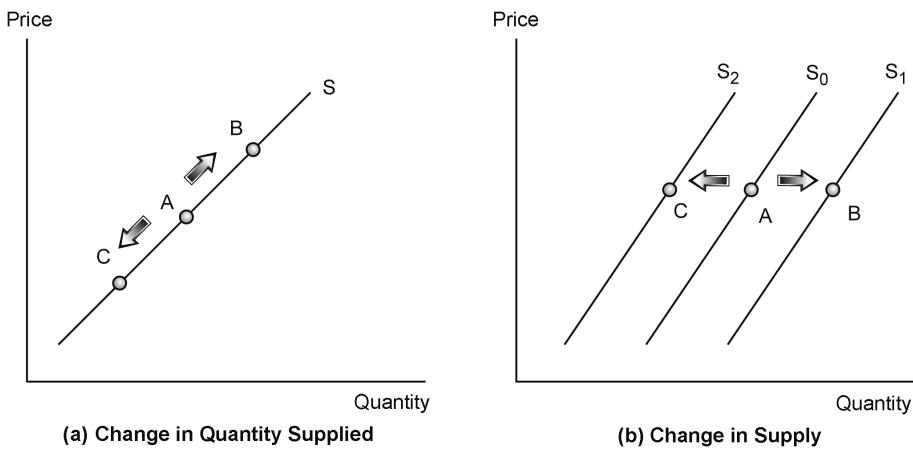
### 2.2.2 Supply and Quantity Supplied

Like demand, the concept of supply and quantity supplied also differ. Change in quantity supplied occurs when there is a change in the price of the goods itself.

Price of goods positively influences quantity supplied. Increase in price will increase the quantity supplied, and vice-versa. Change in goods supplied triggered by change in price will show movement along the same supply curve.

Change in supply on the other hand, refers to shifts of the supply curve caused by changes in supply determinants. The determinants include production cost, predictions and price of other goods.

**Change in goods supplied** means movement along one supply curve, whereas **change in supply** is illustrated by the right or left shift of the curve.



**Figure 2.10:** Movement along the curve and shifts in supply

Figure 2.10(a) illustrates the change in quantity supplied caused by the price variation of the goods itself. Increase in price will cause an increase in quantity supplied from point A to point B. Whereas decrease in quantity supplied caused by price decrease of the product itself is shown by the movement from point A to point C. Look at how movement takes place along the same curve. This is known as change in quantity supplied.

Figure 2.10(b) on the other hand, shows the change in supply due to factors of supply determinants such as price of other goods, production cost, price prediction and number of producers. For example, increase in production cost will bring about decrease in supply and further causes the supply curve to shift to the left from point A in curve  $S_0$  to point C in curve  $S_2$ . On the other hand, decrease in production cost will increase supply in the market and will shift the supply curve to the right ( $S_0 \rightarrow S_1$ ). Observe that price is not a factor that changes supply, but changes are caused by other factors of supply determinants. This is illustrated by shifts in supply curve known as supply change.

## 2.2.3 Supply Determinants

Now we will discuss on supply determinants in more detail.

(a) Price of Other Goods

Correlation of goods in production process influences the supply of a particular good when a price change for related good occurs. Correlation of goods in production process can be divided into two;

- (i) substitutes in supply; and
  - (ii) complements in supply

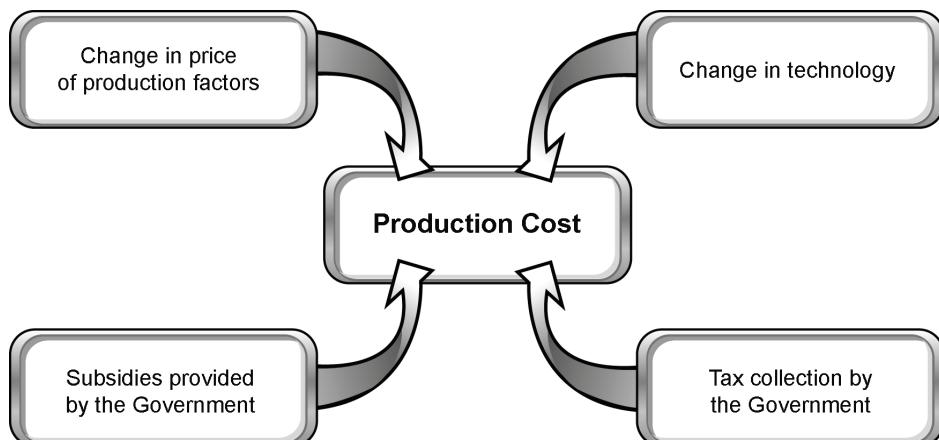
Substitutes in supply refer to goods that can be produced to substitute the production of other goods without having to make significant changes in the production process. For example, the production of rice flour and glutinous rice flour can be done using the same machine.

If the profit or price of a substitute good in the production increases, producer will shift production to that particular good and decrease the production of other goods. From the example of flour mentioned above, if the price of rice flour increases, producer will suspend the production of glutinous rice flour to be substituted with the production of rice flour, in order to gain current profit.

Complements in supply refer to goods jointly produced in a production process. For example, in the process of producing petrol from crude oil, a few other products such as gas and diesel will also be yielded. If the price of petrol increases, increase in supply of petrol also causes the increase in supply of other products, and vice-versa.

#### (b) Change in Production Cost

Production cost can change due to a few reasons including the change in price of production factors, change in technology, tax collection and subsidies provided by the government.



**Figure 2.11:** Factors that cause change in production cost

Producers use a combination of production factors in the production process. The price of production factors is determined in the factors market. Change in the price of factors will influence production cost. Therefore, if the price of factors decreases, production cost will also decrease. This situation provides incentive to producers to increase production, even if there is no price increase for that particular good in the market. Hence,

decrease in the price of factors will shift the supply curve to the right due to increase in supply.

Changes in the government policy related to tax and subsidies will also influence the supply curve. When producers have to pay tax, production cost will increase, resulting in the left shift of the curve. On the other hand, subsidies given to producers will reduce the production cost and hence, shift the curve to the right.

The discovery of new technologies that can reduce production cost will also shift the supply curve to the right.

(c) **Prediction of Price**

If producers are able to predict an increase in price of the goods produced, production will be increased and the supply curve will shift to the right. If price is predicted to decrease, production will also be decreased and the supply curve will shift to the left.

(d) **Number of Producers**

Supply curve will shift to the right when there is an increase in the number of producers and vice-versa.



### Activity 2.4

#### Rise in petrol price will not affect purchase of cars

KLANG: The interest of purchasing cars in Malaysia will not erode even with the rise in petrol and diesel price, says automotive expert, Tan Sri SM Nasimuddin SM Amin.

He says that the increase in price of fuel in Malaysia is not obvious compared to other countries in Europe, Japan and Korea, where the sales of automobiles continue to increase even when the price of fuel increase rapidly.

He also said that suggestions to reduce or even terminate road tax for vehicles will facilitate the selling of cars in this country, especially during this situation of fuel price increase.

"It is good as it will lessen the burden," says the Naza Group Managing Director who supports the suggestion of terminating the road tax for all kinds of vehicles. The Naza Group, operating since 1975, has been involved in the business of importing and selling cars in need of APs.

Nasimuddin was interviewed after attending the opening ceremony of the Kia Motors showroom owned by Perstimas Sdn. Bhd. by Deputy Finance Minister, Datuk Dr. Ng Yen Yen here yesterday.

**Source:** Harian Metro Online (2005)

Based on the article from a local newspaper, give your opinion about the effect of petrol price increase on the supply of cars and other goods. In your opinion, what is supposed to be done by the government to encounter the continuous problem of petrol price increase?

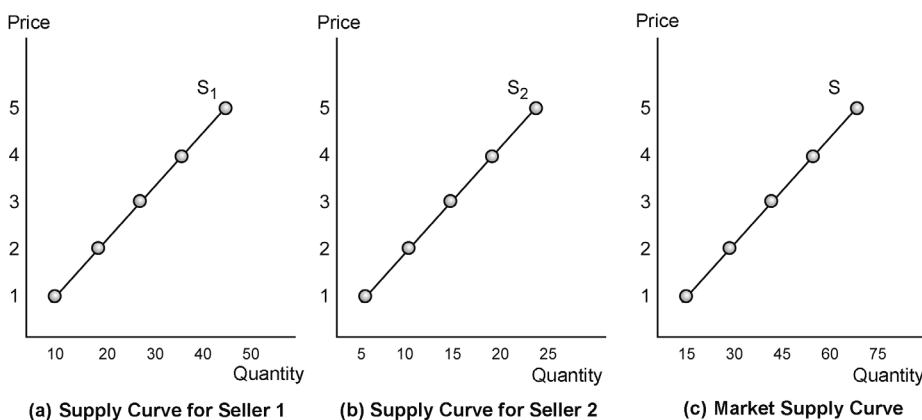
### 2.2.4 Individual Supply and Market Supply

Like market demand, market supply will also be obtained by summing up the quantity supplied by all sellers at various price levels. Table 2.4 and Figure 2.12 illustrate how market supply curve is derived.

Assuming there are only two sellers in the market, at the price of RM1 per unit, seller 1 is supplying 10 units and seller 2 supplying 5 units. Hence, market quantity supplied at RM1 per unit is 15 units and so on.

**Table 2.4:** Derivation of Market Supply

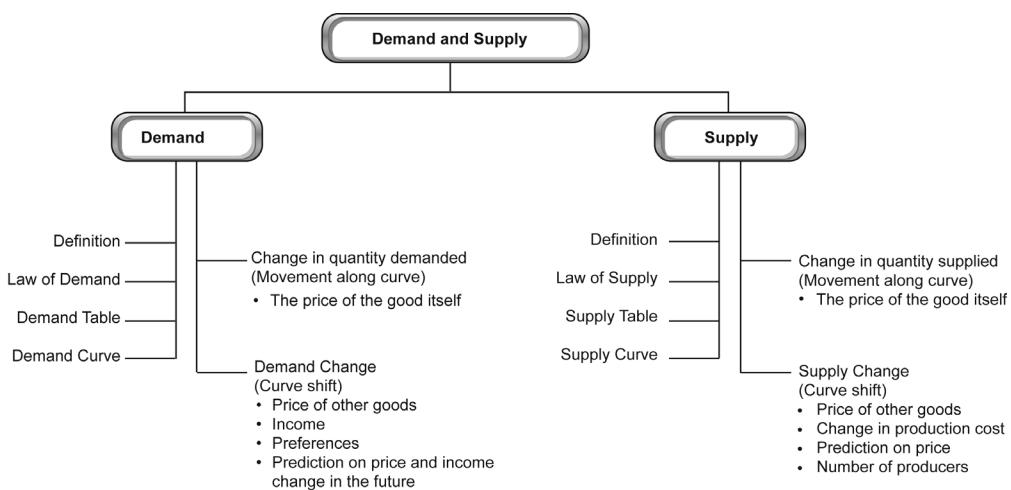
Price (RM)	Quantity Supplied (Unit)		Market Supply (Unit)
	Seller 1	Seller 2	
1	10	5	15
2	20	10	30
3	30	15	45
4	40	20	60
5	50	25	75



**Figure 2.12:** Derivation of market supply curve

## SUMMARY

Below is a mind map to help you visualise the content scope of these topic:



- Demand is the quantity wanted and can be afforded by consumers at various price levels. Demand is determined by the price of the good itself, price of related goods, income, preference and predictions.
- The negative relationship between quantity demanded with the price of the good itself is called the Law of Demand.
- Change in quantity demanded due to the change in the price of the good itself causes movement along one demand curve. Demand change that is caused by changes in demand determinants other than the price of the good itself, will result in shifts of the demand curve.
- Increase in demand will shift the curve to the right, while decrease in demand will shift the curve to the left.
- Supply is the quantity that is willing to be sold by sellers at various price levels. Supply is determined by the price of the good itself, price of related goods, production cost, and predictions.
- The positive relationship between quantity supplied and the price of the good itself is known as the Law of Supply.
- Change in quantity supplied caused by the price of the good itself is shown in the movement along one supply curve.
- Supply change due to change in supply determinants other than the price of the good itself will result in shifts of the supply curve.
- Increase in supply will shift the supply curve to the right while decrease in supply will shift the curve to the left. Market demand is the total sum of individual demands while market supply is the total sum of all individual supplies.

### KEY TERMS

Complementary goods	Law of supply
Demand	Substitute goods
Demand Curve	Supply
Demand determinants	Supply determinants
Law of demand	

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# Topic ► Market 3 Equilibrium

## LEARNING OUTCOMES

By the end of this topic, you should be able to:

1. Demonstrate how equilibrium quantity and price is achieved using diagrams and equations;
2. Explain how market equilibrium can change;
3. Calculate and interpret price elasticity in demand, supply elasticity cross elasticity coefficient, and income elasticity;
4. Interpret cross elasticity coefficient, and income elasticity; and
5. Apply the concept of elasticity in market analysis.

## ► INTRODUCTION

In Topic 2 we have seen in Topic 2 how quantity demanded correlates negatively with price and quantity supplied correlates positively with price. However, those relationships are general. We may have to know how much the quantity demanded will decrease if price increased by 10 percent. In Topic 3, you will learn about market equilibrium. In other words, we want to know about the level of sensitivity of quantity demanded towards price change. This information is important for price determination by firms. On the other hand, for an economist, this information is vital for policy analysis.

The sensitivity of quantity towards price change can be measured using the elasticity concept, which will be discussed in this topic.

## 3.1 MARKET EQUILIBRIUM

What is meant by market equilibrium? How can demand and supply correlate?

Demand and supply are models that explain the respective behaviour of consumers and sellers in market.

To show how both interact in determining price and quantity, we need to draw the demand and supply curves in one diagram.

The point of intersection between the demand and supply curves is the **market equilibrium point**.

The term equilibrium is used in economics to explain a condition when all variables have reached an established position with no tendency to change any further. **Equilibrium change will only happen if there is change in other influence or determinants.**

At the point of market equilibrium, the need of buyers is equal to the need of sellers, that is, quantity demanded is equal to quantity supplied at a certain price level. The particular quantity and price are known as **equilibrium quantity** and **equilibrium price**.

From the past discussions, we know that demand curve has a negative gradient whereas supply curve has a positive gradient. Figure 3.1 depicts both curves drawn in the same diagram. Both curves intersect at point E. Point E is known as **equilibrium point**, while  $P_e$  and  $Q_e$  represent equilibrium price and quantity respectively.

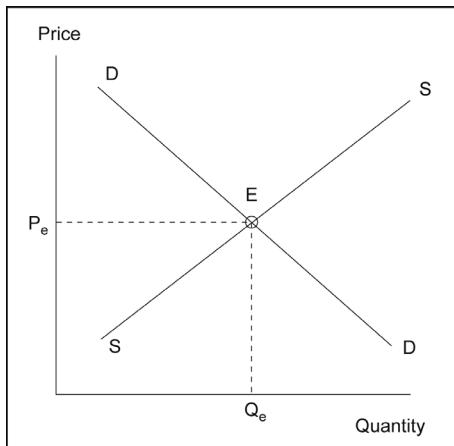


Figure 3.1: Market equilibrium

### 3.1.1 Equilibrium, Surplus and Shortage

Table 3.1 describes the concept of equilibrium, excess demand and excess supply. Sometimes excess in demand is referred to shortage, while excess in supply is known as surplus. Hence, excess in demand is shown using negative value whereas excess in supply using positive value. Zero surplus value indicates equilibrium.

Table 3.1: Market Surplus, Shortage and Equilibrium

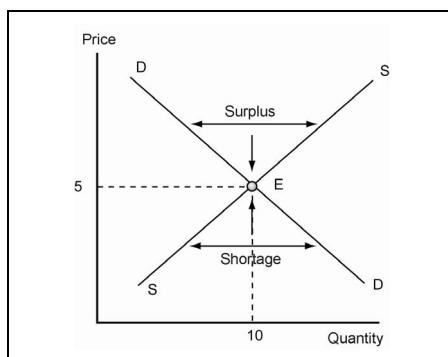
Price (RM)	Quantity Demanded (Unit)	Quantity Supplied (Unit)	Shortage (-) Surplus (+)	Pressure on Price
1	18	2	-16	Increased
2	16	4	-12	Increased
3	14	6	-8	Increased
4	12	8	-4	Increased
5	10	10	0	Equilibrium
6	8	12	+4	Decreased
7	6	14	+8	Decreased
8	4	16	+12	Decreased
9	2	18	+16	Decreased

Shortage occurs when quantity demanded exceeds quantity supplied at a certain price level. From Table 3.1, shortage or excess demand occurs at the price of RM1 to RM4 per unit. At the price of RM1 shortage is at 16 units and at the price of RM4, shortage had decreased to 4 units. Shortage will increase the pressure on price. Therefore, increase in price will reduce shortage.

Surplus occurs when quantity supplied exceeds quantity demanded at a certain price level. Surplus will be reduced when there is decrease in price. Hence, surplus reduces the pressure on price. From Table 3.1, we can see that surplus decreases from 16 units to 4 units when price is reduced from RM 9 to RM6 per unit.

Equilibrium will be achieved when there is no shortage or surplus. Thus, there is no pressure for a price change. In Table 3.1, equilibrium is achieved at the price of RM5 per unit for a quantity of 10 units. Do notice that shortage will cause price increase; whereas surplus will result in price decrease.

Figure 3.2 illustrates the condition of shortage, surplus, equilibrium and pressure on price.



**Figure 3.2:** Equilibrium, shortage and surplus



### SELF-CHECK 3.1

Quantity demanded exceeds quantity supplied =

Quantity supplied exceeds quantity demanded =

Think of which refers to **shortage** and which refers to **surplus**.



### ACTIVITY 3.1

In your own words, describe how a market can achieve equilibrium.  
Share your answer with your classmate.

### 3.1.2 Change in Market Equilibrium

Market equilibrium will remain unchanged as long as there are no market forces affecting demand and supply. However, demand and supply always shift to the left or to the right as a response to changes in other determinant variables. Hence, change in other variables will result in the change of quantity and price equilibrium.

#### (a) Demand Change

Generally, changes in demand or supply lead to predictable effects on equilibrium quantity and price, such as:

- (i) When demand increases while supply remains unchanged, equilibrium price and quantity will also increase. To get a clearer picture about the effect of increase in demand towards market equilibrium, let us look at Diagram 3.3(a). Curve  $D_0$  and  $S$  are the original demand and supply curve respectively. Point  $E_0$  is the point of equilibrium for the initial market, that is, where demand curve  $D_0$  intersects with supply curve  $S$ . Equilibrium price and equilibrium quantity are  $P_0$  and  $Q_0$  respectively. When demand increases, demand curve  $D_0$  will shift to  $D_1$ .  $D_1$  and  $E_1$  are the new demand curve and new point of market equilibrium.
- (ii) When demand decreases while supply remains unchanged, equilibrium price and quantity will decrease [Refer to Figure 3.3(b)].

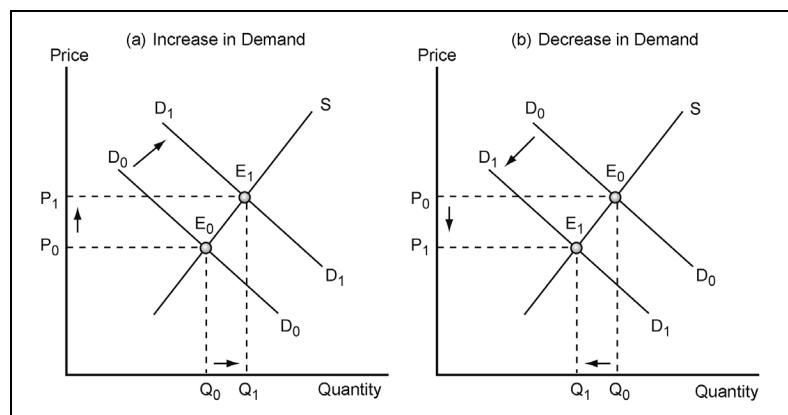
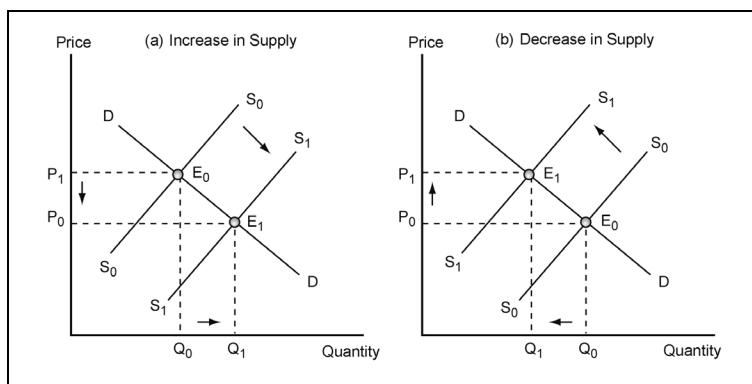


Figure 3.3: Effect of demand curve shifts towards equilibrium

### (b) Supply Change

- (i) When supply increases and demand remains unchanged, equilibrium price will decrease whereas equilibrium quantity will increase [Refer to Figure 3.4(a)].
- (ii) When supply decreases and demand remains unchanged, equilibrium price will increase whereas equilibrium quantity will decrease [Refer to Figure 3.4(b)].

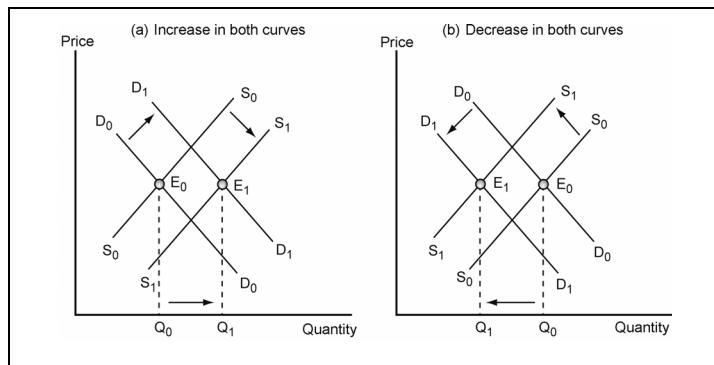


**Figure 3.4:** Effect of supply curve shifts towards equilibrium

### (c) Changes in Demand and Supply

Changes in both demand and supply lead to predictable effects on equilibrium quantity or price.

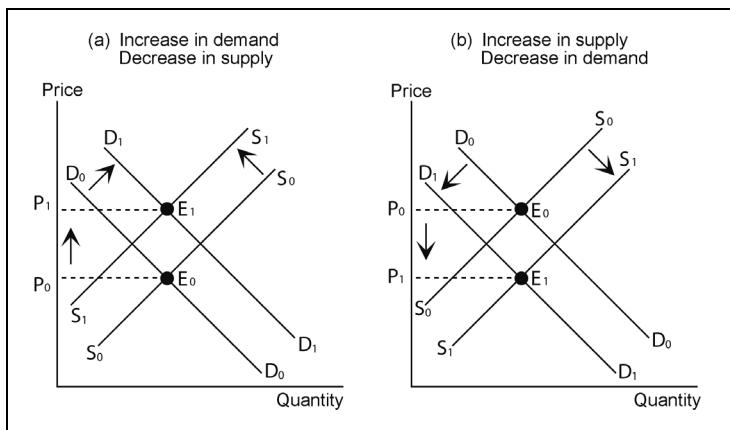
- (i) When both demand and supply increase, equilibrium quantity will increase [Refer to Figure 3.5(a)].
- (ii) When both demand and supply decrease, equilibrium quantity will decrease [Refer to Figure 3.5(b)].



**Figure 3.5:** Effect of shifts of demand curve and supply curve in the same direction

Figure 3.5 illustrates both these conditions. Effect towards price cannot be determined because it depends on a few other matters, especially the degree of curve shifts and curve elasticity

- (i) When demand increases and supply decreases, equilibrium price will increase [Refer to Figure 3.6(a)].
- (ii) When demand decreases and supply increases, equilibrium price will decrease. Effect on quantity cannot be determined because of the same reason as above [Refer to Figure 3.6(b)].



**Figure 3.6:** Effect of shifts of demand and supply curves in opposite directions



### EXERCISE 3.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. When market reaches equilibrium, change in demand or supply will result in surplus or shortage.
2. Most markets are able to maintain equilibrium for a long period of time.
3. Excess in demand, or shortage, will result in price decrease.
4. If demand increases, while supply remains unchanged, then the equilibrium price and quantity will increase.

## 3.2 MARKET IN THE FORM OF EQUATION

We can present the relationship between market demand and market supply for a particular good, and their respective determinants in the form of equations.

Equations can be stated in the form of general functions or by assigning certain values to determinant variables. The equations are known as **demand function** and **supply function** respectively. Besides that, market equilibrium can also be calculated from the particular equations.

### 3.2.1 Demand Function

Demand function shows the relationship between quantity demanded and its determinants in the form of a function.

The general function of demand can be stated as:

$$Q_d = f(P_g, P_s, P_c, Y, T, P_{eg})$$

This general function states broadly that demand quantity,  $Q_d$ , is a function to the price of the good itself,  $P_g$ ; price of substitute goods,  $P_s$ ; price of complementary goods,  $P_c$ ; income,  $Y$ ; preferences,  $T$ ; and price prediction of the good itself,  $P_{eg}$ .

Demand function commonly used shows the relationship between quantity demanded with the price of the good itself. The equation may be in the form of  $Q_d = a - bP$ , where

- $Q_d$  = quantity demanded
- $a$  = constant
- $b$  = demand curve gradient
- $P$  = price of good

This simple equation is based on the assumption that all other determinant variables remain unchanged. All constant variables values are included in the value of constant  $a$ . If a change due to change in other determinant variables, the demand curve will shift. The gradient of demand curve will change if the value of  $b$  changes. Figure 3.7 is the demand curve drawn from the demand function  $Q_d = 20 - 2P$ .

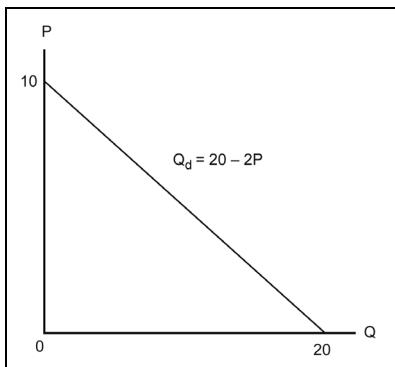


Figure 3.7: Demand curve

### 3.2.2 Supply Function

Like demand, supply also can be presented in the form of equation or function.

The general function of supply can be stated as:

$$Q_s = f(P_g, C_g, P_s, P_c, P_{eg})$$

This general function states that quantity supplied is a function of the price of the good itself,  $P_g$ ; production cost,  $C_g$ ; the price of substitute goods in production,  $P_s$ ; price of jointly produced goods,  $P_c$ ; and price prediction,  $P_{eg}$ .

A simple supply function shows the relationship between quantity supplied with the price of the good itself. Other determinant variables are assumed to remain unchanged. The equation may be in the form of  $Q_s = c + dP$ .

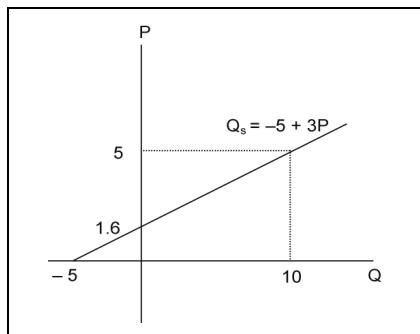
$Q_s$  = quantity supplied

$c$  = constant

$d$  = supply curve gradient

$P$  = price of good

The change of other determinant variables will cause change of  $c$  and shifts the supply curve. Change in  $d$  will alter the gradient of the curve. Figure 3.8 is the supply curve drawn from the equation  $Q_s = -5 + 3P$ .



**Figure 3.8:** Supply curve

### 3.2.3 Market Equilibrium

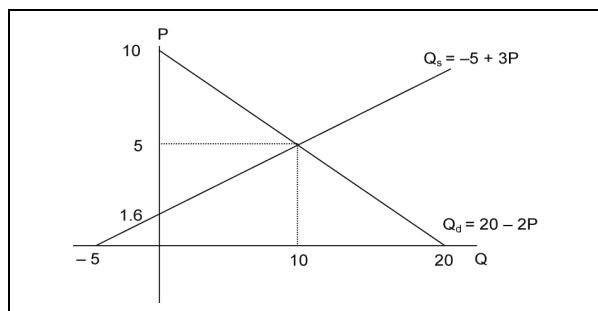
We know that market equilibrium will occur when demand quantity is equivalent to supply quantity or  $Q_d = Q_s$ . Based on the functions we have developed before, equilibrium price and quantity can therefore be obtained from the equations:

$$\begin{aligned} Q_d &= Q_s \\ 20 - 2P &= -5 + 3P \\ 5P &= 25 \\ P &= 5 \end{aligned}$$

Substitute the value of  $P$  into the demand function or supply function to obtain the value of equilibrium quantity (You will obtain the same value).

$$\begin{array}{lll} Q_d = 20 - 2P & \text{or} & Q_s = -5 + 3P \\ = 20 - 2(5) & & = -5 + 3(5) \\ = 10 & & = 10 \end{array}$$

Figure 3.9 shows the market equilibrium achieved at the equilibrium price of RM5 and equilibrium quantity of 10 units.



**Figure 3.9:** Market equilibrium



### EXERCISE 3.2

#### Fill in the Blanks

1. Market is an institution or mechanism that brings together \_\_\_\_\_ and \_\_\_\_\_ for a particular good or service.
2. Factors other than the price that can influence purchase decision include \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
3. The relationship between price and quantity in demand table is \_\_\_\_\_, whereas in supply table, relationship between price and quantity is \_\_\_\_\_.
4. Decrease in demand means that consumers will buy \_\_\_\_\_ quantity at every price level or are only willing to pay \_\_\_\_\_ for the same quantity.
5. Law of supply states that higher price will encourage sellers to offer \_\_\_\_\_ goods to consumers, and vice-versa.
6. Market \_\_\_\_\_ occurs at the price level where quantity demanded is equivalent to quantity \_\_\_\_\_.
7. Shortage occurs when market price \_\_\_\_\_ the equilibrium price because quantity \_\_\_\_\_ is higher than quantity \_\_\_\_\_. If market price exceeds equilibrium price, then \_\_\_\_\_ will occur because quantity \_\_\_\_\_ exceeds quantity \_\_\_\_\_.
8. If demand increases, and supply decreases, equilibrium price will \_\_\_\_\_ while quantity change is \_\_\_\_\_. If both demand and supply increases, \_\_\_\_\_ will increase but change in \_\_\_\_\_ cannot be determined.



### EXERCISE 3.3

Answer the questions below.

1. Below is the demand table of three individuals namely A, B, and C for the market of good X. If market for good X only consists of those three individuals:
  - (a) Derive the market demand table; and
  - (b) Draw the market demand curve for good X.

Price (RM)	Quantity Demanded (Unit)		
	A	B	C
0.40	1	4	0
0.36	3	5	1
0.32	6	6	15
0.28	10	7	10
0.24	15	8	16

2. Demand and supply equation for good X is

$$Q_d = -20 + 3P$$

$$Q_s = 220 - 5P$$

- (a) Calculate the equilibrium price and quantity by solving the equation mathematically.
- (b) Draw both equations in the same diagram on graph paper and indicate equilibrium point as point E.
- (c) Based on the equation, calculate the quantity demanded and quantity supplied for every price level shown below and state whether there is surplus or shortage in the market.

Price (RM)	10	20	30	40	50
Quantity demanded (unit)					
Quantity supplied (unit)					
Surplus/shortage (unit)					

### 3.3 ELASTICITY AND SENSITIVITY

What is meant by elasticity?

**Elasticity** can be defined as the sensitivity measurement of a particular variable (for example, quantity demanded or quantity supplied) towards change in one of its determinants (for example, price or income).

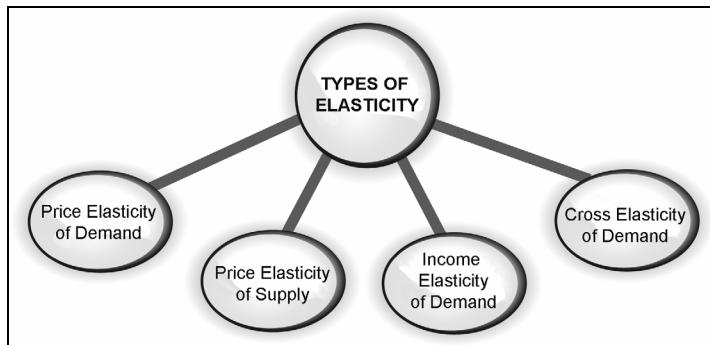
In general, the value of elasticity can be calculated from:

$$\text{Elasticity} = \frac{\text{Percentage of change in quantity}}{\text{Percentage of change in determinant}}$$

We measure elasticity by using percentage of change due to a number of reasons:

- (a) Elasticity allows comparisons to be made towards the change for two subjects measured in different units. For example, we can compare the change of quantity with the change of price in the value of currency.
- (b) We can avoid the problem of determining the size of units used. For example, an increase from RM1 to RM2 is considered as increase of 1 price unit, but the change from 100 cents to 200 cents is 100 price units. By turning it into the form of percentage, the same value will be obtained without considering the price units being used.
- (c) Absolute change is not able to describe whether a change is significant or insignificant. It can only be known if the initial value is given. For example, the change of RM1 for a good with an initial price of RM5 is considered significant. But if the initial price of the good is RM100, a change of RM1 is considered as an insignificant change. In other words, we look at the percentage of change in determining the size of price change. The concept of elasticity can be applied by policy makers, producers, and even consumers. For example, firms can use the elasticity concept to determine the substitution of resource utilisation when one of the input price increases. Thus, if capital price decreases, firms can substitute labour into capital, but the rate of substitution is determined by value of elasticity.

There are four types of elasticity normally used, namely, price elasticity of demand, price elasticity of supply, income elasticity of demand, and cross elasticity of demand. We will discuss about the three types of demand elasticity before looking at supply elasticity.



**Figure 3.10:** Types of elasticity



### ACTIVITY 3.2

In your opinion, why do we measure elasticity? How important is elasticity in our daily lives?

## 3.4

### PRICE ELASTICITY OF DEMAND

**Price elasticity of demand** measures the response of quantity demanded of a particular good towards a change in the price of the good.

It is measured from the percentage of change in quantity demanded caused by one percent of price change. It is a measurement without units.



### ACTIVITY 3.3

The increase in price of goods will cause a decrease in quantity demanded. This is a very clear situation. But will you be able to know the degree of change in quantity demanded? How do we calculate the particular change or decrease?

### 3.4.1 Calculation of Price Elasticity of Demand

Back to the price elasticity of demand, its coefficient value can be calculated from:

$$E_d = \frac{\text{Percentage of change in quantity demanded}}{\text{Percentage of change in price}}$$

If 10 percent of increase in price causes 20 percent decrease in quantity demanded, the price elasticity of demand is  $-20\% / 10\% = -2$ .

**Point elasticity** measures the value of elasticity on one point on a curve, while **arc elasticity** is the average elasticity between two points on a curve.

The formula to calculate point elasticity is as shown below:

$$E_d = \frac{\frac{Q_1 - Q_0}{Q_0} \times 100}{\frac{P_1 - P_0}{P_0} \times 100} = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0}$$

where,  $Q_0$  is the initial quantity and  $Q_1$  is the new quantity, while  $P_0$  is the initial price and  $P_1$  is the new price. The symbol  $\Delta$  is used to represent change, for example:

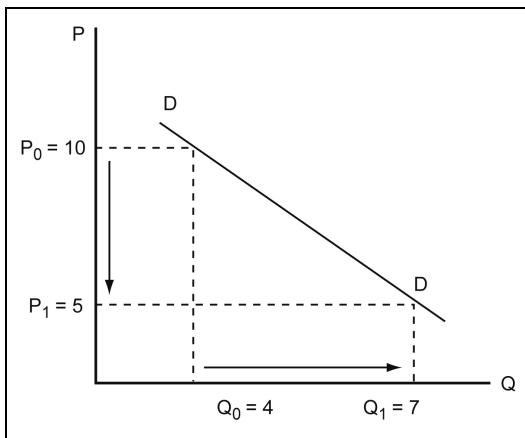
$$\Delta Q = Q_1 - Q_0$$

Notes:

Calculation using the point elasticity formula may bring about some problems because it will give different elasticity values when calculation on price increase and price decrease is carried out. Even at the same price range, elasticity during price decrease differs from the elasticity during price increase. This problem is caused by the different values of the denominator. This condition can be clarified by using the example shown below:

**Example:**

Assume that price X decreases from RM10 to RM5 and quantity demanded increases from 4 units to 7 units.



Calculation using the formula of point elasticity will produce:

$$\begin{aligned}
 E_d &= \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0} \\
 &= \frac{(7 - 4)}{(5 - 10)} \times \frac{10}{4} \\
 &= \frac{3}{-5} \times \frac{10}{4} \\
 &= -1.5
 \end{aligned}$$

Point elasticity obtained when price X decreases from RM10 to RM5 is -1.5.

Now we will try to look at the condition if price is increased from RM5 to RM10 and quantity decreases from 7 units to 4 units. Hence, point elasticity is

$$E_d = \frac{\Delta Q}{\Delta P} \times \frac{P_0}{Q_0} = \frac{3}{5} \times \frac{5}{7} = -0.43$$

Even when we are calculating at the same price range, the value of elasticity differs more than 1. This condition becomes a problem because we find that when price decreases, demand is elastic, but when price increases, demand is inelastic. The difference between the two values may not be a problem if we are looking at an insignificant price change, but as price change becomes more significant, hence the difference between the two values will also become bigger.

The problem with point elasticity formula can be overcome by using the arc elasticity formula, also known as **midpoint elasticity**.

Arc elasticity measures the average elasticity of an arc between two points on one curve.

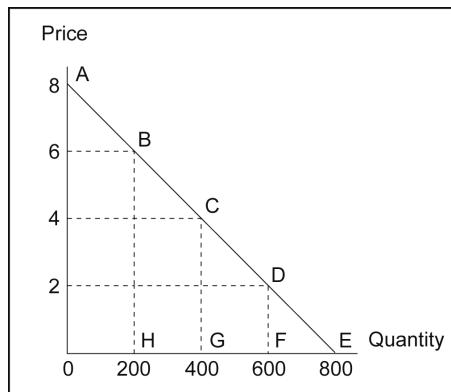
$$E_d = \frac{\frac{Q_1 - Q_0}{(Q_1 + Q_0)/2} \times 100}{\frac{P_1 - P_0}{(P_1 + P_0)/2} \times 100} = \frac{\Delta Q}{\Delta P} \times \frac{(P_1 + P_0)}{(Q_1 + Q_0)}$$

From the example given earlier, the midpoint elasticity is

$$E_d = \frac{\Delta Q}{\Delta P} \times \frac{(P_1 - P_0)}{(Q_1 + Q_0)} = \frac{3}{-5} \times \frac{15}{13} = -0.7$$

The value 0.7 means that, one percent of price change will result in 0.7 percent quantity change. Hence, demand is less elastic along the particular price range. We will obtain the same value whether the price increases or decreases.

The value of point elasticity can also be calculated or estimated by looking at Figure 3.11.



**Figure 3.11:** Calculation of elasticity

Elasticity at point B is

$$\frac{HE}{HB} \times \frac{HB}{OH} = \frac{HE}{OH} \times \frac{600}{200} = 3$$

at point C

$$\frac{GE}{GC} \times \frac{GC}{OG} = \frac{GE}{OG} \times \frac{400}{400} = 1$$



### ACTIVITY 3.2

Assume that the price of petrol increases as much as 60%. This condition will result in decrease of quantity demanded by 15%. What is the price elasticity for petrol?

If price of wheat flour decreases as much as 10% and quantity increases by 30%, what is the demand price elasticity for wheat flour?

In your opinion, which is more elastic?

### 3.4.2 Degrees of Elasticity

To facilitate analysis of price elasticity of demand, we will usually ignore the negative sign and only consider the absolute value, since we will surely obtain a negative value due to the negative relationship between price change and change in quantity demanded.

Generally, elasticity can be pictured in the shape of demand curve. However, as explained earlier, elasticity changes along one curve, except in the case of three conditions, which are, horizontal, vertical and hyperbola-shaped demand curves.

Horizontal demand curve is said to be perfectly elastic and the elasticity values remain the same along the curve, that is, infinity or undefined. Vertical curve, on the other hand, has zero elasticity along the curve. The curve that shows unitary elasticity value along the curve is hyperbola in shape. Table 3.2 summarises the relationship between elasticity value, degrees of elasticity and shape of demand curve.

**Table 3.2:** Degree of Elasticity and Shape of Demand Curve

Elasticity Value	Degrees of Elasticity	Shape of Demand Curve
$E_d = \infty$	Perfectly elastic	Horizontal
$1 < E_d < \infty$	Elastic	Tilted
$E_d = 1$	Unitary elastic	Hyperbola
$0 < E_d < 1$	Inelastic	Steep
$E_d = 0$	Perfectly inelastic	Vertical

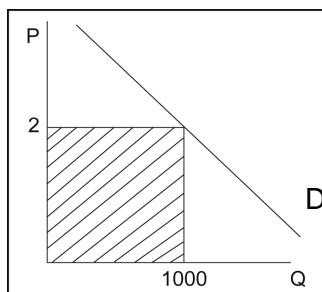


### SELF-CHECK 3.2

How can we say that demand of a particular good is elastic?

#### 3.4.3 Price Elasticity of Demand and Total Expenditure/Revenue

Before this, we have stated that one of the uses of the elasticity concept is to make decisions regarding production and utilisation. Sensitivity of quantity towards price enables us to calculate the sensitivity of total revenue towards price because total revenue (TR) is calculated from price (P), times quantity (Q) or  $TR = P \times Q$ . Besides helping producers to predict changes towards total revenue, consumers can also use it to predict changes in total expenditure.



**Figure 3.12:** Total revenue

Figure 3.12 illustrates how total revenue is calculated. For example, 1,000 units sold at the price of RM2 per unit will generate RM2,000. In Figure 3.12, this amount is shown as the mottled area, total revenue is price (RM2) times quantity (1,000 units).

What if a firm intends to increase its total revenue? Can it be done by increasing or reducing price? Firms can make their decisions based on the value of elasticity of demand price.

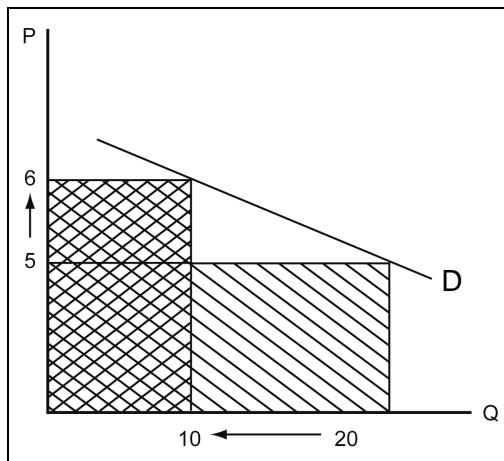
(a) **Elastic Demand**

When demand is elastic, the ratio of change in quantity is bigger than the ratio of price change. Therefore, change in quantity gives a more significant effect towards total revenue compared to price change.

Hence,

If  $P$  increases, the percentage of decrease for  $Q$  is larger. Therefore,  $TR$  decreases. If  $P$  decreases, the percentage of increase for  $Q$  is more significant. Thus,  $TR$  increases.

From here we can see that when demand is elastic, change in total revenue is in the same direction as quantity change.



**Figure 3.13:** Total revenue in elastic demand

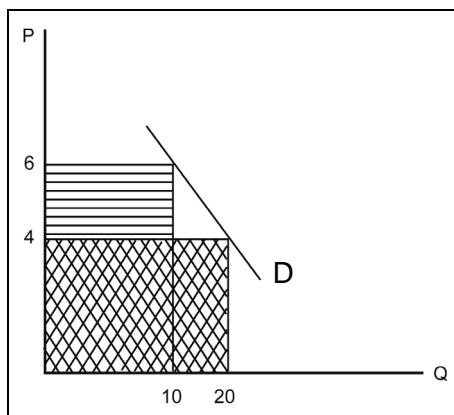
Figure 3.13 illustrates the difference of total revenue obtained from two different price tiers on one elastic demand curve. Assume that price increases from RM5 to RM6. TR will decrease from RM100 to RM60. But if price decreases from RM6 to RM5, TR increases from RM60 to RM100. Thus, if demand is elastic, firm should reduce price to increase total revenue.

(b) **Inelastic Demand**

When demand is inelastic, the opposite will happen. The ratio of price change is bigger compared to the ratio of quantity change. Price change gives a more significant effect compared to quantity change.

