



# Microeconomics

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Only study guide for ECS2601

Department of Economics  
University of South Africa  
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# INTRODUCTION

## **Introduction**

Dear Student

It is with pleasure that I welcome you to ***Microeconomics at second year level.***

The ***purpose*** of Microeconomics 2601 is to prepare you for your studies in the field of economics. The module will allow you to reflect on the skills you already have and the resources you require to manage your own learning development as well as analyse the relationship between consumption (the demand side) and production (the supply side) in the economy. Moreover, you will be able to understand how different types of markets form, function, change and how some even fail.

## **Aims of Microeconomics 2601**

*The main aims of Microeconomics 2601 are:*

- to analyse the relationship between consumption (consumers) and production (suppliers) in the economy from a microeconomic perspective.
- to gain knowledge of consumer behaviour.
- to gain knowledge of producer behaviour.
- to understand the *analogous nature* of the tools used in consumption versus production analysis.
- to gain knowledge of how the interaction of the two sides of the economy lead to varied markets.
- to identify and understand the consequences of consumer and producers behaviour in different market structures.
- to understand and analyse the interactions of consumers and producers in an economy where a general equilibrium exists.

## **Outcomes for Microeconomics 2601**

*Detailed learning outcomes are provided at the beginning of each learning unit.*

The main outcomes for ***Microeconomics 2601*** are:

- a fundamental knowledge of the economic theories of microeconomics.
- a comprehensive understanding of the key economic terms used in microeconomics.
- an understanding of how microeconomics relates to the rest of economic theory.
- a basic understanding of the procedures, operations and techniques relating to microeconomics.
- the ability to solve specific problems using accurate procedures and relevant evidence.

- the ability to critically analyse and synthesise information and accurately present the information.
- the ability to present information logically, coherently, persuasively and reliably, using academic discourse, and the appropriate conventions and formats.

### **Prescribed Tutorial Material**

The prescribed tutorial material consists of the textbook, the study guide and tutorial letters that you will receive during the semester.

The following textbook is prescribed for this course:

Pindyck, RS & Rubinfeld, DL. 2009. *Microeconomics for UNISA*. 7th edition. London: Pearson Educational International.

In this study guide we shall refer to it as “Pindyck and (&) Rubinfeld (2009)” or “the textbook”.

The textbook is an American work that includes international case studies. Discourses (media reports) on economic issues are reported in the newspapers, periodicals, television programmes and the Internet on a daily basis. You are advised to follow these media reports and to try to understand the microeconomic theory (where applicable) underlying these issues.

(**Note:** In accordance with Unisa editorial policy, Standard English spelling, not American, is used in the study guide, e.g. “labor”, “behavior”, “enrollment” is “labour”, “behaviour”, “enrolment” etc. This should not affect your studies in any way.)

**The study guide *guides* you *through* the textbook. We give you certain study instructions, namely to revise, read, ignore and/or study indicated sections in Pindyck and Rubinfeld (2009). Note the following differences between the four types of instruction:**

**Study!** These sections form the basis for examination questions and you should study them with this in mind.

**Read!** These sections contain essential background information for a better understanding of the prescribed or study sections, but no examination questions will be set on them.

**Omit!** These sections may be left out.

Remember the following general rule:

Study guide: You should study all the sections in the study guide (unless otherwise stated). All are prescribed for the examination.

Textbook: **You need study only those sections in the textbook that we refer you to in the study guide.** These sections are prescribed for the examination.

Those of you, who have access to the Internet, may read messages concerning the module on myUnisa. If you do not have access to the Internet, you will receive this information in tutorial letters.

Questions that are considered to be important will be repeated in this study guide or in tutorial letters.

### ***Suggested Study Method***

This study guide comprises 18 learning units, although not all of them contain study material (i.e. learning units 1, 5, 13, 14, 17 and 18). Each learning unit to be studied includes learning outcomes, study instructions, and possible examination-type questions. Below, we suggest a possible method of study.

While you are free to choose a different study method for this course, we strongly recommend the method set out below. It is actually more of a general guideline than a method, and you might find it necessary to adapt it to your own circumstances and abilities.

#### Step 1 Study guide

Read through a learning unit in the study guide to gain an overall picture of the subject matter.

#### Step 2 Study guide and textbook

Have your study guide at hand and read a heading and the section below it carefully. Note the important concepts that are pointed out. **Then read the corresponding section in the chapter in the textbook.** Take note of the diagrams. Make summaries as you go along. Bear in mind that your summaries should be concise – you should be able to summarise a whole chapter in a maximum of four or five A-4 pages. Summarising requires you to extract the essence of a text, not rewrite chunks from the textbook. **Find key words in each paragraph of the textbook!**

#### Step 3 Activities

Once you have completed a section or a couple of sections as described in step 2, proceed to the activity that follows.

Complete the true/false questions of the specific activity. These true/false questions are followed by multiple-choice questions. (The answers to these questions are supplied at the end of each learning unit.) The next category of questions is those which require written answers in the form of a calculation, a paragraph or a short essay. We recommend that you work out paragraph- or essay-type answers and keep them for subsequent revision. The study guide will not provide answers to these questions.

It is also important to answer the questions following each chapter in the textbook (Pindyck & Rubinfeld, 2009). These questions are important and you may encounter them in the examination. Note that some answers to the exercises appear in the back of the textbook (Pindyck & Rubinfeld, 2009:711).

#### Step 4 Assignments

Answer the questions asked in the assignment that relate to the relevant chapter in the textbook. Submit the assignments in good time.

#### Step 5 Revision

It is impossible to master the study material by studying it once only. When you start studying new work, you should allow enough time for at least three systematic revisions of the study material that you have already completed. Do the first revision shortly after your initial study (say, one day later), the second revision, say, another three days later, and the third revision a week later. In this way, the subject matter will sink in and really become part of your thinking.