If P increases, percentage of decrease for Q is smaller. Thus, TR will increase.  
 If P decreases, percentage of increase for Q is smaller. Thus, TR will decrease.

Change in total revenue occurs in the same direction as price change. This condition is illustrated in Figure 3.14.



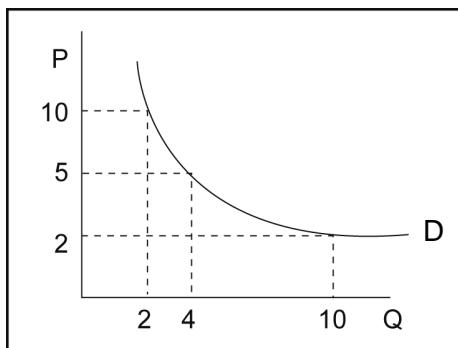
**Figure 3.14:** Total revenue in inelastic demand

If price decreases from RM6 to RM4, TR decreases from RM60 to RM48. Contrary to this, if price increases from RM4 to RM6, TR will increase from RM48 to RM60.

Therefore, if the firm has an inelastic demand curve, price can be increased to increase total revenue.

(c) **Unitary Elastic Demand**

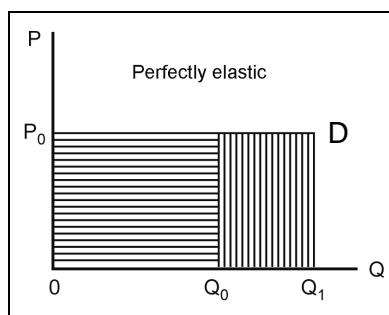
If the percentage of price change is equivalent to the percentage of change in quantity demanded, the demand curve is unitary elastic. When one percent of price increase is followed by one percent of decrease in quantity, the effect of price increase will be eliminated by decrease in quantity, resulting in unchanged total revenue. Figure 3.15 is a demand curve that is unitary elastic along the curve, as you can see, total revenue at the price of RM10 per unit is  $TR = RM10 \times 2 = RM20$ , similarly at the price level at RM5,  $TR = RM5 \times 4 = RM20$ .



**Figure 3.15:** Elasticity of unitary demand and total revenue

(d) **Perfectly Elastic Demand**

Perfectly elastic demand is depicted by a horizontal demand curve, with infinity elasticity value along the curve. At a price higher than market price, demand is null, but at a price lower than the market price, demand is infinity. Percentage of change in total revenue is equivalent to the percentage of change in quantity. In this condition, the only way to increase total revenue is by increasing quantity.



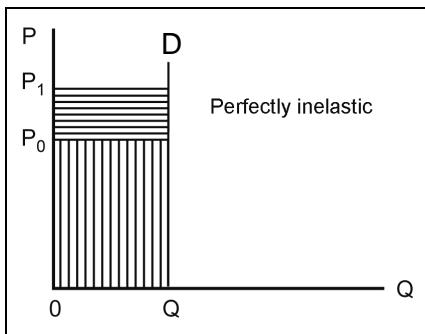
**Figure 3.16:** Perfectly elastic demand curve

This condition is shown in Figure 3.16. Total revenue (shown by the shaded area) increases when quantity increases from  $Q_0$  to  $Q_1$ .

(e) **Perfectly Inelastic Demand**

This type of demand is represented by a straight vertical demand curve, with zero elasticity value along the curve. Demand quantity is insensitive towards change in price. Percentage of change in total revenue is equivalent to percentage of price change. In this condition, total revenue can definitely be increased by increasing price.

Figure 3.17 illustrates the increase of total revenue, shown as the shaded area, from  $P_0$  to  $P_1$ .



**Figure 3.17:** Perfectly inelastic demand curve



### ACTIVITY 3.3

Assume that demand of a particular good is inelastic. Will consumers' expenditure increase if there is an increase in price?

#### 3.4.4 Elasticity of Straight-line Demand Curve

In the previous discussions, we knew that elasticity of vertical and horizontal demand curve remains the same along the curve. However, a straight-line demand curve that slopes downward has elasticity that changes along the curve.

Like what has been explained earlier, change in elasticity occurs because elasticity is measured in the form of ratio. Therefore, when price changes, the ratio of change is large when initial price (or quantity) is small, but the value becomes lesser at a higher price (quantity) level.

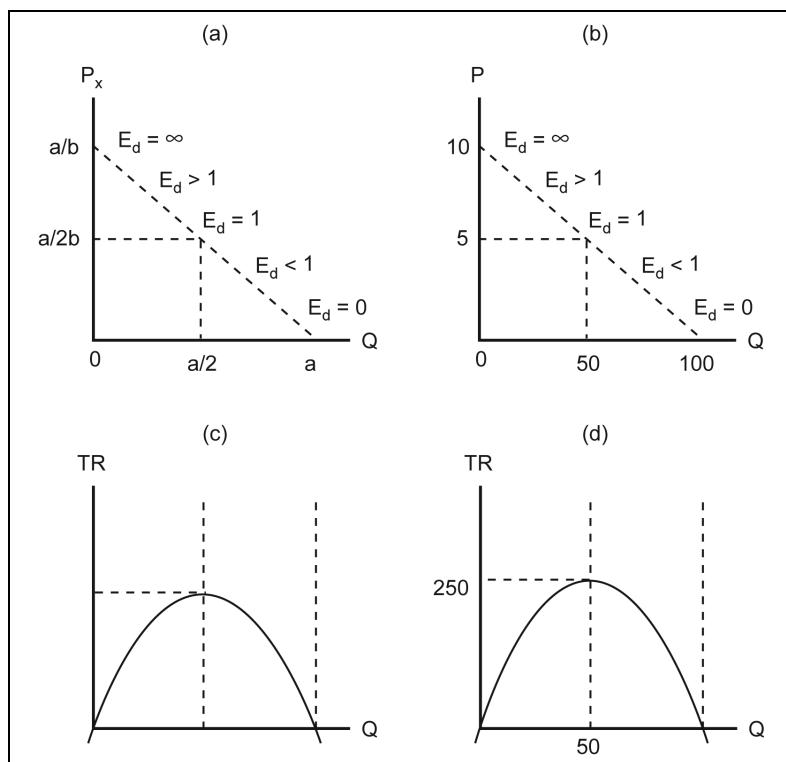
Earlier we have also explained about the correlation between total revenue and elasticity of demand. When elasticity changes along one curve, then the direction of change in total revenue will also change.

Here, we will look at an example of a demand curve with a gradient of -1. Table 3.3 and Figure 3.18(c) is calculated and drawn based on the demand equation  $Q_d = 100 - 10P$ . Meanwhile Figure 3.18(a) shows elasticity based on the function  $Q_d = a - bP$ . Figures 3.18(b) and 3.18(d) are curves that illustrate the relationship between total revenue and quantity respectively.

**Table 3.3:** Function of Straight-line Demand

Price (RM)	Quantity Demanded	Total Revenue	Types of Elasticity
0	100	0	Inelastic
1	90	90	Inelastic
2	80	160	Inelastic
3	70	210	Inelastic
4	60	240	Inelastic
5	50	250	Unitary elastic
6	40	240	Elastic
7	30	210	Elastic
8	20	160	Elastic
9	10	90	Elastic
10	0	0	Elastic

Based on Table 3.3 and Figures 3.18(b) and 3.18(d), look at how total revenue increases with the increase in price when demand curve is inelastic, that is, from  $P = 1$  to  $P = 4$ . However, when demand curve is elastic, that is, from  $P = 6$  until  $P = 10$ , total revenue decreases when price increases.

**Figure 3.18:** Straight-line demand curve and total revenue

### 3.4.5 Elasticity of Demand Determinants

Degrees of elasticity of demand price can be influenced by a number of determinants, including:

(a) **The Number of Substitute Goods**

The most important determinant for elasticity of demand price is the number of substitute goods available, and the similarity among the particular substitute goods. The more substitute goods there are and the closer the similarities with the substitute goods, the larger the elasticity of the good.

Take petrol as an example. In general, demand for petrol is inelastic since there are not many substitute goods for petrol available. But if we look at a petrol brand name, an increase in price of that particular brand will result in consumers moving on to another brand. Therefore, demand for one petrol brand is more elastic. Here, we can say that substitution effect due to price change becomes more significant when the number of substitutes increase.

(b) **Budget Ratio**

The higher the ratio of income we spend on a particular good, the larger the possibility that we can reduce the use of the good when price increases. Therefore, demand will become more elastic, for example, clothes and petrol. For goods that take up only a small portion of our income such as salt or bread, elasticity is low.

(c) **Time**

When price of a product increases, we need time to make amendments in the budget and look for substitutes. Therefore, the longer the time taken, the more elastic demand price becomes.

(d) **The Number of Uses of Goods**

The more uses of a particular good, the larger the elasticity of demand price.



#### SELF-CHECK 3.3

1. Why do some particular goods have a high elasticity of demand while some other goods have a high inelasticity of demand?
2. What are the factors that cause elasticity of demand price?



### EXERCISE 3.4

Determine whether these statement are TRUE (T) or FALSE (F).

1. When percentage of price change is more significant than the percentage of quantity change, elasticity coefficient of demand price is bigger than unity.
2. Elasticity is more likely to become more elastic at a lower price, but less elastic at a higher price.
3. Unitary elastic point of a straight-line demand curve with downward gradient is definitely situated at the midpoint of the curve.
4. All demand curves have their elastic, unitary elastic and inelastic portions.
5. When demand curve is inelastic, total revenue has a positive relationship to price change.

## 3.5 CROSS ELASTICITY OF DEMAND

**Cross elasticity of demand** or cross elasticity measures the demand sensitivity of a good towards the price change of other goods, namely substitute goods or complementary goods.

This measurement enables us to make predictions towards demand shift of a product when price of other goods change.

Cross elasticity is measured by:

$$E_{XY} = \frac{\text{Percentage of change in quantity demanded for good X}}{\text{Percentage of change in price of good Y}}$$

### 3.5.1 Calculation of Cross Elasticity

Cross elasticity is:

$$E_{XY} = \frac{\text{Percentage of change in quantity demanded for good X}}{\text{Percentage of change in price of good Y}}$$

Value of elasticity can be calculated using the point elasticity formula:

$$E_{XY} = \frac{\frac{Q_{X1} - Q_{X0}}{Q_{X0}} \times 100}{\frac{P_{Y1} - P_{Y0}}{P_{Y0}} \times 100} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_{Y0}}{Q_{X0}}$$

Or midpoint elasticity formula:

$$E_{XY} = \frac{\frac{Q_{X1} - Q_{X0}}{(Q_{X1} + Q_{X0})/2} \times 100}{\frac{P_{Y1} - P_{Y0}}{(P_{Y1} + P_{Y0})/2} \times 100} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{(P_{Y1} + P_{Y0})}{(Q_{X1} + Q_{X0})}$$

Now, you must be confident in calculating the value of elasticity. Try calculating the cross elasticity value between good X and good Y, and between good X and good Z from Table 3.4 using the midpoint elasticity formula.

**Table 3.4:** Calculation of Elasticity Value

Price of Good X (RM)	Quantity Demanded (Units)	
	Good Y	Good Z
2	10	20
3	5	30

### 3.5.2 The Use of Cross Elasticity

If good Y is the substitute for good X, demand for X will increase when price of Y increases. Therefore, cross elasticity has a positive value. But if Y is the complementary good for X, demand for X will decrease when price of Y increases. Hence, cross elasticity will carry a negative value.

To make it clear, cross elasticity between bread and butter is negative since bread and butter are complementary for each other. On the other hand, cross elasticity of butter and margarine has a positive value because both goods are considered as substitute for one another. Cross elasticity between margarine and shoes is zero, since there is no connection between the two.

- (i)  $E_{XY} < 0$ , good X and good Y are complementary
- (ii)  $E_{XY} > 0$ , good X and good Y are substitutes
- (iii)  $E_{XY} = 0$ , good X and good Y are not related

The higher the degree of substitution between the goods, the higher the positive value derived. The same applies when the closer the goods are as complements, the higher the negative value derived. The high positive and negative values shown illustrate the extent of the effect of price change of the second good towards demand of the first good.

Firms apply this concept of cross elasticity to identify the effect of price change of their competitors' goods towards their own goods, for the purpose of planning.



#### ACTIVITY 3.4

Film and camera are complements to one another while beef and chicken are substitute goods. Determine the cross elasticity value of both sets of goods, whether they are positive or negative, and give the reasons.

### 3.6 INCOME ELASTICITY OF DEMAND

We know that income is one of the main determinants that shift the demand curve. Hence, income elasticity of demand is a measurement of demand sensitivity towards change in income.

**Income elasticity of demand** or income elasticity is a measurement that enables us to estimate the shift in demand when there is change in income.

#### 3.6.1 Calculation of Income Elasticity

Income elasticity is calculated from:

$$E_Y = \frac{\text{Percentage of change in quantity demanded}}{\text{Percentage of change in income}}$$

When Y is income, point elasticity formula of income elasticity is:

$$E_Y = \frac{\frac{Q_1 - Q_0}{Q_0} \times 100}{\frac{Y_1 - Y_0}{Y_0} \times 100} = \frac{\Delta Q}{\Delta Y} \times \frac{Y_0}{Q_0}$$

And the midpoint elasticity formula is:

$$E_Y = \frac{\frac{Q_1 - Q_0}{(Q_1 + Q_0)/2} \times 100}{\frac{Y_1 - Y_0}{(Y_1 + Y_0)/2} \times 100} = \frac{\Delta Q}{\Delta Y} \times \frac{Y_1 + Y_0}{Q_1 + Q_0}$$

### 3.6.2 The Use of Income Elasticity

Income elasticity can be used to categorise goods as luxury goods, normal goods, necessities or inferior goods. It is also used to predict market size. If one product has a high income elasticity value, sales are predicted to increase rapidly when national income increases, and decrease rapidly if national income decreases.

**Table 3.5:** Value of Income Elasticity and Types of Goods

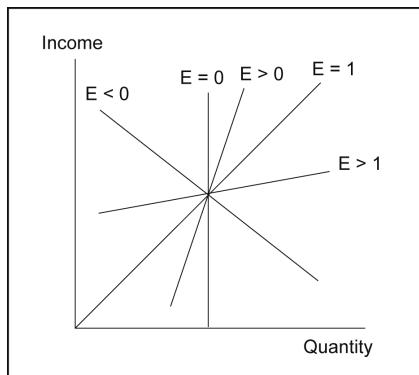
Value of Income Elasticity	Degrees of Elasticity	Types of Goods
$E_Y = 0$	Perfectly inelastic	Necessity
$E_Y > 1$	Elastic	Luxury good
$0 < E_Y < 1$	Inelastic	Normal good
$E_Y < 0$	Negative elasticity	Inferior good

You may need some guidance in order to interpret the degrees of elasticity summarised in Table 3.5.

For example, when  $E_Y = 0$ , any changes of income will not affect change in quantity demanded. Therefore, these goods are considered as necessities. If  $E_Y > 1$ , the rate of change in quantity demanded is bigger than the rate of change in consumers' income. Thus, these are luxury goods. But when  $E_Y < 0$ , income elasticity is negative. The rate of change in quantity demanded is smaller

compared to the rate of change in consumers' income, hence, these goods are considered as inferior goods.

Now, try to interpret the meaning of income elasticity value  $0 < E_y < 1$ .



**Figure 3.19:** Various degrees of income elasticity

Figure 3.19 illustrates the relationship between consumers' income and quantity demanded of a particular good. The curve is also known as Engel curve (Engel curve will be discussed further in Topic 4).

Necessity is shown by a vertical curve while normal good and luxury good are both shown by a curve with positive slope. Inferior good, on the other hand, is shown by a curve with negative slope.

## 3.7 ELASTICITY OF SUPPLY

Elasticity of supply is the measurement of supply sensitivity towards price change. This elasticity is calculated from:

$$E_s = \frac{\text{Percentage of change in quantity supplied}}{\text{Percentage of change in price}}$$

Calculation of the value for elasticity of supply is the same as the calculation for elasticity of demand. However, quantity refers to the quantity supplied.

Similar to elasticity of demand, elasticity of supply also consists of:

- (a) perfectly elastic;
- (b) elastic;
- (c) unitary elastic;

- (d) inelastic; and
- (e) perfectly inelastic.

Vertical supply curve is perfectly inelastic, while horizontal supply curve is perfectly elastic.

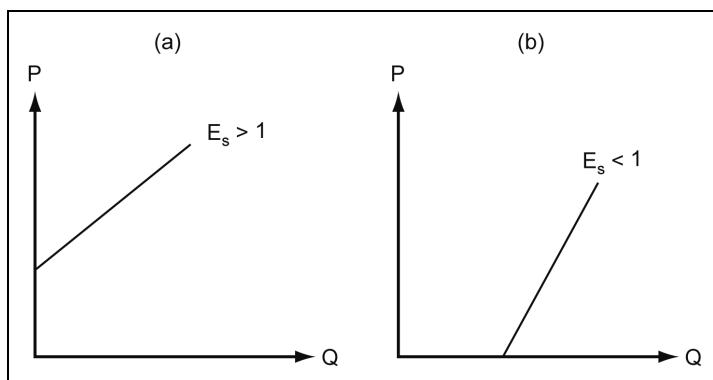
Table 3.6 illustrates the relationship between value of elasticity, degrees of elasticity and the shape of supply curve.

**Table 3.6:** Degree of Elasticity of Supply

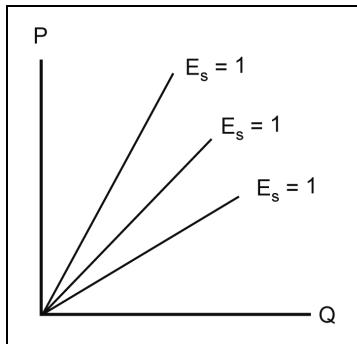
Value of Elasticity	Degrees of Elasticity	Shape of Supply Curve
$E_S = 0$	Perfectly inelastic	Vertical
$E_S < 1$	inelastic	intersects with the quantity-axis
$E_S = 1$	Unitary elastic	starting from the origin
$E_S > 1$	Elastic	intersects with the price-axis
$E_S = \infty$	Perfectly elastic	horizontal

Something exceptional about elasticity of supply is that, the value can easily be obtained from the intersections on the axes. If supply curve intersects the price-axis ( $P$ ), as in Figure 3.20(a), supply is elastic ( $E_S > 1$ ). If supply curve intersects the quantity-axis ( $Q$ ) as in Figure 3.20(b), supply is inelastic ( $E_S < 1$ ). Supply curve with a straight line starting from the origin has unitary elasticity along the curve, even with different gradient values, as illustrated by Figure 3.21.

Using your knowledge on elasticity obtained thus far, you know how to prove the particular condition. You can also try using the method such as the one in shown in Figure 3.21.



**Figure 3.20:** Elasticity of supply



**Figure 3.21:** Demand curve of unitary elastic

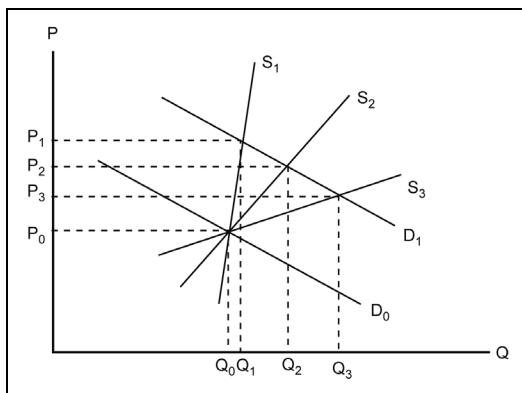
### 3.7.1 Elasticity of Supply Determinants

The elasticity of supply value is determined by a number of factors:

(a) **Time Factor**

Time gives producers a chance to make amendments in supply. Therefore, time can be divided into three stages, namely, very short run, short run and long run.

In a very short run, firms may not be able to alter supply amount much. Supply is fixed or can only have little change based on the amount of inventory. Hence, supply is very inelastic.



**Figure 3.22:** Elasticity of supply at different time periods

Referring to Figure 3.22,  $S_1$  is the very short-run supply curve showing increase in demand, from  $D_0$  to  $D_1$ , resulting in a high price increase from  $P_0$  to  $P_1$ , but a very small change in quantity, from  $Q_0$  to  $Q_1$ .

While in short-run, a few types of inputs can be added in order to increase supply. This is shown using curve  $S_2$  in Figure 3.22, where equilibrium quantity is increased from  $Q_0$  to  $Q_2$ , but increase in price is also high, from  $P_0$  to  $P_2$ .

When firms have the opportunity to increase all inputs in long term period and there may be new firms entering the industry, supply curve becomes more elastic, as shown by curve  $S_3$  in Figure 3.22. Increase in demand results higher percentage of increase in quantity compared to percentage of price increase where price increases from  $P_0$  to  $P_3$ , and quantity increases from  $Q_0$  to  $Q_3$ .

(b) **Size of Industry/Change in Production Cost**

Supply in small industries is more elastic compared to the supply in large industries. Small industries utilising a small number of inputs can purchase the inputs from market without influencing the price of the particular input. Therefore, production cost is not increased and supply is more sensitive towards price change. But for large industries, the increase in input demand will increase the price of inputs; hence, supply in large industries is less elastic.

(c) **Mobility of Production Factors**

Elasticity of supply is higher for goods using production factors that can easily change its' utilisation or using a production process which can be shared without involving a high cost. Take the example used earlier on the production of rice flour and glutinous rice flour. In order to change the use of grinder from grinding rice to grinding glutinous rice, manufacturer will not be needing a high modification cost, therefore, if demand on glutinous rice flour increases rapidly due to certain reasons, manufacturer can easily increase the production of glutinous rice flour by reducing the production of rice flour.

If production of a particular good requires specialised equipments or skills, or its usage cannot be easily altered, hence, supply of the good becomes less elastic.

Take legal services as an example. Even though demand for legal services had increased rapidly, the number of lawyers cannot be easily increased since it is a specialised skill.



### ACTIVITY 3.5

Using your own creativity, draw a graph that summarises all the factors that affect and determine elasticity of supply. Present it in your tutorial. Compare your answer with your friends. Get feedback from your tutor.

## 3.8

## APPLICATION OF THE ELASTICITY CONCEPT

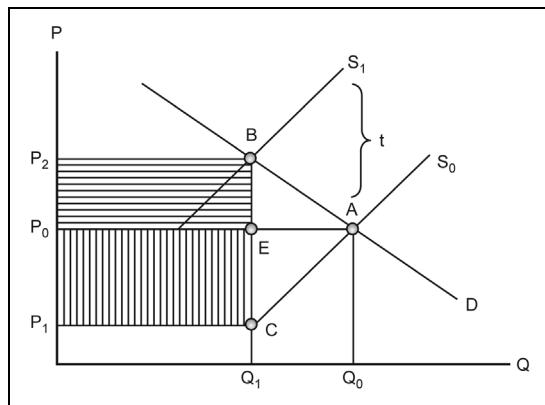
One of the applications of the elasticity concept is in analysing the question of who actually bears the burden of tax implemented by the government. Similarly, who actually deserves the right to get subsidies from the government?

Tax reduces the incentive of sellers to sell and consumers to buy. Therefore, tax generally causes output and sales reduction, and also leads to low input utilisation. Therefore, tax may cause inefficiency and some economists describe the effect of tax as **disincentive effect**. However, sometimes tax does not involve decrease in output, as what we will find out in the discussion below.

### 3.8.1 Tax Burden

When tax is implemented by the government towards sellers for every unit of good sold, the tax causes price paid by buyers to differ from the price accepted by the sellers. Difference between both prices is the revenue for the government. Tax gives burden to sellers in the form of lower price received from every unit and a lower selling quantity.

For consumers on the other hand, burden is in the form of higher price that needs to be paid and a lower usage quantity. Tax burden is normally carried by both sellers and buyers, but the ratio of burden is determined by elasticity or gradient of both demand curve and supply curve.



**Figure 3.23:** The effect of tax towards market equilibrium

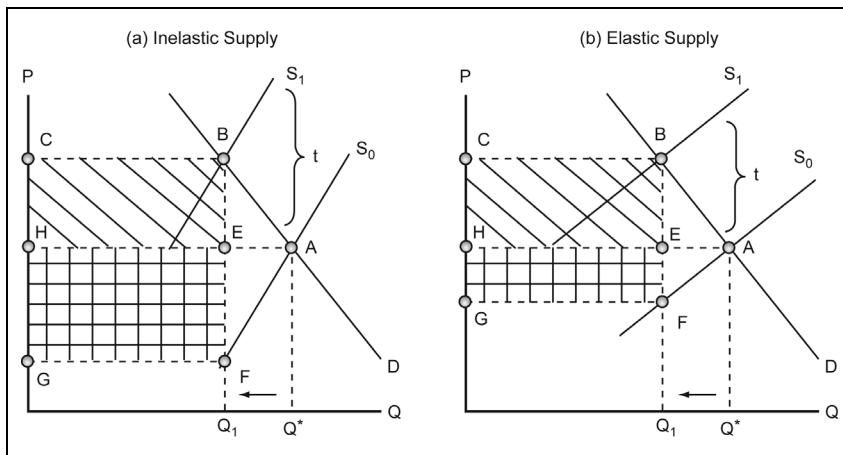
Tax involves increase in cost for sellers; hence, tax will shift the supply curve to the left. Figure 3.23 illustrates the effect of tax towards the supply curve and the ratio of tax burden carried by both sellers and consumers. Without tax, equilibrium is achieved at point A, with equilibrium price and quantity as  $P_0$  and  $Q_0$  respectively. Assume that tax  $t$  for every unit is collected by the government from the sellers; the supply curve will shift vertically at the value of  $t$  at every quantity level. Meanwhile, the demand curve does not shift.

When supply curve shifts from  $S_0$  to  $S_1$ , market equilibrium will move from point A to point B. At point B, quantity demanded after tax is equivalent to supply quantity after tax, that is,  $Q_1$ . However, the price paid by consumers and price received by sellers are different at the tax value of  $t$ .

The increase in price that has to be paid by consumers is the tax portion that needs to be borne by the consumers. From Diagram 3.23, the amount of tax collected by the government is depicted by area  $P_1P_2BC$ ; amount borne by consumers is the area  $P_0P_2BE$  and the remaining, area  $P_1P_0EC$ , is the tax borne by the sellers.

In general, the ratio of tax burden can be summarised as follows:

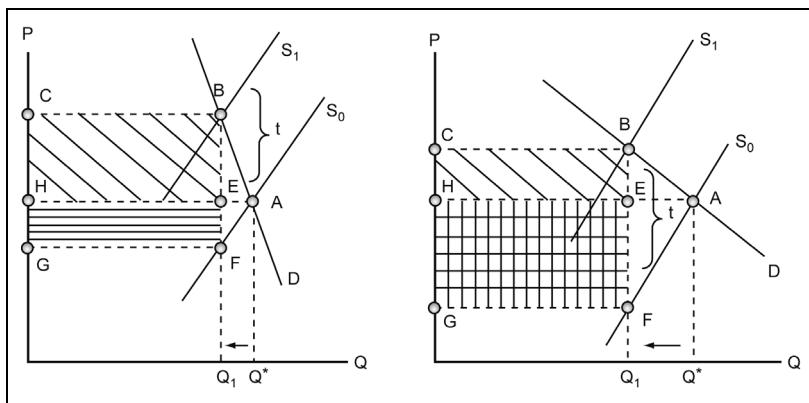
- Given the same demand curve, the lower the elasticity of supply, the bigger the tax burden that has to be borne by sellers; while the higher the elasticity of supply, the larger the burden being shifted to the consumers.
- Given the same supply curve, the lower the elasticity of demand, the larger the tax burden transferred to the consumers; and the higher the elasticity of the demand curve, the larger the tax burden that has to be borne by the sellers.



**Figure 3.24:** Tax burden based on elasticity of supply curve

To prove the formula, look at Figures 3.24 and 3.25. Figure 3.24 shows two shapes of supply curves where Figure 3.24(a) illustrates an inelastic supply curve and Figure 3.24(b) shows an elastic supply curve.

Point A in both diagrams is the initial equilibrium point and point B is the market equilibrium after tax is implemented. From Figure 3.24(a) you can see that more tax burden is carried by producers, depicted by area GHEF, while consumers have to bear as much as area HCBE. You can make your own analysis on Figure 3.24(b).



**Figure 3.25:** Tax burden based on elasticity of demand curve

Meanwhile, Figure 3.25(a) and (b) shows the ratio of tax burden for two demand curves with different elasticity. Based on the diagram, you must be able to analyse and make your own conclusion.

Other than in terms of tax burden, we can also see the effect of tax towards equilibrium output. From the observation in Figures 3.24 and 3.25, we can summarise that as elasticity of demand or supply becomes lesser, the output decrease due to tax also becomes lesser (for example, from  $Q^*$  to  $Q_1$ ).

Thus, you can prove by using diagrams that if demand and supply curves are perfectly inelastic, equilibrium output is totally unchanged. Meanwhile, for tax burden, if demand is perfectly inelastic, all burden is borne by the consumers. When supply is perfectly inelastic, all burden is borne by the producers.

From the analysis of tax burden, we can also summarise that if the government wants to obtain higher tax revenue, tax can be implemented towards commodities with low elasticity of demand and elasticity of supply. This is because tax does not result in high reduction of equilibrium quantity. Take cigarettes for example. We know that smoking can lead to addiction. Therefore, consumers are not very sensitive towards price change because demand is inelastic. Tax implemented on cigarettes will definitely be borne more by the consumers.

### 3.8.2 Benefits of Subsidies

Subsidy ( $\hat{S}$ ) can be assumed as a form negative tax because it is a payment made by the government to retailers, farmers, consumers or anyone as a way to promote production or utilisation. Therefore, subsidy is the opposite of tax.

Production cost will decrease when subsidies are given to producers. Therefore, supply curve will shift vertically to the right at the rate of subsidy amount accepted. In Figure 3.26, it is illustrated as the shift of supply curve from  $S_0$  to  $S_1$ , and the amount of subsidy per unit accepted is  $BC(\hat{S})$ .

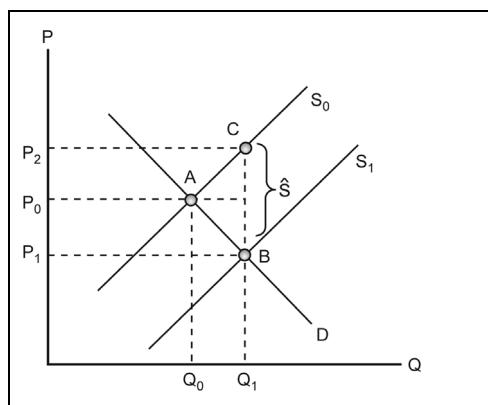


Figure 3.26: Effect of subsidy

The equilibrium quantity before subsidy is  $Q_0$  and increased to  $Q_1$  after subsidy. Likewise, equilibrium price falls from  $P_0$  to  $P_1$ . The price accepted by seller is  $P_2$  while buyers pay a price of  $P_1$ . The ratio of benefits from giving subsidy also depends on the elasticity of demand or supply.

Now you must have gained confidence to make your own analysis towards the effect of subsidy when demand and supply curve have different elasticity values. Among the conclusions you will obtain from your analysis are, the more elastic the demand curve is, the bigger the benefit of subsidy that will be enjoyed by the sellers; and the more elastic the supply curve is, the bigger the benefit of subsidy that will be accepted by the buyers.

You can also make related analysis if subsidy is given to consumers.



### EXERCISE 3.5

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Income elasticity is positive for normal goods, and negative for inferior goods.
2. If supply curve is linear and passes through the origin, elasticity of supply changes along the curve.

#### Fill in the Blanks

1. \_\_\_\_\_ is a general concept that measures the \_\_\_\_\_ of change between two related variables.
2. Elasticity changes along a demand curve with negative slope, when price decreases and quantity \_\_\_\_\_, price elasticity of demand \_\_\_\_\_.
3. If price elasticity of demand has a value more than unity, demand is \_\_\_\_\_ and increase in price will cause total revenue to \_\_\_\_\_. Total revenue is not influenced by price when demand curve is \_\_\_\_\_.
4. \_\_\_\_\_ elasticity of demand shows the method of utilisation changes when there is a change in buying power, it is calculated by dividing percentage of change in quantity demanded with percentage of change in \_\_\_\_\_.
5. \_\_\_\_\_ elasticity of demand measures the percentage of change in quantity demanded of a good when there is one percent of change in the price of other goods. A positive coefficient shows that both goods are \_\_\_\_\_, while a negative coefficient shows that both goods are \_\_\_\_\_ in usage.



## EXERCISE 3.6

### Problem Questions

1. If price of good X increases by 10% and quantity decreases by 30%, what is the price elasticity of demand for the good?
2. The demand function of good M is  $Q_d = 100 - 2P$ . Calculate the price elasticity of demand for M if price increases from RM2 per unit to RM3 per unit.
3. If price elasticity of demand is 2, price increase of X from RM10 per unit to RM12 per unit will result in the decrease of quantity demanded from 20 units to \_\_\_\_\_ units.
4. The table below shows the relationship between income level and quantity demanded for good R, good S and good T.

Consumer's Income	Good R	Good S	Good T
RM1000	20	20	50
RM2000	40	10	50

- (a) Calculate the income elasticity of demand for good R, good S and good T.
- (b) State the type of goods, based on the value of income elasticity obtained in (a).
5. The table below shows the relationship between good A and quantity demanded for good K, good L and good M.

Price of Good A (RM)	Quantity Demanded (Units)		
	K	L	M
2	10	20	40
3	5	30	40

- (a) Calculate the cross elasticity between good A with good K, good L and good M.
- (b) State the relationship between good K and A; L and A; M and A.
6. If price increases from RM20 per unit to RM30 per unit, and quantity supplied increases from 120 to 140 units, calculate the elasticity of supply.

## SUMMARY

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- Market equilibrium is achieved when demand is equivalent to supply. Equilibrium quantity and price will not change as long as there is no change in demand and supply.
- Excess in demand or shortage, causes increasing pressure towards price and excess in supply or surplus, will result in decreasing pressure towards price.
- Equilibrium quantity and/or price can change when either the demand curve or supply curve shifts, or if there are shifts in both demand curve and supply curve.
- Price elasticity of demand measures the response of quantity demanded towards change in price.
- Demand can be elastic, unitary elastic, inelastic, perfectly elastic, or perfectly inelastic depending on the value of coefficient calculated. The bigger the value of coefficient, the bigger the elasticity is.
- The main determinants of elasticity of demand are the number of substitute goods available, time, and the importance of the good in budget.
- Income elasticity is the percentage of change in quantity divided by percentage of change in income. Negative value is for inferior goods, zero for necessities, and positive for normal goods and luxury goods.
- Cross elasticity is the percentage of change in the quantity of a good, divided by the percentage of change of other goods.
- If the elasticity coefficient is positive, both goods are said to be the substitute of one another. If the elasticity coefficient is negative, both goods are said to be the complementary of one another.
- Elasticity of supply is the percentage of change in quantity supplied, divided by percentage of price change.
- The main determinants of elasticity of supply are time period, size of industry, and mobility of production factors.
- Among the application of elasticity concept is in determining the actual burden for tax, and the actual benefits from subsidies.

**KEY TERMS**

Coefficient value	Equilibrium price
Cross elasticity coefficient	Equilibrium quantity
Elasticity curve	Market equilibrium
Elasticity point	Shortage
Equilibrium	Surplus

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# **Topic ► Utility Analysis**

## **4**

### **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Describe the concept of utility;
2. Differentiate between cardinal utility and ordinal utility;
3. Explain the concept of total utility, marginal utility and rule of consumer equilibrium;
4. Examine the concept of indifference curve and budget line, and consumer equilibrium;
5. Derive Engel curve and demand curve from income-consumption curve and price consumption curve; and
6. Distinguish between substitution effect and income effect caused by change in price.

### **► INTRODUCTION**

Through Topic 1 until Topic 3, you have been exposed to the basics of market behaviour. Now you must be ready to make further analysis towards demand curves. The main question that will be answered in this topic is the factors that influence consumers to behave according to the Law of Demand. The theory of consumer behaviour is crucial in the market economy because producers who always compete with each other to attract consumers to buy their products need to know the motives underlying consumers' demand.

The theory of consumer behaviour will further clarify the behaviour you have already known. You or anyone else, are consumers who normally have a sum of money at certain point of time to be spent on any required goods or services. You have to decide on the type and amount of goods that you want to purchase, because you know that every purchase made will take up a part of your limited income. But at the same time, you are also aware of your preferences. In this topic, we will analyse the consumption motives, consumer behaviour and decision making process of consumers.

## 4.1 CHOICE AND UTILITY THEORY

**Utility** is the satisfaction gained by consumers from consumption of goods and services, or it can also be defined as the ability of a good to provide satisfaction to its consumer.

According to the theory of utility, consumers use satisfaction level as the basis to make consumption choices and evaluate goods based on satisfaction. Basically, there are two approaches of utility theory analysis namely, the cardinal approach and ordinal approach. Through cardinal approach, it is assumed that utility can be measured with utile as the unit of measurement. For example, eating a piece of durian gives 2 utils, while eating a piece of rambutan will give 1 util.

Meanwhile, the ordinal approach, assumes that level of satisfaction cannot be measured. For instance, eating durian gives more satisfaction compared to eating rambutan. In this condition, the measurement unit of satisfaction is not given. The level of satisfaction is determined by means of comparison only.

## 4.2 CARDINAL UTILITY THEORY

**Cardinal utility theory** is a method which assumes that satisfaction can be measured using the unit of ‘util’.

For instance, eating a piece of cake will give 8 utils, while eating biscuits will only give 4 utils. This reflects that a cake gives two-times the utility compared to biscuits. Utility level is normally reflected by the willingness of a person to pay based on the value of money. The higher the price willing to be paid, the higher the level of satisfaction gained.



### ACTIVITY 4.1

Do you know who introduced the cardinal utility theory? Cardinal utility theory was introduced by Alfred Marshall. What are the assumptions or presumptions made based on this theory?

### 4.2.1 Total Utility and Marginal Utility

**Total Utility (TU)** is the total satisfaction gained from a given level of consumption of a good.

There are two basic concepts of utility, namely, total utility and marginal utility. Table 4.1 shows the relationship between the consumption of goods with total utility and marginal utility. Observe that total utility for the first unit is 10 utils. When consumption level is increased to 2 units, total utility increases to 22 utils, and so on.

**Marginal utility (MU)** is the increase in total utility when consumption increases by 1 unit.

As you already know, marginal is addition. The formula for marginal utility is as follows:

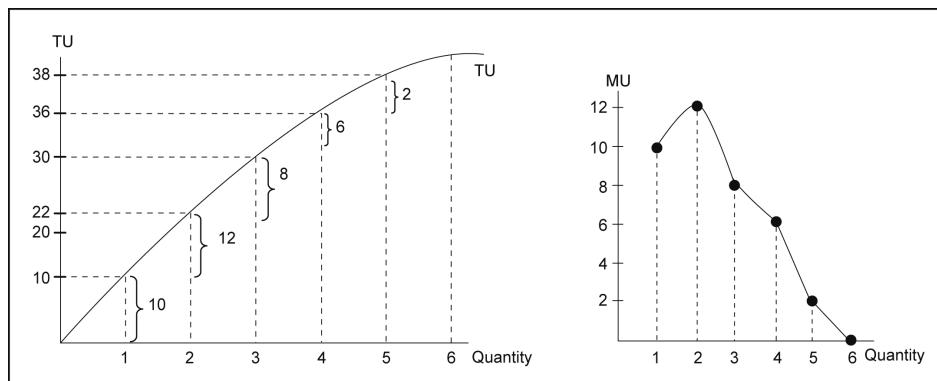
$$MU = \frac{\text{Change in TU}}{\text{Change in Q}}$$

Therefore, marginal utility for the first unit is equivalent to the total utility of that unit. As we can see from Table 4.1, MU for the first unit is 10 utils while for the second unit is 12 or  $(22 - 10)$  utils, and so on.

**Table 4.1:** Total Utility and Marginal Utility

Quantity (Q)	Total Utility (TU)	Marginal Utility (MU)
1	10	10
2	22	12
3	30	8
4	36	6
5	38	2
6	38	0

When we sum up marginal utility up to 5 consumption levels, we will obtain 38 utiles, that is, equivalent to the total utility of the unit.



**Figure 4.1:** Total utility and marginal utility

Figure 4.1 is the illustration of total utility and marginal utility derived from Table 4.1. Observe that marginal utility is equivalent to the gradient of total utility at each unit of consumption. Total utility reaches maximum when marginal utility is zero.



### ACTIVITY 4.2

Discuss how total utility affects marginal utility.

If a good is free-of-charge, what will happen to the level of total utility and marginal utility? Explain your opinion.

## 4.2.2 The Law of Diminishing Marginal Utility

Before this, we defined marginal utility as an increase in satisfaction gained from the consumption of one additional unit of good. We have seen from Table 4.1 and Figure 4.1 that marginal utility shows small increase in the beginning but later decreases until it reaches zero. This condition is referred to as **diminishing marginal utility**.

**Law of diminishing marginal utility** means that the marginal utility obtained from the consumption of additional unit will start to decrease after a certain level of consumption when the amount consumed increases.

Let's see an examples.

When you are so thirsty after a game session on a hot day, a glass of syrup water might give a certain amount of satisfaction. Since you are still thirsty, a second

glass will give higher satisfaction increase than the first. But the third glass will give a decreasing additional satisfaction because you are becoming less thirsty. From Table 4.1, marginal utility is starting to decrease by the consumption of the third unit. You might achieve a negative marginal utility when consumption no longer gives satisfaction but discomfort.

If we measure satisfaction in terms of ringgit, then the marginal utility, MUs, for a glass of syrup water is the sum of ringgit you are willing to pay to get that drink. Therefore, when marginal utility decreases, your willingness to pay for an extra glass also decreases. If MU becomes negative, then somebody else will have to pay for you in order to encourage you to drink.

The concept of diminishing marginal utility gives the reason why individuals have various goods in their carts. The earlier economists explained about the negative gradient of demand curve based on the law of diminishing marginal utility, as what will be discussed in the following section.



### ACTIVITY 4.3

Do you agree if it is said that satisfaction and consumption of a good will decrease after a certain level? Why? Explain.



### EXERCISE 4.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Theory of consumer behaviour assumes that consumer will try to maximise marginal utility.
2. Law of diminishing marginal utility states that when consumption increases consistently, a level will be achieved where total utility will increase at the increasing rate.
3. When total utility increases, marginal utility is positive, and may increase or decrease.

### 4.2.3 Consumer Equilibrium

What is consumer equilibrium? As a rational consumer, you will maximise your satisfaction from consumption. However, through the definition of demand, we know that wants must be in balance with the ability to pay. Therefore, in maximising satisfaction, consumers are restricted by limited income and price of goods. Consumers' objectives are achieved and consumers are said to have achieved consumer equilibrium when maximum utility can be attained with a certain sum of expenditure or income.

#### (a) Consumption Equilibrium for One Good

We will first look at consumption equilibrium of one good. If your income is limited, how can you maximise utility while utility is difficult to be measured? One way to gain maximum satisfaction from limited income is by measuring util in monetary value. Hence, util is the value for consumption. **Marginal utility becomes the sum of money willing to be paid to obtain one additional unit of good.** If you are willing to pay RM1 for an additional cup of coffee, then the cup has  $MU = RM1$ . Here, when consumption only involves one type of good, consumer will maximise satisfaction when marginal utility from the consumption of the good is equivalent to price.

**Satisfaction is maximised when price is equivalent to marginal utility** because marginal utility indicates the willingness to pay. Therefore, if marginal utility obtained from the consumption of an additional unit is much higher than the price that needs to be paid, consumers will still be able to increase satisfaction with additional purchases.

In the example of the glass of syrup water mentioned before, assume that the first glass costs RM1, but since you are evaluating it at more than RM1, you are definitely willing to buy it. The same goes for the second glass. But for the third glass, if the price does not change at RM1, you will not want to buy it because the value you place for that glass is less than RM1.

This equilibrium concept actually describes why demand curve has a negative gradient. Value or the willingness you dedicate for the following unit becomes lower when you obtain more units. Along the demand curve, marginal utility is equivalent to price ( $MU = P$ ), where consumers are at an optimum condition.

**Table 4.2:** Utility and Price

Quantity X	Total Utility	Marginal Utility	Price (RM)
1	10	10	10
2	22	12	10
3	32	10	10
4	40	8	10
5	46	6	10
6	44	-2	10

Table 4.2 shows total utility, marginal utility and price for good X. From the table, consumers achieved equilibrium at the third unit, that is, when marginal utility is equivalent to price.

What if you can obtain the particular good free-of-charge? When a good is free-of-charge, there are no more budget constraints and you are not restricted by the willingness to pay. Therefore, you will use the good until total utility is maximised at the fifth unit. The sixth unit will not be considered because it decreases the total utility. If you purchase the sixth unit, you will feel uncomfortable or reluctant due to excessive consumption.

#### (b) Consumer Equilibrium for Two Goods or More

We have seen the behaviour of consumers when they deal with the problem of consuming one good. Now, let us look at consumers who have to divide a certain amount of expenditure between two or more goods.

Assume that you have a sum of income ( $I$ ) to be divided for the purchase of food (X) and text books (Y). As a rational consumer, you will spend all the money to choose a combination where marginal utility per ringgit for both goods are the same, that is:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}, \text{ where } MU = \text{marginal utility}, P = \text{price}$$

If  $\frac{MU_X}{P_X} > \frac{MU_Y}{P_Y}$ , a rational consumer will increase consumption of good X

because for every ringgit spent, consumer will obtain additional satisfaction (that is, marginal utility) that is bigger. At the same time, consumer will reduce the

consumption of good Y. Increase in demand of good X will cause price X ( $P_X$ ) to increase and  $\frac{MU_X}{P_X}$  becomes smaller.

At the same time,  $\frac{MU_Y}{P_Y}$  becomes larger due to decline in demand of good Y.

This condition will prolong until  $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$ . In this condition, consumer is not inclined to change the combination of goods.

On the other hand, if  $\frac{MU_X}{P_X} < \frac{MU_Y}{P_Y}$ , consumer will increase the consumption of good Y, thus resulting in the increase of price Y ( $P_Y$ ). At the same time,  $P_X$  declines. This causes  $\frac{MU_Y}{P_Y}$  to become smaller and  $\frac{MU_X}{P_X}$  to become bigger. This will prolong until  $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$ .

Now we look at another example:

**Table 4.3:** Marginal Utility Per Ringgit

Quantity	$MU_X$	$MU_X/P_X$	$MU_Y$	$MU_Y/P_Y$
1	30	15	20	10
2	29	14.5	19	9.5
3	28	14	18	9
4	26	13	16	8
5	24	12	14	7
6	22	11	12	6
7	20	10 *	10	5
8	18	9 *	8	4
9	16	8 *	5	2.5

(\*  $P_X$  and  $P_Y$  are RM2 respectively)

Table 4.3 shows the marginal utility (that is,  $MU_X$  and  $MU_Y$ ) and marginal utility per ringgit (that is,  $MU_X / P_X$ , and  $MU_Y / P_Y$ ) obtained by a consumer for the consumption of two goods, that is, X and Y, when price X and Y are RM2 respectively ( $P_X = 2$ ,  $P_Y = 2$ ). It is assumed that the consumer's income of RM22 is only spent for these two goods.

The rule

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$$

is achieved at the combination of  $(X, Y) = (7, 1), (8, 3)$  or  $(9, 4)$ .

However, selection must be made based on the total expenditure allocated, that is RM22. Hence, we will look at the total expenditure needed for the three combinations.

The consumer's expenditure for the three combinations is:

$$A = (7, 1) = (7 \times 2) + (1 \times 2) = 16$$

$$B = (8, 3) = (8 \times 2) + (3 \times 2) = 22$$

$$C = (9, 4) = (9 \times 2) + (4 \times 2) = 26$$

Since combination B meets the rule of expenditure, combination B is the equilibrium combination.

What if the consumer has to divide his income for consumption of more than two goods?

When consumption involves more than two goods, we still apply the same rule. To achieve equilibrium for 3 goods, namely X, Y, and Z, the rule is

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z}$$

If 'n' types of goods are consumed, equilibrium is achieved when  $\frac{MU_1}{P_1} = \frac{MU_2}{P_2} = \dots = \frac{MU_n}{P_n}$ .



#### ACTIVITY 4.4

By using the approach of cardinal utility, explain clearly why the demand curve slopes downward from left to right.



### EXERCISE 4.2

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. To achieve consumer equilibrium, the ratio of price willing to be paid for the purchased good is equivalent to the relative price of good in the market.
2. A good that gives satisfaction may become an undesired good when it is consumed excessively.
3. The marginal utility of good X is 15 with the price of RM5; the marginal utility for good Y is 10 at the price of RM2. Maximisation of utility can be achieved by reducing the consumption of good Y.

## 4.3 ORDINAL UTILITY THEORY

According to the **ordinal utility theory**, the benefit or satisfaction gained by consumers cannot be measured in quantitative form, but in terms of comparison to the consumption of other goods.

Consumer behaviour in maximising satisfaction is depicted by indifference curve. This approach also stresses on comparison with consumption of other goods to determine the level of satisfaction.

### 4.3.1 Choice and Priority

Do you know the difference between the meaning of 'choice' and 'priority'? If you don't, let us differentiate choice and priority. Choice does not depend on price of goods or income. Choice might change but it is not based on the ability to pay. Even though you still cannot afford to own a big house or a luxury car, it does not mean that you cannot like both. You also will not find yourself liking something that you disliked before just because there is a change in your income level or the price of the good. Choice also shows our unlimited wants and needs because rational consumers will always choose something that is more compared to the least.

Priority is contrary to choice. Consumers may have their own choices or preferences, but out of the many choices that they have, consumers will have to choose only one which becomes their priority. Consumer will use the concept of

priority when facing various choices and ability to pay. The simplest example will be the fees that you need to pay to take up this course.

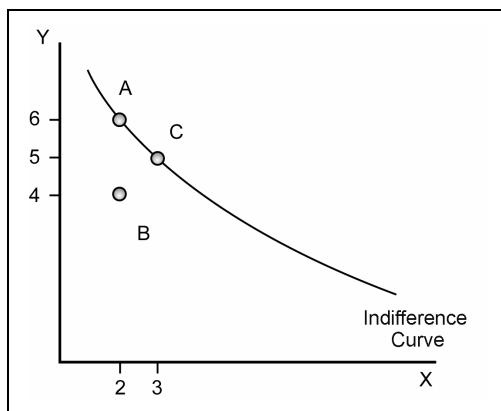
### 4.3.2 Indifference Curve

When choice involves only two goods, that is, good X and good Y, indifference curve will show various combinations of good X and good Y that can give equal satisfaction to the consumer.

Assume that you seek out the help of a friend to choose his preferred combination of the two combinations of good X and good Y.

$$\begin{aligned}\text{Combination A} &= 2 \text{ units of } X + 6 \text{ units of } Y \\ \text{Combination B} &= 2 \text{ units of } X + 4 \text{ units of } Y\end{aligned}$$

Your friend will definitely choose combination A because although the quantity of X is the same in both combinations, combination A has more of good Y. If we assume that combination A is chosen, then we know that any other combination with more of good X or Y or more of both goods, will definitely be preferred than combination A. On the other hand, combination with less of X or Y or less of both, will be less preferred compared to A. Figure 4.2 illustrates the choices.

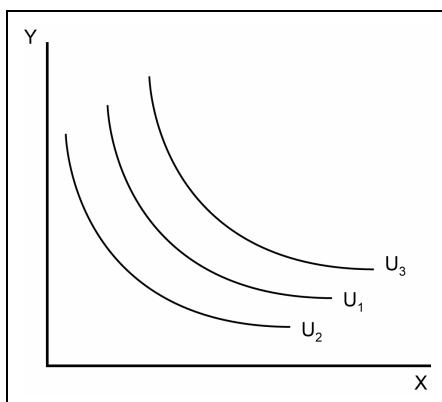


**Figure 4.2:** Indifference curve

What if the choices involve combination C with 3 units of X and 5 units of Y? Even though the quantity of Y in combination C is less compared to combination A, quantity X is larger. Your friend may not be able to make a choice because he may feel that both combinations (A and C) can give equal satisfaction.

When you are able to identify all the combinations that can provide equal level of satisfaction and connect those combinations together, then we will obtain an indifference curve. Further, if you are able to identify other combinations that can give higher or lower level of satisfaction and build the particular curve, you have already formed an indifference map.

An indifference map consists of a series or groups of indifference curves showing various levels of satisfaction of consumers. The higher the indifference curve is from the origin, then the higher the level of satisfaction is. For example, curve  $U_3$  in Figure 4.3 gives a higher level of satisfaction compared to curve  $U_2$  and  $U_1$ . The same goes for curve  $U_1$ , the satisfaction gained is much higher than curve  $U_2$ , but lower than curve  $U_3$ .

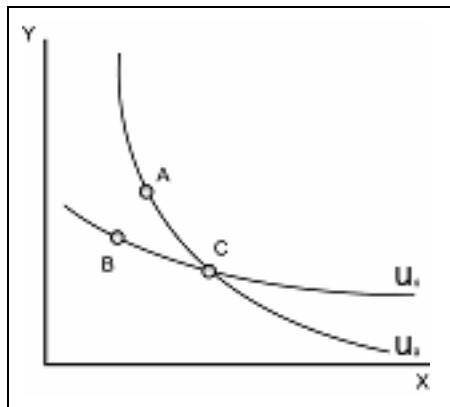


**Figure 4.3:** Indifference map

#### (a) Assumptions

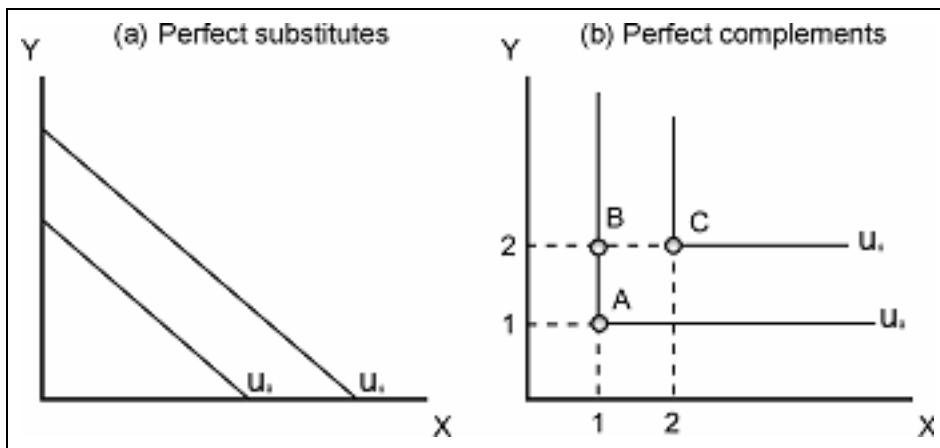
The assumptions that we will use to ensure an accurate consumer analysis are:

- (i) Every combination of goods must be on the same indifference curve.
- (ii) Indifference curve has a negative gradient because you must obtain more of good X if you give up a part of good Y to ensure satisfaction remains unchanged.
- (iii) Higher indifference curve is more preferred because it represents a bigger consumption cart.
- (iv) It is not possible for an indifference curve to intersect, because if it does, it contravenes the assumption that consumers are rational. For a rational consumer, if A is more preferred than B, and if B is more preferred than C, then A is more preferred than C. According to Figure 4.4, we see that  $A > B$ ,  $B = C$ , but  $A = C$  and  $A \neq B$ . Hence, indifference curve cannot intersect.



**Figure 4.4:** Indifference curve is non-crossing

Indifference curves normally used in analyses are convex in shape. However, there are some exceptions. For example, for two goods that are perfect substitutes, indifference curve is linear, as in Figure 4.5(a). A linear indifference curve indicates that the consumer does not mind whether he consumes only good X or good Y or any other combinations because both will give the same level of satisfaction.



**Figure 4.5:** Indifference curves for perfect substitutes and perfect complements

Figure 4.5(b) shows the indifference curve for goods that are perfect complements. For example, if you already have a pair of shoes (at point A), an addition of the right pair of shoes (Y) only will not increase satisfaction (point B), because the complement is missing. Satisfaction will only be increased when you have both right and left pair of shoes (point D).

(b) **Diminishing Marginal Rate of Substitution**

The indifference curve we have seen in Figure 4.2 is non-linear, and convexes towards the origin. This shows that the gradient decreases when more good X are consumed. It is a normal form of indifference curve. Why is a normal indifference curve drawn in such way? This is because most goods are not perfect substitutes or perfect complements.

Some goods cannot substitute the consumption of other goods. Some goods can be substituted but only up to a certain level. You might be able to substitute a glass of syrup water for a plate of rice if you have no rice at all, but if you already have two or three plates of rice and there are two glasses of syrup water left, you might not want to make any more substitution. In indifference analysis, this imperfect substitution concept is referred to as **marginal rate of substitution**, and it changes according to consumption level.

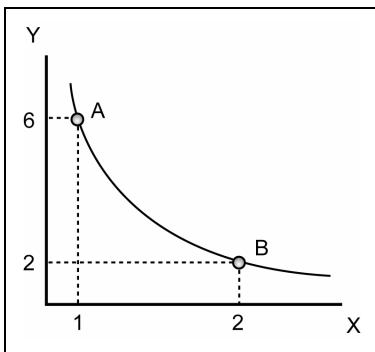
What is meant by marginal rate of substitution? When good Y is at the Y-axis and good X at the X-axis, gradient of the indifference curve is obtained from  $-(\Delta Y / \Delta X)$ .

Example:

Gradient at point A

$$\begin{aligned} &= -(\Delta Y / \Delta X) \\ &= -\frac{4}{1} \\ &= -4 \end{aligned}$$

The gradient of the indifference curve (in example = -4) is referred to as marginal rate of substitution of Y for X [ $MRS_{XY} = -(\Delta Y / \Delta X)$ ]. This gradient indicates the rate where the consumer is willing to give up Y to obtain an additional unit of X and utility remains unchanged. Since an indifference curve has a negative gradient, we will definitely obtain a negative value; however, the negative sign is ignored. We can see that as we move further downward (to the right), the gradient of the curve decreases. Therefore, marginal rate of substitution also decreases. Try comparing the gradient at point A and point B in Figure 4.6.



**Figure 4.6:** Marginal rate of substitution

Diminishing marginal rate of substitution is related to the law of diminishing marginal utility that we have discussed earlier. Individuals will obtain diminishing satisfaction from every addition of consumption units. Therefore, when we move downward along the indifference curve, consumption of X increases while consumption of Y decreases, hence, marginal utility of X decreases and marginal utility of Y increases. Willingness to give up Y for every additional unit of X becomes lesser and  $MRS_{XY}$  will decrease further. In short, MRS depends on the consumption level of consumers, the lower the rate of good consumption, the harder it is to be substituted with other goods.

Let us look back at Figure 4.6. Consumption at point A gives equal satisfaction with consumption at point B. Therefore, the drop in satisfaction caused by the 4 units decrease of Y must be balanced with the addition of satisfaction gained from one additional unit of X. Marginal utility from one additional unit of X must be 4 times bigger than the marginal utility of one unit of Y sacrificed (because consumer had given up 4 units of Y).

Hence,

$$\frac{MU_X}{MU_Y} = MRS_{XY} = 4$$

#### SELF-CHECK 4.1

Through the ordinal approach, consumers are assumed to be rational. Have you ever bought goods in an irrational condition? If you have, describe why. What will happen to the indifference curve? Explain.



### EXERCISE 4.3

Determine whether these statements are TRUE (T) or FALSE (F).

1. Indifference curves may intersect.
2. The indifference curve shows various combinations of goods that gives equal satisfaction to consumers.
3. Indifference curves have positive gradient.
4. When consumption of good X increases, the more of good Y is willingly given up in order to obtain one unit of X.

#### 4.3.3 Budget Line

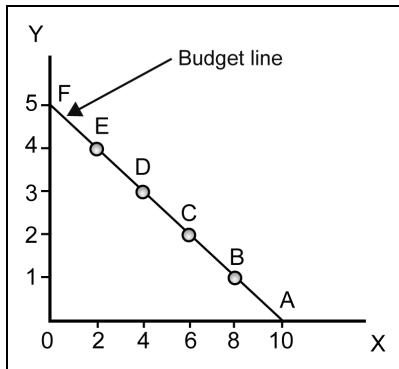
You have already seen various types of lines and curves, but what is a Budget Line? Budget line is important in indifference analysis because it determines the actual choice that will be made by rational consumers. The indifference curve shows consumers' priority while budget line indicates budget constraints or ability to purchase.

**Budget line** is a curve that shows the combinations of two goods that can be purchased by consumer using a certain amount of income and based on the market price of the good.

Assume that you have an allocation of RM10 to be spent on good X and good Y where the price of X ( $P_X$ ) is RM1 and  $P_Y = \text{RM}2$ . The combination of consumption that you can afford to purchase is as shown in Table 4.4 and Figure 4.7.

**Table 4.4:** Combination of Budget

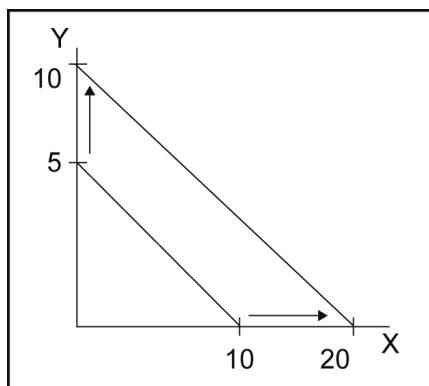
Combination	X	Y
A	10	0
B	8	1
C	6	2
D	4	3
E	2	4
F	0	5

**Figure 4.7:** Budget line

If you spend all the money to purchase Y, you will obtain 5 units of Y; and you will obtain 10 units of X if you decide to spend all the money on X. You can also choose any of the combinations that satisfies the rule  $I = P_xX + P_yY$ , that is, income (I) is equivalent to total expenditure ( $P_xX + P_yY$ ).

#### (a) Effect of Change in Income

Now assume that your income has increased from RM10 to RM20 and the price remains unchanged. The increase in your income will allow you to purchase the maximum amount of 10 units for Y and 20 units for X. Therefore, the budget line will shift in parallel with the initial line because the relative price (gradient of the curve) remains unchanged. Figure 4.8 illustrates two budget lines from two different tiers of income, RM10 and RM20, but the relative price is unchanged; RM1 for X, and RM2 for Y.

**Figure 4.8:** The effect of change in income

(b) **Effect of Change in Price**

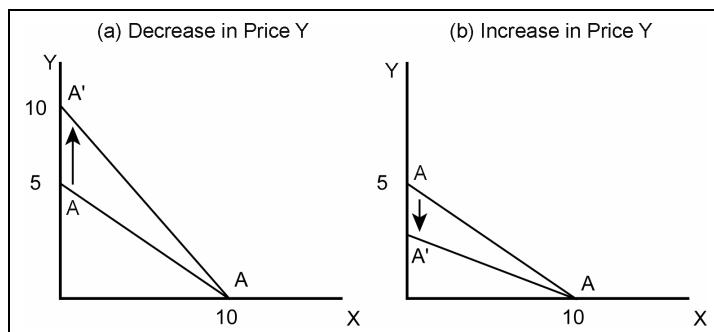
Now we will look at the effect of price change on the budget lines. We are aware that along the budget line, income ( $I$ ) is equivalent to total expenditure ( $P_x X + P_y Y$ ). Hence, budget line can be stated as the equation

$$I = P_x X + P_y Y$$

When  $Y$  is placed at the  $Y$ -axis, the equation can be written as

$$Y = \frac{I - P_x X}{P_y}$$

Therefore, the price ratio  $P_x/P_y$  is the gradient of the budget line. If either one of the price changes, the gradient of the curve will also change.



**Figure 4.9:** The effect of price change on the budget line

Assume that initially, the price of  $X$  is RM1 and price of  $Y$  is RM2, and income is RM10, the budget line is the  $AA$  line in Figure 4.9(a). When the price of  $Y$  drops to RM1, the slope becomes steeper ( $AA'$ ). This indicates that more  $Y$  can be bought with the available income.

The budget line intersects the  $Y$ -axis at 10 units of  $Y$ , but with no changes on the  $X$ -axis. If price  $X$  decreases instead, the curve will shift outside of the  $X$ -axis.



### ACTIVITY 4.5

What will happen when price Y of increases? You can make your own summary based on Figure 4.9(b). Present your answer in your tutorial.



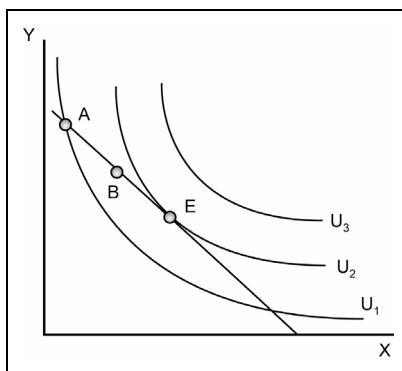
### EXERCISE 4.4

Determine whether these statement are TRUE (T) or FALSE (F).

1. The gradient of budget line when F is drawn at the X-axis and G at the Y-axis is equivalent to price of G divided by price of F.
2. Increase in consumers' income will shift the budget line to the right.

#### 4.3.4 Consumer Equilibrium

We know that indifference curve depicts choice and priority, while budget line shows the ability to pay. Choice and priority can only be achieved when there is affordability. Therefore, in order to obtain consumer equilibrium that maximises utility, we will combine the indifference curve with the budget line to determine the combination of goods that can be purchased within a certain amount of budget.



**Figure 4.10:** Consumer equilibrium – maximisation of satisfaction

Figure 4.10 illustrates the 4 levels of satisfaction represented by 4 indifference curves. According to the figure, consumer may definitely want to achieve a high indifference curve like  $U_3$ . But this may not be achievable due to budget constraint. Consumers can only choose between  $U_1$  or  $U_2$ .

Consumers can choose combination A, but that point is not optimal since downward movement along the budget line can still increase satisfaction. When point B is achieved, consumers have yet to achieve the optimal condition due to the same reason. Equilibrium is achieved at point E of curve  $U_2$  because after that point, total utility decreases.

Point E is the equilibrium point where indifference curve is **tangent** with the budget line. Hence, both have the equal gradient or:

$$\frac{P_x}{P_y} = \frac{MU_x}{MU_y} \text{ atau } \frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

This rule is the same as the **equimarginal principle** that we obtained from the cardinal theory. Therefore, both approaches are the same in terms of marginal utility concept, only here, utility does not need to be calculated.

Point E is not the only equilibrium point present, because each point where the indifference curve is tangent with the budget line is considered as the equilibrium point that maximises satisfaction given income constraints and relative price of the good.

Another way to state the maximisation rule is  $\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$ . Meaning, the marginal

rate of substitution of good Y to good X is the amount of ringgit that we are willing to exchange for one additional unit of good X. Hence, in order to maximise utility, consumer has to choose the combination of goods where marginal rate of substitution is equivalent to the relative price. In short, this rule

states that the willingness to substitute  $\left( \frac{MU_x}{MU_y} \right)$  is equivalent to the ability to pay

$$\frac{P_x}{P_y}.$$

For example, MRS between a cake and a glass of syrup water is the number of slices of cake you are willing to give as a substitute for an additional glass of syrup water. The relative price indicates the number of slices of cake that you can give for a glass of syrup water. If what you are willing to do is equivalent to what you can do, hence you will achieve equilibrium. But if what you are willing to do is more than what you can or able to do, you will reduce your willingness, and vice-versa.

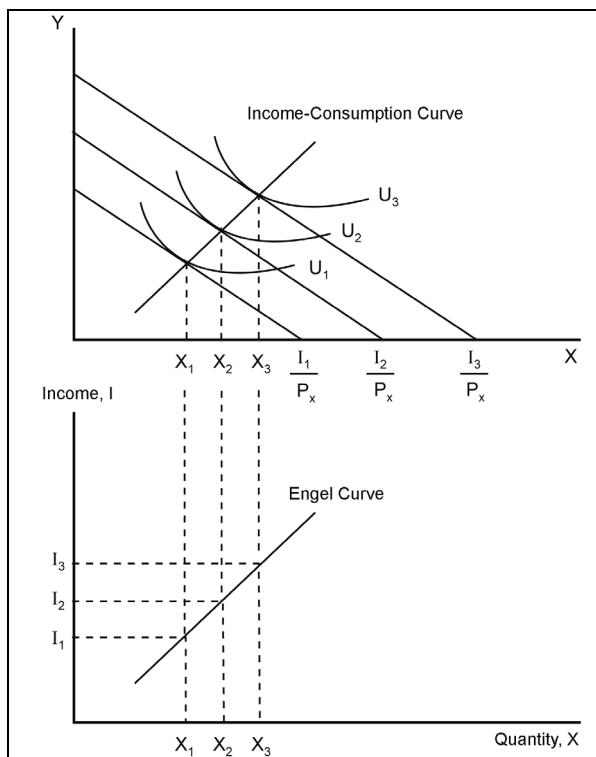
(i) **Income-consumption Curve and Engel Curve**

Now we will look at the income-consumption curve and Engel curve. We know that a change in income without any change in price will result in a parallel shift of the budget line. This will also cause the shift of the consumption equilibrium point. Each different tier of income will produce its own consumption equilibrium point. When we connect the equilibrium points of the various tiers of income, we will derive the **income-consumption curve**.

The shape of income-consumption curve illustrates two topics you have learned earlier, namely, the income elasticity of demand and types of goods. These two concepts can be seen more clearly using the Engel curve derived from the income-consumption curve.

**Engel curve** is a curve that illustrates the relationship between consumers' income with the demand towards a particular type of good.

Figure 4.11 illustrates (a) income-consumption curve, and (b) Engel curve for normal goods. The Engel curve for normal goods has a positive gradient due to the positive relationship between income and demand quantity. To obtain an income-consumption curve as the one in Figure 4.11, both good X and Y should be normal goods and the Engel curve derived is the Engel curve for good X.



**Figure 4.11:** Income-consumption curve and Engel curve for normal goods

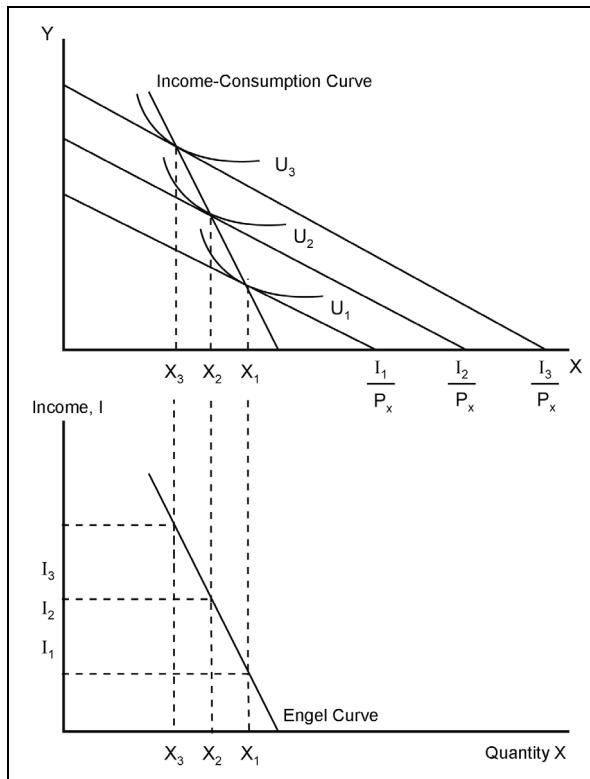
Contrarily, Figure 4.12 shows the Engel curve with negative gradient for inferior goods. In the diagram, good X is an inferior good, and good Y is a luxury good.

Good X is an inferior good because when income increases, consumption of X will decrease. Conversely, good Y is a luxury good because an increase in income will increase the consumption of Y. The Engel curve we have drawn in Figure 4.12(b) is the Engel curve for good X.



### SELF-CHECK 4.2

Now, try to draw the income-consumption curve and Engel curve for good X if good X is a necessity. If you place good X at the X-axis, what are the assumptions needed for good Y?



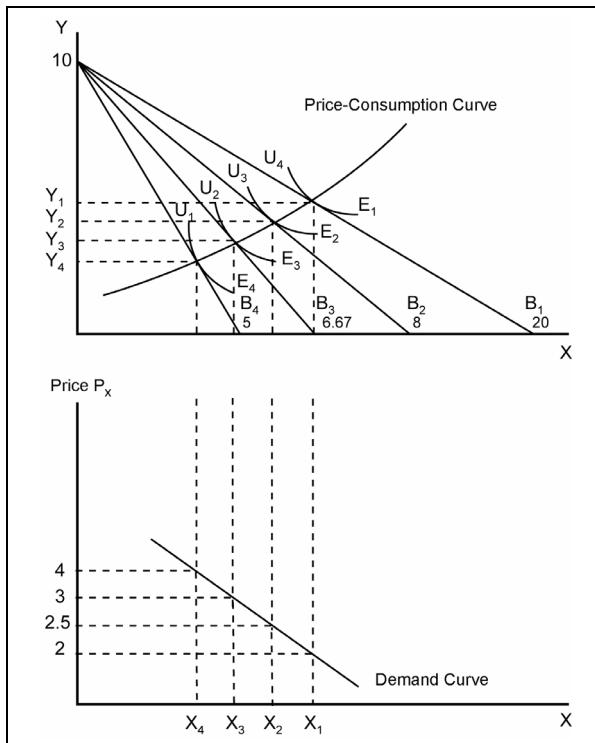
**Figure 4.12:** Income-consumption curve and Engel curve for inferior good

(ii) **Price-Consumption Curve and Demand Curve**

We know that if price of either goods change, the budget line will revolve at the axis that represents the good with the change of price. If price of X decreases, the budget line will revolve outside the X-axis. Consumer equilibrium will also shift to the new budget line. Figure 4.13 illustrates a series of budget lines revolving at the X-axis. Each budget line represents the different tiers of price. Consumer's income and price of Y is constant. When the budget line revolves, the equilibrium point will also shift. When we connect the equilibrium points, we have derived a **price-consumption curve**.

**Price-consumption curve** shows the change in consumer equilibrium when there is a change in price.

Therefore, we can use this curve to derive individual demand curve and also to calculate price elasticity of demand. To further clarify on how demand curve is derived from the price-consumption curve, let us look at one example.



**Figure 4.13:** Price-consumption curve and demand curve

Assume that you have RM20 to be spent on X and Y. Line  $B_1$  in Figure 4.13(a) is your budget line when Y is priced at RM2 per unit and X priced at RM1 per unit. Assume point  $E_1$  as your equilibrium point and the quantity  $Y_1$  and  $X_1$  is your optimal consumption combination.

Other budget lines are drawn based on different prices of X, that is, curve  $B_2$  for X priced at RM2.50,  $B_3$  for X priced at RM3, and curve  $B_4$  when X is priced at RM4. Each price level will produce different equilibrium combinations and consumption quantity of X at each price level as shown by  $X_1$ ,  $X_2$ ,  $X_3$  and  $X_4$ . When we connect all the equilibrium points, we have produced a price-consumption curve. When we relate the level of price X with equilibrium quantity X, we will find that a demand curve is produced, as shown by Figure 4.13(b).

Since demand curve is derived from price-consumption curve, satisfaction level will change along the demand curve; lower price will result in higher

satisfaction, that is, satisfaction increases from  $U_1$  when X is priced at RM4, to  $U_4$  when X is priced at RM1.



### EXERCISE 4.5

Determine whether these statement are TRUE (T) or FALSE (F).

1. The curve that is closer to the origin shows lower level of satisfaction for the consumer.
2. If a consumer moves from one point to another at the same indifference curve, total satisfaction gained is unchanged.
3. A consumer is said to maximise total utility when he purchases the combination of goods where the budget line intersects with the indifference curve.
4. Decrease in price of good will usually allow consumer to achieve a higher indifference curve.

### 4.3.5 Substitution Effect and Income Effect

From Unit 1, we already know that when price increases, consumer will reduce consumption due to decreasing affordability. This effect is identified as the **Income Effect, IE**. Consumer will also reduce consumption because the good becomes more expensive compared to other goods and this is known as the **Substitution Effect, SE**.

Using the marginal utility theory, we have looked at how the effect of substitution causes movement along the curve for the good with price change, and the demand shift for other goods. Substitution effect occurs due to change in relative price. However, change in price will also cause change in actual income due to the increasing purchasing power of the consumer. Hence, a part of the curve shift can be caused by the effect of change in actual income. Through the utility theory, we cannot separate the two effects. However, using the indifference analysis, we will be able to separate the two effects.

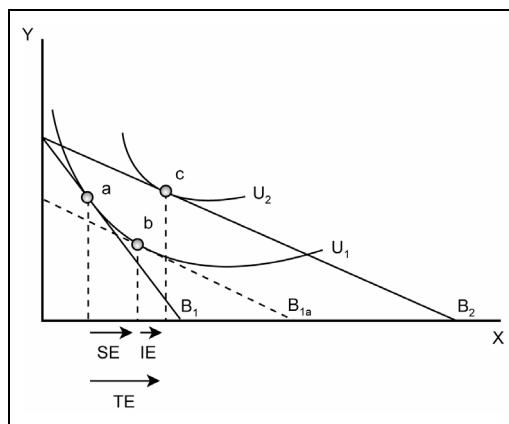
**Income effect** is defined as change in quantity demanded due to the **change in actual income or purchasing power**.

Actual income or purchasing power depends on the quantity of goods able to be purchased by consumer. Assume that income,  $I = \text{RM}10$ ;  $P_x = \text{RM}1$  and  $P_y = \text{RM}2$ . Before the change in price of X, consumer consumed 2Y and 6X. If  $P_x$  declines to 50 cents per unit, 2Y and 6X can be purchased at the price of RM7 only. This shows that there is an excess income of RM3 that can be used to add the quantity of X or Y, or both. This is referred to as increase in actual income or purchasing power.

**Substitution effect** is the change in quantity demanded due to **change in relative price**, where actual income or purchasing power remains unchanged.

Therefore, if price of X decreases (increases), the relative price of X decreases (increases) and consumer will increase (decrease) consumption of X, even when actual income is unchanged.

Substitution effect is parallel with change in price, that is, when price increases, substitution effect will result in an increase in consumption, and vice-versa. Conversely, the relationship between income effect and price depends on the type of goods. For normal goods, increase in price will cause a negative income effect (decrease in consumption). For inferior goods, price increase will give a positive income effect (increase in consumption).

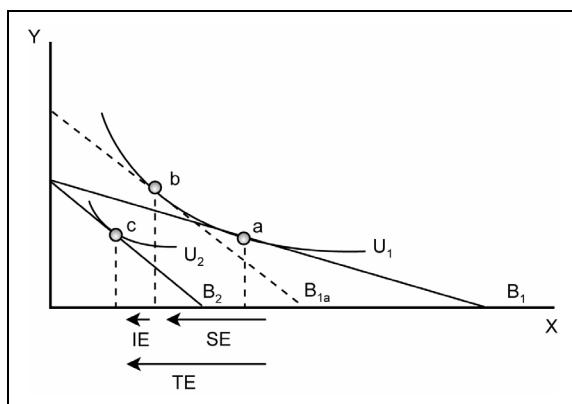


**Figure 4.14:** Income effect and substitution effect for decrease in price of normal good

Figure 4.14 illustrates how we separate the two effects for normal goods. Assume  $B_1$  is the initial budget line and  $B_2$  is the new budget line when price X declines. To separate the income effect from substitution effect, we must draw a shadow

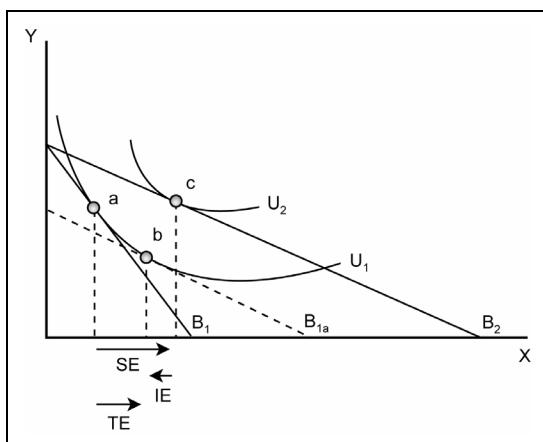
budget line that is parallel with  $B_2$  but touches the initial indifference curve ( $U_1$ ). Since it is parallel with  $B_2$ ,  $B_{1a}$  shows the new price ratio, but touches  $U_1$  at the same time. This enables consumer to obtain utility equal to the initial utility. Therefore,  $B_1$  and  $B_{1a}$  shows the same actual income. Movement from  $a$  to  $b$  is merely due to the change in relative price and the remaining from  $b$  to  $c$  is due to the change in actual income.

In Figure 4.14, notice that both IE and SE causes an increase in consumption of good X when its price decreases. Now, observe the IE and SE for the price increase of good X as a normal good in Figure 4.15 and make a comparison.



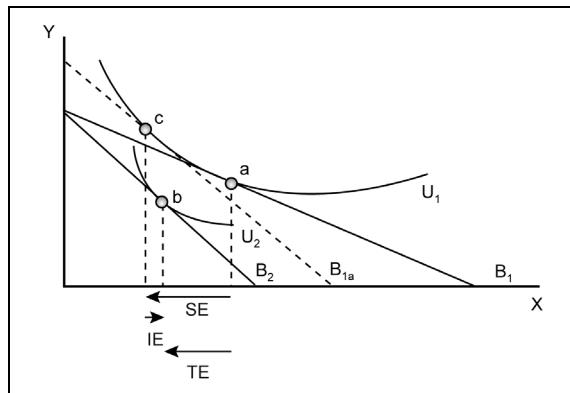
**Figure 4.15:** Income effect and substitution effect for increase in price of normal good

Figure 4.16 illustrates how we separate the two effects in the case of price decrease of X as an inferior good. Notice how we can obtain a positive SE but a negative IE.



**Figure 4.16:** Income effect and substitution effect for decrease in price of inferior good

Then look at Figure 4.17 in the case of price increase of inferior good and make a comparison and draw a suitable conclusion.

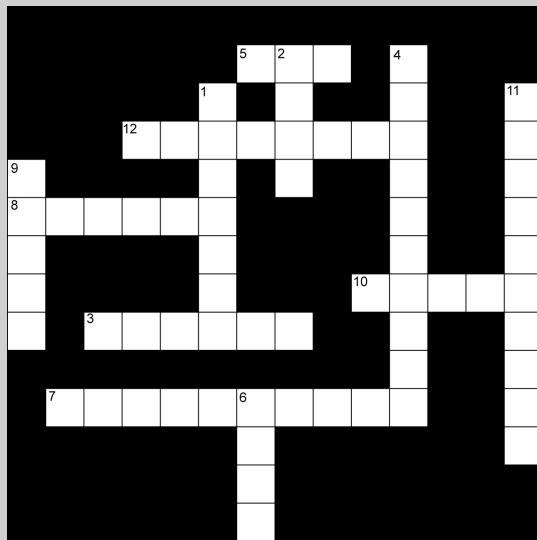


**Figure 4.17:** Income effect and substitution effect for increase in price of inferior good



### SELF-CHECK 4.3

Let us test your knowledge by solving the crossword puzzle below.



1. \_\_\_\_\_ utility theory states that utility obtained by a consumer cannot be measured quantitatively but can be listed through an indifference curve
2. Form of utility measurement.
3. The two important concepts of utility are \_\_\_\_\_ utility and marginal utility.
4. \_\_\_\_\_ line is the curve that shows the combination of two goods able to be purchased by consumer using a certain amount of income and based on the market price of the good.
5. \_\_\_\_\_ utility refers to addition or reduction in satisfaction due to the increase (decrease) in consumption of one unit of a particular good.
6. A convex \_\_\_\_\_ curve indicates diminishing marginal rate of substitution.
7. Change in \_\_\_\_\_ will cause the budget line to shift in parallel with the initial budget line.
16. Indifference curve has a \_\_\_\_\_ gradient.

12. \_\_\_\_\_ curve is the curve that shows the relationship between consumer's income and the demand towards a particular type of good.
13. \_\_\_\_\_ consumption curve is a curve that connects consumer equilibrium when there is a change of price for either goods.
14. Marginal rate of \_\_\_\_\_ is the rate where a good is to be substituted with another.
15. \_\_\_\_\_ theory approach states that utility can be measured quantitatively using the unit of utile.



### EXERCISE 4.6

Determine whether these statement are TRUE (T) or FALSE (F).

1. Substitution effect shows the effect of change in actual income towards consumer's consumption pattern.
2. Substitution effect is positive for luxury goods, zero for normal goods and negative for inferior goods.
3. Income effect and substitution effect will encourage the increase in consumption of normal goods when the price of the goods increases.
4. When price declines, actual income will increase, but when price increases, actual income will decrease. This condition is referred to as the income effect.



### EXERCISE 4.7

#### Calculation

- (a) The table below shows the quantity and total utility obtained from consumption of good X. Fill in the blanks for marginal utility.

Quantity	Total Utility	Marginal Utility
1	40	
2	75	
3	105	
4	130	
5	150	

- (b) If price per unit of X is RM25, calculate the quantity of X that will maximise the utility of this consumer.

### SUMMARY

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- Indifference curve is a curve that connects all the combinations of consumption that gives equal satisfaction.
- Marginal rate of substitution is a rate where a good is to be substituted with another. Therefore, it indicates the gradient of the indifference curve.
- A convex indifference curve shows a diminishing marginal rate of substitution. Diminishing marginal rate of substitution happens when the rate of willingness to substitute, changes with the total consumption.
- Budget line is a line that connects the combinations of goods able to be purchased within an amount of expenditure.
- Budget line shifts when total expenditure changes and revolves at the axis when there is a price change in either one of the goods.
- Budget line represents the ability to purchase, while indifference curve represents preferences and priority.
- Consumer equilibrium is achieved when consumer gains maximum satisfaction from his spending, that is, when indifference curve is tangent with the budget line.

- Price-consumption curve is a curve that connects the consumer equilibrium when price of one of the goods changes.
- Demand curve is derived from price-consumption curve.
- Income-consumption curve is a curve that connects consumer equilibrium when income changes. Engel curve is derived from income-consumption curve.
- When quantity demanded changes due to change in price, the change is caused by two effects, namely, the income effect and substitution effect.
- Income effect is the change that is caused by the change in actual income, while substitution effect is caused by the change in relative price.

## KEY TERMS .....

Cardina utility

Ordinal utility

Engel curve

Price consumption curve

Income effect

Substitution effect

Income-consumption curve

Total utility

Marginal utility

Utility

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# **Topic ▶ Theory of Production**

## **5**

### **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Explain the concept of production, plant, firm and industry;
2. Differentiate between the concept of long-run and short-run in production;
3. Apply the concept of diminishing marginal returns;
4. Compare isoquants and isocosts; and
5. Differentiate the three types of returns to scale for long-run production.

### **▶ INTRODUCTION**

Through Topic 1 until Topic 3 we know that there are two main sectors in the circular flow of income namely the household sector and the firm sector. In the previous topics, we discussed about the household sector, including the background of demand theory, through theory of utility, theory of indifference, or the theory of consumer behaviour in general. The theory of consumer behaviour explains the behaviour of rational consumers who make decisions based on consideration of cost (price), and benefit (utility). In this topic, we will look at the rationale that underlies the behaviour of producers that influences the theory of supply. We will start by discussing the concept related to production process, and subsequently we will discuss production in the short-run, and finally production in the long-run.

## 5.1 PRODUCTION PROCESS

Production is very important in an economy; in fact many economists consider the success in production activities as an indication of progress of a country. Production is important due to its role in changing inputs into more valuable materials. The value enhancement will result in higher consumption satisfaction.

In connection with that, we can define

**Production** as any activity or process of combining inputs to transform into outputs that produce utility at present time or in the future.

**Firms** are organisations that perform production processes, by combining inputs in the production process to produce outputs.

The behaviour of firms is important in determining the type of goods and services to be produced for the society, price, and its quantity. In short, firms have to face questions as shown in Figure 5.1.

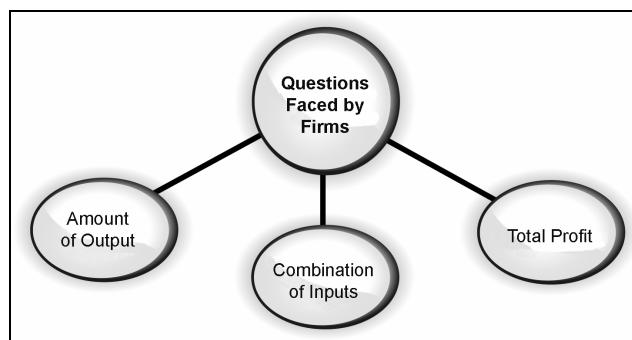


Figure 5.1: Questions of firms

Therefore, the behaviour of firms is influenced by consumers, competitors and the environment.

How the production process is carried out and the combination of input used depends on technology. Hence, technology determines the form of production function. Production function shows the technical relationship between inputs and outputs. It explains the method used by firms to change inputs into outputs.

The general production function =  $Q = f(L, K, M, \dots)$ ,

where  $Q$  = output,  $L$  = labour,  $K$  = capital,  $M$  = raw materials.

We can summarise the firm's decision making process into three steps:

- (a) choosing the quantity to be produced and listing all efficient methods in producing the specified quantity;
- (b) choosing the economically efficient method, that is, the method of lowest cost to produce the specified quantity; and
- (c) repeat step 1 and 2 for all the other quantities.