#### Step 6 Study programme

Tutorial Letter 101 contains a study programme as well as guidelines regarding study hours to give you an indication of the rate at which you should work. It is vitally important to stick to this programme. If you fall behind, it is your responsibility to catch up. Remember, a semester is very short.

#### Step 7 Further reading

At the end of most learning units, additional sources for further reading, websites, books and articles are given, if available. This is not for examination purposes, but for those of you who are interested in getting more out of a specific topic. Each chapter in the textbook also ends with a list of additional sources (Pindyck & Rubinfeld, 2009).

We wish you every success with your studies!



## Assumptions of Prior Learning in Microeconomics

**OMIT**

Pages 3 to 19.

**This learning unit you need to revise all your first year microeconomics.**

In this course it is assumed that you have studied the following introductory concepts:

- (1) Scarcity, choice and opportunity cost, Economics as a science.
- (2) What should be produced, how and for whom?
- (3) Interdependence between major economic sectors, markets, and flows in mixed economies.
- (4) Demand, supply and prices.
- (5) Demand and supply in action.
- (6) Some concepts in Elasticity.
- (7) Background to demand: the theory of consumer choice.
- (8) Background to supply: the theory of production and cost.
- (9) Perfect competition.
- (10) Monopoly and imperfect competition – overview.
- (11) The labour market – introduction.

**Revise the above concepts revise the work from most first year economics textbooks, including Mohr, Fourie, L & Associates. 2007. Economics for South African Students 4th edition: Chapters 1, 2, 3, 7, 8, 9, 10, 11, 13 and 14.**

# Elasticity

## **Contents**

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### **Economics in action**

#### **2.4 Various types of elasticity**

Activity 2.4

#### **2.7 Effects of government intervention – price controls**

Activities 2.7

### **Economics in action revisited**

### **Further reading**

### **Answers to some of the questions**

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## **Learning Outcomes**

**Once you have studied learning unit 2 you should be able to:**

- *explain the meanings and calculation of different elasticity concepts;*
- *discuss the consequences of government intervention in the market.*

## **Economics in Action**

When the prices of television sets go up, what happens to purchases of TVs at electronic stores?

When many skilled foreign builders enter a country like South Africa, what do you think happens to the quantity supplied of houses?

When students graduate and start earning middle class incomes, what happens to their demand for taxis?

These are some of the questions that can be asked with respect to the RESPONSIVENESS of quantity demanded or supplied in response to changes in price (also wages) and incomes.

You encountered the basics of elasticity in your first year. This year we expand on this topic and expect you to not only remember your first year conceptual work but to calculate and apply this concept in real world economic questions.

**OMIT/STUDY**

Omit Pages 21 to 33 and  
Study Pages 34 to 48.

## 2.4 Various Types of Elasticity

**Elasticity measures the sensitivity of one variable to another.** For example, what is the percentage change in variable A if variable B changes with 1%? (This is based on the assumption that the two variables are related to each other.)

We said previously that quantity supplied ( $Q_s$ ) and quantity demanded ( $Q_D$ ) are determined by various factors, including the own price of a specific product.<sup>1</sup>

When the price elasticity of demand is calculated, we want to know by how much the quantity demanded changed due to a 1% change in the own price of the product. Note that when calculating the price elasticity of demand, the answer must be negative (if the price of a product increases (decreases) the quantity demanded decreases (increases)). However, in the case of this type of elasticity we are interested in the absolute value of the answer, so we can **ignore the negative sign**. The different types of elasticity of demand are summarised in table SG2.1. In the case of supply, we are interested in the percentage change of quantity supplied with a 1% change in the own price of the good or service.<sup>2</sup>

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1 See section 2.1 in this learning unit.

2 We can also refer to supply elasticity with respect to the non-own price determinants of the good or service (as in the case with demand elasticity).

**TABLE SG2.1:** Point and Arc elasticity of demand and supply

Type of elasticity	Magnitude	Elasticity	Description <sup>3</sup>	
Price elasticity of demand ( $E_p$ )	$= \infty$	Infinitely elastic	Figure 2.11: Where $P = 4$ and $Q = 0$ , or Figure 2.12(a)	
	$>1$	Price elastic	Figure 2.11: $P$ between 4 and 2, or $Q$ between 0 and 4	
	$=1$	Unitary price elastic	Figure 2.11: Where $P = 2$ and $Q = 4$	
	$<1$	Price inelastic	Figure 2.11: $P$ between 2 and 0, or $Q$ between 4 and 8	
	$= 0$	Completely inelastic	Where $P = 0$ and $Q = 8$ , or Figure 2.12(b)	
Income elasticity of demand	$>0$	Normal goods and services	<i>Example:</i> telephones, houses, cameras, etc.	
		$>1$	Luxury goods and services	<i>Example:</i> sport cars, yachts, exotic holidays, etc.
		$0-1$	Necessities	<i>Example:</i> medicine, milk, bread and porridge.
	$< 0$	Inferior goods and services	A bicycle relative to a motor vehicle. Ball point pens relative to fountain pens.	
Cross-price elasticity of demand	$= 0$	Goods and/or services have no relationship with each other	Butter and petrol. Computers and wood. House plants and holidays overseas.	
	$=$ positive	Goods and/or services will be substitutes	<i>Example:</i> butter and margarine. A bolt and a nut.	
	$=$ negative	Goods and/or services will be complementary	<i>Example:</i> motor cars and petrol. Shoes (left and right).	
Price elasticity of supply	$=$ positive	Will usually be positive with increase in own price	<i>Example:</i> with an increase in the price of gold, marginal gold mines will start production (and supply will increase).	
	$=$ negative	Will usually be negative with increase in the price of inputs	<i>Example:</i> with an increase in the price of labour, insecticides and/or fertilisers, production (supply) will decrease.	

<sup>3</sup> Figure 2.11 is on page 35 and Figure 2.12 on page 36 (Pindyck & Rubinfeld, 2009).