Of all the various production technologies available, one of it is assumed to be the most efficient. An efficient production technique is the production method that does not waste resources, that is, one of the inputs cannot be reduced without the addition of other inputs. If an input can be reduced without adding other inputs, the method is still considered inefficient.

Each technology only shows certain combinations of inputs that can be used to produce a certain amount of output, and firms must decide on the production plan for the most efficient technology. Basically, production technology can be divided into two, namely:

- (a) **Labour-intensive technology** - If production process uses more labour force compared to capital.
- (b) **Capital-intensive technology** - If more capital is used compared to labour.

Firms will definitely take into account the cost and profit in choosing technology besides determining the level of efficiency. Thus, the technology chosen is a technology that is able to minimise production cost. For example, if a firm operates in a country which has abundant cheap labour but lacking in capital goods, the most optimal production method will be the one that is labour-intensive.

### 5.1.1 Industry, Firm and Plant

The three prime movers in a production process are industry, plant and firm. What is meant by industry, plant and firm? We will look at the following explanations:

(a) **Firm**

A firm is an organisation that buys resources from the household or other firms to be used in the production of goods or services that will be sold to consumers. Firm size may vary, from a peddler selling snacks by the sidewalk to multinational firms operating worldwide.

Why do firms exist? Households have various needs and these needs cannot be fulfilled by the household itself due to various constraints such as the lack of resources, lack of expertise, or high cost. Are you able to build your own house or design a television set or refrigerator? Firms have substantial compared benefits in the use of inputs in production processes. The advantage is due to a number of factors including specialisation and economies of scale.

(b) **Plants**

Most firms have more than one plant, that is, an area, machine or tools and equipments used in the production process. Plant is the unit of production, while the firm is the unit of ownership and control. Plants owned by a large firm may consist of a number of factories with high-tech production equipments in a few areas or countries. For a small firm such as a tailor, the plants owned may consist of a few sewing machines.

(c) **Industry**

An industry consists of all firms that are competing in one market. Examples of industries are such as the fast-food industry, clothing industry and automobile industry. The interaction of firms within an industry determines the form of market structure that gives different implications towards the level of output and price. Examples of market structure are such as the perfect competition market, and monopoly, which will be discussed in the following unit.



### ACTIVITY 5.1

Use the Venn diagram to illustrate the relationship between firm, plant and industry.

## 5.1.2 Input and Output

Resource used in production process is known as **input**.

Input includes raw materials, labour, area of production, machines and intermediate goods purchased from other firms.

**Output** is a good or service that is produced from the production process.

Output produced by a firm might be purchased by consumers, other firms or the government.

Input can be categorised into variable inputs and fixed inputs, as shown in Figure 5.2.

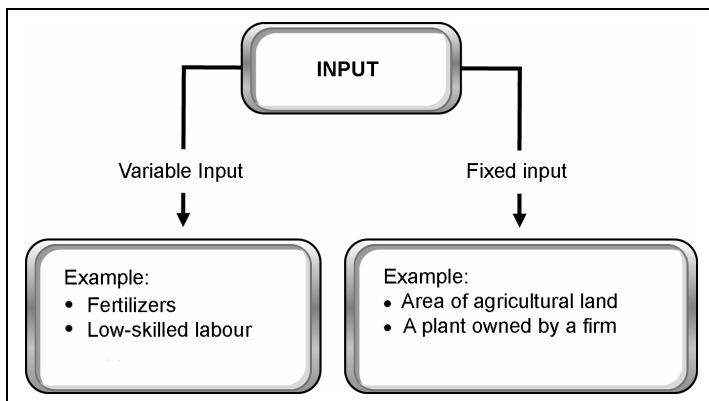


Figure 5.2: Types of input

**Variable inputs** are inputs that can be added or reduced within a short period of time.

Variable input will change according to the change in output. Its quantity is influenced by the change in output.

**Fixed inputs** are inputs that cannot be added or reduced within a short period of time.

Examples are such as an area of agricultural land for a farmer or plant owned by a firm. Land for a farmer is an input that is very hard to be altered. A farmer may not buy land gradually when he wants to increase production a little; similarly, he cannot sell the land in small portions if production is to be reduced a little.

Fixed inputs usually provide service for a long period of time. Factories built can be used for years; land can be used endlessly if not sold. Skilled work force is also considered as fixed input that are paid monthly salary; it may be quite difficult to change the number of these workers in a short time since advertising and interview process are required.

### 5.1.3 Long-Run and Short-Run

What is the relationship between inputs and period of production? Fixed input and variable input are closely related to the concept of production period.

- (a) **Short-run** in production is a period where at least one of the input is fixed and a firm cannot enter or leave the industry.
- (b) **Long-run** is the period of production where all inputs are variable, and firms can increase or reduce its production capacity, and also enter or leave the industry. Production period is not an absolute time concept such as days, weeks, months or years. It is a relative concept and refers to the rate of changing fixed input into variable input.

For a banana fritters seller for example, his short-run may be a day or a week because he can easily find a helper or add in new frying equipments such as stoves and pans. But on the contrary for an electrical power supplier of a town, the short-run will definitely take up a longer time period, maybe 10 years or more. This is because the equipments and plants needed to generate electricity are costly and cannot be easily built without proper planning.

From these two examples, we have obtained another determinant of production period, that is, the cost involved in adding or reducing inputs. If addition or reduction of input involves a high cost, the short-run will become much longer.

**EXERCISE 5.1**

Determine whether these statement are TRUE (T) or FALSE (F).

1. When production is being carried out, inputs will be transformed into outputs, and these outputs may be purchased by consumers, other firms or by the government.
2. In short-run, the size or capacity of a plant is fixed.
3. In long-run, there are no fixed inputs, while firms can leave or enter the industry easily.
4. All inputs are variable in long-run, and all inputs are fixed in short-run.

**SELF-CHECK 5.1**

Try to recall production process. What is the relationship between fixed inputs and variable inputs with production in short-run?

## **5.2 PRODUCTION IN SHORT-RUN**

After knowing a few important concepts in production, we will further discuss about the implementation of short-run productions. As defined earlier, short-run is a period where at least one input is fixed. Even though a production process usually consists of more than two inputs, we will focus on the short-run production that consists of only one fixed input and one variable input to facilitate the analysis. However, the concepts stated can be applied to any production processes which involve at least one fixed input.

### **5.2.1 Total Product, Average Product and Marginal Product**

Here, we will discuss the characteristics and production constraints faced by firms that operate in the short-run. To facilitate the analysis, we assume that a firm uses only one fixed input, and one variable input in the production of one type of output. **The general production function** of this firm can be stated as:

$$Q = f(K, L)$$

where Q is the output, capital (K) is the fixed input, and labour (L) is the variable input.

The production function can also be shown using tables and diagrams. Figure 5.3 and Table 5.1 illustrates the production function of a firm producing one type of output.

The table and diagram shows the change in output when variable input is added to fixed input in production.

There are three main concepts that you need to understand in short-run production:

- (a) **Total product** is the amount of output that can be produced by combining all inputs in a particular period of time.
- (b) **Average product (AP)** is the output per unit of variable input or  $AP = TP/L$ . In Figure 5.1, we find that the average product for 2 units of labour is  $8/2 = 4$ .
- (c) **Marginal product (MP)** is the addition or increment in output when one unit of variable input is added while the total of other input is constant. Marginal product is the gradient of the Total Product curve. Marginal product of capital or  $MP_K$  is the addition in output as a result of an increase in capital input while total labour remains unchanged. Marginal product of labour or  $MP_L$  is the increase in output as a result of an additional labour input; while capital remains unchanged. In the short-run model, when labour is the variable input, discussion will be focused on the productivity of labour.

$$MP_L = \frac{\Delta TP}{\Delta L} = \frac{\text{Change in Total Product}}{\text{Change in unit of labour}}$$

In Figure 5.1, marginal product for the fourth labour is:

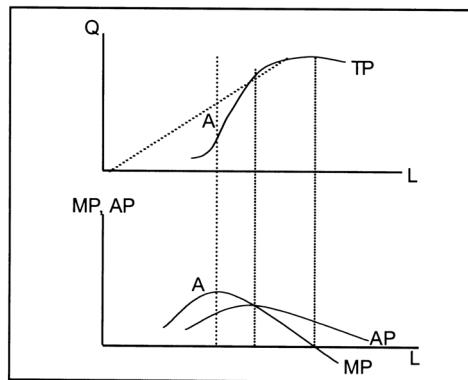
$$\frac{\Delta TP}{\Delta L} = \frac{15 - 12}{4 - 3} = \frac{3}{1} = 3$$

We divide the change in total product (TP) with change in quantity (L), and not with one unit of input because some of the variable inputs can only be added in a few units simultaneously. For example, a labour is hired to work eight hours a day. Therefore, in knowing the addition of product by one hour of labour, we must divide the change of output produced with eight units of labour.

**Table 5.1:** Total Product, Average Product and Marginal Product

Capital	Labour	TP	AP <sub>L</sub>	MP <sub>L</sub>
1	0	0	-	-
1	1	3	3	3
1	2	8	4	5
1	3	12	4	4
1	4	15	3	3
1	5	17	3 2/5	2
1	6	17	3 5/6	0
1	7	16	2 2/7	-
1	8	13	1 5/8	-

Figure 5.3 is drawn based on the information from Table 5.1. Through the diagram, we can obtain information about the features and relationship between these three concepts we have just defined.



**Figure 5.3:** Total product, marginal product and average product

Based on Table 5.1 and Figure 5.3, we can see that total product increases rapidly with the first and second labour employed. However, the increase in production starts to decline when the third labour is hired. Similarly with MP, initially MP increased rapidly compared to AP, achieving maximum point before AP, then decreases to intersect at the maximum point of AP before reaching zero. MP is

zero when TP achieves maximum point, and then becomes negative as TP decreases.

The concepts of marginal and average have general relation that can be applied in all theories involving these two concepts, which are:

- (a) if marginal is equivalent to average, average remains unchanged;
- (b) if marginal is higher or above average, average will increase; and
- (c) if marginal is lower than average, average will decrease.

An example of average-marginal relationship is the GPA (Grade Point Average), and CGPA (Cumulative Grade Point Average) you obtain every semester. GPA is marginal while CGPA is average. If the GPA you obtain in a semester is higher than CGPA, then your CGPA will increase. If GPA is lower than CGPA, then CGPA will decrease. Therefore, to ensure CGPA increases, GPA should always be increased.

### 5.2.2 Law of Diminishing Marginal Returns

Based on Figure 5.3, we have seen that the total product increases with an increasing rate initially, but eventually starts to increase at a decreasing rate, before declining further. Meanwhile, the marginal product increases rapidly, and then decreases before achieving negative. The curve of marginal product starts to decline when the total product starts to increase at a decreasing rate; this is the starting point for the law of diminishing returns. This point is denoted by point A in Figure 5.3.

**Law of diminishing marginal returns** states that if variable input is added into a production process that uses at least one fixed input, increment in total output may increase at an increasing rate initially, but the rate of increase will decline after one level of input.

This law only happens in the short-run. If seen through marginal product, this law starts to occur when MP starts to decline. Due to this law of diminishing marginal returns, the optimal level of output in the short-run is achieved when  $MP_L = 0$ .

This law is very rational and can be used in various fields. In the agricultural field for example, land is a fixed input. When the first labour is hired to tap rubber, he might not be able to tap all trees available in one day. When the second labour is added, yield will increase, but if more tappers are added

continuously, it will reach a stage where yield increases but at a lower rate compared to the initial rate of increase. Sooner or later, the land will become congested of rubber tappers until some of them will not have the chance to tap.

It is the same in the manufacturing field that uses machines as its fixed input. The first few labourers hired may increase production at an increasing rate. But when more labourers are hired and machines have reached a high capacity, marginal product will start to decrease.

Some say that if the law of diminishing marginal returns does not occur, the whole world population can be fed from only one flower pot, because seeds can always be added to increase the yield of food. However, through this concept, there are also predictions that at one time, a large number of world population will die of starvation due to shortage of agricultural land. We see that this condition is yet to happen because technology enables the fixed input of agriculture, which is land, to increasing its capacity. For instance, in the past, we only can plant rice once a year; but now it can be done twice a year.



### SELF-CHECK 5.2

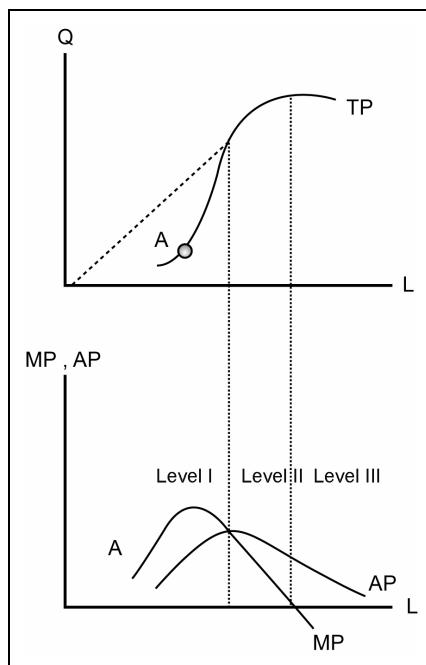
Explain, how does the law of diminishing marginal returns occur?

### 5.2.3 Production Level

Now we will look at production level. We can use the relationship between the curves of  $AP_L$  with  $MP_L$  to define the three levels of production in the short-run, which are Level I, Level II and Level III. Figure 5.4 will help to illustrate these levels.

(a) **Level I**

Level I begins with the usage of the first labour until the maximum point of  $AP_L$ . At this level, both, the average product and marginal product are positive. Since the marginal product exceeds average product, average product increases. Level I is an irrational production level because  $AP$  can always be increased by adding in labour. Increased return to fixed input also occurs at this level. Therefore, rational producers will not operate at this level.



**Figure 5.4:** Production levels

(b) **Level II**

Level II is the area between the maximum point of  $AP_L$  and the point where  $MP_L$  is zero. Both  $MP$  and  $AP$  are still positive but  $MP$  is less than  $AP$ . Thus,  $AP$  decreases. Rational producers will operate at this level because the marginal product of fixed input and variable input is positive.

(c) **Level III**

Level III covers the area of negative  $MP_L$  and total product decrease. This means that additional of variable input will further decrease the total output. Rational producers will not operate at this level.



### EXERCISE 5.2

Determine whether these statement are TRUE (T) or FALSE (F).

1. When firms start to face a decreasing average product for labour, the marginal product for labour is maximum.
2. The law of diminishing marginal returns states that when all inputs are added simultaneously at an equal rate, a stage where outputs will diminish at an increasing rate will be experienced.
3. The law of diminishing marginal returns assumes that all variable inputs have the same quality.
4. When marginal product increases, average product will decrease; and when marginal product decreases, average product will increase.

## 5.3 PRODUCTION IN LONG-RUN

Do you still remember the important concept in the short-run production? Now, we will look at production in the long-run.

Production process is in the long-run if all inputs are variable. When all inputs are variable, firms have more choices in terms of input combinations, production scale, technology and production location. The firm's decision on those matters will influence production cost. Hence, firms must make optimal and efficient decisions.

The relationship of input – output in the long-run can be seen using the **isoquant** curve. For producers who use only two variable inputs, the isoquant curve can be drawn in two dimensions, but it will get more complex if the number of variable inputs increases.

However, the conclusion drawn from the analysis of isoquants-isocost can be used as a general rule for productions that involve more than two variable inputs, which is based on the **equi-marginal principle** as we will discover in the following section.

### 5.3.1 Isoquants

What is meant by isoquants? The concept of isoquants closely resembles the concept of indifference curve that we have discussed in Topic 4. Both these curves are different in terms of the measurement used. For indifference curve, choice or priority that determines the shape of curve is an abstract and subjective concept, but on the other hand, the level of output that determines the isoquant curve is true and can be calculated.

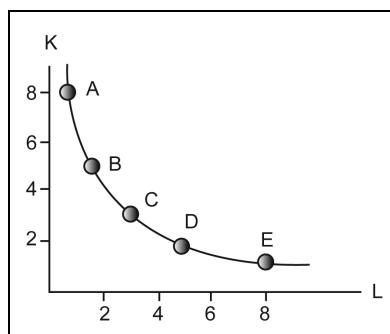
If the production process only utilises two variable inputs, namely capital (K), and labour (L), hence the production function is  $Q = f(K, L)$ . Therefore, the isoquant curve illustrates the compilation of all combinations of L and K that can produce a particular amount of output that fulfils

$$Q_0 = f(K, L)$$

For example, to produce 10 units of good X, the possible combinations of capital and labour that can be used are as shown in Table 5.2 and Figure 5.5.

**Table 5.2:** Combinations of Input for Production of 10 Units of Good X

Combination	K	L
A	8	1
B	5	2
C	3	3
D	2	5
E	1	8

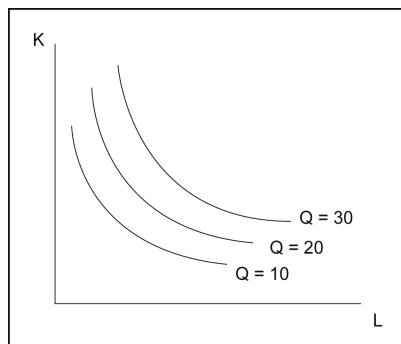


**Figure 5.5:** Isoquant curve

Even though there are five different combinations of inputs, the quantity of output produced is still 10 units. The change of input combination on the isoquant curve does not change the quantity of output produced. For instance, 10 units of output can be produced using 8K and 1L (combination A), or 3K and 3L (combination C).

Now, we can define the isoquant curve as a curve that connects all possible input combinations that can be used to produce a certain amount of output.

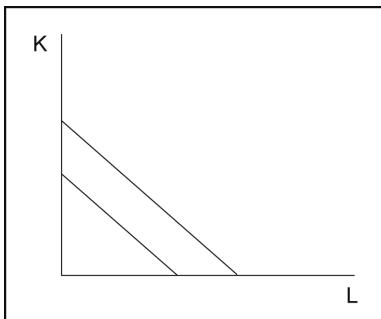
When we attain other curves which are obtained based on the combination of inputs for various levels of output, we will obtain a compilation of isoquant map as shown in Figure 5.6. The number of isoquant curves in an isoquant map is unlimited. Figure 5.6 illustrates the isoquant curves for three levels of output production, which are for the production of 10 units, 20 units and 30 units.



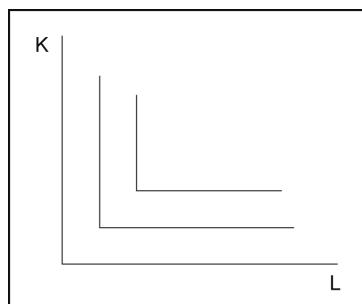
**Figure 5.6:** Isoquant map

One of the main features of a normal isoquant curve is the negative gradient. The isoquant curve has a negative gradient because producers will choose technologies which provides positive marginal product for all inputs. If the isoquant curve has a positive gradient, one of the inputs has a negative MP. As in the indifference curve, the isoquant curve shows a higher level of output at the higher position. The isoquant curve normally has a convex shape towards the origin due to the variable rate of substitution between inputs, which we will discuss in the subsequent section.

Variable rate of substitution between inputs is a general feature of technology. However, there are some technologies featuring the constant technique of substitution, as depicted by Figure 5.7, and technologies showing the use of fixed ratio input, as in Figure 5.8.



**Figure 5.7:** Isoquant curve for constant substitution production function



**Figure 5.8:** Isoquant curve for fixed ratio production function



### ACTIVITY 5.2

Can isoquant curves intersect? Discuss this matter with your friends.

### 5.3.2 Diminishing Marginal Rate of Technical Substitution

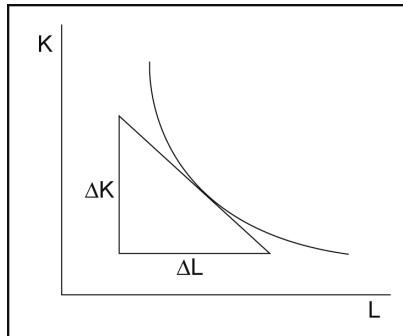
Along an isoquant curve, quantity of output is fixed. If labour is added, increment in output produced by the additional labour is equivalent to the change in labour ( $\Delta L$ ) times marginal product of labour ( $MP_L$ ). Since labour had increased in order to maintain the level of output, capital must be decreased to maintain the output level and the amount of reduction needed is equivalent to  $\Delta K \times MP_K$ . In short, both, the increase in labour product and decrease of capital must be equal to maintain total output. Hence,  $\Delta K \times MP_K = \Delta L \times MP_L$ , or

$$\frac{\Delta K}{\Delta L} = \frac{MP_L}{MP_K}$$

**Marginal rate of technical substitution (MRTS)** is the rate where an input can be substituted with other inputs while total output remains unchanged.

When production only involves the use of labour and capital,  $MRTS_{LK}$  is the marginal rate of technical substitution of capital to labour, that is, the rate in which capital is substituted with labour without any change in output.

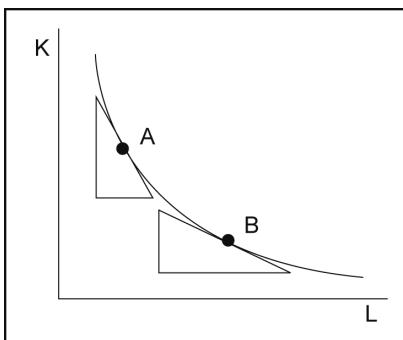
$$MRTS_{LK} = -K/L$$



**Figure 5.9:** Marginal rate of technical substitution

The gradient of isoquants with negative sign is ignored. This gradient is also referred to as **MRTS** or **marginal rate of technical substitution**. The word 'technical' is used to differentiate this term from marginal rate of substitution in the theory of consumers.

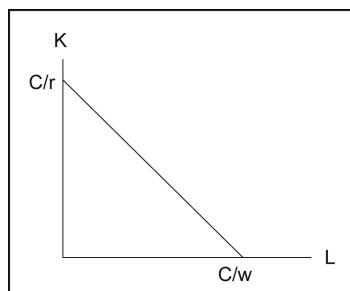
Diminishing MRTS means that rate of substitution between inputs will decrease according to the ratio between inputs. For a concaved isoquant with negative gradient, when the ratio of capital-labour ( $K/L$ ) is high, a large amount of  $K$  can be foregone or given up to be substituted with one additional unit of labour; when  $K/L$  decreases, the rate of capital that can be sacrificed to be substituted by one additional unit of labour, will decrease. Diminishing  $MRTS_{LK}$  is depicted by a decreasing gradient of the isoquant curve. Figure 5.10 illustrates the diminishing marginal rate of technical substitution of capital to labour, which can be seen from the gradient at point B which is lower than the gradient at point A.



**Figure 5.10:** Diminishing marginal rate of technical substitution

### 5.3.3 Isocosts

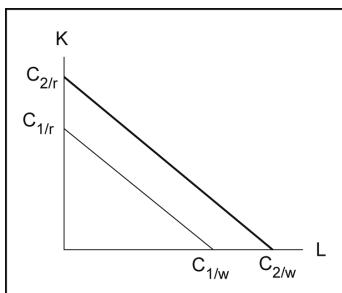
After learning about the concept of isoquants, you probably want to know what is meant by the concept of isocosts curve. The concept of isocosts curve is similar to budget line. The budget line is the budget constraint for consumers, while isocosts is the production costs limitation for firms. Isocosts illustrates the maximum spending that can be done by a firm to purchase two production inputs. Figure 5.11 illustrates an isocosts curve where capital (K) input is at the vertical or Y-axis, while labour (L) input at the horizontal or X-axis. The equation of this isocosts curve is  $C = wL + rK$ , and C is total cost, w and r are wage per unit of labour, and rental per unit of capital respectively.



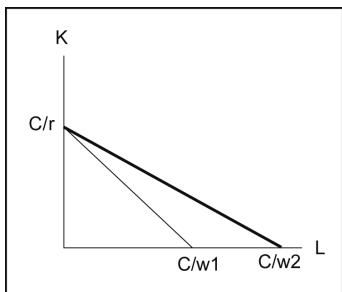
**Figure 5.11:** Isocosts curve

Change in total cost causes a parallel shift of the isocosts curve from the initial curve, as shown in Figure 5.12. Figure 5.12 illustrates an increase of total cost from  $C_1$  to  $C_2$ . However, similar changes can happen if the input prices changed at a proportionate rate; for example, if both w and r increased as much as 50 percent respectively, hence the isocosts will experience a parallel shift to the left.

Change in input price will cause the gradient of isocosts to change because ratio of price and isocosts will revolve at the axis of the input with the change in price. Figure 5.13 illustrates the effect of change in labour wage where  $w$  declines from  $w_1$  to  $w_2$ .



**Figure 5.12:** Effect of change in total cost towards isocosts curve



**Figure 5.13:** Change in labour wage towards isocosts curve



### ACTIVITY 5.3

Try to use your own examples to differentiate the concept of isoquants and isocosts. Present your answer in your tutorial.

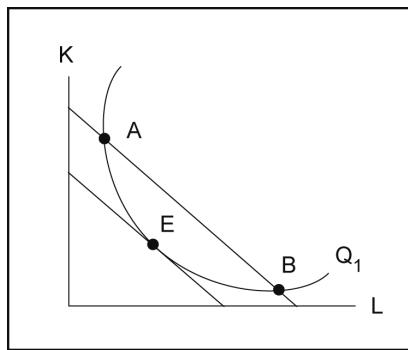
### 5.3.4 Combination of Minimum Input Cost

A firm that maximises its profit will choose an optimal combination of inputs by equating MRTS with the ratio of input price. Diagrammatically, the optimal choice input will occur when the isocosts is tangent with the isoquants, that is, the gradient of isocosts is equivalent to the gradient of isoquants, or:

$$\frac{\Delta K}{\Delta L} = \frac{w}{r} = \frac{MP_L}{MP_K}$$

This equilibrium condition is denoted by point E in Figure 5.14.

Why didn't the firm choose combination A or B? If combination A was chosen, it means that the firm can still reduce cost by substituting some of the capital input with labour input, that is, by moving downwards along curve  $Q_1$ . Therefore, optimal efficiency is still not achieved. It is the same if combination B was chosen; cost can still be reduced by substituting some labour with capital. The transition from an inefficient condition to a more efficient condition will finally bring the firm to the point of equilibrium E where cost is minimal and cannot be further reduced, unless if output is also reduced.



**Figure 5.14:** Combination of minimum input cost

### 5.3.5 Equal Marginal Principle

The equal marginal principle is applied in choosing the combinations of long-run input using the concept of marginal product (MP).

According to this principle, optimal input combination is achieved when marginal product of one ringgit for all inputs are equal, or

$$\frac{MP_A}{P_A} = \frac{MP_B}{P_B} = \dots = \frac{MP_N}{P_N}$$

where A, B, ..., N are the inputs, and  $P_A, P_B, \dots, P_N$  are the input price.

If the long-run production only uses capital (K) and labour (L), hence a combination of optimal input is achieved when

$$\frac{MP_K}{r} = \frac{MP_L}{w}$$

If

$$\frac{MP_K}{r} > \frac{MP_L}{w}$$

(due to increase in wage), the firm should substitute a part of the labour input with capital because firms obtain higher returns than the cost spent on capital compared to labour. When more capital is being utilised, diminishing returns to capital will occur until the rule of equilibrium is achieved again.

The main problem in the application of this concept is the difficulty in predicting changes in input price. Therefore, even though the principle of equal marginal is achieved, and the firm has built suitable equipments, (for example, the use of labour-intensive technology due to low wage), an unpredicted increase in wage causes the firm to be in that particular short-run condition for a few years. In this situation, the initial decision made was a mistake due to failure in predicting change in wages.

### 5.3.6 Returns to Scale

Change in input usage enables a firm to change the production scale.

Here, **scale change** means that the amount of all inputs is changed in the same ratio.

For example, a firm can double up the amount of all inputs used. When production scale is altered, three possibilities will occur upon the level of production, which are:

(a) **Constant Returns to Scale**

This will happen when the change ratio of all inputs is equivalent to change ratio of output. For example, when all inputs are increased by 10 percent, output will also increase by 10 percent.

(b) **Increasing Returns to Scale**

Increasing returns to scale occurs when the ratio of increase in output is much higher than the ratio of increase in all inputs.

(c) **Decreasing Returns to Scale**

Decreasing returns to scale occurs when the ratio of increase in output is much lower than the ratio of increase in all inputs. Decreasing returns to scale is different from the diminishing marginal returns that occur in short-run because in short-run, only the variable inputs are increased.

**EXERCISE 5.3**

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. The principle of equal marginal in theory of production is similar to the principle of equal one ringgit marginal utility in the theory of consumer.
2. Increasing returns to scale occurs when the ratio of increase in output is much lower than the percentage of increase in all inputs.

**EXERCISE 5.4****Problem Question**

Complete the following table for marginal product, and average product and answer the following questions.

Labour (Unit)	Total Product (TP)	Marginal Product (MP)	Average Product (AP)
0	0		
1	80		
2	200		
3	330		
4	400		
5	450		
6	480		
7	490		
8	480		

- (a) Increasing returns to scale occurs from \_\_\_\_\_ use of labour to \_\_\_\_\_.
- (b) Diminishing marginal product starts to occur at the \_\_\_\_\_ unit of labour.
- (c) When total product increases, marginal product \_\_\_\_\_, and when total product decreases, marginal product\_\_\_\_\_.

## SUMMARY

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- The production process involves industry, firm, plant, technology, input and output.
- The production function illustrates the form of technology used in production, that is, the process that combines inputs to produce output.
- Firms are organisations that perform the production process. Firms may own several plants as the production unit.
- Meanwhile, industry consists of all firms competing in one market.
- Inputs used by firms may consist of fixed or variable inputs.
- The use of fixed input will not change with change in output, while variable output changes according to the change in output quantity.
- Time period is crucial in determining the choices made by firms. In short-run, firms are constrained by at least one fixed input. Meanwhile, in long-run, firms have more extensive choices since all the inputs are variable.
- The three important concepts in short-run production are total product, average product and marginal product.
- Fixed input constraints causes short-run production to face the law of diminishing returns.
- This law states that if a variable input is added in a production process that uses at least one fixed input, the increase in total output will eventually diminish after a certain level of input.
- In long-run production that uses more than one variable input, production technology can be illustrated by isoquants.
- Isoquants depict all the combinations of inputs that can be combined to produce a certain amount of output.
- Meanwhile, the isocosts is a curve that connects all the combinations of inputs that gives same amount of costs.
- Based on isoquants and isocosts, the optimal input combination is achieved when marginal product of one ringgit for all inputs are the same. This principle is referred to as the principle of equal marginal.
- Returns to scale is a long-run production concept that measures the response of output towards expansion of production scale.

- Constant returns is obtained when the percentage of increase in output is equivalent to the increase in all inputs, while decreasing returns to scale occurs when the percentage of increase in output is much lower than the percentage of increase in all inputs.

## KEY TERMS

Equi-marginal principle	Marginal rate of technical substitution
Firm	Marginal returns
Fixed input	Plant
Industry	Production
Isocost	Short run
Isoquants	Variable input
Long run	

# **Topic ► Cost Theory**

# **6**

## **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Describe several concepts of economic costs;
2. Draw the curves of short-run costs;
3. Explain the curves of short-run costs;
4. Relate the short-run costs with the long-run costs; and
5. Evaluate why the long-run average costs curve has a U-shape.

## **► INTRODUCTION**

Topic 5 discussed the choices faced by firms in solving the questions of how outputs should be produced. When firms make decisions regarding the production techniques and combinations of inputs used, we know that the firm operating the production process obtains its supply of inputs from household or other firms. Inputs have to be paid for according to the market price which is determined in the input market. The payment made is cost for the firm. The costs involved in production will change according to the amount of output. We all have our own understanding about the definition of costs. However, costs that we normally define only involve private costs and accounting costs. The concept of costs in economics is more extensive where economic costs involve all tangible and intangible costs. In this topic, we will discuss the concept of costs in economics before discussing further regarding the short-run and long-run production costs.

## 6.1 CONCEPT OF COST

Generally, costs are matters that must be exchanged or sacrificed in order to obtain something else in return. The sacrifice made can involve various forms, which can be valued monetarily or not. Costs may be in the form of money, goods, time and so on.

Firms must know the shape of the cost curves in order to make decisions. Short-run costs curve is used to make decisions regarding output and price; while long-run costs curve is used for growth planning and investment policy.

### 6.1.1 Economic Costs

Economists consider all costs of inputs used in production without taking into account who owns the inputs. This view influences their definition towards costs, profit and optimal production level.

You have been exposed to the concept of **opportunity cost** in our discussion about the production possibilities curve. The concept of opportunity costs is the basis of the concept of economic costs.

**Economic costs** for a good can be defined as the value of the best alternative foregone in order to obtain the particular good.

Therefore, to determine the economic cost of a certain good, economists must calculate the sacrifices that have to be made by the society in order to produce one additional unit of that particular good. Figure 6.1 illustrates the components of economic costs.

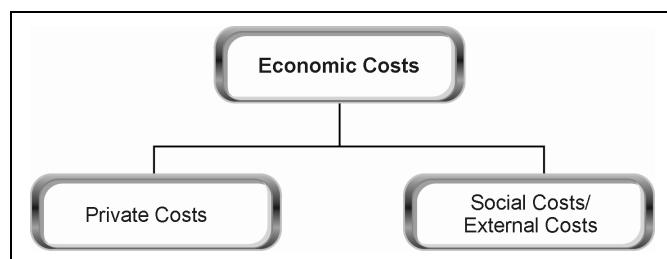


Figure 6.1: Components of economic costs



### ACTIVITY 6.1

How do we apply the principle of opportunity cost towards a particular firm? Discuss.

#### 6.1.2 Private Costs and Social Costs

**Private cost** is the cost that has to be paid by an individual who is directly involved in the production or consumption of a particular good.

**Social cost** or external cost is the cost burden carried by individuals who are not directly involved in the production or consumption of that particular good.

Let's take the process of cooking oil production from oil-palm trees as an example. Private costs are costs that have to be paid by the manufacturer to the supplier of raw oil-palm, labour force, amount of electricity used and others.

However, this factory may produce industrial wastes that can pollute the river or drainage systems nearby.

This pollution problem might cause some members of the society living around the area to lose their source of income or their recreation area. Meanwhile, the government is forced to use tax revenue money to clean up the pollution. All these costs are considered as external costs or third-party costs. In this case, social cost is higher than private cost.

External costs are caused by **external effects**. Since external effects can be negative or positive, external costs can also reduce or increase social costs. Positive external effects such as the joy experienced by society from the scenery of a private garden, causes the private cost borne by the garden owner to be higher than the social cost. This is because society benefit from that garden.

### 6.1.3 Explicit Costs and Implicit Costs

Economists have divided private costs into explicit (tangible) costs and implicit (intangible) costs.

**Explicit cost** is the market value of all inputs purchased by a producer.

**Implicit cost** is the market value of inputs owned by the producer himself.

Self-owned inputs of the producer are such as the value of his own building used, and the expertise possessed by the producer. Self-owned resources are valued based on opportunity cost, that is, value of the best alternative foregone. This implicit cost is the cost that differentiates economic costs and accounting costs or the related concepts, namely economic profits and accounting profits.

To further explain these two concepts, we look at one example:

Assume you have graduated from OUM and have received a job offer at the value of RM40,000 per annum. But you are determined to start your own business using the money you inherited from your grandfather at the value of RM50,000. At the end of the first year of your business, your accountant showed you the list of expenditure consisting of labour wage (RM50,000), rental (RM18,000) and other costs (RM17,000), and in all amounted to RM85,000. However, due to a good background in the principles of microeconomics, you know that your private cost is much higher.

In your calculation, the implicit cost you have to bear includes the value of the job offered, that is, RM40,000 per annum, and value of the interests from your savings of the inherited money at the rate of 10 percent or RM5,000 per annum. Thus, you add in another RM45,000 into the amount of RM85,000 totalling up the overall private cost to RM130,000.

This concept of economic costs is the one that we will apply in our following discussion on production costs.



### EXERCISE 6.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Economic cost of a firm is the payment that has to be made to the owner of input to draw input from alternative usage.
2. For the owner of a firm, the cost of using own input in business is the implicit cost, while the cost for purchase of market input is the explicit cost.



### ACTIVITY 6.2

Give three examples of implicit costs. Discuss the matter with your friends to broaden your knowledge.

## 6.2 SHORT-RUN PRODUCTION COSTS

Do you still remember about short-run production you have learned in Topic 5?

We know that short-run production involves the use of fixed inputs and variable inputs. The cost that is related to fixed inputs is referred to as fixed cost, while cost related to variable inputs is the variable cost. Now, let us look at the definition of fixed costs and variable costs.

**Fixed costs** are costs that do not change according to change in output.

**Variable costs** are costs that change along with the change in output.

When we only use two types of inputs in the short-run, that is, capital as the fixed input and labour as the variable input, hence, rental for capital is the fixed cost and payment of wage for labour is the variable cost.

### 6.2.1 Total Cost

**Total cost** of a firm is the economic cost of the firm. Total cost (TC) comprise of the total fixed costs (TFC) and the total variable costs (TVC) or

$$\begin{aligned}\text{Total Cost} &= \text{Total Fixed Costs} + \text{Total Variable Costs} \\ \text{TC} &= \text{TFC} + \text{TVC}\end{aligned}$$

If  $r$  is rental for one unit of capital ( $K$ ), and capital is the fixed input, hence, fixed cost is  $r \times K$ ; and if  $w$  is wage for one unit of labour ( $L$ ), while labour is the variable input, then variable cost for one production level is  $w \times L$ . Since variable cost will change along with the change in output, we state variable cost as a function to output, for example  $\text{TVC} = 2Q$ . Therefore, you will obtain the function of total cost such as  $\text{TC} = 1000 + 2Q$ , where 1000 is TFC and  $2Q$  is TVC. Indirectly from here we will obtain:

$$\begin{aligned}\text{Total Fixed Cost} &= \text{Total Cost} - \text{Total Variable Cost} \\ \text{TFC} &= \text{TC} - \text{TVC}\end{aligned}$$

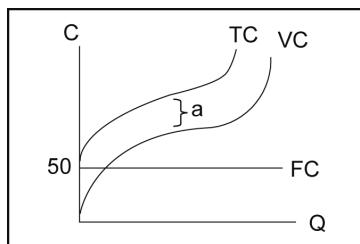
and

$$\begin{aligned}\text{Total Variable Cost} &= \text{Total Cost} - \text{Total Fixed Cost} \\ \text{TVC} &= \text{TC} - \text{TFC}\end{aligned}$$

Table 6.1 and Figure 6.2 illustrate the three types of total costs. Total fixed cost and total variable cost are calculated based on the assumption  $r = \text{RM}25$  per unit of capital, and  $w = \text{RM}10$  per unit of labour.

**Table 6.1: Total Costs**

Fixed Input (K)	Variable Input (L)	Output	TFC	TVC	TC	AFC	AVC	AC	MC
2	0	0	50	--	50	--	--	--	--
2	1	5	50	10	60	10	2	12	2
2	2	15	50	20	70	3.33	1.33	4.67	1.00
2	3	30	50	30	80	1.67	1.00	2.67	0.67
2	4	50	50	40	90	1.00	0.80	1.80	0.50
2	5	75	50	50	100	0.67	0.67	1.33	0.40
2	6	95	50	60	110	0.53	0.63	1.16	0.50
2	7	110	50	70	120	0.45	0.64	1.09	0.67
2	8	120	50	80	130	0.42	0.67	1.08	1.00
2	9	125	50	90	140	0.40	0.72	1.12	2.00



**Figure 6.2:** Total cost curve, total fixed cost curve and total variable cost curve

Observe that the total fixed cost curve is horizontal because fixed cost does not change along with the change in output. Meanwhile, the total variable cost curve increases at an increasing rate (curve becoming steeper) due to the law of diminishing returns in short-run. The total cost curve is the vertical sum of fixed cost and variable cost. Therefore, the distance between the total cost curve and the total variable cost curve (a) represents the total fixed cost.

## 6.2.2 Average Costs

**Average Fixed Cost (AFC)** is the total fixed cost divided by total output, or

$$\text{Average Fixed Cost} = \frac{\text{Total Fixed Cost}}{\text{Total Output}} \text{ or } \text{AFC} = \frac{\text{TFC}}{Q}$$

If TFC = 1000, hence  $\text{AFC} = 1000/Q$

**Average Variable Cost (AVC)** is the total variable cost divided by total output, or:

$$\text{Average Variable Cost} = \frac{\text{Total Variable Cost}}{\text{Total Output}} \text{ or } \text{AVC} = \frac{\text{TVC}}{Q}$$

If  $\text{TVC} = 10Q$ , then  $\text{AVC} = 10Q/Q = 10$

**Total Average Cost (AC)** is the total cost divided by total output;

$$\text{Total Average Cost} = \frac{\text{Total Cost}}{\text{Total Output}} \text{ or } \text{AC} = \text{AFC} + \text{AVC}$$

Average cost can also be computed by adding average fixed cost and average variable cost.

From the example above, hence  $\text{AC} = (1000/Q) + 10$ .

### 6.2.3 Marginal Costs

**Marginal cost** is the change in total cost caused by one unit of output change, or

$$\text{Marginal Cost} = \frac{\text{Change in Total Cost}}{\text{Change in Total Output}} \text{ or } MC = \frac{\Delta TC}{\Delta Q}$$

Total costs consist of total fixed costs and total variable costs. However, since only the total variable cost changes along with the change in output, hence marginal cost can also be obtained from:

$$\text{Marginal Cost} = \frac{\text{Change in Total Variable Cost}}{\text{Change in Total Output}} \text{ or } MC = \frac{\Delta TVC}{\Delta Q}$$

Now, refer to Table 6.1 for the calculation of AFC, AVC, AC and MC; and Figure 6.3 for the drawing of AC, AFC, AVC and MC curves.

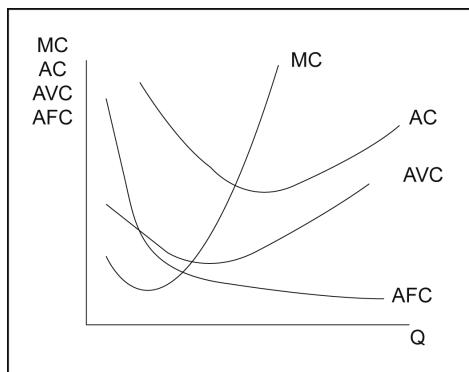


Figure 6.3: Average cost and marginal cost curves

Observe that the average fixed cost will continually decline but does not reach zero due to the value of fixed cost divided by total output that is increasing. Meanwhile, average variable cost decreases a little at a lower level of output, but then increases due to the law of diminishing returns. Meanwhile, total average cost is the vertical sum between average fixed cost and average variable cost. Due to the continually decreasing average fixed cost, the distance between AC and AVC becomes narrower when output increases.

AC decreases longer than AVC because initially, the decreasing effect of AFC is bigger than the increasing rate of AVC. After one point, the increase in AVC

gives a bigger effect compared to the decrease of AFC. AVC and AC are normally U shaped because average cost usually decreases in the beginning but increases after one point due to the law of diminishing returns.

Marginal cost (MC) decreases along with AVC at the early stage of production but increases after one point due to the law of diminishing returns. MC and AVC are equal at the first output level. MC intersects AC and AVC at the minimum point of AC because if marginal or addition is lower than average, average will decline; but if addition is higher than average, average will increase. The relationship between MC and AC is similar to the relationship between marginal and other averages, that is, average cost will increase if marginal cost is higher and the contrary if marginal cost is lower than average cost.

### Relationship between Production and Short-Run Costs

What is the relationship between production and short-run costs? Production involves the purchase of inputs. Therefore, cost and production have an inseparable relationship. Firms have to know the relationship between these two short-run concepts especially for the purpose of determining the output level in the short-run. Hence here we will try to look at the relationship between short-run average cost and marginal cost, with short-run average product and marginal product.

The connection between short-run cost and short-run production can be described as the following:

Assume you have just opened up a tailoring shop receiving orders to sew dresses. Workers are the variable inputs and the shop is fixed input. Here we will only look at the productivity of variable inputs. When you hire a worker with a wage of RM10 per hour ( $w = \text{RM}10$ ) and the worker is able to complete sewing 2 dresses in an hour, total variable cost for 2 dresses is RM10 ( $\text{TVC} = \text{RM}10$ ) and

$$\text{Average variable cost, } \text{AVC} = \frac{\text{TVC}}{Q} = \frac{\text{RM}10}{2} = \text{RM}5$$

$$\text{Average product for the worker } \text{AP} = \frac{\text{TP}}{\text{L}} = \frac{2}{1} = 2$$

From here we are able to see the connection between AVC and AP, that is:

$$\text{AVC} = \frac{w}{\text{AP}} = \frac{\text{RM}10}{2} = \text{RM}5$$

$$\text{AVC} = \frac{w}{\text{AP}}$$
 can also be stated as  $\text{AP} = w/\text{AVC}$ .

Due to increasing orders, you will hire another worker with the same amount of wage, that is, RM10 ( $w = RM10$ ) per hour. Both workers are able to complete 6 dresses in an hour. Hence, marginal product is

$$MP = \frac{\Delta TP}{\Delta L} = \frac{4}{1} = 4$$

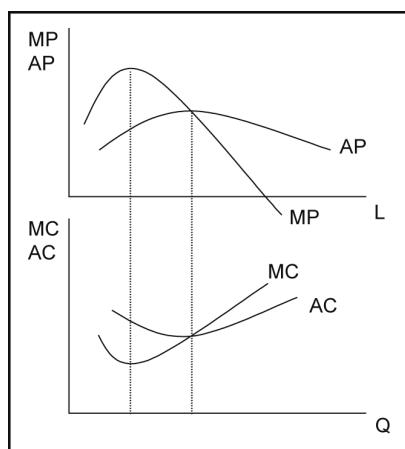
While marginal cost is:

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{RM10}{4} = RM2.50$$

We see that RM2.50 can also be obtained from  $w/MP$ . Therefore, we obtain the relationship between MC and MP, that is,  $MC = w/MP$  or  $MP = w/MC$ . AP and AVC for both workers are  $AP = 6/2 = 3$ , and  $AVC = w/AP = RM10/3 = RM3.33$ . We find that AVC declined from RM5 to RM3.33, and AP increased from 2 to 3.

From the relationship that we have just described ( $AVC = w/AP$ ), we can summarise that when AP is maximum, then AVC is minimum, and vice-versa. Also, because  $MC = w/MP$ , hence MP is maximum when MC is minimum, and vice-versa.

The relationship between both the two cost curves and two production curves can be seen clearly in Figure 6.4, that is, the average cost curve and marginal cost curve are the mirror images for the average product and marginal product.



**Figure 6.4:** Relationship between cost and production in short-run

**ACTIVITY 6.3**

Try to give other examples you have came across to establish the relationship between cost and production in short-run.

**EXERCISE 6.2****TRUE (T) / FALSE (F) Statements**

1. Average fixed cost (AFC) depicted by a horizontal line, is the main factor in determining decision in the short-run.
2. Average variable cost (AVC) curve and total average cost (AC) curve are intersected from the bottom by the marginal cost (MC) curve at the respective minimum point.
3. Marginal cost (MC) is the change in total cost due to increase in unit of labour.
4. Horizontal sum between AFC and AVC curves produces AC.

## **6.3 LONG-RUN PRODUCTION COSTS**

In the previous section, we have looked at the concept of cost in the short-run and its importance in the decision-making of firms in the short-run. Even though the discussion only involved variable inputs but the conclusion obtained can be applied in productions using more than one variable input, and at least one fixed input.

Firm will continue to be in the short-run situation as long as production involves fixed cost. When a firm alters its operation size by transforming fixed input into variable inputs, then the firm will be in the long-run situation and facing long-run costs.

Long-run costs and short-run costs are different due to a number of reasons:

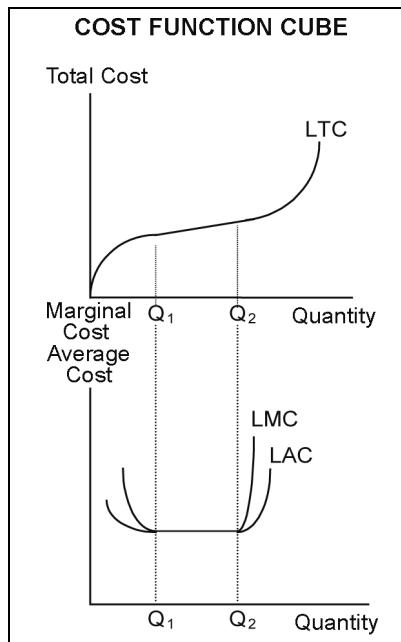
- (a) there are no fixed costs in the long-run. Hence,  $TC = VC$ ;
- (b) the law of diminishing marginal returns does not occur in the long-run because the firm is able to change all inputs. Therefore, the law of diminishing marginal returns does not influence the long-run costs curve;
- (c) the size of plant and production level change continuously along the long-run costs curve because all inputs are variable. Therefore, the long-run costs curve shows the minimum production cost for every output level when all inputs are variable;
- (d) producers cannot build a plant that is tandem with the long-run average costs curve (LAC). This is because each plant built has its own short-run costs; and
- (e) long-run is also the planning period for a firm. If demand is found to be increasing, the producer will plan to increase production by building or upgrading their production equipments. If demand is found to be insufficient, the firm can pull out from the industry.

### 6.3.1 Average Costs and Marginal Costs in the Long-Run

**Long-run average cost** is also known as the planning curve because it depicts growth path that can be followed by the firm only in the long-run.

The average cost and marginal cost in the long-run are U shaped due to different effects of returns to scale at different level of outputs.

Figure 6.5 illustrates the long-run total cost (LTC) and the long-run average cost (LAC) that faces three conditions of economies of scale at different levels of output. The curve shows an increasing return to scale or economies of scale at the initial output level to  $Q_1$ , while production from  $Q_1$  to  $Q_2$  depicts the constant returns to scale. After  $Q_2$ , the firm faces diseconomies of scale.



**Figure 6.5:** Long-run average cost curve and long-run marginal cost curve

Curve LAC is constructed based on a few assumptions:

- input price is fixed in the market. Therefore, change in input price involves change in cost and causes the LAC curve to shift upwards or downwards;
- the technology and quality of inputs are constant and may only change in a very long period of time; and
- the firm chooses a combination of lowest cost for every level of output. Therefore, besides LAC, the optimization rule  $MP_A/P_A = MP_B/P_B = \dots = MP_N/P_N$  has been fulfilled. If firm does not choose the optimal combination, production is located at a point on LAC, not along LAC.

### 6.3.2 Economies of Scale

Just now, you have come across the phrases 'economies of scale', 'diseconomies of scale' and 'constant economies of scale'. Now let us look at the explanation for each of these concepts.

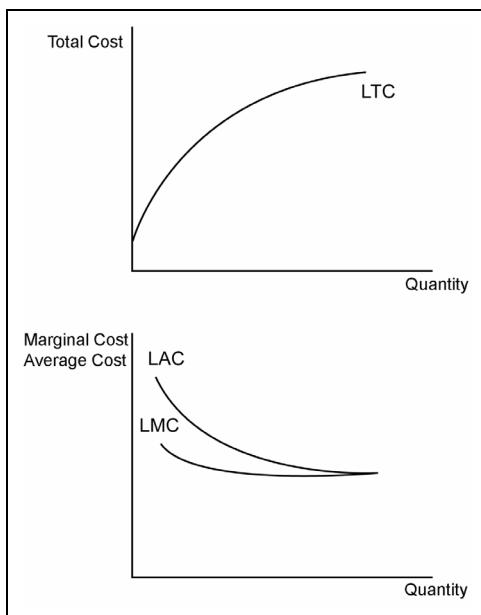
#### (a) Economies of Scale

We can see that long-run average cost (LAC) is U-shaped similar to the short-run average cost (SAC) but more gently sloped. Some writers refer to it as saucer-shaped. The U-shape of LAC is caused by scale economics or

economies of scale. If you still remember, the U-shape of short-run average cost curve is due to decreasing returns.

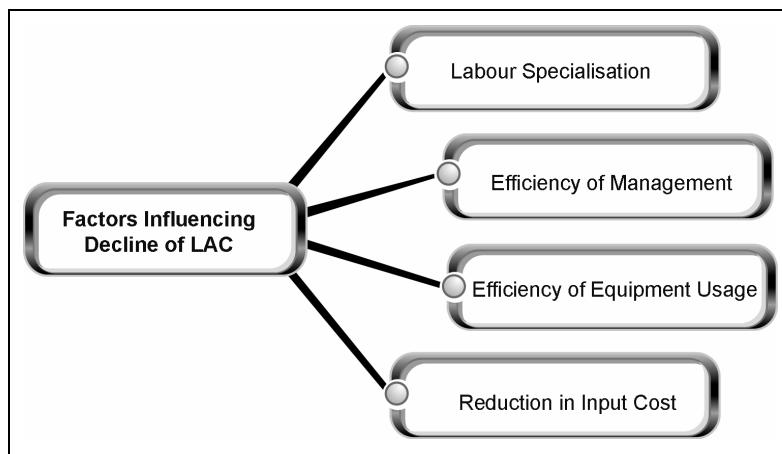
Economies of scale can be caused by increasing returns to scale and also other factors. Firms facing economies of scale will find a continuously declining LAC curve.

Figure 6.6 illustrates the long-run total cost and average cost curves facing economies of scale.



**Figure 6.6:** Long-run total cost curve and average cost curve for economies of scale

**Economies of scale** or economies of production on large scale explain the reasons why LAC declines. The decline in LAC with the increase in plant size can be caused by many factors. We will look at some of these factors.



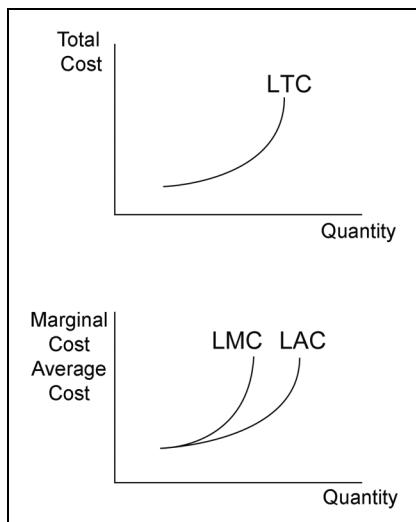
**Figure 6.7:** Factors in decline of LAC

Let us go through one by one.

- (i) **Labour Specialisation**  
Labour specialisation can be increased when the size of plant increases. When more workers are hired then it would be easier for them to perform more specialised tasks.
  - (ii) **Efficiency of Management**  
Efficiency of management can be achieved when the size of plant increases and managers can increase efficiency by managing more workers and more materials.
  - (iii) **Efficiency of Equipment Usage**  
Sometimes machines are operated below its true capacity if the plant is small. When the size of plant increases, usage of capacity can be increased.
  - (iv) **Reduction in Input Cost**  
When materials are purchased in large quantities, the firm may obtain a higher discounted rate. Large firms are able to purchase raw materials at lower prices compared to small firms. Hence, production cost can be reduced.
- (b) **Diseconomies of Scale**  
**Diseconomies of scale** occur when the firm operates at the right side of minimum point of LAC, where LAC is increasing. Diseconomies of scale can be caused by decreasing returns to scale or other factors including:

- (i) inefficiency of management that might be caused by increase in bureaucracy, or excessive burden to the management. Hence, cost increases; and
- (ii) increase in input cost. This can happen when many firms simultaneously increase their capacity which causes the input price to increase due to competition.

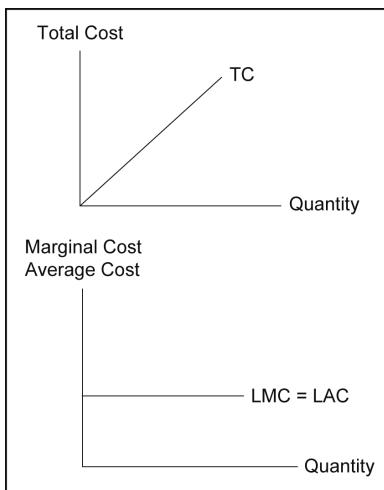
Figure 6.8 illustrates the long-run costs curves for diseconomies of scale.



**Figure 6.8:** Diseconomies of scale

(c) **Constant Economies of Scale**

Besides economies of scale and diseconomies of scale, long-run production may also face constant economies of scale. Constant economies of scale can be caused by constant returns to scale, that is, when output increase is equivalent to input increase. The LAC for this condition is horizontal as shown in Figure 6.9.



**Figure 6.9:** Constant economies of scale



### SELF-CHECK 6.2

Can you identify the position of Figure 6.6, Figure 6.8, and Figure 6.9 in Figure 6.5? If you can, try explain in your own words about each situation that makes LAC U-shaped as in Figure 6.5.

### 6.3.3 The Relationship between Short-Run Costs and Long-Run Costs

We know that before making any investment decisions, entrepreneurs are in the long-run situation because they can choose among the alternatives shown by the levels of technology. When decisions have been made and fund is tied to fixed capital, they start operating in the short-run. Therefore, short-run costs and long-run costs have certain relationships.

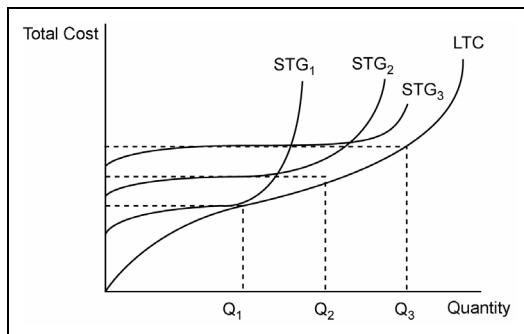
The two basic relationships between long-run costs curve and short-run costs curve are:

- long-run cost is less than or equivalent to short-run cost for every production levels [ $LTC(Q) \leq STC(Q)$  for all levels of  $Q$ ].
- long-run cost and short-run cost must be equal on at least one level of output.

(i) **Relationship between the Long-Run Total Cost and Short-Run Total Cost**

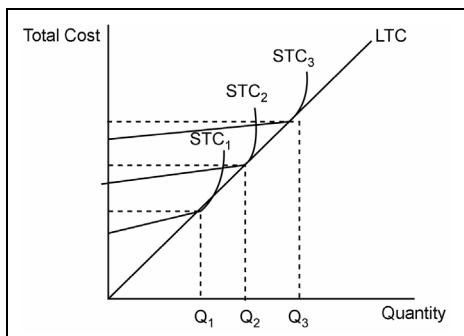
A long-run total cost curve of a firm at one particular level of output is the total cost related to the combination of minimum input cost that can be used to produce the level of output. Therefore, the long-run cost curve is the envelope for short-run cost curve, that is, each point on the long-run cost curve is tangent to a point on a short-run cost curve.

For example, from Figure 6.10, with the size of plant represented by  $STC_1$ , the firm achieves minimum cost when  $Q_1$  is produced. With that,  $STC_1$  and LTC are equal at that particular level of output. Meanwhile, when the size of plant is increased to  $STC_2$ , cost is optimal at  $Q_2$ , hence,  $STC_2$  and LTC are equal at that particular output level. The same goes for all other sizes of plant. When the size of plant can be changed continuously, countless of the amount, hence a smooth LTC curve is formed as we can see in Figure 6.10.



**Figure 6.10:** Short-run total cost curve and long-run total cost curve

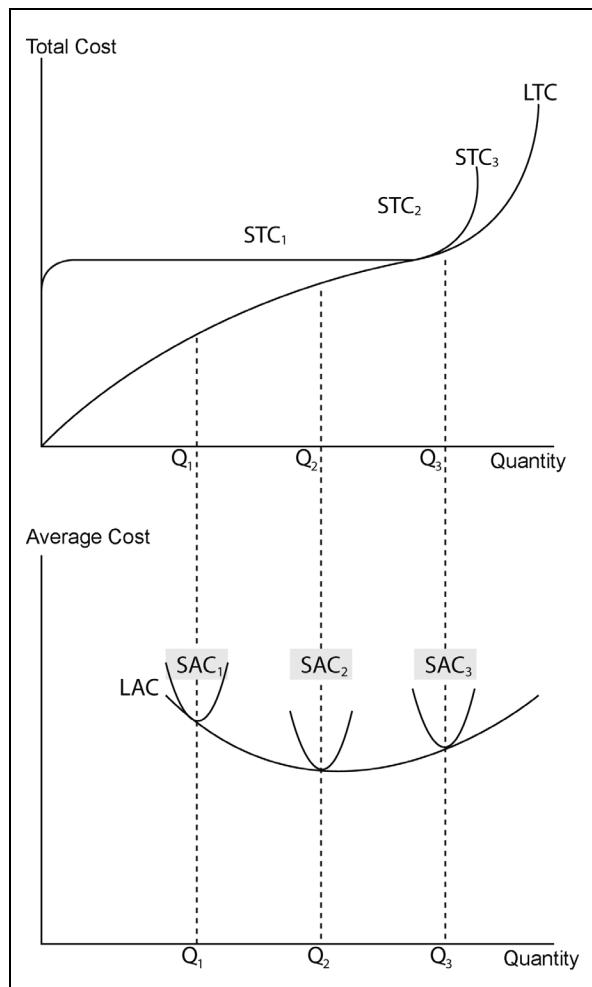
For a firm facing constant economies of scale with a horizontal LAC, the short-run total cost curve and long-run total cost curve is as shown in Figure 6.11. Observe that the short-run optimal output is always equivalent to the long-run optimal output.



**Figure 6.11:** Short-run total cost curve and long-run total cost curve for constant economies of scale

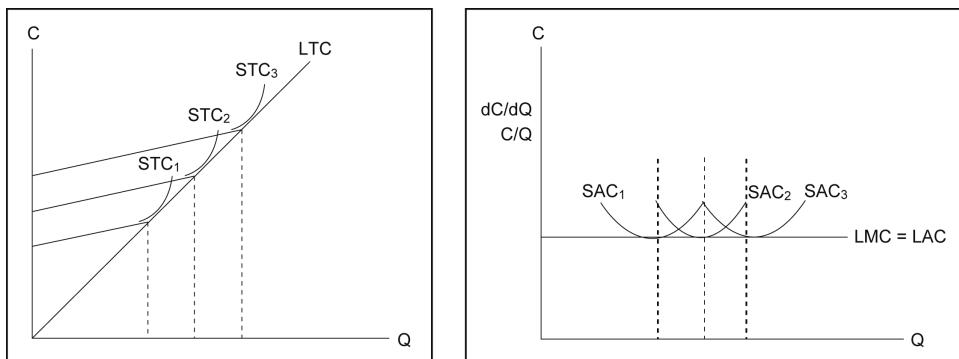
## (ii) Long-Run Average Cost and Short-Run Average Cost

From the relationship between STC and LTC as shown above, the relationship between long-run and short-run average costs and marginal costs, can be illustrated as in Figure 6.12.



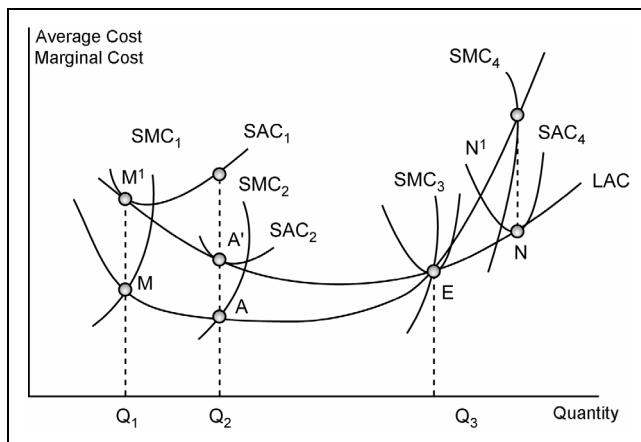
**Figure 6.12:** Short-run costs and long-run costs

Meanwhile, for a firm facing constant economies of scale, average cost curve is horizontal because optimal point of short-run average cost is always equivalent to long-run optimal cost. In this condition, any level of output, and any plant size is considered as the optimal size. The LAC curve for constant economies of scale is shown in Figure 6.13.



**Figure 6.13:** Long-run costs curve of constant economies of scale

From what we have seen, long-run average cost (LAC) curve is the envelope to an amount of short-run average costs (SAC). Each point on LAC touches one point on one SAC related to one plant size. Figure 6.14 illustrates several SAC of various plant sizes for the firm facing a U-shaped LAC. Observe that when LAC decreases, that is, at the left side of point A, the LAC touches the left side of SAC where the short-run cost is decreasing and vice-versa at the right side of A. LAC only touches the minimum point of SAC at the minimum point of LAC.



**Figure 6.14:** Short-run average cost curve and long-run average cost curve

Through the SAC curves, we can see that size gives the lowest production cost for one output tier. If a firm wants to produce as much as  $Q_1$  units, hence the firm will use the first plant size. If a firm wants to produce  $Q_2$  unit, the optimal size will be the second plant due to a lower average cost compared to the first. If the first size is used for  $Q_2$  output, average cost is  $Q_2B$  but if the second plant is used, average cost will be  $Q_2A$ . But if the firm is not able to change the size to plant 2, being in the short-run, cost  $Q_2B$  has to be borne.

However, the optimal size of plant is size 3 because minimum point of SAC touches the minimum point of LAC.

### (iii) Long-Run Marginal Costs and Short-Run Marginal Costs

Long-run average cost is the envelope for short-run average cost, but on the other hand, long-run marginal cost is not the envelope for short-run marginal cost, SMC. However, LMC is equivalent to SMC when LAC is equivalent to SAC. This is because when  $SAC = LAC$ , it means that the short-run total cost is equivalent to the long-run total cost ( $STC = LTC$ ). We know that SMC is the gradient of STC, and LMC is the gradient of LTC. Therefore, when  $STC = LTC$ , then  $SMC = LMC$ . Look at points A and A', and points M and M' in Figure 6.14.

However,  $SMC = LMC = SAC = LAC$  at only one point, that is, the minimum point of LAC. The marginal cost intersects with the average cost at the minimum point of average cost, thus when LAC achieves the minimum point, hence  $LMC = LAC$ , and when SAC is minimum,  $SMC = SAC$ . Therefore, what we can conclude that the optimal point in the long-run is achieved at  $LAC = SAC = LMC = SMC$ .



### EXERCISE 6.3

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. When a firm faces economies of scale when increasing capacity, long-run average cost will decrease.
2. When the marginal product of variable input increases, the marginal cost of production will fall, and when the marginal product of variable input decreases, the marginal cost of production will increase.
3. When a firm faces constant returns to scale in the long-run, total cost is unchanged when the firm increases or reduces its total product.
4. Long-run average cost is the envelope for plant size that gives the minimum average cost for every level of production.
5. When a firm increases its total output in the short-run, average fixed cost will decline initially, but then increases when output increases.



### EXERCISE 6.4

1. Assume that a firm can build 3 different sizes of plant, and the average cost for every plant is shown by the following table:

Output	AC 1 (Plant 1)	AC 2 (Plant 2)	AC 3 (Plant 3)
10	7	17	53
20	5	13	44
30	5	9	35
40	4	6	27
50	5	4	20
60	7	3	14
70	10	4	11
80	14	5	8
90	19	7	6
100	25	10	5
110	32	16	7
120	40	25	10

Based on the table above, and with the assumption that the firm can only operate with these 3 sizes of plant, complete the following table of long-run average cost and marginal cost:

Output	Long-Run Average Cost	Long-Run Total Cost	Long-Run Marginal Cost
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
110			
120			

- (b) The firm will operate at size 1 plant if the firm wants to increase output level of \_\_\_\_\_ units to \_\_\_\_\_ units.
- (c) Firm will operate at size 3 plant if output level to be produced is at \_\_\_\_\_ units to \_\_\_\_\_ units.
- (d) The optimal plant size in long-run is the \_\_\_\_\_ plant.

## SUMMARY .....

- Economic costs consist of private costs and social costs.
- Private cost is the cost borne by the producer, while social cost is the cost borne by the society.
- Private costs consist of explicit costs and implicit costs.
- Explicit cost is the tangible cost such as payment to production factors purchased in market, while implicit cost is the cost for inputs owned by the producer.
- Short-run total production cost consists of total variable costs and total fixed costs. When total cost, total fixed cost and total average cost are divided by total output, average cost, average fixed cost and average variable cost will be obtained.
- Meanwhile, marginal cost is the addition in cost caused by an addition of one unit of output.
- Short-run average cost and short-run marginal cost are mirror images to the short-run average product curve and short-run marginal product curve.
- Firms operating in long-run can choose the optimal capacity from various sizes of plants.
- Therefore, the long-run average cost curve is the envelope for the short-run average cost curve.
- Firms operating in long-run may be facing economies of scale, constant economies of scale, and diseconomies of scale.
- One of the factors that influence economies of scale is the returns to scale.

**KEY TERMS**

Average Fix Costs	Long-Run Costs
Average Variable Costs	Private Costs
Constant Economies of Scale	Production Costs
Diseconomies of Scale	Short-Run Costs
Economic Costs	Social / Extrenal Costs
Economies of Scale	Total Average Costs

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# **Topic** ► Perfectly Competitive Market

## **7**

### **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Explain the characteristics of a perfectly competitive market;
2. Explain how the firm decides on the optimal outputs;
3. Analyse the conditions of profit and loss experienced by the firm;
4. Review the situations where a firm has to shut down operation;
5. Assess how the short-run supply curve of firms and industries are derived; and
6. Design the firm and industry ways to achieve equilibrium in the long-run.

### ► **INTRODUCTION**

As what you have already understood in the introduction section of this unit, the pricing and output decision does not only depend on demand of consumers and costs faced by firms. The pricing and output decision of the firm also depends on the structure of the market in which the firm is operating.

In connection with that, in this topic, we will study the way firms operating in the perfectly competitive market (PCM) determine price and output that maximises their profit. We will begin this lesson by first understanding the characteristics of the perfectly competitive market. Then we will look at the shapes of the demand curve, average revenue curve and marginal revenue curve faced by firms in the perfectly competitive market.

After that, we will study how the perfectly competitive firms achieve equilibrium in the short-run and look at the shape of supply curve of firm. Finally, we will study on how perfectly competitive firms and industries achieve equilibrium in the long-run.

## 7.1 ECONOMIC PROFIT AND ACCOUNTING PROFIT

Firms (regardless in which industry structure) are assumed to have a common goal, that is, to maximise profit. Therefore, you should first understand the concept of profit. This is because profit through the perspective of economists is different from the profit calculated by accountants.

Generally, it is undeniable that the main motive of producers is to maximise profit. In other words, profit is the incentive for producers to produce goods and services.

Profit is the difference between total revenue (TR) with total costs (TC).

However, the calculation of profit from the perspective of an economist differs from the calculation of profit by an accountant. This is because accountants will only consider the explicit costs. Hence, the profit calculated by accountants is referred to as accounting profit.

Meanwhile, for an economist, the explicit costs and implicit costs are both taken into account. Therefore, profit obtained from the calculation by an economist is known as the economic profit. Here, implicit cost refers to opportunity costs.

Let us look at one example:

Mr. Azman has a degree in mechanical engineering. He was offered to work as an executive with a private company with the salary of RM1,250 per month. However, he decided to open a shop selling motorcycle spare parts by withdrawing his savings of RM50,000 to be used as the capital. Rate of returns on the savings is 10% per annum.

He also rented a shop house with the rental of RM600 per month, and hired two workers with the wage of RM700 per month. Besides that, Mr. Azman spent RM40,000 in that particular year to purchase all the necessary equipments needed for his business.

If the total revenue he obtained for that year is RM120,000 minus the explicit cost amounting to RM64,000, hence Mr. Azman gained an accounting profit of RM56,000 per annum.

For an economist, Mr. Azman has to also take into account the implicit costs in calculating his profit. In this example, implicit costs refer to the opportunity costs since Mr. Azman had turned down the job as an executive, that is, at the amount of RM15,000 per annum. Mr. Azman also had to forego the returns of RM5,000 per year for using his savings for the business.

This means that the implicit cost involved is RM20,000 per year. By subtracting the implicit cost from the accounting profit, Mr. Azman is actually gaining an economic profit of only RM36,000 per year.

The difference in calculating accounting profit and economic profit is depicted in the following table:

	RM	RM
Total revenue		
<i>minus</i> Explicit cost:		120,000
Shop rental (RM600 x 12 months)	7,200	
Wage (RM700 x 2 workers x 12 months)	16,800	
Necessary equipments	40,000	
Total explicit cost	<u>64,000</u>	
Accounting profit (Total revenue minus explicit cost)		<u>56,000</u>
<i>minus</i> Implicit cost:		
Salary received as an executive	15,000	
Returns to savings, 10% from RM50,000	5,000	
Total implicit cost	<u>20,000</u>	
Economic profit (Total revenue – Total costs)		<u>36,000</u>



### SELF-CHECK 7.1

Assume there are company A, B, C, and D. All of these companies produce detergent powder with different brands. How is the detergent price of company A, B, C, and D determined?



### ACTIVITY 7.1

In your own words, define the meaning of economic profit. Explain further by using diagrams, and refer to reference books to have a better understanding.

## 7.2

## CHARACTERISTICS OF A PERFECTLY COMPETITIVE MARKET

Generally, a perfectly competitive market can be defined as a market that consists of many firms selling homogeneous products, having perfect market information, and with no restrictions for firms to enter or leave the industry.

A particular market is said to be operating under perfect competition if it has the following characteristics:

(a) **A Large Number of Sellers and Buyers**

The market consists of a large number of sellers and buyers. Therefore, any action by a single seller or buyer will not influence price. This is because the quantity produced (purchased) by a seller (buyer) relatively is very small compared to the quantity produced (purchased) in the market. Therefore, sellers and buyers will only accept the price fixed by the market.

(b) **Goods Produced are Homogeneous**

Every firm in the perfectly competitive market produces homogenous goods. This means that buyers are not able to differentiate the goods sold in the market. The most important implication of this characteristic is firms are not given any power in determining the price. Therefore, firms act only as the 'price taker'.

(c) **Freedom to Leave or Enter Market**

This means that there are no restrictions for a firm to enter or leave the market. If the existing firm experiences positive economic profit, it cannot prevent new firms from entering the market. On the other hand, if the existing firm faces loss, it is free to leave the market. Since firms are free to leave and enter the market, there is always a large number of sellers and buyers in the perfectly competitive market. This freedom is only meant for the long-run. In the short-run however, firms cannot leave or enter market freely.

**(d) Perfect Information**

Every firm and buyer is assumed to have perfect information regarding the goods available in the market and the price fixed. With perfect information available, sellers will not sell goods at a price lower than the market price. Meanwhile, buyers will not purchase goods at a price higher than the market price.

After knowing the characteristics of a perfectly competitive market, now we can look at the shape of the demand curve, average revenue curve and marginal revenue curve of a firm in this market.

**ACTIVITY 7.3**

Can the market for petrol be considered as a perfectly competitive market? Explain your opinion.

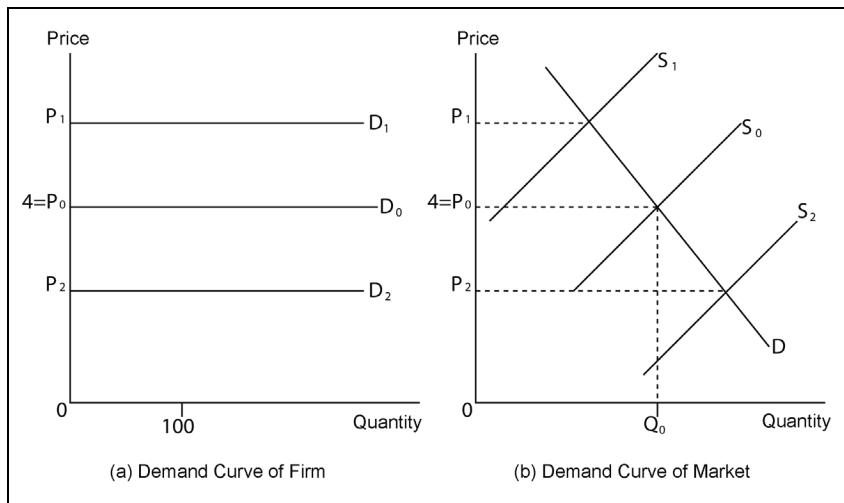
**SELF-CHECK 7.2**

What is meant by a perfectly competitive market, and explain the characteristics of the market.

**7.3****DEMAND, AVERAGE REVENUE AND MARGINAL REVENUE**

One of the features of a perfectly competitive market is that every firm is a price taker. This price is referred to as the market price. We know that the market price is the equilibrium price determined from the intersection of the demand and supply curve.

Hence at a certain level of market price, it is found that the demand curve of every firm is in the form of a horizontal line or is perfectly elastic. A perfectly elastic demand curve means that the firm can sell as many outputs as desired without changing the price level of the goods. Figure 7.1 helps us to identify why demand curve bears a perfectly elastic shape.



**Figure 7.1:** Demand curve of a firm in a perfectly competitive market

In Figure 7.1, market price  $P_0$  is determined in panel (b), that is, when demand curve,  $D$  intersects supply curve,  $S$ . When market equilibrium price has been determined, firm can sell as many quantities as desired at that particular price level. Therefore, at  $P_0$ , individual demand curve is denoted by a horizontal line, curve  $D_0$ . This is shown in panel (a).

Any changes in market price will alter the demand curve of the firm. Let us say that there is a decline in supply, and this is shown by the shift of curve from  $S_0$  to  $S_1$ . In effect, the price will increase to  $P_1$ . This means that the demand curve of firm will shift upwards, to  $D_1$ . On the other hand, if supply in the market increases, curve  $S_0$  will shift to  $S_2$  and this will cause the market price to fall to  $P_2$ . At the market price of  $P_2$ , it is found that individual demand curve shifts downwards to  $D_2$ .

### 7.3.1 Marginal Revenue (MR) Curve and Average Revenue (AR) Curve

From the explanation above, we already know that the demand curve of the firm is perfectly elastic. What is the shape of the average revenue curve and marginal revenue curve of a firm in perfectly competitive market?

Based on Figure 7.1, assume that the market price is RM4. At the price of RM4, the demand curve of the firm is at  $D_0$ . Let us say that at the price level of RM4, the firm will produce 100 units of output initially. Assume that the firm increases its production as shown in Table 7.1:

**Table 7.1:** Total Revenue, Marginal Revenue and Average Revenue in a Perfectly Competitive Market

Output (Unit)	Price (RM)	Total Revenue (TR)	Marginal Revenue ( $\Delta TR / \Delta Q = MR$ )	Average Revenue (TR/Q = AR)
100	4	400	-	4
101	4	404	4	4
102	4	408	4	4
103	4	412	4	4

From Table 7.1, when the firm increases output from 100 units to 101 units, that is, an addition of one unit of output, it is found that the marginal revenue and average revenue of the firm is equal to the price level of RM4. Subsequently, for every additional unit of output we notice that the marginal revenue and average revenue is still equal to RM4.

In conclusion, we conclude that at the price level of RM4, the demand curve of the firm, D, is also the marginal revenue curve and average revenue curve for the firm in a perfectly competitive market.

$$D = P = MR = AR$$



### EXERCISE 7.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Price taker means that every firm in market is not able to determine the price of their self-produced goods.
2. Price of goods are determined by the interaction between sellers and consumers in the market.
3. Inability of sellers to influence price is because the goods produced take up only a small portion out of the total product in the perfectly competitive market.
4. The large number of sellers and buyers in a perfectly competitive market means that both parties do not have the power to determine price.
5. In a perfectly competitive market, demand curve is also the marginal revenue curve and average revenue curve.

## 7.4 PROFIT MAXIMISATION IN THE SHORT-RUN

The main motive of a firm is to maximise profit. How can a firm maximise its profit? We know that perfectly competitive firms do not have the power to determine price. What can be determined is the output to be produced. The question is, what level of output can maximise profit of a firm?

There are two approaches that can be used to determine the level of output:

- (a) Total revenue (TR) and total costs (TC) approach; and
- (b) Marginal revenue (MR) and marginal costs (MC) approach.

### 7.4.1 Total Revenue and Total Costs Approach

To facilitate discussion, we look at the numerical example in Table 7.2:

**Table 7.2:** Numerical Example for Profit Maximisation

Quantity	Total Revenue	Total Costs	Profit/Loss	Marginal Revenue	Marginal Costs
Q (Units)	TR (RM)	TC (RM)	TR-TC (RM)	$MR = \Delta TR / \Delta Q$	$MC = \Delta TC / \Delta Q$
0	0	3	-3	-	-
1	6	5	1	RM 6	RM 2
2	12	8	4	6	3
3	18	12	6	6	4
4	24	17	7	6	5
5	30	23	7	6	6
6	36	30	6	6	7
7	42	38	4	6	8
8	48	47	1	6	9

From Table 7.2, we find that profit (loss) of the firm is obtained by subtracting total cost from total revenue. When the firm does not produce any output, it will face a loss of RM3 which is equivalent to the total fixed cost in the short-run. When production is at 1 unit, profit gained by firm is RM1. Profit increases to RM4 when output produced is at 2 units, and so on.

In order to maximise profit, the firm must produce at the level of output where the gap (range) between total revenue and total cost is the largest. This means,

the firm must produce 4 or 5 units of output because the profit size is the largest, that is, RM7.

### 7.4.2 Marginal Revenue and Marginal Costs Approach

According to this approach, firms that want to maximise profit must produce outputs at the point where marginal revenue is equivalent to marginal costs. From Table 7.2, column (5) shows the marginal revenue of the firm. Marginal revenue is the change in total revenue divided by the change in output, or  $MR = \Delta TR / \Delta Q$ .

In perfect competition, every firm is a price taker. Therefore, if one additional unit of output is sold, total revenue will increase at the same amount as the market price of that particular good. As a result, in perfect competition, marginal revenue is equivalent to market price. From Table 7.2, it is found that marginal revenue, that is, addition in revenue, is RM6.

In the previous topics, we have learnt that marginal cost is the change in cost divided by the change in quantity or  $MC = \Delta TC / \Delta Q$ . Column (6) in Table 7.2 shows the marginal cost of the firm. The marginal cost decreases initially, depicting the law of increasing returns in the short-run when variable inputs are added.

However, the marginal cost then increases when the law of diminishing returns occurs. The firm will increase output as long as every additional unit of output sold will produce more total revenue compared to total cost, or in other words, as long as marginal revenue exceeds marginal cost.

Referring to Table 7.2, the firm must produce 6 units of output in order to maximise profit because at this level, the marginal revenue is equivalent to the marginal cost. Therefore, an important rule that must be fulfilled by the firm in order to maximise profit is to produce at a level where **marginal revenue is equivalent to marginal cost**.

## 7.5 SHORT-RUN EQUILIBRIUM OF THE FIRM

How does a firm in a perfectly competitive market achieve equilibrium in the short-run? We know that the main goal of the firm is to maximise its profit. This means that the firm will continuously produce output at a level where  $MR = MC$ . Hence, the firm will be in an equilibrium state when it fulfils this rule.

The question is, if the firm is in an equilibrium state, will it gain profit or loss instead? This is because in the short-run, the firm might gain normal profit, supernormal profit or subnormal profit.

Now let us look at each of these situations.

### 7.5.1 Supernormal Profit

From the explanation above, you have understood about the rule that needs to be fulfilled by the firm in determining the output that will maximise its profit. Therefore, based on the information provided in Table 7.2, we can draw a diagram to illustrate the level of output that will maximise profit of the firm.

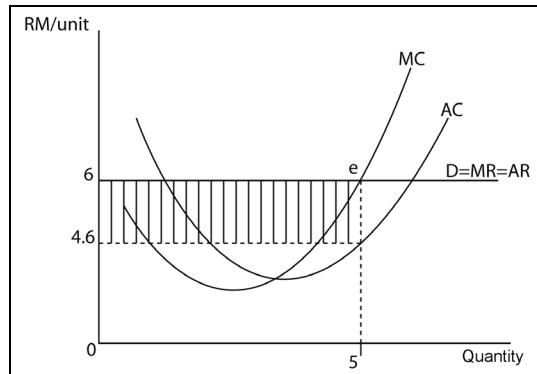
In a perfectly competitive market, since marginal revenue is equivalent to market price, hence the marginal revenue curve is a horizontal line at the market price level of RM6. This also indicates that the demand curve of the firm is also the marginal revenue curve.

The firm will gain RM6 for every unit of output sold and this is also the average revenue for the firm. Average revenue (AR) is total revenue divided by quantity, or  $AR/Q$ . Thus, the demand curve of the firm ( $D$ ) is also the marginal revenue (MR) curve and average revenue (AR) curve. In conclusion,  $D$  is the demand curve, marginal revenue curve and average revenue curve of the firm, that is,  $D = MR = AR$ .



#### ACTIVITY 7.4

Why is the demand curve of perfectly competitive firm also the marginal revenue (MR) curve, and the average revenue (AR) curve? Explain your answer.



**Figure 7.2:** Equilibrium of the firm with supernormal profit

A firm achieves equilibrium in the short-run when it produces output at the level where  $MR = MC$ . Referring to Figure 7.2, we find that the firm achieves equilibrium at point e. At this level of equilibrium, the firm must produce 5 units of output in order to maximise its profit.

If the output level is less than 5 units, it is noted that the marginal revenue exceeds marginal cost. Therefore, the firm needs to increase production to increase profit.

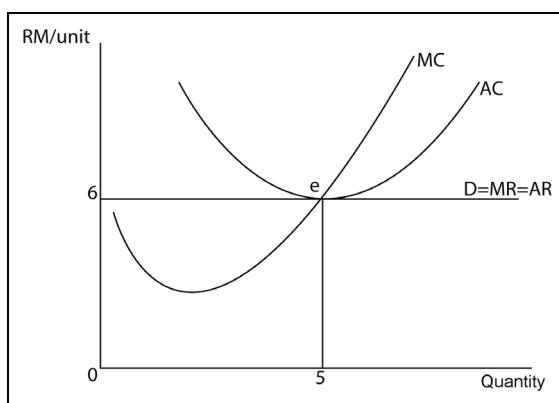
On the other hand, if output produced is more than 5 units, the firm needs to reduce production to increase profit since the marginal cost exceeds marginal revenue.

At the equilibrium point, it is found that average cost (AC) curve is situated below the demand curve. This indicates that the firm gains supernormal profit. Profit gained by firm is denoted by the shaded area. Total profit is:

$$\begin{aligned}
 & \text{Total Revenue} - \text{Total Cost} \quad \text{or} \quad (\text{Price} - \text{Average Cost}) \times \text{Quantity} \\
 &= (P \times Q) - (AC \times Q) \quad = (6 - 4.6) \times 5 \\
 &= (6 \times 5) - (4.6 \times 5) \quad = (1.4) \times 5 \\
 &= 30 - 23 \quad = \mathbf{RM7} \\
 &= \mathbf{RM7}
 \end{aligned}$$

### 7.5.2 Normal Profit

Normal profit is a condition where the total revenue gained by a firm is only enough to cover its total production cost, or when price of one unit of output is equivalent to its average cost.



**Figure 7.3:** Equilibrium of the firm with normal profit

Referring to Figure 7.3, observe that the firm achieves equilibrium at point e, that is, when  $MR = MC$ . Assume at that equilibrium level, the firm produces 5 units of output with the price of RM6 per unit. The firm's cost per unit is also equal to the price, that is, RM6. This is indicated by average cost (AC) curve touching the demand curve at point e. This is because

Total Revenue – Total Cost      or	$(Price - Average\ Cost) \times Quantity$
$= (P \times Q) - (AC \times Q)$	$= (6 - 6) \times 5$
$= (6 \times 5) - (6 \times 5)$	$= 0 \times 5$
$= 0 - 0$	$= \text{RM}0$
$= \text{RM}0$	

Since total revenue is equivalent to total cost, hence the firm will only gain normal profit in the short-run.

### 7.5.3 Subnormal Profit/Economic Loss

Firms in a perfectly competitive market might experience subnormal profit in the short-run. Subnormal profit is a condition where the price of one unit of output is lower than the production cost per unit of output, or total cost exceeds total revenue of firm. This situation is shown in Figure 7.4.

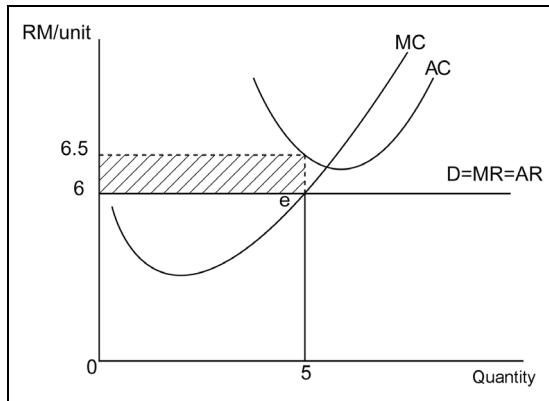


Figure 7.4: Equilibrium of firm with subnormal profit

Figure 7.4 depicts that the firm achieves equilibrium at point e. At that point of equilibrium, the firm will produce 5 units of output in order to maximise its profit. Firm imposes a price of RM6 per unit.