In Figure 2.11 (Pindyck & Rubinfeld, 2009:35) **point elasticity of demand** is used; this refers to the elasticity at a specific point. However, if we calculate the elasticity of demand or supply over a range of prices or quantities demanded (or supplied), we must use arc elasticity of demand or supply. Pindyck and Rubinfeld (2009:37) illustrate the reason why we must use the mid-point between the original price (and the quantity demanded) and the end price (or quantity demanded). We thus use average price (or quantity demanded) and we measure the **arc elasticity of demand**.

According to table SG2.2, the **nature of the product** can determine the elasticity of demand and supply. Another factor which can have an influence is the **time span**. We know that human behaviour changes over time. Consumers may act immediately after a price increase of a certain product by buying less of the product (the short run). However, over time the consumer may become used to the higher price and the quantity demanded will return more or less to its previous levels (the long run). The influence of time (short and long run) on elasticity is discussed in the textbook (Pindyck & Rubinfeld, 2009:40–48).

### Activity 2.4

Decide whether the following statements are **True** or **False**.

		T	F
1	The words “elasticity” and “slope” are synonymous.		
2	The elasticity of a single point on the demand curve can be determined.		
3	Essential products have a negative income elasticity.		
4	Cross-elasticity is only relevant in the case of related products.		
5	Price elasticity of demand is a theoretical concept with no practical value.		

### Multiple-choice questions

- Elasticity measures ...
  - the slope of a demand curve.
  - the inverse of the slope of a demand curve.
  - the percentage change in one variable in response to a 1% increase in another variable.
  - sensitivity of price to a change in quantity.
- The price elasticity of demand for a demand curve that has a zero slope is ...
  - zero.
  - one.
  - negative but approaches zero as consumption increases.
  - infinite.

3. A vertical demand curve is ...
  - [1] completely inelastic.
  - [2] infinitely elastic.
  - [3] highly (but not infinitely) elastic.
  - [4] highly (but not completely) inelastic.
  
4. Along any downward-sloping straight-line demand curve ...
  - [1] both the price elasticity and slope vary.
  - [2] the price elasticity varies, but the slope is constant.
  - [3] the slope varies, but the price elasticity is constant.
  - [4] both the price elasticity and slope are constant.
  
5. If two goods are substitutes, the cross-price elasticity of demand must be ...
  - [1] negative.
  - [2] positive.
  - [3] zero.
  - [4] infinite.

#### Questions with written answers

- (1) The cross-price elasticity of demand for peanut butter in comparison with the price of jelly is -0.3. If we expect the price of jelly to decline by 15%, what is the expected change in the quantity demanded for peanut butter? Show your calculations. (4)

**OMIT**  
Pages 49 to 58.

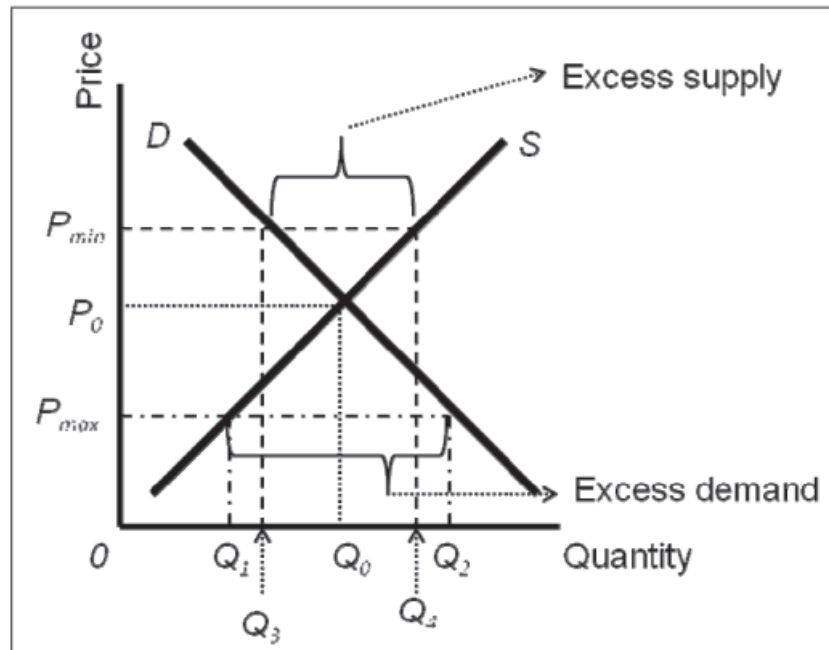
### 2.7 *Effects of Government Intervention – Price Controls*

**STUDY**  
Pages 58 to 61.

Government intervention in the market mechanism may take place in a number of ways. Although we will reconsider price controls later in this study guide, we wish to discuss **ceiling prices (also called a “maximum price”) and floor prices (also called a “minimum price”)** here.<sup>4</sup> In the textbook (Pindyck & Rubinfeld, 2009:58–59) attention is given to ceiling prices only. By redrawing Figure 2.24, we can also explain floor prices (see Figure SG2.1).

<sup>4</sup> See learning unit 9, sections 9.3 and 9.4.

In the case of ceiling prices, government officials regard the equilibrium price (or market clearing price) as too high and a price lower than the equilibrium price is set ( $P_{max}$  in Figure 2.24.) In the case of a floor price, the officials feel that the equilibrium price is too low and set a (floor) price which is above the equilibrium price,  $P_{min}$  in the Figure below (Figure SG2.1). (This can also be inserted in Figure 2.24 (Pindyck & Rubinfeld, 2009:59) above the equilibrium price,  $P_0$ .) Such a floor price will give an excess supply, as producers are more than willing to produce at such a high price, but consumers regard the price as too high.



**FIGURE SG2.1:** Setting of a floor (minimum) price and ceiling (maximum) price

The following table summarises the ceiling and floor prices.

**TABLE SG2.3:** Ceiling and floor prices

Problem	Government action	Result		Type	Example
Equilibrium price too high	Set price below equilibrium price	Quantity demanded > quantity supplied	Excess demand because price is low	Ceiling price (maximum price)	Rented housing Sale of petrol
Equilibrium price too low	Set price above equilibrium price	Quantity demanded < quantity supplied	Excess supply because price is high	Floor price (minimum price)	Agricultural products

## Activity 2.7

Decide whether the following statements are **True** or **False**.

		T	F
1	In a real competitive market, government intervention is never needed.		
2	To help the poor a floor price is needed on the level of rent for housing.		
3	The price of cigarettes is a typical price on which a maximum will be set.		

### Multiple-choice questions

1. When the government controls the price of a product, causing the market price to be below the free market equilibrium price,
  - [1] some consumers gain from the price controls and other consumers lose.
  - [2] all producers gain from the price controls.
  - [3] both producers and consumers gain.
  - [4] all consumers are better off.
  
2. What happens if price falls below the market clearing price?
  - [1] Demand shifts out.
  - [2] Supply shifts in.
  - [3] Quantity demanded decreases, quantity supplied increases, and price falls.
  - [4] Quantity demanded increases, quantity supplied decreases, and price rises.
  
3. Other things being equal, the increase in rents that occurs after rent controls are abolished is smaller when ...
  - [1] the own price elasticity of demand for rental homes is price inelastic.
  - [2] the own price elasticity of demand for rental homes is price elastic.
  - [3] the own price elasticity of demand for rental homes has unitary price elasticity.
  - [4] rented homes and owned homes are complements.

### Questions with written answers

- (1) The S.A. Department of Agriculture is interested in analyzing the domestic market for corn. The staff economists estimate the following equations for the demand and supply curves:

$$Q_d = 1,600 - 125P$$

$$Q_s = 440 + 165P$$



Quantities are measured in millions of bushels; prices are measured in rand per bushel.

- a. Calculate the equilibrium price and quantity that will prevail under a completely free market. (4)
- b. Calculate the price elasticities of supply and demand at the equilibrium values. (4)
- c. The government currently has a R4.50 bushel support price in place. What impact will this support price have on the market? Will the government be forced to purchase corn under a program that requires them to buy up any surpluses? If so, how much? (4)

### **Economics in Action Revisited**

From the discussion in this learning unit it should be clear that for different market conditions consumers and other market actors change their behavior when prices or their incomes also change.

### **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.

Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### **Activity 2.4**

**True/False:** True: 2, 4.  
False: 1, 3, and 5.

**Multiple-choice questions:**

1. [3]
2. [4]
3. [1]
4. [2]
5. [2]

#### **Activity 2.7**

**True/False:** True: None  
False: 1, 2, and 3.

**Multiple-choice questions:**

1. [1]
2. [4]
3. [2]

# Consumer behaviour

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- 3.2 Budget Constraints**  
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Activity 3.3
- 3.4 Revealed Preference**
- 3.5 Marginal Utility and Consumer Choice**  
Activity 3.5
- 3.6 Cost-of-Living Revisited**

### **Economics in Action Revisited**

### **Further reading**

### **Answers to some of the questions**

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## ***Learning Outcomes***

*This learning unit tries to answer the following question: **How does a consumer make choices on which goods and services to buy in a situation with limited income?***

*As stated in learning unit 1, economists must use assumptions to simplify reality. To do this and to answer the question on how these choices are made, three related assumptions<sup>5</sup> about the consumer are used, namely:*

- *Consumers have needs, which are expressed as preferences for certain goods and services.*
- *Consumers cannot satisfy all the needs, and are therefore subject to a budget constraint.*
- *Consumers try to maximise their satisfaction, given their preferences and budget constraint.*

***Once you have studied learning unit 2 you should be able to:***

- *describe the role played by consumer preferences;*
- *use preferences graphically in a model of consumer behaviour;*

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<sup>5</sup> Later in this learning unit we will add a fourth assumption.

- discuss the role played by budget constraints on consumer choice;
- discuss the role played by marginal utility in consumer choice.

## **Economics in Action**

### **Not in the bag yet**

American **consumers** showed signs of life in the first quarter, with retail sales and car-buying picking up a bit. But housing is still struggling and **consumer** spirits remain low. A bit depressing – but proof that the country is learning to live within its means. Americans will not return to their profligate ways soon. **Consumer** spending will recover as employment grows, but it will no longer outpace incomes the way it did when credit was easy and home prices bubbly. Many households will not be able to borrow against their homes for years because they have become worth less than the mortgages on them.

(**Source:** Not in the bag yet. 2010. *Economist*, 4 March.)

The paragraph quoted above describes the behaviour of American consumers after the subprime world financial crisis (2008–2009). However, it could be applicable to any consumer. It is clear that consumers play an important role in the economy, that their economic behaviour changes over time, and that they have limitations on the level of satisfying their needs. Consumer behaviour is the topic of this learning unit.

### **3.1 Consumer Preferences**

#### **STUDY**

Pages 67 to 82.

We have already mentioned a number of assumptions applicable to the consumer. A fourth assumption is that the consumer is **rational**. With this assumption, the implication is that consumers have goals, and that they make decisions that will enable them to achieve those goals. It does not mean that people do what others might think is right or best for them. Economists generally assume that consumers want to maximise their happiness or satisfaction (or utility), and as long as consumers are making decisions that achieve this goal, they are considered to be rational. If a person who absolutely loves travelling overseas lives in a dump, wears worn-out clothes and eats poorly to be able to afford travelling, he or she is being completely rational if that is what makes him or her most happy.