However, the production cost per unit is higher than the price per unit, that is, RM6.50. This is indicated by the average cost (AC) curve that is above the

demand curve. In conclusion, the firm gains subnormal profit in the short-run. The shaded area in the diagram denotes the loss faced by firm.

$$\begin{array}{ll} \text{Total Revenue} - \text{Total Cost} & \text{or} \\ = (P \times Q) - (AC \times Q) & (Price - Average Cost) \times Quantity \\ = (6 \times 5) - (6.5 \times 5) & = (6 - 6.50) \times 5 \\ = 30 - 32.50 & = -0.50 \times 5 \\ = -\text{RM}2.50 & = -\text{RM}2.50 \end{array}$$



### ACTIVITY 7.5

In the short-run, a firm may gain **THREE** types of profit. What are these three types of profit? Illustrate them in a suitable diagram.

Is it true that subnormal profit will attract new firms to enter the market? Explain your answer.

#### 7.5.4 Decision on Firm Closure



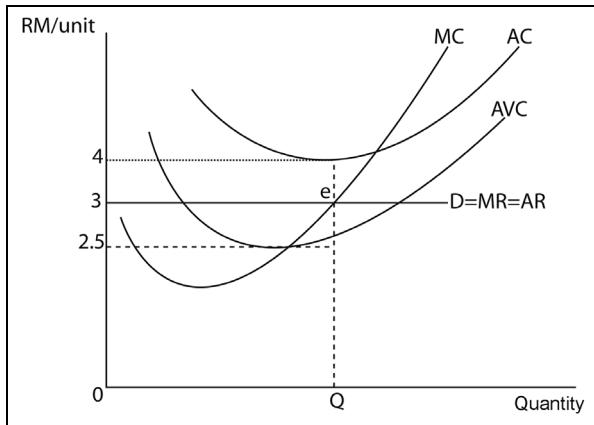
### SELF-CHECK 7.3

What will happen if a firm is unable to gain profit at every level of output? Should the firm close down its operations?

In the discussion above, we have analysed that a firm needs to produce output at the level where  $MR = MC$  in order to maximise its profit. We also have understood that at the equilibrium level, a firm might experience loss. Now, we will study on when a firm will close down its operations due to loss.

We know that the rule to maximise profit in the short-run is to produce at the level where price (marginal revenue) is equivalent to marginal cost.

This is because, if the price is lower than the minimum point of the AVC curve, it will be much better if the firm shuts down its operations (not producing anymore output) in the short-run. This can be further clarified by referring to Figure 7.5.



**Figure 7.5:** Decision of closure of firm in the short-run

Let us say market price is at RM3.00 and equilibrium of the firm is achieved at point e where  $MR = MC$ . It is found that the firm faces loss because the average cost (AC) of RM4.00 is much higher than the price of one unit of output.

However, the firm continues its operations since the total revenue gained can still cover the variable costs and a portion of the fixed costs. If the firm stops its operations, the firm will face a bigger loss because without any revenue, it has to bear all the fixed costs.

When price decreases further to RM2.50, it is found that the total revenue can only cover the variable costs, meaning the firm has to bear the fixed costs. If price decreases lower than RM2.50, the firm needs to close down its production operations in the short-run because its total revenue can no longer cover both costs.

We know that the variable costs exist when production is being carried out. Therefore, if production is stopped, the firm will only have to bear its fixed costs. In conclusion, the firm will close down its operations if it faces a condition of price being lower than the average variable costs, or  $P < AVC$ .

Since fixed cost is beyond the control of firm in the short-run, TR gained must at least be able to cover the variable costs. If not, there is no use for the firm in paying the salary of workers and the costs of raw materials if TR is unable to cover the expenditure for purchasing variable inputs.

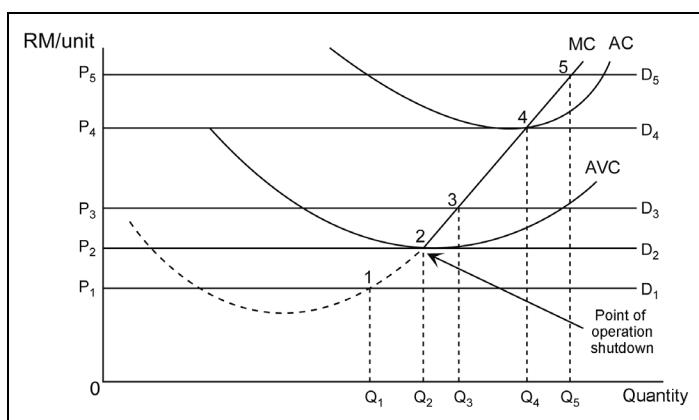


### ACTIVITY 7.6

Firms in a perfectly competitive market will continue to operate even when facing loss. Discuss this issue with your friends.

## 7.6 SUPPLY CURVE OF FIRM IN THE SHORT-RUN

A firm will change its level of output when the market price changes. It will continuously produce output at the level where  $MR = MC$  as long as price is higher than the average variable costs. A firm will shut down production operations if price is lower than the average variable costs. Production operations closure does not mean the firm closes down its business. It means that the firm does not produce goods in the short-run and will continue production in long-run.



**Figure 7.6:** Supply curve of firm in the short-run

In Figure 7.6, points 1, 2, 3, 4, and 5 indicate points where the marginal cost intersects with various demand curves or marginal revenue curves. At the price level of  $P_1$ , it is better for the firm to shut down its operations rather than carrying out production at point 1. This is because the price level is lower than the minimum point of  $AVC$  curve. In other words, the revenue gained by the firm is no longer able to cover variable costs. Hence, at  $P_1$  the firm's output equals to zero as denoted by  $Q_1$ .

At  $P_2$ , the firm is in a condition of indifference between producing  $Q_2$  and closing down operations because in whichever condition, the firm's loss is equal to the fixed cost as price only accommodates the average variable costs. Point 2 is referred to as **point of operation shutdown**.

When price is at  $P_3$ , the firm will produce  $Q_3$  to minimise loss. At price  $P_4$ , the firm will produce  $Q_4$  of output and will only gain normal profit. Subsequently, at price  $P_5$ , the firm will produce  $Q_5$  of output and gain supernormal profit since the price is much higher than the average cost.

From the explanation above, we find that as long as price is high enough to cover the average variable costs, the firm will continue to produce output when marginal cost intersects marginal revenue. In other words, the supply curve of firm in the short-run is the marginal cost curve that begins at and is on the point of firm shutdown, or  $P = \text{minimum AVC}$ .



### EXERCISE 7.2

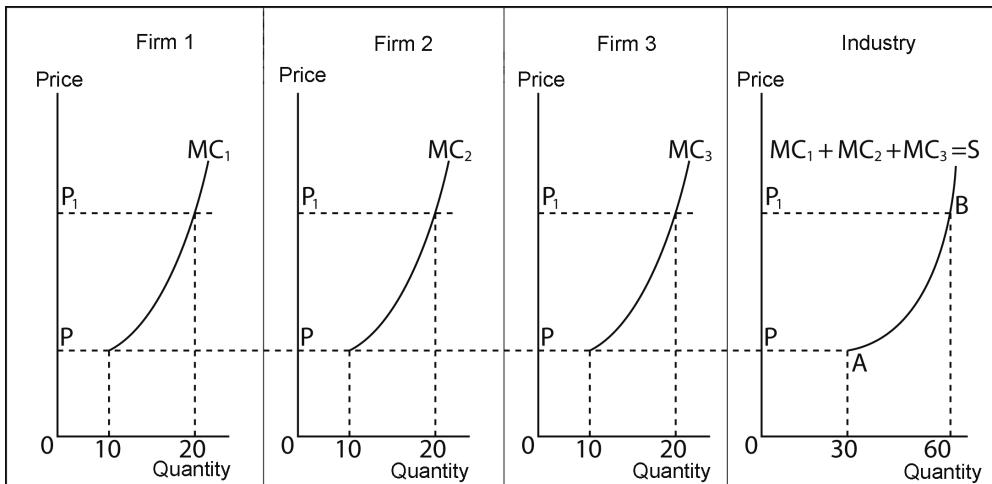
Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. In a perfectly competitive market, firms have the mobility to exit and enter market.
2. Sellers are inclined to sell goods at a price higher than the market price, and buyers will not purchase goods at a price higher than the market price.
3. The government does not intervene in production; the level of market price is determined by market supply and demand.
4. Production factor moves freely between the firm and its uses.
5. In order to achieve efficiency in the usage of production factors, firms will not take into account social costs such as environmental pollution, congestion, flood problem and others.

## 7.7

## SUPPLY CURVE OF THE INDUSTRY IN THE SHORT-RUN

From the discussion above, we know that the marginal cost curve of every firm indicates how much output will be produced by the firm at various levels of market price. Therefore, the supply curve of the industry in the short-run is derived by summing up the quantities produced by each firm present in the market, or the horizontal summation of marginal costs curves of each firm.



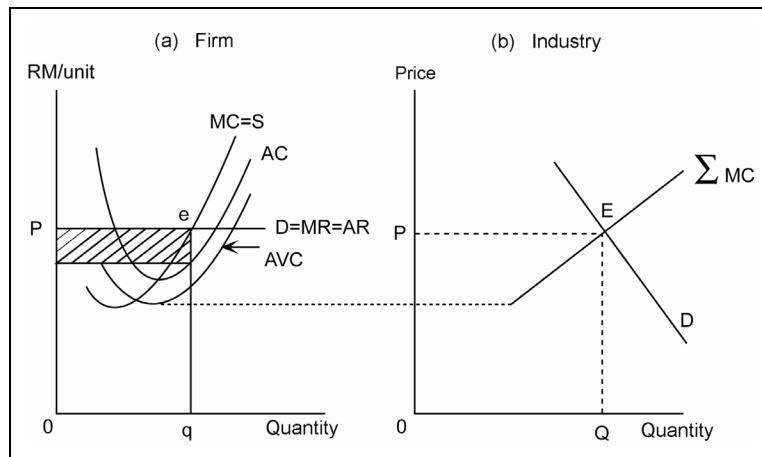
**Figure 7.7:** Supply curve of industry in short-run

Figure 7.7 illustrates how supply curve of the industry is derived with the assumption that there are three firms, Firm 1, 2 and 3, in the industry. The supply curve of each firm is denoted by curves  $MC_1$ ,  $MC_2$ , and  $MC_3$  that starts from the price level of  $P$ . At the price level of  $P$ , each firm supplies 10 units of output. This means that the total quantity supplied in the market is 30 units as indicated by point A.

When price increases to  $P_1$ , it is found that each firm supplies 20 units of output. Therefore, the total quantity in the market increases to 60 units and this is denoted by point B. When point A and point B are connected, the connecting line is referred to as the supply curve of the industry in the short-run which is the horizontal summation of  $MC_1$ ,  $MC_2$ , and  $MC_3$ .

### 7.7.1 The Relationship between the Firm's Equilibrium and the Industry's Equilibrium in the Short-Run

Based on the discussion in the previous topic, we have understood that market price equilibrium is achieved when the total quantity demanded is equivalent to total quantity supplied. We know that every firm will adopt the equilibrium price in order to maximise their profit in the short-run because it will produce output at the level where marginal cost is equivalent to price (marginal revenue).



**Figure 7.8:** The relationship between profit maximisation of the firm in the short-run with market equilibrium

Figure 7.8 illustrates the industry (market) equilibrium and the firm equilibrium in the short-run. Market equilibrium, E is achieved when demand curve (D) intersects the supply curve ( $S$ ). Curve  $S$  is the horizontal summation of the marginal costs of every firm present in the market. Equilibrium price and quantity are achieved at P and Q.

Since firms are price takers, the demand curve of the firm is a horizontal line denoted by curve  $D = MR = AR$  at the price level of P. In order to maximise profit, the firm will produce output when the MC curve intersects the demand curve (which is also the MR curve).

Firm equilibrium is achieved at point e by producing  $q$  units of output and imposing a price of P. At the level of equilibrium, it is found that the firm gains positive economic profit since the AC curve is situated below the price line. Profit of the firm in the short-run is denoted by the shaded area in the diagram.



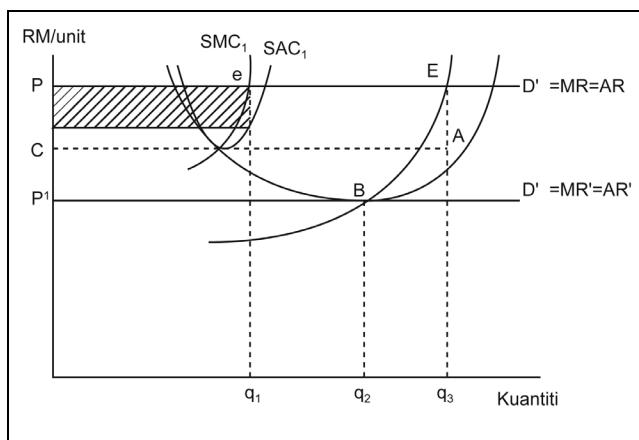
### ACTIVITY 7.8

If a firm wishes to maximise its profit in the short-run, what is the rule that needs to be fulfilled? Explain how the rule ensures the firm maximises its profit.

## 7.8 LONG-RUN EQUILIBRIUM OF THE FIRM

In the long-run, a firm can change all the inputs used and choose the size of plant to produce output. Now we will look at how the aim to maximise profit helps a firm to make decisions in the long-run.

The rule used to maximise profit in the short-run, that is,  $MR = P = MC$  will also be used in the long-run. The difference is firms will be facing costs curve in the long-run.



**Figure 7.9:** Profit maximisation in long-run

From Figure 7.9, we can see that at the price level  $P$ , the firm achieves equilibrium in the short-run at point  $e$ , that is when the firm produces output at the point where  $P = MR = SMC_1$ . Output produced ( $q_1$ ) is produced using the plant denoted by the average costs curve ( $SAC_1$ ), and marginal costs ( $SMC_1$ ) in the short-run. It is found that the firm gains supernormal profit as denoted by the shaded area of the diagram.

However, this short-run equilibrium is only a temporary equilibrium because if price does not move from  $P$ , the firm will expand the size of its production plant to increase profit. Referring to Figure 7.9, it is observed that the firm will expand its plant (curve  $SAC_1$ ) until point  $A$  because profit is maximised.

In the long-run, the firm can change all inputs used and expand the size of plant used. Therefore, Figure 7.9 illustrates the long-run average costs (LAC) curve and long-run marginal costs (LMC) curve of a firm in a perfectly competitive market.

Let us assume that the market price equilibrium remains unchanged at  $P$ . In the long-run, in order to maximise its profit, the firm must be at the level where

$MR = LMC$ . The output that maximises profit is  $q_3$ . To produce  $q_3$  units of output, firm has to expand the size of its plant, that is, the short-run average costs curve (not drawn) until it touches the LAC curve at point A.

The long-run equilibrium of the firm is achieved at point E and the firm has gained a larger total profit when producing output at  $q_3$ . The area of profit is denoted by CPEA. Hence, the plant at point A illustrates the firm in its short-run and long-run equilibrium as long as there are no changes in the market (that will change level of price).

### 7.8.1 Coordination in Long-run

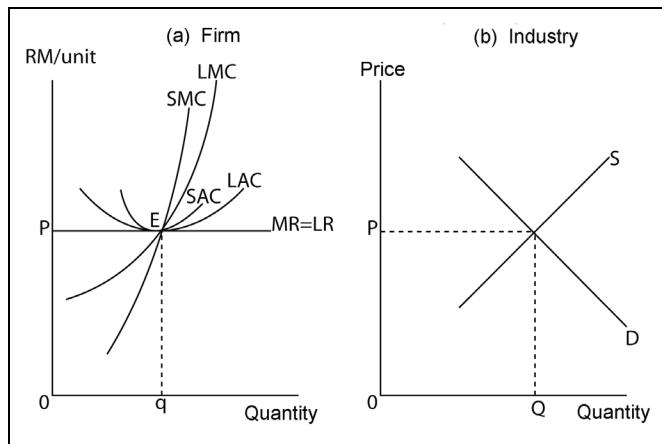
The previous discussion assumed that market price is fixed at P. However, we need to consider the important feature of a perfectly competitive market, that is, firms are free to enter and leave the market. We know that in the short-run, firms may gain supernormal profit, normal profit, or subnormal profit.

Based on Figure 7.9, a firm is shown to gain supernormal profit in the short-run. When firms existing in the market gain supernormal profit, new firms will be attracted to enter the market in order to enjoy the profit as well. This will increase supply in the industry that will further lead to price decline.

This process continues until price is equivalent to average costs, let us say at  $P_1$ . At the price level of  $P_1$ , it is found that the demand curve touches the LAC curve at point B. Output that will maximise profit is at  $q_2$ . At the level of long-run equilibrium of  $q_2$ , the firm will only gain normal profit because price is equivalent to cost per unit.

## 7.9 LONG-RUN EQUILIBRIUM OF THE INDUSTRY

The long-run equilibrium of the industry is achieved when all firms present in the market are at equilibrium and only gain normal profit. This means every firm in the industry will produce at the level where price is equivalent to the minimum point of the long-run average costs curve. This is illustrated by Figure 7.10.



**Figure 7.10:** Equilibrium of industry in the long-run

From Figure 7.10, the equilibrium price and quantity of the industry is  $P$  and  $Q$ . At the price level of  $P$ , each firm achieves equilibrium at point  $E$  and produces  $q$  units only. Each firm will only gain normal profit in the long-run. At the long-run equilibrium, each firm produces output when  $P = SMC = SAC = LMC = LAC$ . At this level, there are no more incentives for the firm to leave and enter market.



### EXERCISE 7.3

#### Problem Question

1. The table below shows the costs faced by a firm in a perfectly competitive market.

Output (Unit)	AC (RM)
1	400
2	225
3	170
4	148
5	140
6	140
7	146
8	156
9	171
10	190

- (a) If the level of price equilibrium is at RM140, the firm will produce \_\_\_\_\_ units of output.
- (b) If the level of market price is at RM179, hence profit per unit at the equilibrium level is \_\_\_\_\_.
- (c) In the long-run, what is the production level at the point of firm shutdown?
- (d) At the output level of 3 units, what are the conditions of the marginal costs curve and average costs curve?

After going through this topic, you are advised to take a short break before proceeding to the following sections.

## 7.10 SUPPLY CURVE OF INDUSTRY IN LONG-RUN

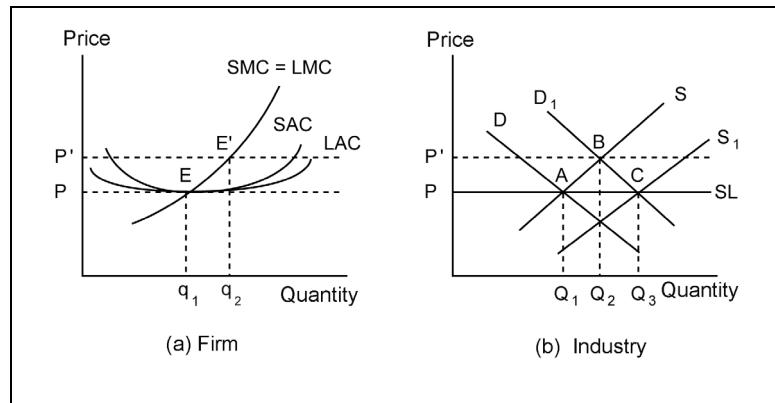
We have understood that the supply curve of an industry in the short-run is the horizontal summation of the supply curve of every firm in the market. However, the supply curve of an industry in the long-run cannot be derived in the same method. This is because in the long-run, coordination process occurs, where firms will leave and enter the market depending on the profit gained.

Therefore, we cannot determine which firm's supply curve to be summed up horizontally. This causes the long-run supply curve of a perfectly competitive industry to take into consideration the change in input price when the industry expands.

When the industry expands, there are three possibilities that might occur towards input price, which are price will increase, price is unchanged (constant), or price will decrease. Therefore, in the long-run, perfectly competitive industries will be classified into constant-cost industry, increasing-cost industry and decreasing-cost industry. The shape of industry supply curve in long-run is based on this classification.

### 7.10.1 Constant-cost Industry

To understand how the supply curve of the constant-cost industry is formed, refer to Figure 7.11 for further explanation.



**Figure 7.11:** Long-run supply curve of constant-cost industry

Figure 7.11 illustrates the long-run equilibrium in industry facing constant costs. Let us see the starting initial point of equilibrium of the firm, E, that is, when the demand curve touches the minimum point of the long-run average costs (LAC) curve and short-run average costs (SAC) curve. Industry equilibrium is at point A, and the total market output is  $Q_1$  meaning that every firm only produces  $q_1$  units of output.

Now assume that there is an unexpected increase in demand. This will cause the demand curve to shift to  $D_1$  and the industry equilibrium is now at point B where market price increases to  $P'$ . In the short-run, the firm will produce  $q_2$ , that is, when  $P = SMC$  at point  $E'$ . This condition is only a short-run equilibrium due to coordination effects in the long-run by profit-seeking firms.

The condition of supernormal profit gained by existing firms will encourage new firms to enter the market and this will result in an increase in supply in the market as depicted by the shift of the supply curve to the right.

When the supply of output in the market increases, demand towards input will also increase. However, in the constant-cost industry it is found that an increase in input demand will not result in an increase of input price.

Hence, the entry process of new firms and the increase in supply will reduce price until finally all firms gain normal profits only. In other words, at the new level of the long-run equilibrium, all firms will only gain normal profits.

Since there is no increase in input price, the supply curve will shift to  $S_1$  and the new equilibrium of the industry is achieved at C. The market price drops to the initial price of P. Point C is the second point in the long-run supply curve. At the demand curve  $D_1$ , the supply of industry expands to  $Q_3$  and price at P.

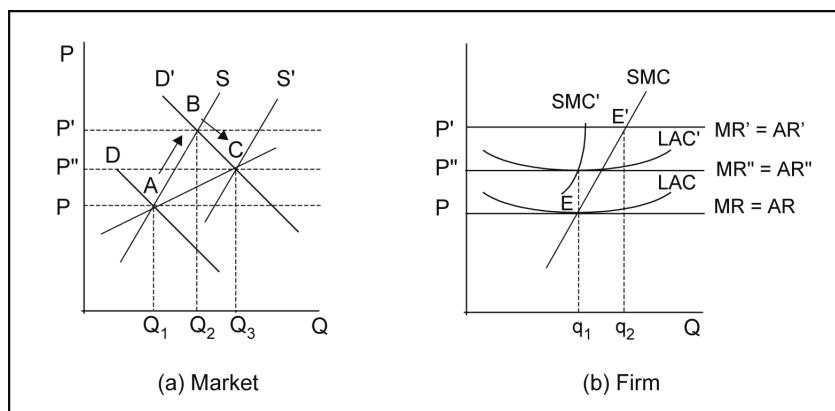
Each firm produces  $q_1$  output and only gains a normal profit. Increase in the industry output from  $Q_1$  to  $Q_3$  is due to the entry of new firms.

Hence, the constant-cost industry in a perfectly competitive market faces a perfectly elastic long-run supply curve, that is, curve  $S_L$  as in the Figure above.

## 7.10.2 Increasing-cost Industry

Competitive industries facing increasing costs will have a long-run supply curve with a positive slope from left to right. We will derive a long-run supply curve for an increasing-cost industry using the same method we used to derive the curve in the constant-cost industry.

Figure 7.12 illustrates this condition. Let us say that the initial equilibrium of the industry begins at point A where the equilibrium price and quantity is P and  $Q_1$ . The firm produces  $q_1$  at the price of P, and the long-run equilibrium at E.



**Figure 7.12:** The long-run supply curve in an increasing-cost industry.

Now assume that the market demand increased unexpectedly and this is shown by the shift of the demand curve from D to  $D'$ . Market equilibrium is now at point B which is the short-run equilibrium. Price increases to  $P'$  and output increases to  $Q_2$ . The firm will offer  $q_2$  units of output, that is when the SMC curve intersects with the new demand curve at  $P'$ , and gained supernormal profit.

In the long-run, supernormal profit gained by the firm in the industry will attract new firms to enter the market. Output in the market will increase and this causes the demand towards input to also increase and subsequently resulting in an increase of input price.

Therefore, we will look at how these two different conditions will influence the coordination process in the long-run. Supernormal profit in the short-run will expand the output in the market due to the entry of new firms, and this will be depicted by the shift of the supply curve. This causes a price decline and eventually will reduce profit.

At the same time, input price increases due to an increase in input demand. This condition will increase cost and reduce profit. These two effects will continuously influence the new long-run equilibrium achieved where all firms will only gain zero economic profit.

Based on Figure 7.12, when price increases to  $P'$ , it is found that new firm starts entering the market. This will cause the supply curve  $S$  to shift to  $S'$  and the price will decrease to  $P''$ . Therefore, the demand curve of the firm will shift downwards along with the price decrease, that is from  $P'$  to  $P''$ , and this will reduce profit. At the same time, the increase in input price will shift the costs curve of the firm upwards, that is, from  $LAC$  to  $LAC'$ .

Price decrease and increase in costs will finally eliminate the profit gained by the firm. This occurs at the price level of  $P''$ , that is when price is equivalent to cost per unit. Output is produced at the point where price is equal to the minimum point of the  $LAC'$  curve and this indicates that the new long-run equilibrium has been achieved.

The new long-run equilibrium of the industry is achieved at point C. Connecting points A and C will form the long-run supply curve in a perfectly competitive industry facing an increasing cost,  $S_L$  that is positively sloping from left to right.

The concept of increasing cost illustrates that the costs curves of all firms increases when the industry expands because the expansion of output will result in an increase of input price.

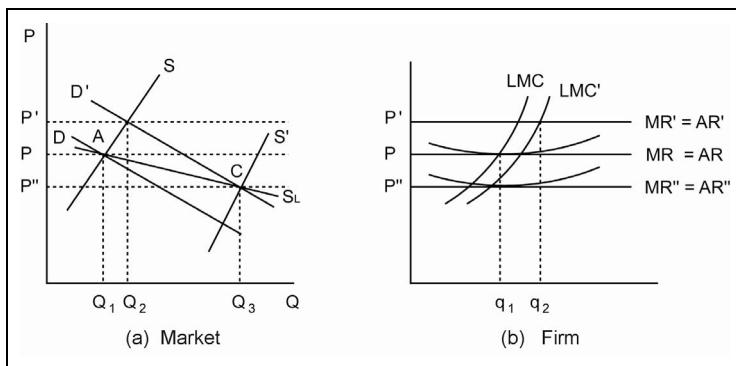
### 7.10.3 Decreasing-cost Industry

The supply curve of an industry facing decreasing costs is a curve that slopes negatively from left to right. The explanation for the formation of the long-run supply curve of the decreasing-cost industry is similar to the way we explain the formation of the long-run supply curve of an increasing-cost industry.

The difference is when demand in the market increases, output will expand and it is found that the expansion of output will decline the costs curve of each firm. The downwards shift of the costs curve is due to the reduction in input price.

The question is, how does an increase in demand for input (due to the increase in quantity of supply) can reduce the price of input? We know that in the long-run, a firm can expand its capacity and this will allow the firm to enjoy economies of scale, that is, the increasing returns to scale.

Besides that, the entry of new firms will facilitate the occurrence of economies of scale resulting in the decrease of input price. This is the condition that causes the supply curve of a decreasing-cost industry to slope negatively from left to right. This can be seen in Figure 7.13.



**Figure 7.13:** The long-run supply curve in a decreasing-cost industry

From Figure 7.13 the initial long-run equilibrium of the industry is at point A. The firm is also in a long-run equilibrium when the LAC curve touches the demand curve at the price level of P. When demand increases, the demand curve will shift from D to D', and price increases to P'. Point B is the short-run equilibrium, that is, at the price level of P' existing firms will gain supernormal profit.

Therefore, new firms will enter the market and this will result in the expansion of output. This is depicted by the shift of the supply curve to the right from S to S'. When output expands, the demand towards input increases and in a decreasing-cost industry, it is found that the costs curve shifts downwards indicating a reduction in input price.

Hence, the supply curve will shift until S' where at the price level of P'', the long-run equilibrium of the industry and firm is achieved where all firms will only gain normal profit.

The new long-run equilibrium of the industry is at point C. When point A and point C are connected, we will derive the long-run supply curve for the decreasing-cost industry that is curve  $S_L$ .

## 7.11 PERFECT COMPETITION AND EFFICIENCY

A particular market is always related to whether it has achieved efficiency in the economy. There are two concepts of efficiency, namely:

- Productive efficiency, that is, producing output at the lowest cost; and
- Distributive efficiency referring to the emphasis on production of output that will benefit the consumers.

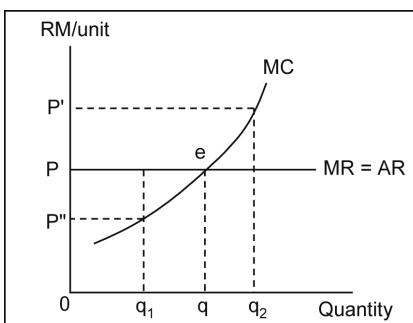
### (a) Productive Efficiency

Productive efficiency occurs when the firm produces at the minimum point of the long-run average costs curve where price is equivalent to average cost. We know that in the long-run, firms in perfect competition can freely enter and leave the market.

Long-run coordination will stop when the firm achieves long-run equilibrium in which it produces at the level where price is equivalent to the minimum point of the long-run average cost curve. Production at point  $P = \text{minimum LAC}$  indicates that perfectly competitive firm has achieved productive efficiency.

### (b) Distributive Efficiency

Distributive efficiency occurs when the firm produces output at a level that is most desired by consumers. We know that a perfectly competitive firm will produce at the level of  $P = MC$  in the short-run. Why does a firm not produce at a level where  $P < MC$  or  $P > MC$ ? Look at Figure 7.14 for further explanation.



**Figure 7.14:** Distributive efficiency for a perfectly competitive firm

The firm will achieve equilibrium at e if it produces output at  $P = MC$ . If the firm produces output at  $q_1$  where  $P > MC$ , we find that the price per unit, P is much higher than addition in cost ( $P''$ ) in order to produce the  $q_1$  unit. Therefore the firm needs to increase output as long as the price is much higher than the addition in cost to produce one additional unit of output in order to maximise profit.

Meanwhile, from the society's point of view, producing output at the area of  $P > MC$  is referred to as less distribution of resources used in the production of the good. On the other hand, producing output at the level where  $P < MC$  will cause a loss to the firm since the addition in costs (P) to produce the  $q_2$  unit is much higher than price per unit, P.

The society view the area at  $P < MC$  as excess distribution of resources used in the production of the good. Therefore, producing at the level of  $P = MC$  is the level of distributive efficiency that will be achieved by the firm in perfect competition.

## SUMMARY

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- Perfectly competitive firms only take the price that has been fixed by the market. In order to maximise profit, firms will produce output at levels where price is equivalent to marginal costs. In the short-run, there are three possibilities of firm profit, namely the subnormal profit, normal profit, and supernormal profit. If the price is lower than the average variable costs, the firm will shut down its operations in the short-run.
- In the discussion above, we have also studied about the shape of supply curves of perfectly competitive firms and industries in the short-run. Later, we have also looked at how equilibrium of the firm and industry is achieved in the long-run. Due to the factor of freedom of entering and leaving market, firms in a perfectly competitive market only gain normal profit in the long-run.
- Finally, we looked at how the shape of the long-run supply curve of an industry is derived based on costs. Getting the picture on how firms operate in a perfectly competitive market, will help us to study firm behaviour in the next market structure.

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# Topic ► Monopoly Market

## 8

### LEARNING OUTCOMES

By the end of this topic, you should be able to:

1. Describe the meaning of monopoly and sources of monopoly power;
2. Differentiate monopoly market from other market structures;
3. Explain how price and output that maximises profit of a monopoly firm are determined;
4. Explain the concept of monopoly implemented in the monopoly market; and
5. Apply the theory of price discrimination in the monopoly market.

### ► INTRODUCTION

What is a monopoly market? A monopoly market is a market structure that contradicts the perfectly competitive market.

Besides that, there are other characteristics that differentiate monopoly market and perfectly competitive market. In this topic, these characteristics will be described in detail.

The **monopoly market** (or usually referred to as the monopoly) can be defined as a market that consists of only one firm or seller.

## 8.1 CHARACTERISTICS OF A MONOPOLY MARKET



### SELF-CHECK 8.1

In your opinion, why is there only one firm that controls the production of a particular good or service?

The main characteristics that differentiate a monopoly from a perfectly competitive market are as shown in Figure 8.1:

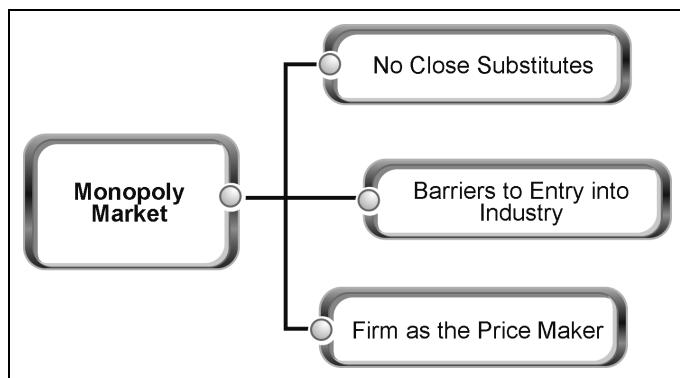


Figure 8.1: The features of a monopoly market

### 8.1.1 No Close Substitutes

Goods produced by a monopoly do not have close substitutes in terms of the consumption of the good. In Malaysia, Tenaga Nasional Berhad (TNB) is the best example of a monopoly. Electricity supplied by TNB cannot be substituted with other forms of energy. Even though there might be other goods that can substitute the use of electricity, the good may still be limited in terms of its use and nature.

Candles, for example, can be used to provide light and substitute electricity power during blackout, but its use is limited. It cannot be used to receive television or radio programmes, or to turn on an electric fan.

### 8.1.2 Barriers to Entry into Industry

Unlike the perfectly competitive market, monopoly has the power to restrict the entry of other firms into the industry. This restriction is due to several reasons such as:

- (i) license given by the government;
- (ii) control over production resources; and
- (iii) having the benefits of economies of scale, and others.

This will create monopoly power in a particular industry. Monopoly power will be explained in the following section of this chapter.

### 8.1.3 Firm as the Price Maker

As mentioned from the beginning, a monopoly market consists of only one firm that controls the whole market. This enables the monopolist to solely determine the price of goods or services provided.



#### ACTIVITY 8.1

In your opinion, why can similar goods or services be sold at different prices to two different consumers?

## 8.2

### POWER SOURCE OF MONOPOLY



#### SELF-CHECK 8.2

Before proceeding with your readings, determine which of these are considered a monopoly?

- (a) Tenaga Nasional Berhad
- (b) Celcom (M) Berhad
- (c) Perbadanan Urus Air Selangor (PUAS)
- (d) Malaysian Airline System (MAS)
- (e) Sistem Televisyen Malaysia Berhad (TV3)

There are several sources that cause monopoly power:

- (a) Control over certain production resources;
- (b) Economies of scale; and
- (c) Legal barriers

### 8.2.1 Control Over Certain Production Resources

A monopoly can occur when a particular firm is able to control a large portion or the entire supply of raw material that cannot be afforded by other firms. Telekom Malaysia Berhad is one of the businesses attempting to control a large portion of telecommunication resources by taking over several other telecommunication companies such as Celcom and thus, becoming the monopoly in this industry.

De Beers is a common example that exemplifies world monopoly of the mining of precious gems. Almost all of the world's precious gem mining is controlled by De Beers.

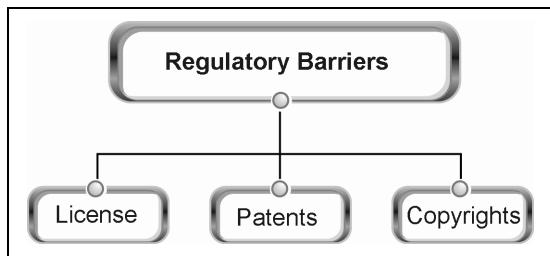
### 8.2.2 Economies of Scale

Economies of scale means a firm can produce output with a low average cost due to the large quantities produced. The output produced is able to accommodate almost all the demand in the market. This prevents new firms from entering the market because of the long time period needed to achieve economic scale.

If a new firm intends to enter the market, it needs to sell its output at a price as low as the price of the firm experiencing economies of scale; this will probably result in a loss and the new firm will soon have to leave the market.

### 8.2.3 Legal Barriers

The government creates regulatory barriers to protect the interests of the monopoly. The regulatory barriers can be in the form of licenses, patents, and copyrights. Figure 8.2 illustrates the legal barriers present.



**Figure 8.2:** Regulatory barriers in the economy

(a) **License**

Public license is a legal right granted by the state government or the local government by imposing certain amount of payment onto the business owner. Without this license, the business operated is considered illegal and legal action can be taken towards it.

Any business such as the medical, food and other industries, will need to have a license. How can a license create monopoly power? License can create monopoly power because not all businesses will be granted license by the government.

However, granting of license seldom leads to monopoly power. In most situations, it will only reduce competition. The government will only provide license to a particular business which is considered to be more viable than other competitors. Any firm without license will be restricted from doing business.

(b) **Patent**

Patent is a form of special right given by the government to inventors or creators, with regard to their inventions or creations. This patent restricts other individuals from producing output similar to the invention that has been granted the patent right. Patent is vital in protecting new inventions and creations since it involves a very high cost. In the United States, patent for an invention is granted for a period of at least seventeen years.



**ACTIVITY 8.2**

In Malaysia, it is said that the awareness regarding patent choice of a particular invention by individuals is still low. In your opinion, what are the necessary measures that should be taken in order to increase awareness regarding this matter?

(c) **Copyrights**

Copyright is also a patent that protects inventors from imitations. Copyright differs from patent as it is given to writings and publication of books, and song writing. Copyright only allows the particular writer to publish the particular book or song. Any unauthorised publication will be legally dealt with.

**ACTIVITY 8.3**

Describe the reasons why monopoly power exists.

**EXERCISE 8.1**

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

1. Monopoly is said to be the imperfect competitive market because it only consists of one sole seller of goods that has no close substitutes.
2. Monopoly consists of only one buyer, while sellers are relatively large in number.
3. Factors such as large capital and high level of technology facilitate the monopolists to have a secured position in the market.

**8.3****DEMAND, AVERAGE REVENUE AND MARGINAL REVENUE**

Before knowing further about the maximisation of monopoly profit, we first have to know about the basic matters related to it. Here, we will look at the relationship between demand curve (D), total revenue curve (TR), and marginal revenue curve (MR) of a monopoly market.

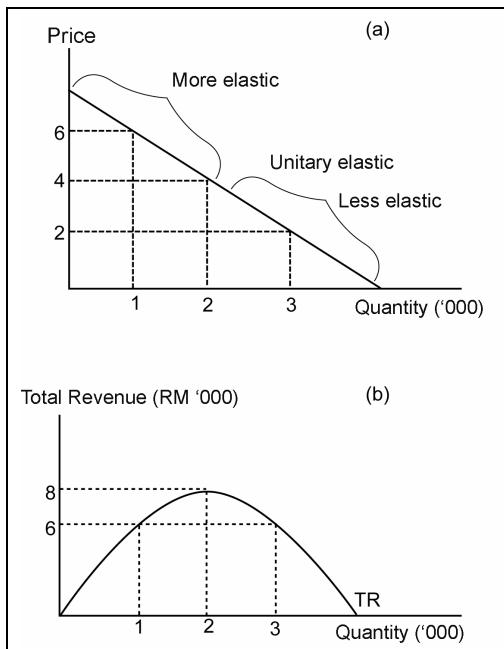
**8.3.1 Relationship between the Demand Curve and the Total Revenue Curve****SELF-CHECK 8.3**

Do you know how to obtain total revenue?

Total revenue can be obtained by multiplying price with the quantity of output sold.

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

Figure 8.3(a) illustrates the demand curve of a monopoly, while Figure 8.3(b) shows its total revenue curve.



**Figure 8.3:** Relationship between demand curve and total revenue curve

The total revenue curve of a monopoly is similar to the total revenue curve of a perfectly competitive market, which begins at the origin indicating that **no revenue is gained when there is no output produced**.

From the figure, we are able to see how total revenue experiences increase in value until the maximum level is achieved then decreases continuously.

Its relationship with the demand curve is at the section where demand curve is more elastic. When there is more output being produced due to decrease in price, total revenue will increase.

Output ↑ = Total revenue ↑  
Due to Price Decrease

Total revenue is maximum at the section where the demand curve is unitary elastic. After that particular point, total revenue will decrease when more quantities are being produced. This is one of the reasons why a monopolist will not produce output at the section where demand curve is inelastic.

### 8.3.2 Total Revenue Curve, Total Costs Curve and Monopoly Profit



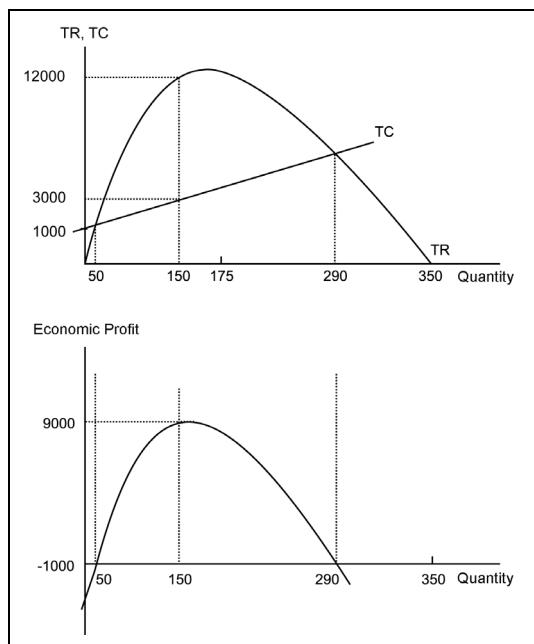
### **SELF-CHECK 8.4**

In your opinion, how do we calculate the economic profit based on Figure 8.3?

Economic profit is calculated based on the biggest difference in distance between total costs curve (TC) and total revenue curve (TR). Figure 8.4 illustrates that the biggest distance is when output is equivalent to 150 units.

Observe that, in that condition, the gradients of both curves are equal. Any output between 50 to 290 units will still give economic profit to a monopolist but the total profit is not maximal.

Profit will only be maximal at the output level of 150 units. Meanwhile, output level that is less than 50 units, or more than 290 units, will bring loss since the total costs curve is above the total revenue curve, meaning that cost is higher than revenue for every unit of output. This can be seen in Figure 8.4.



**Figure 8.4:** Total revenue curve, total costs curve and monopoly profit

### 8.3.3 The Relationship between Demand Curve and Marginal Revenue Curve

The marginal revenue curve of a monopoly has the similar intersection as its demand curve at the vertical axis (price axis), that is when price is at RM80. However, its value of slope at the horizontal axis is different; the intersection of the demand curve is twice the intersection of its marginal revenue curve.

Figure 8.5 shows that the marginal revenue curve intersects the horizontal axis at the output level of 400 units, while the demand curve intersects the axis at the output level of 800 units. This also means that the sloping or gradient of the marginal revenue curve is twice the gradient of the demand curve of a monopoly.

For example, if given the demand function of monopoly is

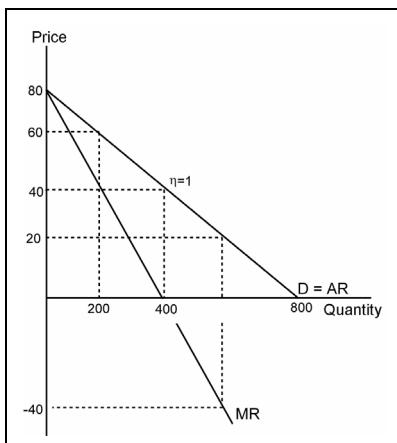
$$P = 24 - 6Q$$

Hence, the marginal revenue function is

$$MR = 24 - 12Q$$

We can see here that the gradient for the demand function is 6, while the gradient for the marginal revenue function is 12.

Why does the marginal revenue curve intersect the X-axis at half the value of the demand curve intersection on the same axis? This is because, marginal revenue is maximum at the point where demand curve is unitary elastic, that is, in the middle of the demand curve. After that point, the value of marginal revenue becomes negative.



**Figure 8.5:** The relationship between demand curve and marginal revenue curve

### 8.3.4 Marginal Revenue



#### SELF-CHECK 8.5

After going through the previous topic, in your opinion, what is meant by marginal revenue?

Marginal revenue is the gradient of the total revenue curve (TR), while marginal cost is the gradient of the total costs curve (TC).

Based on this definition, we can state that a monopolist will choose the output level where total revenue is equivalent to total costs.