Concerning the **preferences** of the consumer, we further use the following three assumptions, namely **completeness, transitivity and more is better than less**. By using these assumptions and different market baskets, we can

construct indifference curves.<sup>6</sup> The definition in the textbook (Pindyck & Rubinfeld, 2009:70) emphasises different market baskets which give the **same level of satisfaction**. Because the indifference curves are based on different market baskets that give the same level of satisfaction, they **cannot intersect** (see Figure 3.4 in Pindyck & Rubinfeld, 2009:73).

An indifference curve is shown in Figure 3.2 (Pindyck & Rubinfeld, 2009:72); note that physical quantities are represented on the two axes. This indifference curve illustrates or contains the need of the consumer. Typical of a consumer is that he or she wants more of a good or service rather than less (we assumed this behaviour). This is illustrated by the **indifference map** (see Figure 3.3 (Pindyck & Rubinfeld, 2009:73)) – the further the indifference curve is from the origin, the better.

The **marginal rate of substitution (MRS)** is equal to the slope of the indifference curve (see Figure 3.5 in Pindyck & Rubinfeld, 2009:74). It shows the rate at which the consumer is willing to trade one good for the other. Also note that we are not substituting  $X$  for  $Y$ , but  $Y$  for one unit of  $X$ . The general form of the indifference curve is **convex** and it illustrates the diminishing marginal rate of substitution ( $MRS$ ).

The  $MRS$  is constant in the case of **substitutes** (Figure 3.6[a]) and zero in the case of **complements** (Figure 3.6[b] in Pindyck & Rubinfeld, 2009:76).

Now we consider the concept of **utility**. Suppose that the indifference map in Figure 3.3 (Pindyck & Rubinfeld, 2009:7) belongs to Siphso from Soweto near Johannesburg. If we put quantitative values on the three indifference curves in Figure 3.3 (Pindyck & Rubinfeld, 2009:7), like  $U_1 = 10$ ,  $U_2 = 20$  and  $U_3 = 30$ , can we say that Siphso's happiness doubled from  $U_1$  to  $U_2$ ? No, these **cardinal utility** functions are not possible, because we cannot put a numerical value on utility. For example, Siphso cannot say that his first cool drink gave him 10 utility units and the second cool drink 20 utility units and therefore his happiness doubled after drinking the second cool drink. What Siphso can say, however, is that he enjoyed the second cool drink ( $U_2$ ) more than the first cool drink ( $U_1$ ). He can therefore rank them and this is done by **ordinal utility** functions.

In the same manner that Siphso cannot use cardinal utility functions to express his happiness (except for ranking) we cannot use cardinal utility values if we compare Lindiwe's utility with Siphso's utility. Such values are arbitrary, and interpersonal comparisons are therefore impossible. We are only interested in the ranking of different baskets to describe consumer behaviour.

---

6 In learning unit 6, section 6.3 we are going to develop a near similar curve, an isoquant, to explain production.

### Activity 3.1

Decide whether the following statements are **True** or **False**.

		T	F
1	A curve that represents all combinations of market baskets that provide the same level of utility to a consumer is called an isoquant.		
2	If indifference curves cross, then the assumption of a diminishing marginal rate of substitution is violated.		

#### Multiple-choice questions

- Which of the following is **NOT** an assumption regarding people's preferences in the theory of consumer behaviour?
  - Preferences are complete.
  - Preferences are transitive.
  - Consumers prefer more of a good to less.
  - All of the above are basic assumptions about consumer preferences.
- The assumption of transitive preferences implies that indifference curves must ...
  - not cross one another.
  - have a positive slope.
  - be L-shaped.
  - be convex to the origin.
- If a market basket is changed by adding more of at least one good, then rational consumers will ...
  - rank the market basket more highly after the change.
  - more likely prefer a different market basket.
  - rank the market basket as being just as desirable as before.
  - be unable to decide whether the first market basket is preferred to the second or vice versa.
- A consumer prefers market basket A to market basket B, and prefers market basket B to market basket C. Therefore, A is preferred to C. The assumption that leads to this conclusion is ...
  - transitivity.
  - completeness.
  - all goods are good.
  - diminishing *MRS*.
- The slope of an indifference curve reveals ...
  - that preferences are complete.
  - the marginal rate of substitution of one good for another good.

- [3] the ratio of market prices.
- [4] that preferences are transitive.

### Questions with written answers

- (1) Using a graph, explain the following characteristics of an indifference curve:
- They do not intersect.
  - The slope of the indifference curve is the marginal rate of substitution (*MRS*).
  - What does a diminishing *MRS* imply?
  - Which indifference curve is preferred in an indifference map?
- (16)

## 3.2 Budget Constraints

**STUDY**  
Pages 83 to 86.

Given the preferences of the consumer, explained in the previous section, we know that he or she prefers more to less. However, we also know that consuming more and more is impossible; there must be a limitation on consumer behaviour. This limitation is graphically illustrated by the **budget line** (see Figure 3.10 in Pindyck and Rubinfeld (2009:84)).<sup>7</sup> By using the income of the consumer and the prices of the different consumer goods (clothing and food), we can construct the budget line. It is clear from Figure 3.10 that if you spend all your income (suppose it is R80) on clothing ( $P_c = R2$ ), then you will buy 40 units ( $R80/R2 = 40$ ; thus  $I/P_c$ ) of clothing (the Y-axis in Figure 3.10). Also, if you spend all your income on food ( $P_f = R1$ ) you will consume 80 units ( $R80/R1 = 80$ ; thus  $I/P_f$ ) of food (the X-axis in Figure 3.10).

The extent to which a consumer can satisfy his or her preferences is limited by the income of the consumer and the prices of goods and services.

If income increases (decreases), then the budget line will move in a parallel direction outwards (inwards) (see Figure 3.11 in Pindyck and Rubinfeld (2009:85)). Note that the slope of the budget line does not change with this movement.

A change in the prices of clothing and/or food has to do with a change in the relative prices between the two products. This is illustrated by a change in the slope of the budget line (see Figure 3.12 in Pindyck and Rubinfeld (2009:86)).

<sup>7</sup> In an earlier footnote we indicated that we were going to construct an isoquant in terms of production, which is almost similar to the indifference curve in consumption. The same is applicable on the budget line; in production we are going to construct an isocost which functions as a (budget) limitation on production. (See learning unit 7.)

Make sure that you understand that both income and prices can change and that you know what will happen to the budget line.

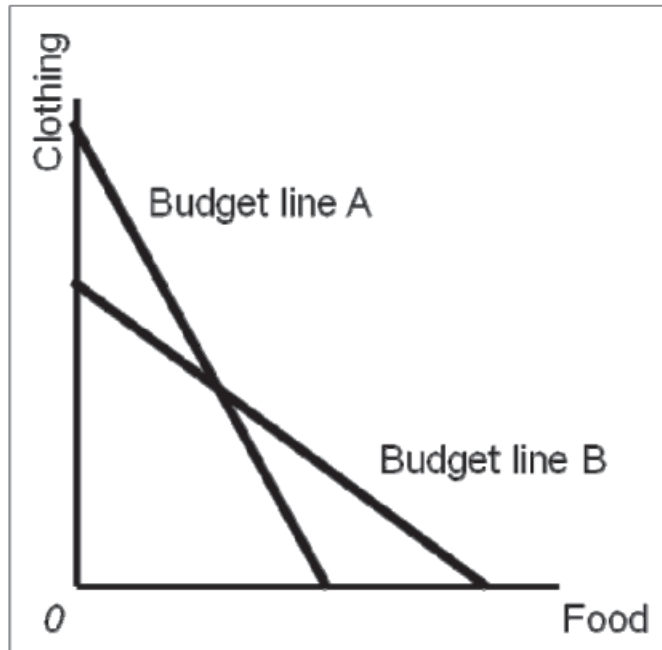
### Activity 3.2

Decide whether the following statements are **True** or **False**.

		T	F
1	An increase in income, holding prices constant, can be represented as a change in the slope of the budget line.		
2	If prices and income in a two-good society double, there will be no effect on the budget line.		

### Multiple-choice questions

- A consumer has R100.00 per day to spend on product A, which has a unit price of R7.00, and product B, which has a unit price of R15.00. What is the slope of the budget line if good A is on the horizontal axis and good B is on the vertical axis?
  - 7/15
  - 7/100
  - 15/7
  - 7/15
- Suppose that the prices of good A and good B were to suddenly double. If good A is plotted along the horizontal axis,
  - the budget line will become steeper.
  - the budget line will become flatter.
  - the slope of the budget line will not change.
  - the slope of the budget line will change, but in an indeterminate way.



**FIGURE SG3.1:** Graph for question 3

3. Theodore's budget line has changed from A to B. (See Figure SG3.1 above.) Which of the following explains the change in Theodore's budget line?
  - [1] The price of food and the price of clothing increased.
  - [2] The price of food increased, and the price of clothing decreased.
  - [3] The price of food decreased, and the price of clothing increased.
  - [4] The price of food and the price of clothing decreased.
  
4. If the quantity of good A ( $Q_A$ ) is plotted along the horizontal axis, the quantity of good B ( $Q_B$ ) is plotted along the vertical axis, the price of good A is  $P_A$ , the price of good B is  $P_B$  and the consumer's income is  $I$ , then the slope of the consumer's budget constraint is \_\_\_\_\_.
  - [1]  $-Q_a/Q_b$
  - [2]  $-Q_b/Q_a$
  - [3]  $-P_a/P_b$
  - [4]  $-P_b/P_a$
  
5. The endpoints (horizontal and vertical intercepts) of the budget line ...
  - [1] measure its slope.
  - [2] measure the rate at which one good can be substituted for another.
  - [3] measure the rate at which a consumer is willing to trade one good for another.
  - [4] represent the quantity of each good that could be purchased if all of the budget were allocated to that good.



**Questions with written answers**

- (1) Use the information in table 3.2 in the textbook (Pindyck & Rubinfeld, 2009:83) and construct a budget line. Show then how the following movements of the budget line will take place and give the reasons for it:
- (a) The budget line moves parallelly outwards.  
 (b) The slope of the budget line changed. (10)

**3.3 Consumer Choice****STUDY**

Pages 86 to 92.

According to the third assumption stated at the beginning of this learning unit, consumers try to maximise their satisfaction given their preferences and budget constraint. The consumer will prefer the indifference curve the furthest from the origin, given the budget constraint.

This is illustrated in Figure 3.13 (Pindyck & Rubinfeld, 2009:87). Point A is the equilibrium point, as this is where the marginal rate of substitution (*MRS*) equal the price ratio between food and clothes ( $P_F/P_C$ ) (thus  $MRS = P_F/P_C$ ). The consumer can adjust the consumption of goods food (*F*) and clothing (*C*) so that the *MRS* equals the price ratio (and he or she can get maximum satisfaction). This equilibrium point illustrates a very important concept in economics. In this instance, satisfaction (utility) is maximised where marginal benefits equals marginal costs. Satisfaction (utility) can be replaced with many other variables, such as profit, but the principle is:

**Equilibrium is reached where marginal benefits equal marginal costs.**<sup>8</sup>

The consumer will continue to adjust his or her consumption until:

$$MRS = P_F/P_C$$

Or

Marginal rate of substitution of clothing for food = the price ratio of food to clothing

<sup>8</sup> Think of this equilibrium condition in a practical way, as consumer or producer:

**As a consumer:** You will continue consuming a good or service when the satisfaction (utility) of consumption is higher than the cost of the good or service. You will continue until satisfaction (utility) equals cost of the last unit. Why would you continue consumption if the satisfaction (the utility) is lower than the cost?