Marginal revenue of a monopoly can be obtained from the differentiating method towards the total revenue function. In function,

$$MR = \frac{\Delta TR}{\Delta Q} \text{ atau } \frac{\delta TR}{\delta Q}$$

Given that the profit function is

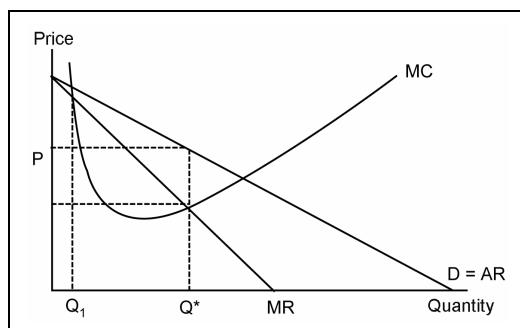
$$\pi = TR - TC$$

In order to gain maximum profit, we need to differentiate the profit function against output and equating it to zero.

$$\begin{aligned}\frac{\partial \pi}{\partial Q} &= \frac{\partial [TR - TC]}{\partial Q} = 0 \\ &= \frac{\partial TR}{\partial Q} - \frac{\partial TC}{\partial Q} = 0 \\ &= MR - MC = 0 \\ \text{atau} \\ &\boxed{MR = MC}\end{aligned}$$

This rule must also be followed as with the rule fixed in the perfectly competitive market, that is, the **marginal revenue curve must intersect the marginal costs curve from above**.

Rationally, this condition is when all firms wanted to produce their output at the condition where marginal revenue exceeds marginal cost. Thus, marginal revenue must be above the marginal cost before the intersection (crossing).



**Figure 8.6:** Maximisation of monopoly profit

Based on Figure 8.6, we can see the condition where the marginal costs curve intersects the marginal revenue curve. Intersection takes place at two points, that is when output is at  $Q_1$  and  $Q^*$  units of output.

However, the output chosen is the output that maximises profit because at this point, marginal cost curve intersects marginal revenue curve from the top and after the intersection, marginal costs curve is at the bottom of the marginal revenue curve.

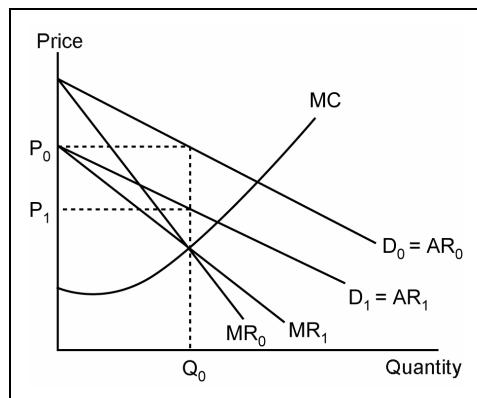
This means that when the production of output is between  $Q_1$  and  $Q^*$ , the average cost of output is still very much lower compared to its average revenue. Meanwhile after  $Q^*$  unit of output, an increase in the subsequent output will result in a bigger increase in cost compared to the increase in revenue.

Only at  $Q^*$  unit, output produced will give a marginal revenue that is equivalent to the marginal cost, and this is the output that can maximise the monopoly profit.  $Q_1$  is the output produced when the firm achieves the condition of capital break even.

### 8.3.5 Monopoly and Supply Curve

What is supply curve? Supply curve of a perfectly competitive market is its own marginal cost curve (MC) with a condition that the curve is situated above the minimum point of its average variable costs. In a monopoly, its marginal costs curve cannot be considered as the supply curve. This is because the supply curve of each good indicates the relationship between price level and the quantity of good supplied.

This means, for every price level, there will be one level of good. But for a monopoly, one level of output can have different prices. Figure 8.7 will validate this condition.



**Figure 8.7:** Monopoly and supply curve

Curves  $D_0$  and  $MR_0$  are the initial demand curve and marginal revenue curve respectively, and the  $MC$  curve is the marginal costs curve for the monopoly. Since the rule of maximising monopoly profit is at the point where marginal revenue is equivalent to marginal cost,  $Q_0$  is the output that maximises monopoly profit with the imposed price of  $P_0$ .

When we assume that demand decreases and the  $D_0$  curve shifts to  $D_1$ , hence curve  $MR_1$  is produced. With the assumption that the production costs remain unchanged, the  $MC$  curve is also unchanged. Since  $Q_0$  is the level of output identified as the output that maximises profit, the monopolist must produce at that particular level of output.

Since the demand curve has declined from the initial demand curve, the new price formed at that particular output is  $P_1$  which is much lower than the initial price of  $P_0$ . Here we are able to see clearly how a monopoly can impose two different prices at one level of output ( $Q_0$ ).

Therefore, the marginal costs curve of a monopoly cannot be considered as its supply curve because it can give two different levels of price at the same level of output.



### EXERCISE 8.2

#### Fill in the Blanks

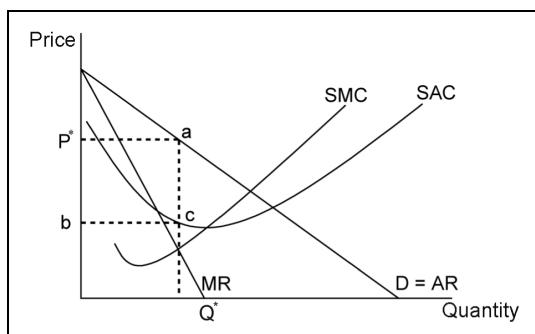
1. \_\_\_\_\_ is the government's legal assurance in order to encourage the development of research and new inventions, besides preventing the occurrence of imitation activities.
2. \_\_\_\_\_ are given to firms that are involved in providing public utilities. This will assure that there is only one firm in that particular industry and enabling the firm to enjoy maximum economies of scale.
3. Average revenue =  $\frac{x}{\text{Production quantity}}$ . Variable  $x$  is \_\_\_\_\_.
4. Total revenue = production quantity  $\times$  Y. Variable Y is \_\_\_\_\_.

## 8.4 SHORT-RUN EQUILIBRIUM OF MONOPOLY

Short-run equilibrium of a monopoly is achieved when the marginal revenue curve intersects with the short-run marginal costs curve.

The output and price at that point of intersection is the output and price that will maximise profit of the firm in short-run. In other words, **equilibrium is achieved in the short-run when marginal costs is equivalent to marginal revenue ( $MC = MR$ )**.

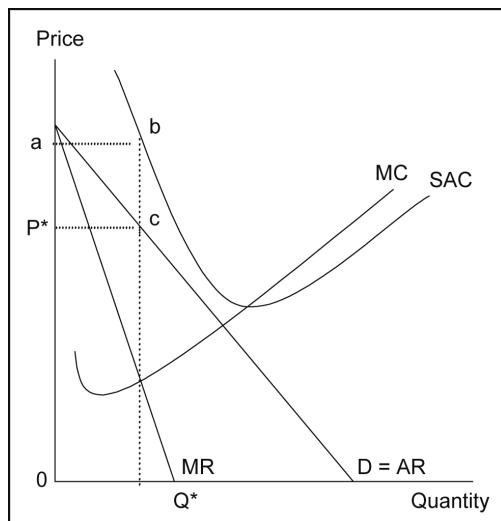
Figure 8.8 illustrates the condition of short-run equilibrium of a monopoly with  $Q^*$  and  $P^*$  as the level of output and price that maximises profit respectively. The area  $P^*bca$  is the total profit gained by the monopoly, that is, the **difference between price and average costs in the short-run**.



**Figure 8.8:** Short-run equilibrium of a monopoly

Like any other firms, a monopolist can also face loss in the short-run. The monopolist will experience loss in the short-run if the short-run average costs curve (SAC) is situated above its demand curve (which is also its average revenue curve).

Figure 8.9 below illustrates the condition where a monopoly faces loss in the short-run. Based on the diagram, we are able to see clearly that price per unit of output is lower than the production cost per unit of output.  $Q^*$  is the output level that maximises profit of this monopoly.



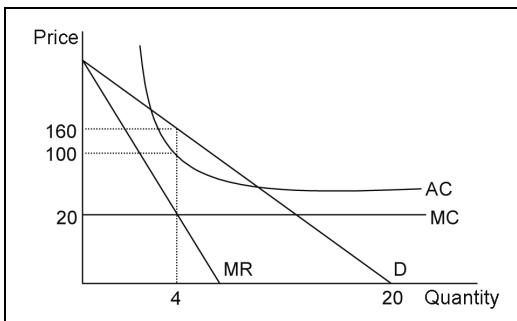
**Figure 8.9:** Loss in the short-run

The total revenue for  $Q^*$  unit of output is  $P^*cQ^*0$ , while the cost of producing  $Q^*$  unit of output is  $abQ^*0$ . Here, we can compare how the total revenue is lower than the total production.

This condition brings about loss to the monopolist. If this condition prolongs into the long-run, the monopolist has to shut down its operations. The area  $abcP^*$  represents the loss faced by the monopolist.

#### 8.4.1 Price and Output that Maximises Profit: A Special Case

If we want to determine the output and price that maximises monopoly profit in special cases, the rule or condition needed is similar to the other normal cases. Special case here refers to the horizontal shape of the marginal costs curve. The marginal costs curve bears that shape due to the constant value of marginal cost throughout the production process. This can be seen in Figure 8.10.



**Figure 8.10:** Monopoly with a constant marginal costs curve

An example of special case as in Figure 8.10 is:

Given the respective demand function and cost function of a monopoly as below:

$$P = 200 - 10Q$$

$$TC = 320 + 20Q$$

This condition will produce a marginal cost function of  $MC = 20$ .

From the figure above we find that, even though the marginal cost function of monopoly differs from the normal, **U-shaped** marginal cost function of monopoly, it still gives the same condition in determining the output and price that maximises profit. The output of four units and price of RM160 is the output and price that will maximise the profit of that particular firm.

## 8.5 THE MONOPOLY FIRM SHUT DOWN IN THE SHORT-RUN



### SELF-CHECK 8.6

Do you know when a monopoly firm has to close/ shut down its operations?

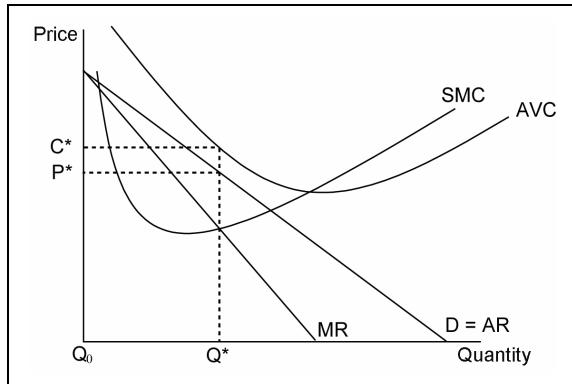
The situation of shut down of a monopoly is similar to the perfectly competitive market, that is, the **firm will shut down its operations when the equilibrium price is much lower than the average variable costs**. The price is also considered as the average revenue of monopoly.

If the average revenue of output cannot accommodate the average production cost of the output then it is best that the monopoly firm shuts down its

operations. This is because at a price less than the average variable cost, not only is the fixed cost is unbearable but also the variable costs.

Therefore, it is best that the firm closes down its production operations in such condition. When operations closed down, the firm is able to minimise its loss by only bearing its fixed costs.

Figure 8.11 illustrates how a monopoly is forced to shut down its operations in the short-run. Based on the rule of profit maximisation,  $Q^*$  and  $P^*$  are the output and price that maximises the monopoly profit respectively.



**Figure 8.11:** Monopoly firm shut down in the short-run

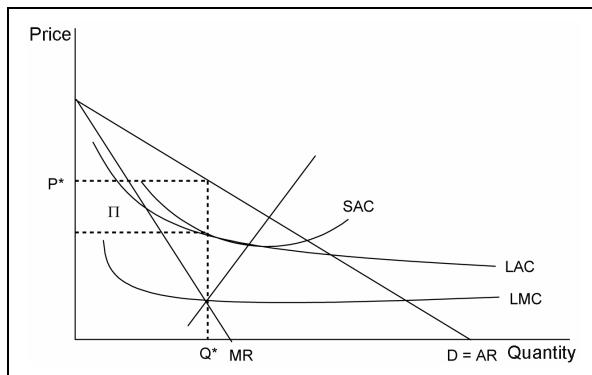
However, from this diagram we find that when  $Q^*$  is produced, the firm faces loss because the price is much lower than its average variable cost. The average variable cost in the production of  $Q^*$  units of output is denoted by  $C^*$ .

This will force the firm to close its operations since the firm can no longer bear its fixed costs and also its variable costs.

## 8.6 LONG-RUN EQUILIBRIUM OF MONOPOLY

**Long-run** is a particular time period in which the firm is able to change all its inputs, or in other words, all inputs are variable inputs.

In the short-run, output equilibrium is achieved when the marginal costs curve crosses the marginal revenue curve, but in the long-run, the output that maximises profit is when the long-run marginal costs curve (LMC) intersects with the marginal revenue curve of that monopoly.



**Figure 8.12:** Long-run equilibrium of a monopoly

Figure 8.12 illustrates how the long-run equilibrium of a monopoly is achieved. Observe that in the long-run, the monopolist is still able to gain supernormal profit. This condition occurs for firms that obtain monopoly power through the granting of license by the government.

Pressure towards profit does not occur. This causes the supernormal profit enjoyed to remain even in the long-run. From the diagram above, it is clearly shown that the continuous long-run average costs curve faces decline. This means that the monopolist obtains cost advantage compared to its competitors.

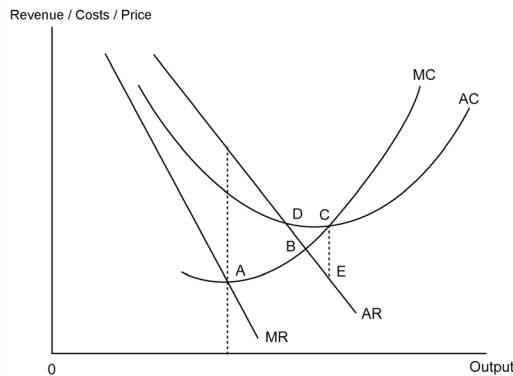
In the long-run as well, the monopoly firm can experience normal profit or decrease in profit. Competitors might create substitute inputs for the input controlled by the monopolist.

Competing firms supplying outputs that have similar use as the output supplied by the monopolist can also emerge in the long-run. This causes the profit gained by the monopolist to decline.



### EXERCISE 8.3

#### Fill in the Blanks



1. If the monopoly firm intends to maximise its profit, hence the equilibrium point is \_\_\_\_\_.
2. The government needs to provide subsidies to the monopoly firm if the equilibrium tier is achieved at \_\_\_\_\_.
3. Which equilibrium point indicates that the monopoly firm is operating at its full capacity?
4. Monopoly firm will achieve allocation efficiency at point \_\_\_\_\_.

You are advised to take a short break after completing this exercise, to enable you to focus on the next topic.

## 8.7 PRICE DISCRIMINATION

Up to the previous section, we have discussed about the monopoly with the assumption that the monopoly supplies output at only one price to every buyer or consumer who purchases their goods. In this section, we will discuss on how monopolists have the ability to supply their output at different prices to each of its buyers. This condition is referred to as price discrimination.

**Price discrimination** means that monopolist imposes different prices on the same good to different consumers.

When price discrimination takes place, it means that the monopolist is able to transfer consumer surplus and transform them into their own profit instead.

### 8.7.1 Conditions for the Occurrence of Price Discrimination

There are a few matters which have been identified in ensuring the success of price discrimination. Among the conditions or rules for price discriminations are:

(a) **No Feasible Reallocation of Goods**

Price discrimination will not succeed if goods sold in market with a lower price can be easily reallocated to the market that imposes a higher price. In other words, there is no possibility of reselling for that particular good in a different market.

If reallocation or reselling of goods ever occur, this will cause the price received by firm to be unequal to the price fixed, and there might be a possibility for the price in both markets to be equal. When this condition takes place, price discrimination cannot be carried out.

(b) **Geographically Segmented Markets**

When two markets are segmented geographically, the possibility of reallocation of goods is low; if goods can be reallocated, this will result in change of the production costs. Production costs of firms imposing price discriminations are the same. Hence, when costs differ, price discrimination will not succeed.

(c) **Different Elasticity and Demand Characteristics in Both Markets**

Higher price will be imposed in the market with low elasticity of demand compared to the market with higher price elasticity (more elastic). When

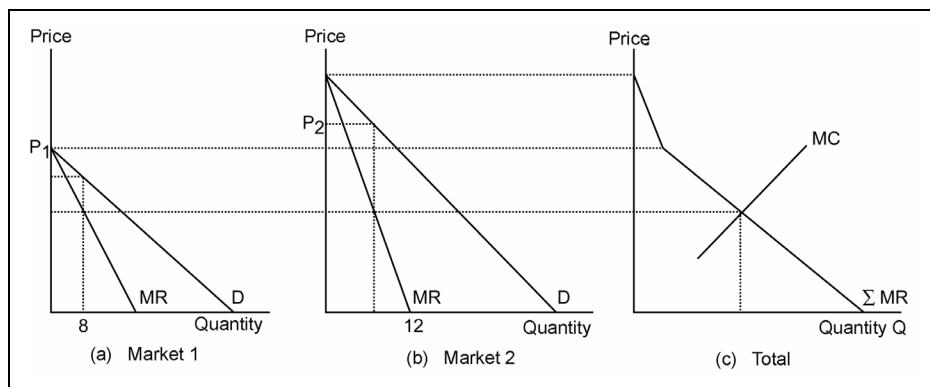
both markets have the same elasticity, monopoly will not be able to differentiate the price for both markets hence price discrimination will not take place.

### 8.7.2 Sales in Segmented Markets

One of the rule or condition that enables discrimination to be carried out is that the monopolist can segment their output market. Assuming that the firm is the one and only producer of that particular good, it can impose different prices for both of its market.

Even when selling takes place in two different markets, the monopolist faces the same total costs curve. This results in **the same marginal costs for both markets**.

Figure 8.13 illustrates the demand curve and marginal revenue curve for monopolist that sells their output in two different markets. Observe that the marginal revenue curve of two firms selling at different markets is the horizontal summation of the marginal revenue curves of each market.



**Figure 8.13:** Monopoly and sales in different markets

From Figure 8.13, it is found that the overall output that is able to maximise monopoly profit is 20 units, where 8 units are produced for market 1 while the remaining 12 units are produced for market 2.

We can conclude here that, even the marginal revenue for both markets are the same at the time of production, price imposed at each market is different. This is because both markets have different demand curves.

### 8.7.3 Profit Maximisation: Equilibrium Price and Output of a Monopoly Conducting Price Discrimination

In this section, we will look at how a monopolist determines the price and output that are able to maximise profit in the discrimination condition. Even when conducting discrimination, the monopolist is still tied to the rule of profit maximisation as before, that is, the marginal cost is equivalent to marginal revenue.

A monopolist will determine the output needed to be produced, the allocation of output for each market, and the price at each market. In order to determine these matters, the monopolist will carry out these following actions:

- (a) The monopolist has to determine beforehand the output level that can maximise profit by equating the marginal cost with its marginal revenue in both markets; and
- (b) The output will then be distributed to each market segment and the total output allocated is different for each market. When outputs have been identified, the equivalent price for that particular output can be determined, that is, based on the demand curve of each market.

As stated before, for the market with low elasticity of demand, a smaller number of outputs are distributed for that market compared to the output allocated for the market with a higher elasticity of demand. The opposite happens for price where a lower price is imposed on the market with a higher elasticity of demand.

Previously, Figure 8.13 illustrated how output is allocated for both markets. The marginal revenue curve of a monopoly selling at two different markets is the horizontal summation of the marginal revenue curves of each market. Output that maximises profit is determined when the marginal costs curve intersects the marginal revenue curve.

From the diagram, we also found that the equilibrium output is 20 units of which 8 units were distributed to market 1 while the remaining 12 units to market 2. Prices in the respective markets are different where price in market 2 is higher compared to the price in market 1.

## 8.7.4 Degrees of Price Discrimination

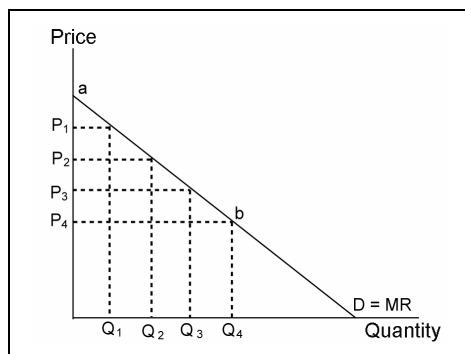
There are three degrees of price discrimination, namely the first, second, and third degree discrimination.

### (a) First Degree Price Discrimination

First degree price discrimination is also referred to as perfect price discrimination. Perfect price discrimination means the monopolist imposes different prices for every unit of output sold.

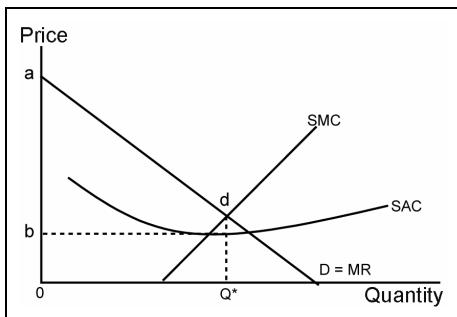
In this case, the monopolist knows perfectly about the willingness to pay of each buyer. Therefore in first degree price discrimination, the monopolist is able to obtain the entire consumer surplus available in the market. In this first degree price discrimination, the demand curve of the monopoly is also its marginal revenue curve.

Figure 8.14 illustrates how the monopolist imposes different prices for each unit of output sold. This results in an area covering  $aP_4b$  to indicate the profit or producer surplus of the monopoly and there is no consumer surplus in this case.



**Figure 8.14:** First degree price discrimination

How does a monopolist determine the output that is able to maximise its profit? The condition that determines the output that maximises profit of a monopolist practising price discrimination is marginal revenue (MR) equals marginal cost (MC).



**Figure 8.15:** Price discrimination and equilibrium

Figure 8.15 illustrates how a monopolist determines the output that maximises their profit. From the diagram,  $Q^*$  is the output that maximises profit for this monopolist. At this point, the marginal costs curve intersects the marginal revenue curve, which is also the demand curve of monopoly.

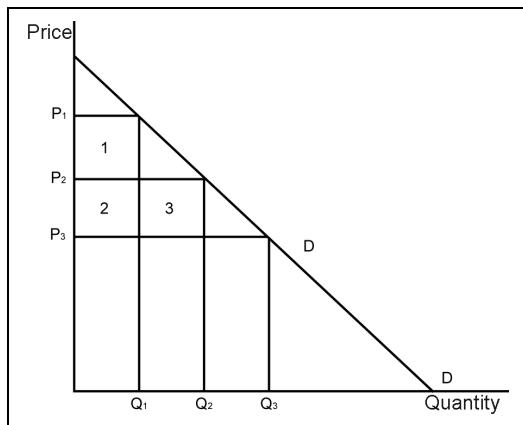
For every unit of output from 0 to the  $Q^*$  unit, the monopolist imposes different prices to the buyers. Prices imposed by the monopolist are between a and b for every unit of output 0 to  $Q^*$ . All consumer surpluses go to the monopolist as profit.

This first degree price discrimination seldom occurs because:

- (i) the difficulty for the monopolist to know the true amount each potential customer is willing to pay for a particular good; and
  - (ii) the possibility of reselling to occur is high.
- (b) **Second Degree Price Discrimination**

The second degree price discrimination occurs more often compared to the first degree. In the case of second degree price discrimination, the price of good declines with the increase in the quantity of the good purchased. The monopoly determines different prices for every usage group of different units of output. Unlike perfect price discrimination, the second degree price discrimination only takes up a portion of consumer surpluses and not the whole of it.

Figure 8.16 illustrates how a monopolist determines the price for consumers using their products. For every first  $Q_1$  units of output, the price imposed is  $P_1$  per unit. Addition of output is subsequently imposed with the price of  $P_2$  for every units of that particular output.



**Figure 8.16:** Second degree price discrimination

It is the same for the following additional units of  $Q_2Q_3$ . Price that has to be paid for each unit of output is  $P_3$ . Area 1, 2, and 3 which are the areas with consumer surplus, are converted into profit for the monopoly.

Note: Second degree price discrimination is effective when the market for the particular good is very wide, with large number of buyers, different preferences, different levels of income, and different conditions.

For example:

A firm that practices second degree price discrimination is Tenaga Nasional Berhad (TNB). For example, TNB will impose a high price for the first 300 kilowatts of output. For the following 300 units, it will impose a lower price, and so on.

### (c) Third Degree Price Discrimination

Third degree price discrimination occurs when the monopoly differentiates price according to groups or classes of consumers, based on their level of income, or their willingness to pay. Each consumer group has their own demand curves.

Consumer groups that often obtain low prices are student groups and senior citizens group. Transportation companies often practice this type of discrimination.

How is output determined in this third degree price discrimination? There are several steps implemented by the firms involved.

**Firstly**, once the output that maximises profit has been identified, that output will be allocated to the relevant groups of consumer.

Assuming there are two consumer groups and the marginal revenue for the first group exceeds the marginal revenue of the second group, it is better for the firm to reallocate output from the second market to the first market.

Reallocation of output is carried out by lowering the price for the first group and increasing the price for the second group. Whichever price imposed on both markets, marginal revenue for both groups are the same.

**Secondly**, we know that the total output that maximises profit is obtained when marginal revenue for each group of buyers is equivalent to the marginal cost of production. However, if this condition does not take place, the firm can increase profit by increasing output (decreasing the total output) and reducing (increasing) price for both markets.

Example:

When the marginal revenue for each group are equal but exceeds the marginal production cost, hence the firm can increase profit by increasing output.

Price will be reduced for both groups of buyers resulting in a decrease in their marginal revenue (but marginal revenue are still the same for each consumer groups) until it is equivalent to the marginal cost. This condition can be proved using algebra, which is:

$$\begin{aligned} Q_T &= Q_1 + Q_2 \text{ and} \\ \pi &= P_1 Q_1 + P_2 Q_2 - C(Q_T) \end{aligned}$$

where  $Q_T$  is the overall total market output.  $P_1 Q_1$  and  $P_2 Q_2$  are the prices and output for market one and market two respectively.

Firm will increase sales in both groups until the profit increase for the final unit sold is equivalent to zero.

$$\frac{\partial \pi}{\partial Q_1} = \frac{\partial [P_1 Q_1]}{\partial Q_1} - \frac{\partial C}{\partial Q_1} = 0$$

$$MR_1 = MC$$

$$\frac{\partial \pi}{\partial Q_2} = \frac{\partial [P_2 Q_2]}{\partial Q_2} - \frac{\partial C}{\partial Q_2} = 0$$

$$MR_2 = MC$$

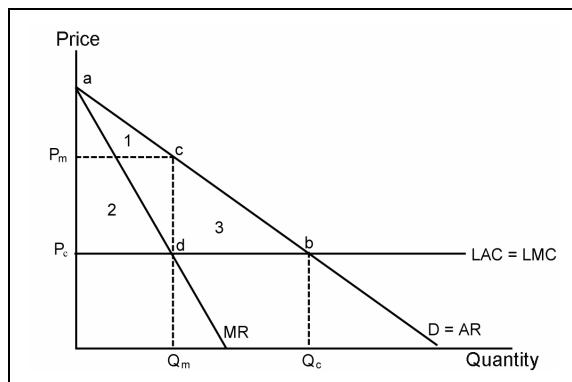
As marginal costs for both groups of consumers are the same, hence it is found that the rule of maximising profit for a firm practicing third degree price discrimination is:

$$MR_1 = MR_2 = MC$$

## 8.8 SOCIAL COSTS OF MONOPOLY

In economics, only the perfectly competitive market operates efficiently, that is, when it produces output at the point where price is equivalent to marginal costs ( $P = MC$ ). Efficiency here refers to the valuation of buyers towards the final unit of output is equivalent to the market value of the production resources used in producing the particular output.

Efficiency also means there is no possibility for the occurrence of increase in profit or interests due to substitution in the market. Monopoly is said to be inefficient because output production is carried out when price exceeds marginal cost ( $P > MC$ ).



**Figure 8.17:** Monopoly and social costs

Figure 8.17 illustrates how inefficiency in monopoly causes a loss in social welfare. LMC and LAC are the long-run average costs curve and long-run marginal costs curve of a monopoly respectively. A monopoly that does not implement price discrimination will impose a price of  $P_m$  and produce  $Q_m$  units of output.

A perfectly competitive market operating under similar cost condition will produce at  $Q_c$  unit of output and impose a price of  $P_c$ . When compared to the perfectly competitive market, the monopoly will cause a loss in consumer surpluses.

The area  $aP_c b$  is the area of consumer surplus of a perfectly competitive market. However, in a monopoly, consumer surplus has diminished to only  $aP_m c$  (area 1). Meanwhile, the area of  $P_m P_c d c$  is consumer surplus that has become the producer surplus (profit) for the monopoly (area 2).

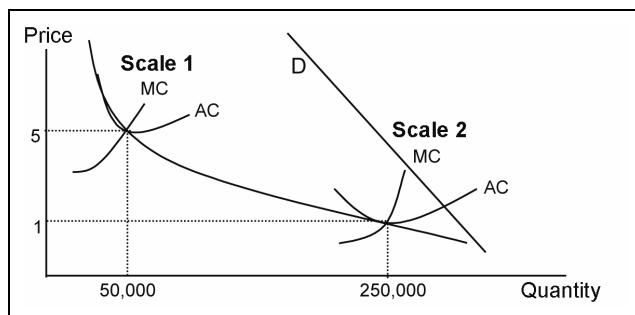
Area  $cdb$  (area 3) is the area of consumer surplus, that is lost from the perfectly competitive market but also not gained by the monopoly and it is referred to as the social costs of society and also known as the deadweight loss from the monopoly.

### 8.8.1 Natural Monopoly

Natural monopoly is the monopoly that enjoys a large economic scale in production. Generally, a firm can choose between large scale and small scale production.

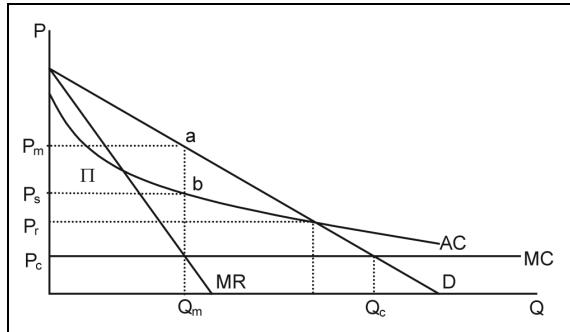
Natural monopoly is the monopoly that produces public goods such as electricity and water supply, which needs a very large economic scale in its production.

Figure 8.18 illustrates that a large scale plant (scale two) can produce 250,000 units of output at an average cost of RM1.00. If the industry is restructured into five firms, each firm will produce in small scale (scale 1); the industry can still produce the same amount (50,000 for each firm) but with a higher cost per unit (RM5.00).



**Figure 8.18:** Natural monopoly

## 8.8.2 Control and Natural Monopoly



**Figure 8.19:** Control and natural monopoly

Figure 8.19 illustrates the structure of a natural monopoly. Assume that the firm faces a declining average cost curve (AC) when more output is produced. Meanwhile, the marginal cost (MC) faced is also very low and constant.

From the diagram above,  $P_m$  and  $Q_m$  are the price and quantity produced by a monopoly which is not controlled by the government. This results in high price being imposed and the production of too little output which does not fulfil the overall market demand.

Profit gained by the firm covers the area of  $P_m P_s b a$ . This condition causes a loss to consumers because the price is much higher than the production cost. The government can control the firm so as to increase production so that it can accommodate more demand in the market while imposing the price when  $P = MC$ .

When this condition occurs, output produced is at  $Q_c$  units and the price imposed is  $P_c$ . But at that price, the firm will face a loss since the price is much lower than the average costs (AC), and if this condition prolongs into the long-run, the firm has to shut down its operation.

Through price control, there are two matters that can be imposed by the government, namely:

(a) **Setting a Ceiling Price**

Ceiling price is the maximum price that can be imposed by a particular firm for their products. However, by imposing a ceiling price, the government has to give subsidies to the firm.

(b) **Imposing a Price at  $P = AC$**

When this condition takes place, the firm will not face any loss even in the long-run. Profit gained will reduce to an extent the firm will only gain

normal profit. While for consumers, with this kind of control, more of their demand can be fulfilled and at the same time, the price is much lower compared to when firms are not controlled by the government.



### ACTIVITY 8.4

Try to recall back what you have learned. Explain the term:

- (a) Social Costs of Monopoly; and
- (b) Natural Monopoly



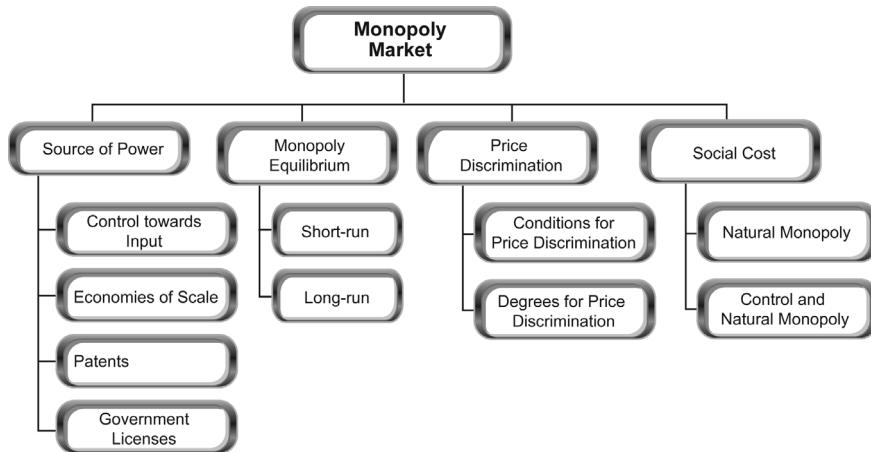
### EXERCISE 8.4

#### Essay Questions

1. State the characteristics of a monopoly market.
2. How does a monopoly gain its power?
3. Draw the demand curve and marginal production curve of a monopoly given the production function:  
 $P = 100 - 4Q$
4. Why will a monopoly avoid from producing at the section of its demand curve that is less elastic?
5. In order to maximise profit in a monopoly, why must the marginal revenue curve intersect the marginal costs curve from above?

## SUMMARY .....

Up to this point, you have learnt about the concept of a monopoly market. In short, monopoly market can be elaborated as in the mind map:



- Monopoly is a type of market that consists of only one firm producing output for the entire society. A few factors have been identified as the source of monopoly power such as control towards input, economies of scale, patents, and licenses granted by the government.
- Unlike the perfectly competitive market, a monopoly faces a demand curve that is sloping downwards from left to right.
- This allows a monopoly to be only able to control either its price or output, but not both simultaneously. If the monopoly wishes to increase the sales of its output, it has no choice but to reduce the price.
- If a monopoly is able to sell in two different markets, it will keep producing output until the marginal revenue of both markets are equal.
- Monopoly is considered as an inefficient market structure because causes a loss of consumer welfare.
- This can be proven when we compare the perfectly competitive market to a monopoly. Only the perfectly competitive market is considered efficient in production because it produces output at the point where price is equivalent to marginal costs.
- This means that for every additional unit of output produced by the monopoly will give more value compared to the production cost that output. This inefficiency results in the monopoly being controlled by the government through several suitable methods

# Topic ▶ Monopolistic Market

## 9

### LEARNING OUTCOMES

By the end of this topic, you should be able to:

1. Describe the characteristics of a monopolistic market;
2. Differentiate a monopolistic market, perfectly competitive market and the monopoly market;
3. Assess the short-run equilibrium of a firm, and the long-run equilibrium of a firm; and
4. Analyse the social costs that exist in the monopolistic market.

### ▶ INTRODUCTION

In the previous discussions, we have understood how two market structures having contrasting features or characteristics (the perfectly competitive market and monopoly) operate in the market. Now you are ready to learn about a type of market structure that has a combination of characteristics of the perfectly competitive market and the monopoly market, and this market structure is known as the monopolistic market.

#### 9.1 THE CHARACTERISTICS OF A MONOPOLISTIC MARKET



##### SELF-CHECK 9.1

The monopolistic competition market is a market that has quite a large number of firms, producing a variety of goods which are close substitutes of each other. Can you list down some examples of goods or services based on the characteristics of the monopolistic market?

Let us look at the characteristics of a monopolistic market. A market is classified as a monopolistic market when it has the following characteristics:

- (a) a large number of sellers;
- (b) unrestricted freedom of leaving or entering market; and
- (c) different kinds of goods.

### 9.1.1 A Large Number of Sellers

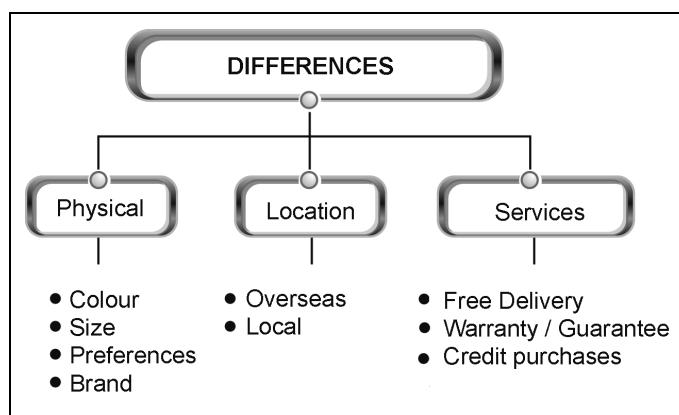
There are many sellers in a monopolistic market but not as many as in a perfectly competitive market. This means that the product of each firm is relatively small compared to the market product.

### 9.1.2 Unrestricted Freedom of Leaving or Entering Market

Firms have the freedom to leave or enter market as with firms in a perfectly competitive market. The effect is that the number of firms in the industry is coordinated until all firms in the market gain normal profit.

### 9.1.3 Goods that Can Be Differentiated

In a perfectly competitive market, goods produced are homogenous. In reality however, most goods have close substitutes, but not perfect substitutes. Therefore, goods produced by firms in a monopolistic competition market can be differentiated. Among the differences are as shown in Figure 9.1.



**Figure 9.1:** Differences of goods produced



### SELF-CHECK 9.2

Try to give a few examples of monopolistic competition. Seek help from your friends or browse websites in order to obtain more information

## 9.2 DEMAND, AVERAGE REVENUE AND MARGINAL REVENUE

In order to study how price and output that maximises profit are determined in a monopolistic competition, firstly we have to identify the demand curve faced by each firm.

### 9.2.1 Goods that Can Be Differentiated and Elasticity of Demand

Every firm in monopolistic competition sells goods that can be differentiated by consumers and do not have perfect substitutes. Why is this so? This is the source of power for firms to determine the price level of their goods. Therefore, the firm will have a demand curve that is negatively sloping from left to right as with firms in the monopoly market.

However, the power to determine price is not as large as the power possessed by a monopoly firm because the goods produced have close substitutes. Since the power to determine price is less hence the firm will have a more elastic demand curve compared to the demand curve of a monopoly firm. In other words, a monopolistic firm has a demand curve that slopes downward from left to right which is more elastic compared to the demand curve of a monopoly.

The demand curve is also the average revenue curve of the monopolistic competition firm. Its marginal revenue curve is a curve that slopes downwards from left to right and the gradient is twice the gradient of the demand curve.



### EXERCISE 9.1

Determine whether these statement are **TRUE (T)** or **FALSE (F)**.

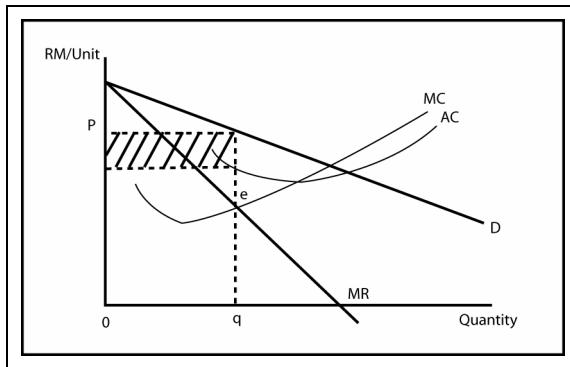
1. This market has a large number of firms but not as many as in the perfectly competitive market.
2. The differences in goods of each firm are in terms of brand, packaging, style of advertising and so forth.
3. In order to participate in a monopolistic industry, a firm must have the ability to produce goods that are slightly different and more attractive than any other goods already available in the market.
4. Demand curve of a monopolistic firm slopes downwards from right to left.
5. The marginal revenue curve is always above the demand curve because demand curve slopes downwards.

## 9.3

### SHORT-RUN EQUILIBRIUM OF FIRM

From the discussion above, we know that the firm has a demand curve with a negative gradient from left to right because the firm is able to control price. This means the marginal revenue curve (MR) is the curve situated below the demand curve and crosses the horizontal axis at the middle point between the origin and the point where demand curve intersects the horizontal axis.

In the short-run, a monopolistic competition firm acts similarly to a monopoly firm. Here, we find that a monopolistic competition firm maximises its profit (or minimises its loss) in the short-run by producing output at the level where marginal revenue is equivalent to marginal costs ( $MR = MC$ ). For further explanation, let us look at Figure 9.2.



**Figure 9.2:** Monopolistic competition firm and supernormal profit in short-run

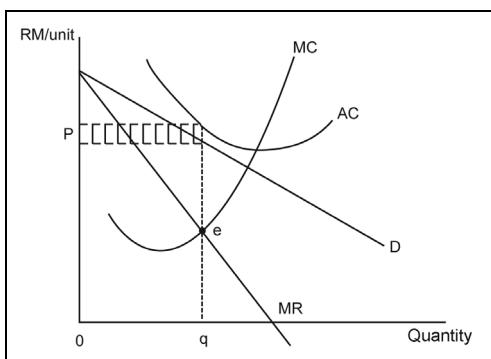
Figure 9.2 illustrates the costs curve, demand curve and marginal revenue curve of a firm in a monopolistic competition market. In order to maximise profit, the firm fulfills the rule  $MR = MC$ , that is at point e, and produces  $q$  units of output and imposes price  $P$  for each unit.

We find that the average costs curve is situated below the demand curve. This means the firm enjoys supernormal profit as denoted by the shaded area. However, there is no guarantee for a firm in a monopolistic competition to gain supernormal profit in the short-run.

Even though the firm is able to control price, the factor of market demand is not enough to enable the firm to gain a supernormal profit. Therefore, we will look at the condition of the firm having the same costs curve but faces a weak market demand.

### 9.3.1 Monopolistic Competition Firm and Subnormal Profit in Short-Run

Now we will look at monopolistic firm and subnormal profit as shown in Figure 9.3.



**Figure 9.3:** Monopolistic competition firm and subnormal profit in short-run

Figure 9.3 illustrates the condition where a monopolistic competition firm faces subnormal profit in the short-run. The firm produces output when  $MR = MC$ , that is at point e. The firm will minimise loss by producing q units of output and imposing a price of P. The firm's loss is denoted by the shaded area.

In a certain condition, the firm must determine whether to continue with production operations or not. Here, the firm will use the same rule as used by firms in a perfect competition and monopoly market. The rule is that, as long as price is at or above the average variable cost curve, the firm will produce output in short-run. If price is can no longer accommodate variable costs, the firm will close down its operations.

## 9.4 EQUILIBRIUM IN THE LONG-RUN

In the discussion above, we find that maximisation of profit in the short-run for firms in monopolistic competition is similar to monopoly firms. However, the situation is different in the long-run. This is because firms in monopolistic competition can effortlessly exit from and enter into the industry depending on the condition of profit enjoyed by firms already present in the industry.

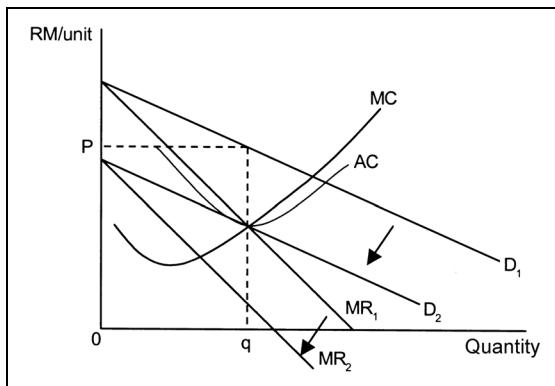
In the long-run, supernormal profit enjoyed by the firms existing in the industry will attract new firms to enter the industry. Since new firms supply goods that are similar to the goods supplied by the existing firms, the number of consumers for the existing firm will decline because part of their consumers have moved to the new firms.

In other words, the entry of new firms causes the market share of the existing firms to decline. This condition is shown by the downwards movement of the demand curve as in Figure 9.4. As more new firms enter the market, hence the smaller the market shares of the existing firms. This means the demand curve will further shift downwards.

This process will stop when there are no more new firms entering the industry, that is, the condition where demand curve touches the average costs curve and the firm only gains normal profit.