**As a producer:** To increase your profit (the equivalent of utility in the case of the consumer), you will keep on producing when the income (generated by selling) from the product is higher than the cost of producing the product. Production will continue until income equals cost of that (marginal) unit of the product. The producer will not produce any more units of the product, because the cost of producing that unit of the product will be higher than the income generated from selling that unit of the product.

Or

$$\frac{1}{2} = \frac{1}{2} \text{ (in the case of Figure 3.13 (Pindyck \& Rubinfeld, 2009:87))}$$

Or

Magnitude of the slope of indifference curve = magnitude of the slope of budget line

The above condition does not hold if the consumer spends his or her income on only one product. In such a case, the equilibrium condition is called the **corner solution** (see Figure 3.13 in Pindyck and Rubinfeld (2009:91)).

### ■ **Activity 3.3**

#### **Multiple-choice questions**

1. A consumer maximises satisfaction at the point where his valuation of good X, measured as the amount of good Y he would willingly give up to obtain an additional unit of X, equals ...
  - [1] the magnitude of the slope of the indifference curve through that point.
  - [2] one over the magnitude of the slope of the indifference curve through that point.
  - [3]  $P_x/P_y$ .
  - [4]  $P_y/P_x$ .
  
2. Pencils sell for 10 cents and pens sell for 50 cents. Suppose Jack, whose preferences satisfy all of the basic assumptions, buys 5 pens and one pencil each semester. With this consumption bundle, his MRS of pencils for pens is 3. Which of the following is **TRUE**?
  - [1] Jack could increase his utility by buying more pens and fewer pencils.
  - [2] Jack could increase his utility by buying more pencils and fewer pens.
  - [3] Jack could increase his utility by buying more pencils and more pens.
  - [4] Jack could increase his utility by buying fewer pencils and fewer pens.
  
3. An individual consumes only two goods, X and Y. Which of the following expressions represents the utility maximising market basket?
  - [1]  $MRS_{xy}$  is at a maximum.
  - [2]  $P_x/P_y = \text{money income}$ .
  - [3]  $MRS_{xy} = \text{money income}$ .
  - [4]  $MRS_{xy} = P_x/P_y$ .

4. The fact that Emma spends no money on travel ...
- [1] implies that she does not derive any satisfaction from travel.
  - [2] implies that she is at a corner solution.
  - [3] implies that her MRS does not equal the price ratio.
  - [4] any of the above are possible.
5. The price of lemonade is R0.50; the price of popcorn is R1.00. If Fred has maximised his utility by purchasing lemonade and popcorn, his marginal rate of substitution will be ...
- [1] 2 lemonades for each popcorn.
  - [2] 1 lemonade for each popcorn.
  - [3] 1/2 lemonade for each popcorn.
  - [4] indeterminate unless more information on Fred's marginal utilities is provided.

### Questions with written answers

- (1) Lindiwe has a budget of R100.00. The price of food is R20.00 and the price of clothes is R10.00. Draw a budget line and, supposing an indifference map exists, show her equilibrium point. Which condition must be satisfied to gain equilibrium? (8)

### 3.4 Revealed Preference

**OMIT**

Pages 92 to 95 and  
Example 3.5.

### 3.5 Marginal Utility and Consumer Choice

**STUDY**

Pages 92 to 97 and  
Example 3.6 and 3.7.

We have already noted that the consumer can increase his or her satisfaction (or utility) by finding the highest indifference curve, given the budget constraint. This equilibrium point can also be described in terms of **utility**. To do this, we must differentiate between **total utility and marginal utility** (MU). The latter is the additional satisfaction obtained from consuming one additional unit of a good or service. This additional satisfaction is also subject to diminishing returns and in this case, diminishing marginal utility. Remember, we are still considering how consumers make their choices. Work through the arguments and equations

on page 96 (Pindyck & Rubinfeld, 2009). It is important to understand how we derived the conclusion that utility maximisation is achieved when the budget is allocated so that the marginal utility per dollar of expenditure is the same for each good. This is the familiar equal marginal principle.<sup>9</sup>

### ■ **Activity 3.5**

#### **Multiple-choice questions**

1. Marginal utility measures the ...
  - [1] slope of the indifference curve.
  - [2] additional satisfaction from consuming one more unit of a good.
  - [3] slope of the budget line.
  - [4] marginal rate of substitution.
  
2. When someone consumes two goods (A and B), that person's utility is maximised when the budget is allocated such that the ...
  - [1] marginal utility of A equals the marginal utility of B.
  - [2] marginal utility of A times the price of A equals the marginal utility of B times the price of B.
  - [3] ratio of total utility of A to the price of A equals the ratio of the marginal utility of B to the price of A.
  - [4] ratio of the marginal utility of A to the price of A equals the ratio of the marginal utility of B to the price of B.

#### **Questions with written answers**

The following table presents Alfred's marginal utility for each good while exhausting his income. Fill in the remaining column in the table. If the price of tuna is twice the price of peanut butter, at what consumption bundle in the table is Alfred maximising his level of satisfaction? Which commodity bundle entails the largest level of tuna fish consumption? (12)

Bundle	MU of peanut butter	MU of tuna	Marginal Rate of Substitution
A	0.25	2.41	
B	0.31	1.50	
C	0.42	0.84	
D	0.66	0.33	

<sup>9</sup> Sometimes also called the equimarginal principle.

### 3.6 Cost-of-Living Indices

**OMIT**

Pages 100 to 104 and  
Example 3.8.

#### ■ **Economics in Action Revisited**

In this learning unit we constructed a model of consumer behaviour by using the preferences and income limitations of consumers. After the international financial crisis mentioned in *The Economist*, it is clear that consumer preferences or consumption was limited by consumers' income or consumption on credit.