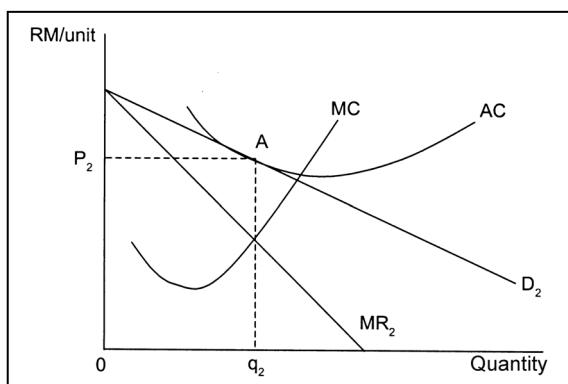
Figure 9.4 illustrates the coordination that takes place in the long-run for monopolistic competition firm. In order to maximise profit, firm produces q unit of output and imposes a price of P. Curve  $D_1$  and  $MR_1$  represents the short-run demand and marginal revenue. The firm gains positive supernormal economic profit because the average costs curve is below the demand curve.

In the long-run, positive economic profit will attract new firms to enter the industry. These new firms will produce goods that are close substitutes for goods produced by the existing firms. The entry of new firms will cause the market shares of existing firms to diminish, and this is indicated by the downward shift of the demand curve, from  $D_1$  to  $D_2$ , where long-run equilibrium is achieved. The shift of demand curve is followed by the shift of the marginal revenue curve from  $MR_1$  to  $MR_2$ .



**Figure 9.4:** The effect of new firms' entry into the monopolistic competition industry

What will happen now? Long-run equilibrium is achieved when new firms realise that there are no more incentives to enter the market, while existing firms realise that there are no more excuses to leave the market, that is, at the level of normal profit. Figure 9.4 illustrates the long-run equilibrium of a monopolistic competition firm. Figure 9.5 is the result of the shifts that occurred in Figure 9.4.



**Figure 9.5:** Long-run equilibrium of monopolistic competition firm

From Figure 9.5, long-run equilibrium is achieved when each firm produces  $q_2$  units of output and imposes a price of  $P_2$  after fulfilling the rule of  $MR = MC$ . The price imposed by the firm at  $P_2$  is equivalent to the average cost.

This means every firm will only gain normal profit. Here, the long-run equilibrium occurs when the new firms enter the industry and reduces the demand curve until the curve touches the average costs curve as denoted by point A.

If the firm faces loss in the short-run, coordination in the long-run will take place when there are firms that leave the industry resulting in the increase in market shares of existing firms.

Therefore, the demand curve will shift upwards until the industry achieves long-run equilibrium, that is, when all firms only gain normal profit. In the end, all firms will be in the state of long-run equilibrium, as depicted by Figure 9.5.



## EXERCISE 9.2

### Structured Questions

1. Answer the following questions based on the table below:

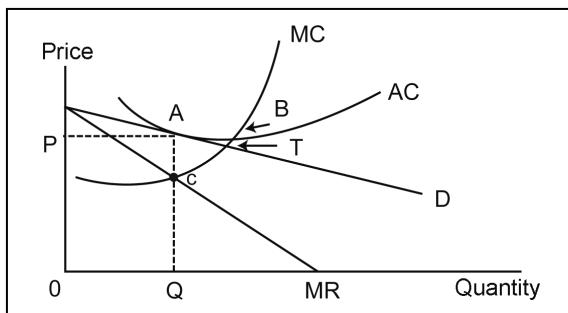
Price	Quantity Demanded	Average Costs	Product
10	1	14.00	1
9	2	8.00	2
8	3	7.33	3
7	4	7.50	4
6	5	7.60	5
5	6	8.17	6

- (a) How much output will be produced by the monopolistic competition firm at the level of monopolistic equilibrium?
- (b) What is the level of profit or loss of this firm?
- (c) In the long-run, what will happen to the number of firms in this market?

## 9.5 SOCIAL COSTS IN MONOPOLISTIC MARKET

In Topic 7, we know that economic efficiency is achieved when  $P = MC = \text{minimum AC}$ . Distributive efficiency is achieved when  $P = MC$  and productive efficiency is achieved when  $P = \text{minimum AC}$ .

Since monopolistic competition market is a combination of characteristics of the perfectly competitive market and the monopoly market, it is reasonable to consider whether it is an efficient market structure such as the perfectly competitive market, or inefficient as the monopoly market. Analysis will be made based on Figure 9.6.



**Figure 9.6:** Inefficiency in monopolistic competition market

Figure 9.6 indicates a monopolistic competition firm in long-run equilibrium. We find the firm operating at point A, which is the declining section of the average costs curve. In order to achieve production efficiency, the firm should be operating at point B, that is, the minimum point of the average costs curve. This means that at point A, the firm faces a higher average cost per unit compared to point B.

On the other hand, a perfect competition firm is in the state of long-run equilibrium when it operates at the minimum point of the long-run average costs curve (point B). Since the monopolistic competition firm does not operate at the minimum point of the AC curve, we find that output produced at point A is lower compared to production at point B.

Failure of the firm to operate at point B will result in capacity surplus, that is, the difference between output level at the minimum point of average costs curve with the output level that maximises the firm's profit.

Based on Figure 9.6, the monopolistic competition firm is not producing at  $P = MC$  (point T) in order to achieve distributive efficiency. At the output level that maximises profit, Q, it is found that price (AQ) exceeds the marginal cost

(CQ). As the discussion in the case of a monopoly, the consequence is the existence of social costs as denoted by the area ABT which is referred to as deadweight loss.

### 9.5.1 Monopolistic Competition and Consumer Welfare

From the discussion above and Figure 9.6 earlier, it is clear that a monopolistic competition firm does not achieve economic efficiency. In fact, production at the level that maximises profit had resulted in capacity surplus and deadweight loss to the society. The question is, can policy makers fix this condition?

One of the sources of inefficiency is price at the output level that maximises profit exceeds marginal costs. If the government imposes the rule that the firms must produce at  $P = MC$  to eliminate deadweight loss, do you think it will work?

In the long-run, a monopolistic competition firm will only gain normal profit. If the government forces firm to reduce price until it is equivalent to the marginal cost (point T), the firm will experience loss because point T is situated below the AC curve. This will result in the shut down of the firm's operation in the long-run, because the firm faces the condition of  $P$  less than AC.

If all firms shut down their operations, this means there are no more firms to supply goods that can be differentiated. In other words, there will only be homogenous goods and no close substitutes in the market.

Besides that, the deadweight loss which exists in the monopolistic competition market is not as large as the deadweight loss in the monopoly market. This is because the demand curve of monopolistic competition firm is more elastic compared to the demand curve of a monopoly firm.

The same applies if the firm is forced to produce at the minimum point of AC curve in order to eliminate capacity surplus, that is, at point B. In Figure 9.6, we find that the firm will experience loss because the average cost is much higher than price. In the long-run, the firm has to shut down its operation if it is facing loss in order to avoid bigger losses.

In conclusion, the production of differentiated goods by monopolistic competition firms is the exchange for the inefficiency that exists in a monopolistic competition. Consumers have to pay a higher price to obtain goods that can fulfil their preferences besides being able to diversify their choices.



### ACTIVITY 9.1

Describe how a monopolistic competition market is different from a perfectly competitive market and monopoly market.

## SUMMARY

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- In short, the understanding towards market structure of the perfect competition and monopoly is very useful in studying the behaviour of firms in a monopolistic competition.
- What is important is how you are able to look at the role of differentiated goods in influencing the shape of the demand curve, average revenue curve and marginal revenue curve.
- From there, you are able to understand the reasons why firms in monopolistic competition can act like a monopoly in determining price and output.
- Even though the firm has the power to determine price, it is not able to maintain profit in the long-run since there are many producers.
- Besides that, there are no barriers of entry or exit for firms in the market, which finally will lead to firms gaining only normal profit in the long-run.
- Further, you have looked at the social costs that exist in the monopolistic competition structure. We find that the firm does not achieve economic efficiency.
- The most prominent issue in the discussion about this market structure is that it results in capacity surplus. We have also discussed the advantages and disadvantages if we try to eliminate them.
- Summarisation can also be seen from the following diagram.

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# **Topic ► Oligopoly Market**

# **10**

## **LEARNING OUTCOMES**

By the end of this topic, you should be able to:

1. Describe the characteristics of the oligopoly market;
2. Identify the market structure situated between a perfectly competitive market and monopoly market;
3. Explain the criteria of equilibrium in the oligopoly market; and
4. Analyse the Cournot Model and the Sweezy Model in determining the market equilibrium.

## **► INTRODUCTION**

If seen in terms of competition, market structures can be arranged in the sequence starting from the perfectly competitive market, monopolistic competition market, oligopoly market, and finally the monopoly market. In the previous chapters, we have discussed all types of market structure excluding the oligopoly market. The following discussion will provide understanding about the structure of an oligopoly market.

### **10.1 CHARACTERISTICS OF AN OLIGOPOLY MARKET**

There are three main characteristics or features in the oligopoly market:

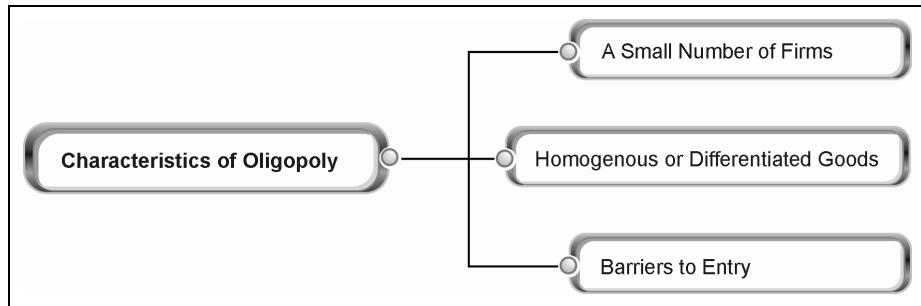


Figure 10.1: Characteristics of an oligopoly market



### SELF-CHECK 10.1

What are examples of firms that have the characteristics of an oligopoly market?

Now let us look at the characteristics of an oligopoly market in detail.

#### 10.1.1 A Small Number of Firms

Oligopoly is a market structure characterised by a few firms. This is different compared to the perfectly competitive market and the monopolistic market that consist of large number of sellers, whereas there is only one sole seller in the monopoly market.

Due to the small number of firms, an oligopoly firm is perceived to have the power to determine price but each firm must consider the action of competitors that is predicted to influence its decisions in determining price, output and carrying out advertising campaigns.

As a result, oligopoly firms are considered as mutually dependent since the profit of each firm not only depends on the strategies of price and sales, but also on the action of its competitors. The characteristic of mutual interdependence that exists among these firms in an oligopoly industry makes it hard to analyse the behaviour of a certain firm.

## 10.1.2 Homogenous Goods and Goods that Can Be Differentiated

In terms of goods, oligopoly firms may produce either homogenous goods or differentiated goods. Most of the goods produced such as zinc, aluminium, cement and steel are homogenous goods.

Meanwhile, consumer goods such as automobile, tyres, electronic equipments, cigarettes, breakfast cereals and sports equipments are goods that can be differentiated. For goods that can be differentiated, firms will usually conduct non-price competition such as advertising.

## 10.1.3 Barriers to Entry

Firms in an oligopoly market also face barriers as in the monopoly market. There are a few important barriers that influence the number of firms in market.

The small number of firms enables each firm to make enough sales to achieve economies of scale. For new firms, they only control a small portion of market share and definitely will not be able to achieve economies of scale. This means they run production with a high average cost and eventually, they will not be able to sustain in the industry.

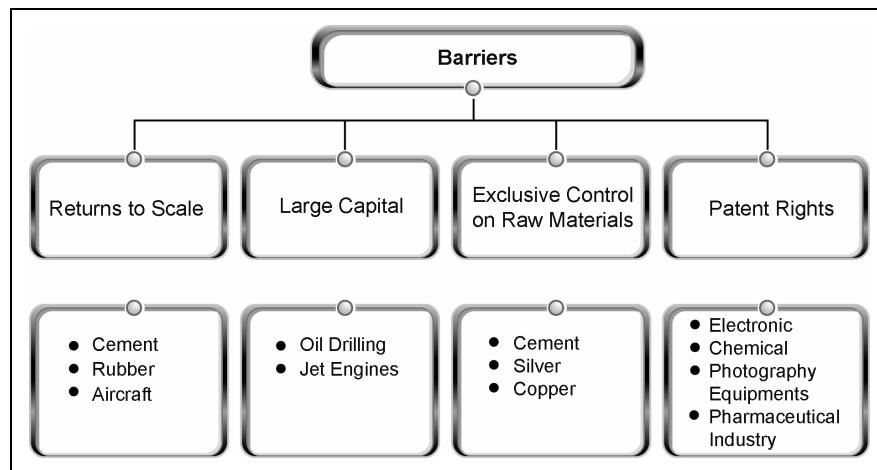


Figure 10.2: Barriers in an oligopoly market

## 10.2 EQUILIBRIUM IN AN OLIGOPOLY MARKET

In the discussions about market structures in Topic 7, 8 and 9, our main focus is to analyse how equilibrium price and outputs are determined. For instance, in the perfectly competitive market, the firm acts as takers of price which is determined by the market. Equilibrium output of the firm is achieved when price is equivalent to marginal cost. Meanwhile, in a monopoly market and monopolistic market, equilibrium price and output is achieved by fulfilling the rule of marginal revenue equivalent to marginal costs, or  $MR = MC$ .

However, the determination of equilibrium in the oligopoly market is more complicated. This is because in determining price and output, the firm has to take into account the action of its competitors. Similarly with competitors, their decisions depend on the action of other firms.

Since firms' decisions depend on the behaviour of their competitors, how is equilibrium price and output determined in the oligopoly market?

In the year 1951, a mathematician named John Nash had described the concept of equilibrium in an oligopoly market which is known as the Nash Equilibrium.

**Nash Equilibrium** is achieved when each firm executes the best action after considering the actions of its competitors. It is an important concept and will be used in the following discussion.



### EXERCISE 10.1

#### TRUE (T) / FALSE (F) Statements

1. Oligopoly market does not have any specific model to summarise its market structure.
2. Production cost of an oligopoly firm is equal to zero.
3. Limited number of firms in an oligopoly market prevents entry of new firms.
4. Level of product achieved by firm is not at the minimum point of the average cost.
5. Allocation of production factors of oligopoly market is efficient.

## 10.3 OLIGOPOLY MODELS

As stated above, the mutual interdependence among firm makes it difficult to analyse the behaviour a particular firm in the oligopoly market. Therefore, there are many models regarding the theory of oligopoly that tries to explain the behaviour of oligopoly in determining price. However, for this purpose, we will only concentrate on two models, namely:

- (a) Cournot Model
- (b) Sweezy Model

### 10.3.1 The Cournot Model

We begin our discussion by looking at the earliest model introduced by an economist named Augustin Cournot in the year 1838. Cournot presented a simple model with three basic assumptions:

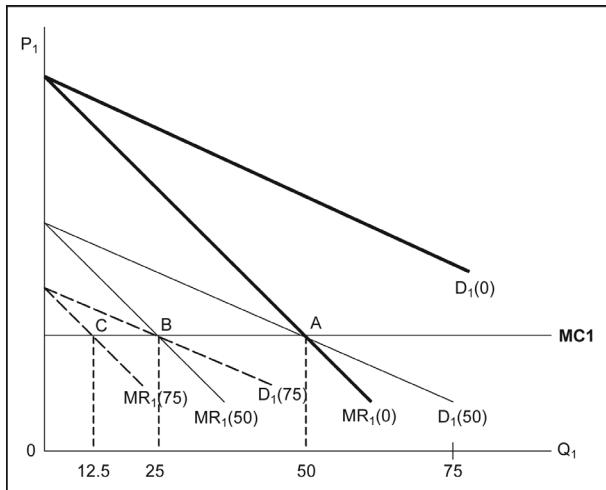
- (i) There are only two firms in the industry. These two firms are referred to as duopoly.
- (ii) Each firm assumes that the outputs produced by competing firms are constant.
- (iii) Both firm wishes to maximise their profit.

Now we will look at the explanation regarding the assumptions made. To illustrate his analysis, Cournot assumed that there are only two firms selling mineral water from two wells in the same area. Let us refer to those firms selling the bottled mineral water as Firm 1 and Firm 2. Since there are only two firms in the industry, hence it is known as duopoly.

Also assume that there are barriers for the new firms to enter the industry. This means we only consider the behaviour of the two firms present in the industry. The bottled water sold by both firms is a homogenous good and this results in the existence of only one price in the market. To facilitate analysis, both firms are assumed to have a marginal costs curve that are similar and constant.

The essence of the Cournot Model is that each firm determines its output based on the assumption that the outputs produced by its competing firms are constant. This assumption enables price and output to be determined. To understand this, let us look at how Firm 1 determines its output. This can be explained with the help of Figure 10.3.

Figure 10.3 shows the demand curve ( $D_1$ ), marginal revenue curve ( $MR_1$ ) and marginal cost curve ( $MC_1$ ) of Firm 1. Let us say that Firm 1 assumes Firm 2 does not produce any output. This means that Firm 1 will act as though it is a monopoly firm. Therefore, the demand curve faced by Firm 1, is also the market demand curve,  $D_1(0)$ .



**Figure 10.3:** Output determination by Firm 1

The number in bracket denotes the assumption of Firm 1 towards output that will be produced by Firm 2. In line with the demand curve, Firm 1 will face the marginal revenue curve denoted by  $MR_1(0)$ .

As explained above, Firm 1 faces a constant marginal costs curve that is at  $MC_1$ . Since Firm 1 assumes that Firm 2 does not produce any output, hence Firm 1 will maximise its profit by producing at the level where marginal revenue is equivalent to marginal cost.

Referring to the diagram, the  $MR_1(0)$  curve intersects with  $MC$  at point A. This means that if the output of Firm 2 is equal to zero, Firm 1 will maximise its profit by producing 50 units of output.

Now, suppose Firm 1 assumes that Firm 2 produces 50 units of output. This means the market share owned by Firm 1 has diminished. This result in the shift of the demand curve of Firm 1 to the left as far as 50 units and this is shown by curve  $D_1(50)$ .

In connection with this new demand curve, Firm 1 faces marginal revenue curve  $MR_1(50)$ . To maximise profit, Firm 1 will produce 25 units of output, that is at the level where  $MR_1(50) = MC_1$  (point B).

The process above will continue. Suppose Firm 1 assumes Firm 2 will produce 75 units of output. As explained above, the market share of Firm 1 will diminish further. Demand curve of Firm 1 will shift to the left for 75 units and now at  $D_1(75)$ . Subsequently, the marginal revenue curve of the firm will also shift to  $MR_1(75)$ .

Based on the belief that Firm 2 will produce 75 units of output, the decision of Firm 1 is to produce 12.5 units of output in order to maximise its profit. This level of output is produced at point C, that is, the intersection point between curve  $D_1(75)$  with  $MR_1(75)$ .

Finally, suppose Firm 1 believes that Firm 2 will produce 100 units of output. This means the demand curve and marginal revenue curve faced by Firm 1 will intersect with the marginal cost curve at the vertical axis (this situation is not shown in diagram). In conclusion, if Firm 2 is expected to produce 100 units of output, then it is Firm 1 is better off not producing any output.

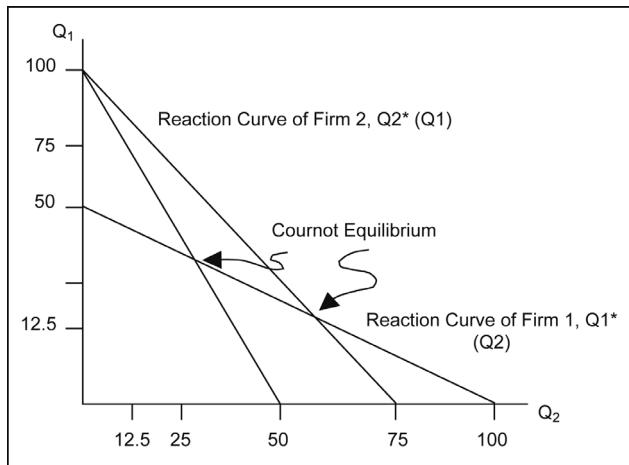
### Reaction Curve

From the explanation above, we find that there are four combinations of output based on the action of Firm 1 in determining its output after making assumptions towards the output produced by Firm 2.

**Table 10.1:** Production of Firm 1 based on the Production of Firm 2

	Firm 1	Firm 2
Amount of Output Produced	50	0
	25	50
	12.5	75
	0	100

In conclusion, it can be seen that the output that maximises profit of Firm 1 is a production table that is declines based on how much output will Firm 2 produces. This production table of Firm 1 is referred to as the reaction curve labelled as  $Q_1^*(Q_2)$ . The reaction curve of Firm 1 can be obtained by plotting the four combinations of output marked x. This is shown in the following Figure 10.4.



**Figure 10.4:** Reaction curve and Cournot equilibrium

The analysis above describes how Firm 1 determines its output after predicting the output level produced by Firm 2. For Firm 2, it will also react like Firm 1 when determining its output level.

If the same analysis is used on Firm 2, we will be able to form the reaction curve of Firm 2. The reaction curve of Firm 2 is labelled as  $Q_2^*(Q_1)$  as shown in Figure 10.4.

The question now is, what is the amount of output produced by each firm? The reaction curve of each firm describes the quantity that needs to be produced by firms after taking into consideration the output produced by its competitor. This means that each firm determines their output by referring to its reaction curve.

Therefore, the level of equilibrium output is achieved when the reaction curves intersect. The point of intersection is referred to as the **Cournot Equilibrium**. At this level of equilibrium, each firm has made accurate assumptions regarding how much output is being produced by its competitor. Then, the firm will determine the level of output that can maximise its profit based on the information obtained.

Cournot equilibrium is an example of Nash equilibrium. We know that Nash equilibrium is achieved when every firm has done their best after taking into consideration their competitors' action. Thus, when Nash equilibrium exists, none of the firm will alter its behaviour.

The conclusion obtained from Cournot equilibrium is that each firm will produce the amount of output that will maximise its profit after considering the amount of output produced by its competitor.

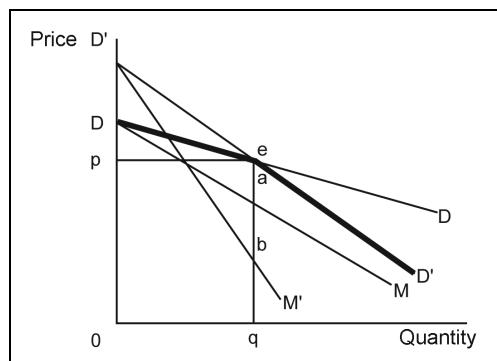
### 10.3.2 Sweezy Model

In the Cournot Model, we have seen how the duopoly mutually considers the output produced by its competitor in order to determine its own output. We find that the behaviour of duopoly is influenced by the output level. What if the firm alter its price level? What will be done by its competing firm and how will it affect other firms?

We will look at an oligopoly model that discusses a simple idea, that is, if a firm reduces price, the firm believes that this act will be followed by its competitors. On the other hand, if the firm increases price, this will not be followed by its competitors. The model is known as the Sweezy Model or the kinked demand curve model.

This model assumes that the part of demand curve that shows the reaction towards price decrease differs from the part of the demand curve that shows the reaction towards price increase. Pertaining to that, this model is also able to explain the price strategy of an oligopoly firm.

Now we will try to understand the kinked demand curve model by referring to Figure 10.5.



**Figure 10.5:** Kinked demand curve model of oligopoly

Figure 10.5 illustrates how a kinked demand curve of a firm is formed. The curve  $DD$  denotes the demand curve of an oligopoly firm when one firm alters its price and this action is not followed by the competing firm. Meanwhile, curve  $D'D'$  denotes the demand curve of an oligopoly firm when one firm alters its price and this action is followed by the competing firm.

Suppose the firm begins at point  $e$  where the firm produces  $q$  units of output and imposes a price of  $p$ . If the firm reduces its price, demand quantity will increase.

From the explanation above, we know that the firm's action in reducing price will be followed by other firms. This is because competing firms do not want to face loss in sales and market share. This means the firm will face demand curve D'D'. Therefore, if price decreases lower than  $p$ , the firm will face a demand curve marked eD'.

On the other hand, if the firm decides to increase price, it is assumed that other firms will not follow the decision. This causes the firm to face loss in terms of sales and market share. Thus, the firm will face demand curve DD if it decides to increase price. Therefore, if price increases higher than  $p$ , the firm will face a demand curve marked De.

In conclusion, because the reaction of competing firm is different towards the firm's decision either to increase or reduce price, the firm faces a kinked demand curve, that is DeD'.



### ACTIVITY 10.1

In your own words, compare the Cournot Model and the Sweezy Model.

## SUMMARY

.....

- In the discussions above, you have understood the behaviour of firms in the market structure that consists only of several firms.
- We have understood that in order to maximise profit, the firm must produce at the level where marginal cost is equivalent to marginal revenue.
- However, in an oligopoly market, the firm not only has to fulfil this condition, but must also consider the action of its competitors when determining the price and output that maximises its profit.
- Therefore, you have been exposed to two out of the many models that tries to explain the behaviour of competitors that influences the decision of firm in determining the equilibrium price and output.
- The models are the Cournot Model and the Sweezy Model. Your understanding towards the two models will help you understand the behaviour of firm in the real situation.



# Answers

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## TOPIC 1: INTRODUCTION TO ECONOMICS

### Exercise 1.1

TRUE (T) / FALSE (F) Statements

1. T
2. T
3. F
4. T

### Exercise 1.2

TRUE (T) / FALSE (F) Statements

1. T
2. T
3. F

### Exercise 1.3

TRUE (T) / FALSE (F) Statements

1. T
2. F
3. T

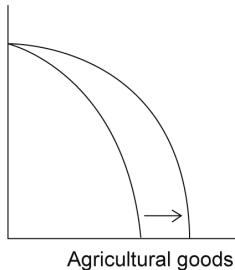
### Exercise 1.4

Fill in the Blanks

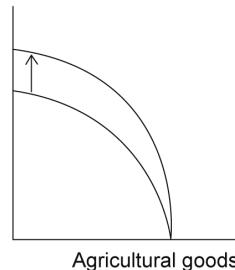
1. insatiable, limited
2. what, how, who
3. alternative, opportunity cost
4. Macroeconomics, Microeconomics
5. circular flow of income
6. wasted, not achieved
7. increasing, decreasing
8. non-intervention, mixed

## Structured Questions

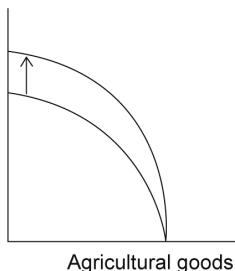
1. (a) Consumer goods



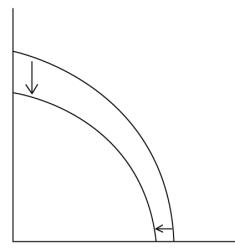
- (b) Consumer goods



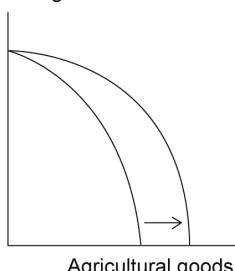
- (c) Consumer goods



- (d) Consumer goods



- (e) Consumer goods



- |    |     |   |     |   |
|----|-----|---|-----|---|
| 2. | (a) | F | (f) | F |
|    | (b) | T | (g) | T |
|    | (c) | F | (h) | T |
|    | (d) | T | (i) | F |
|    | (e) | T | (f) | T |

## **TOPIC 2: DEMAND AND SUPPLY**

### **Exercise 2.1**

**TRUE (T) / FALSE (F) Statements**

1. T
2. F

### **Exercise 2.2**

**TRUE (T) / FALSE (F) Statements**

1. F
2. T

## **TOPIC 3: MARKET EQUILIBRIUM**

### **Exercise 3.1**

**TRUE (T) / FALSE (F) Statements**

1. T
2. F
3. T
4. T

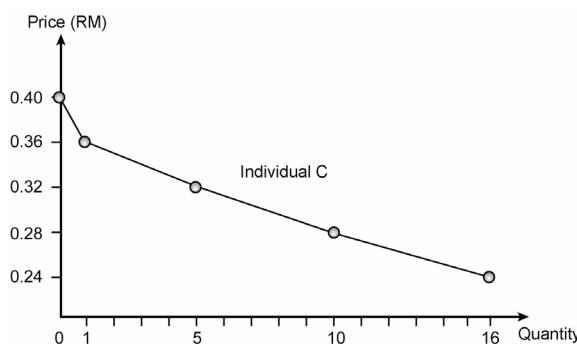
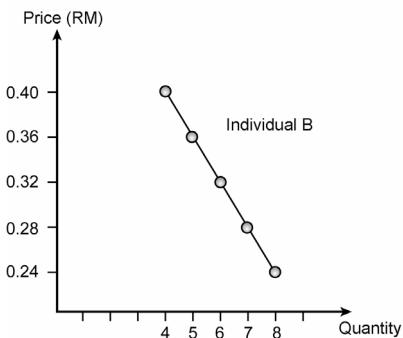
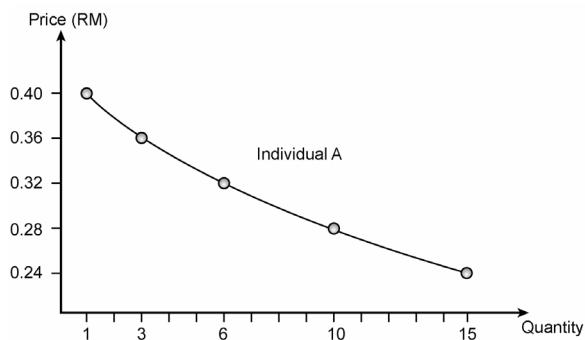
### **Exercise 3.2**

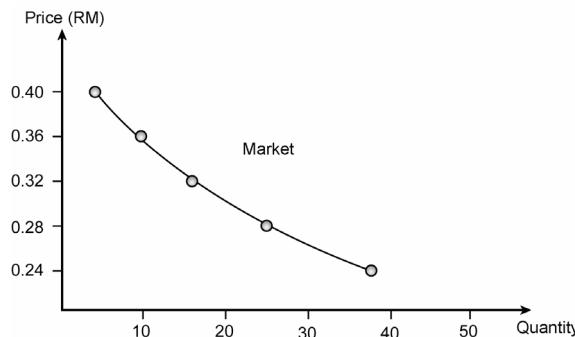
1. sellers, buyers
2. income, preferences, price of related goods
3. negative, positive
4. less, lower
5. more
6. equilibrium, supplied
7. is lower than, demanded, supplied, surplus, supplied, demanded
8. increase, unascertained, quantity, price

**Problem Question**

1.

Price (RM)	Market Demand (Unit)
0.4	5
0.36	9
0.32	17
0.28	27
0.24	39



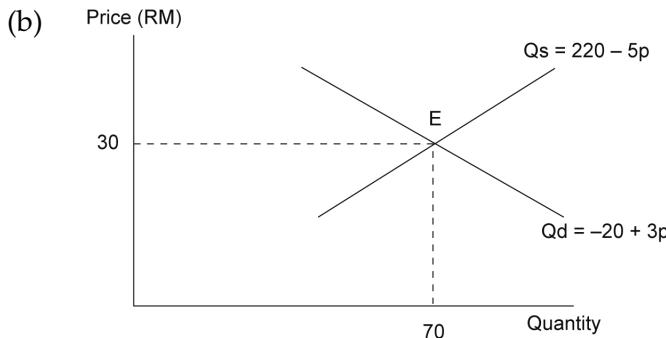


2. (a) Equilibrium quantity and price are obtained by equaling quantity demanded with quantity supplied, that is:

$$\begin{aligned}
 Q_d &= Q_s \\
 -20P + P &= 220 - 5P \\
 8P &= 240 \\
 P &= \frac{240}{8} \\
 P &= 30
 \end{aligned}$$

Substitute  $P = 30$  into the demand or supply equation. It is found that

$$\begin{array}{lll}
 Q_s = 220 - 5(30) = 70 = Q_d & & Q_d = -20 + 3P \\
 Q_s = 220 - 5P & \text{or} & = -20 + 3(30) \\
 = 220 - 150 & & = -20 + 90 \\
 = 70 & & = 70
 \end{array}$$



(c)

Price (RM)	10	20	30	40	50
Quantity demanded	10	40	70	100	130
Quantity supplied	170	120	70	20	-30
Surplus/Shortage	160	80	0	-80	-160

## Exercise 3.4

**TRUE (T) / FALSE (F) Statements**

1. F
2. F
3. T

## Exercise 3.5

**TRUE (T) / FALSE (F) Statements**

1. T
2. T

## Exercise 3.6

**TRUE (T) / FALSE (F) Statements**

1. T
2. F

### Fill in the Blanks

1. elasticity, percentage
2. increases, decreases
3. elastic, increases, unitary elastic
4. income, income
5. cross, substitutes, complementary

### Problem Question

1.  $Ed = \frac{\% \Delta Q}{\% \Delta P} = \frac{-30\%}{10\%} = -3$

Price elasticity of demand is 3.

2. Using the point elasticity formula

$$Ed = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

At  $P = RM2$ , hence  $Q_d = 100 - 2(2) = 100 - 4 = 96$  units

At  $P = RM3$ ,  $Q_d = 100 - 2(3) = 100 - 6 = 94$  units

$$\text{Hence } E_d = \frac{94 - 96}{96} \times \frac{\text{RM2}}{\text{RM3} - \text{RM2}} = \frac{-2}{96} \times \frac{2}{1} = \frac{-4}{96} = -0.04$$

Price elasticity of demand is 0.04

$$\begin{aligned} 3. \quad E_d &= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \\ -2 &= \frac{Q - 20}{2} \times \frac{10}{20} \\ Q - 20 &= -8 \\ Q &= 12 \text{ units} \end{aligned}$$

Quantity demanded falls from 20 units to 12 units

$$\begin{aligned} 4. \quad (a) \quad E_{mR} &= \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{40 - 20}{20} \times \frac{1000}{2000 - 1000} = 1 \\ E_{mS} &= \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{10 - 20}{20} \times \frac{1000}{2000 - 1000} = -0.5 \\ E_{mT} &= \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{50 - 50}{50} \times \frac{1000}{2000 - 1000} = 0 \end{aligned}$$

- (b) R = Normal good
- S = Giffen good
- T = Necessity

$$\begin{aligned} 5. \quad (a) \quad E_{AK} &= \frac{\Delta Q_K}{Q_K} \times \frac{P_A}{\Delta P_A} = \frac{5 - 10}{10} \times \frac{2}{3 - 2} = \frac{-5}{10} \times \frac{2}{1} = -1 \\ E_{AL} &= \frac{\Delta Q_L}{Q_L} \times \frac{P_A}{\Delta P_A} = \frac{30 - 20}{20} \times \frac{2}{3 - 2} = \frac{10}{20} \times \frac{2}{1} = 1 \\ E_{AM} &= \frac{\Delta Q_L}{Q_L} \times \frac{P_A}{\Delta P_A} = \frac{40 - 40}{40} \times \frac{2}{3 - 2} = 0 \end{aligned}$$

- (b) A and K = Complements
- A and L = Substitutes
- A and M = Not related

$$6. \quad E_S = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} = \frac{140 - 120}{120} \times \frac{20}{30 - 20} = \frac{1}{3} = 0.33$$

## TOPIC 4: UTILITY ANALYSIS

### Exercise 4.1

TRUE (T) / FALSE (F) Statements

1. F
2. F
3. T
4. T

### Exercise 4.2

TRUE (T) / FALSE (F) Statements

1. T
2. T
3. F

### Exercise 4.3

TRUE (T) / FALSE (F) Statements

1. F
2. T
3. F
4. F

### Exercise 4.4

TRUE (T) / FALSE (F) Statements

1. F
2. T

### Exercise 4.5

TRUE (T) / FALSE (F) Statements

1. T
2. T
3. F
4. T

## Exercise 4.6

### TRUE (T) / FALSE (F) Statements

1. F
2. F
3. F
4. T

5. (a)

Quantity	Marginal Utility (MU)
1	40
2	35
3	30
4	25
5	20

- (b) The rule to maximise Consumer Utility (for 1 good)

$$\begin{array}{lcl} \text{Marginal Utility} & = & \text{Price} \\ \text{MU} & = & P \end{array}$$

To maximise utility, consumer must purchase 4 units of good X.

## TOPIC 5: PRODUCTION THEORY

## Exercise 5.1

### TRUE (T) / FALSE (F) Statements

1. T
2. T
3. T
4. F

## Exercise 5.2

### TRUE (T) / FALSE (F) Statements

1. F
2. F
3. T
4. F

## Exercise 5.3

TRUE (T) / FALSE (F) Statements

1. T
2. T

**Problem Question**

Labour (Unit)	Total Product (TP)	Marginal Product (MP)	Average Product (AP)
4	0	-	-
4	80	80	80
4	200	120	100
4	330	130	120
4	400	70	100
4	450	50	90
4	480	30	80
4	490	10	70
4	480	-10	60

## TOPIC 6: COST THEORY

### Exercise 6.1

TRUE (T) / FALSE (F) Statements

1. T
2. T

### Exercise 6.2

TRUE (T) / FALSE (F) Statements

1. F
2. T
3. F
4. T

## Exercise 6.3

### TRUE (T) / FALSE (F) Statements

1. T
2. T
3. F
4. T
5. F

### Problem Question

1. (a)

Output	Long-Run Average Cost	Long-Run Total Cost	Long -Run Marginal Cost
10	7	70	7
20	6	120	5
30	5	150	3
40	4	160	1
50	4	200	4
60	3	180	2
70	4	280	10
80	5	400	12
90	6	540	14
100	5	500	16
110	7	770	27
120	10	1,200	43

- (b) 10 units to 40 units
- (c) 90 units to 120 units
- (d) Plant 2

## TOPIC 7: PERFECTLY COMPETITIVE MARKET

### Exercise 7.1

TRUE (T) / FALSE (F) Statements

1. T
2. T
3. T
4. T
5. T

### Exercise 7.2

TRUE (T) / FALSE (F) Statements

1. T
2. F
3. T
4. T
5. T

### Exercise 7.3

Problem Questions

1. 6 units
2. RM39
3. 6 units
4. MC situated below AC

## TOPIC 8: MONOPOLY MARKET

### Exercise 8.1

TRUE (T) / FALSE (F) Statements

1. T
2. F
3. T
4. F

## Exercise 8.2

### Fill in the Blanks

1. Patent rights
2. Exclusive power rights
3. Total revenue
4. Price

## Exercise 8.3

### Fill in the Blanks

1. Point A
2. Point C
3. Point C
4. Point E

## Exercise 8.4

### Essay Questions

1. (a) **No Close Substitutes**

Goods produced by a monopoly do not have close substitutes in terms of the consumption of the good. In Malaysia, Tenaga Nasional Berhad (TNB) is the best example of a monopoly. Electricity supplied by TNB cannot be substituted by other forms of energy. Even though there might be other goods that can substitute the use of electricity, the good may still be limited in terms of its use and nature.

Candles, for example, can be used to provide light and can substitute the electricity power during power failure, but its use is limited. It cannot be used to receive television or radio programmes, or to turn on an electric fan.

(b) **Barriers to Entry into Industry**

Unlike the perfectly competitive market, a monopoly has the power to restrict the entry of other firms into the industry. This restriction is due to several reasons such as:

- (i) license given by the government;
- (ii) control over production resources; and
- (iii) experiencing the benefits of economies of scale, and others.

This will create monopoly power in a particular industry. Monopoly power is explained in the following section of this chapter.

- (c) **Firm as the Price Maker**  
As mentioned from the beginning, a monopoly market only consists of one firm that controls the whole market. This enables the monopolist to determine the price of goods or services provided on its own.
2. (a) **Control over Certain Production Resources**  
Monopoly can occur when a particular industry is able to control a large portion or the entire supply of raw material that cannot be obtained by other industries. Telekom Malaysia Berhad is one of the businesses attempting to control a large portion of the telecommunication resources by taking over several other telecommunication companies such as Celcom and becoming the monopoly in this industry.  
  
De Beers is one of the example that is often referred to as an example of world monopoly towards the mining of precious gems. Almost all the world's mining of precious gems is controlled by De Beers.
- (b) **Economies of Scale**  
Economies of scale means an industry can produce output with a low average cost due to the large number of quantities produced. The output produced is able to accommodate almost all the demand in market. This prevents new firms from entering the market because of the long period of time needed to achieve the economic scale.  
  
If there are new firms attempting to enter market, they need to sell their output at a price that is at least as low as the price offered by the firm experiencing the benefit of economies of scale; this will probably result in a loss and the new firm will soon have to leave the market.
- (c) **Legal Barriers**  
The government creates regulatory barriers in order to protect the interests of the monopoly. The regulatory barriers can be in the form of licenses, patents, and copyrights.
- (i) **License**  
Public license is a legal right granted by the state government or the local government by imposing certain amount of payment onto the business owner. Without this license, the business operated is considered illegal and legal action can be taken towards it.

Any business such as the medical, food industry and others, will need to have a license. How can license create monopoly power? License can create monopoly power because not all businesses will be granted license by the government.

However, granting of license seldom leads to monopoly power. In most situations, it will only reduce competition. The government will only provide license to a particular business which is considered to be more viable than the other competitors. Any firm without license will be restricted from doing business.

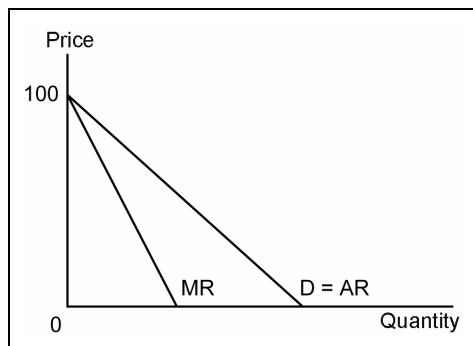
(ii) **Patent**

Patent is a form of special right given by the government to inventors or creators, with regard to their inventions or creations. This patent restricts other individuals from producing output which is similar to the invention that has been granted the patent right. Patent is vital in protecting new inventions and creations since it involves a very high cost. In the United States, patent for an invention is granted for a period of at least seventeen years.

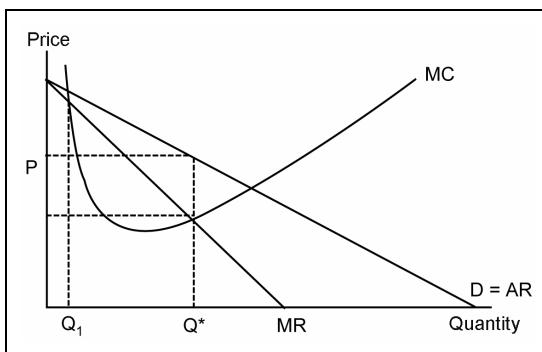
(iii) **Copyrights**

Copyright is also a patent that protects inventors from imitations. Copyright differs from patent as it is given to writings and publication of books, and song writing. Copyright only allows the particular writer to publish the particular book or song. Any unauthorised publication will be legally dealt with.

3.  $P = 100 - 4Q$   
 $MR = 100 - 8Q$



4. Monopoly will not produce output at the section where the demand curve is less elastic because the total revenue will decrease when more quantity is produced.
5. Rationally, this condition is when all firms wanted to produce their output at the condition where marginal revenue exceeds marginal cost. Thus, marginal revenue must be above of marginal cost before the intersection (crossing).



**Figure 8.6:** Maximisation of monopoly profit

Based on Figure 8.6, we can see the case where the marginal costs curve intersects the marginal revenue curve. Intersection takes place at two points, that is when output is  $Q_1$  and  $Q^*$  units of output

However, the output chosen is not the output that maximises profit because at this point, the marginal cost curve intersects the marginal revenue curve from above and after the intersection, the marginal costs curve is at the bottom of the marginal revenue curve.

This means that when the production of output is between  $Q_1$  and  $Q^*$ , the average cost of output is still very much lower compared to its average revenue. Meanwhile after  $Q^*$  unit of output, an increase in subsequent output will result in a bigger increase in cost compared to the increase in revenue.

Only at  $Q^*$  unit, output produced will give a marginal revenue that is equivalent to the marginal cost, and this is the output that can maximise the monopoly profit.  $Q_1$  is the output produced when the firm achieves the condition of capital break even.

## **TOPIC 9: MONOPOLISTIC MARKET**

### **Exercise 9.1**

**TRUE (T) / FALSE (F) Statements**

1. T
2. T
3. T
4. F
5. F

### **Exercise 9.2**

**Structured Questions**

1. 3 units
2. RM2
3. Increases

## **TOPIC 10: OLIGOPOLY MARKET**

### **Exercise 10.1**

**TRUE (T) / FALSE (F) Statements**

1. T
2. T
3. T
4. T
5. F