#### **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

#### **Answers to Some of the Questions**

##### ■ **Activity 3.1**

**True/False:** True: None  
False: 1, 2

**Multiple-choice questions:**

1. [4]
2. [1]
3. [1]
4. [1]
5. [2]

##### ■ **Activity 3.2**

**True/False:** True: 2  
False: 1

**Multiple-choice questions:**

1. [1]
2. [3]
3. [3]
4. [3]
5. [4]

### ■ **Activity 3.3**

- Multiple-choice questions:
1. [3]
  2. [2]
  3. [4]
  4. [4]
  5. [1]

### ■ **Activity 3.5**

- Multiple-choice questions:
1. [2]
  2. [4]

### ■ **Activity 3.6**

No questions

# Individual and Market Demand

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## ***Learning Outcomes***

In this learning unit we explore the reasons why a demand curve slopes downwards from left to right, and point out the factors that have an influence on consumer behaviour when there is a change in the determinants of the quantity demanded, namely price and income.

### ***Once you have studied learning unit 4 you should be able to:***

- *derive the demand curve for an individual consumer;*
- *explain the effect of changes in price and income on the demand curve for an individual consumer;*
- *derive a market demand curve;*
- *identify the consumer surplus;*
- *describe the effects of network externalities.*

## **Economics in Action**

### **Stirring of life in SA consumer as retail fall slows**

RETAIL sales fell more slowly than anticipated in January, signaling that the weak link in SA's economic recovery – consumer demand – might be on the mend, official data showed yesterday.

The fall of 1,7% compared with the corresponding month last year was the smallest since sales began to shrink last February. It was also more benign than the 2,5% drops predicted by local markets, after a revised 3,8% fall in December. But it is too early to point to a meaningful rebound in household consumption, the economy's main growth engine.

"Although there are now clear signs the economy is gaining traction, the growth outlook for retail ... is still fragile," Standard Bank economist Johan Botha said. "The reality is that the economic health of the consumer has not improved in recent months owing to the steep rate of job losses."

SA shed 870 000 jobs as the recession took its toll last year.

(**Source:** Isa, M. 2010. Stirring of life in SA consumer as retail fall slows. Available at: <http://www.businessday.co.za/Articles/Content.aspx?id=103935> [accessed on 15/05/2010].)

According to this extract from *Business Day*, consumer demand is an important factor determining economic growth, so this will be our main focus in this learning unit.

### **4.1 Individual Demand**

#### **STUDY**

Pages 111 to 117 and  
Example 4.1.

In learning unit 2, section 2.1.2, we said that quantity demanded depends on the own price of the product and demand on, among other determinants, the income of the consumer.<sup>10</sup> We are going to use these two factors to explain why, for example, demand curves almost always slope downwards from left to right.

In Figure 4.1 (Pindyck & Rubinfeld, 2009:112) the price of food changed and therefore the price of food relative to that of clothing changed. With an increase in the food price, the budget line swivels or rotates inwards; with a decrease,

<sup>10</sup> We used the following equation to illustrate some possible determinants of quantity demanded and demand:  $Q_D = Q_D(P, I, \dots)$ .



the budget line swivels or rotates outwards.<sup>11</sup> Using an indifference map, we can identify equilibrium points where an indifference curve form a tangent point with each one of the budget lines, namely points *A*, *B* and *D*. Combining these points, we obtain the **price-consumption curve**. This curve illustrates the utility maximising points with the consumption of food and clothes with every possible price of food.

We derive the **demand curve** (the relationship between price and quantity demanded) for food by using the information contained in the price-consumption curve. For example, points *A*, *B* or *D* in Figure 4.1(a) (Pindyck & Rubinfeld, 2009:112) contains information on the quantity demanded of food (we get this from the x-axis) as well as for which price. (Constructing a budget line, we use the budget [income] of the consumer and the prices of the goods in his or her preference basket.) In Figure 4.1(b) we draw the demand given for food with this information.

Previously we left income constant when we changed the price of food. By changing income, and keeping prices constant, the budget line will move parallel outwards with an increase in income and parallel inwards with a decrease in income. Just as we did in the case of a change in price, we use the indifference map to identify points of equilibrium (points *A*, *B* and *D* in Figure 4.2[a] in Pindyck and Rubinfeld (2009:115)). Combining these points we get the **income-consumption curve**, which shows the utility maximising points from the consumption of food and clothing when the income of the consumer changes.

Now we can derive **demand curves** from the information contained in the income-consumption curve (see Figure 4.2[b] in Pindyck and Rubinfeld (2009:115)). Note that we get a single point on each demand curve.

We have already paid attention to<sup>12</sup> another important factor, namely that a change in the own price of a good or service will cause a movement along the demand curve (Figure 4.1 in Pindyck and Rubinfeld (2009:112)). With a change in the value of a determinant other than own price, there will be a movement of the demand curve (Figure 4.2 in Pindyck and Rubinfeld (2009:115)).

In table SG2.1 we indicated that the income elasticity of demand is positive with normal products and negative with inferior products. The income-consumption curve for normal products is illustrated in Figure 4.2 (Pindyck & Rubinfeld, 2009:115) and for inferior products in Figure 4.3 (Pindyck & Rubinfeld, 2009:116).

To construct an income-consumption curve (and a price-consumption curve), we place the quantities of the two products in the preference basket on the y- and x-axes, respectively. For a direct illustration of the relationship between

<sup>11</sup> See learning unit 3, section 3.2, on how to construct a budget line with changes in income or price.

<sup>12</sup> See learning unit 2, section 2.1.

income and the consumption of a specific product, we use the **Engel curve**.<sup>13</sup> This curve shows the relationship between the spending of income on a specific product and consumption of the product (see Figure 4.4 in Pindyck and Rubinfeld (2009:117)).

The final point we wish to make in this section is that the price-consumption curve can also be used to identify **substitute and complementary** goods and services.

### Activity 4.1

Decide whether the following statements are **True** or **False**.

		T	F
1	A change in relative prices means that fish was R50.00 a kilogram and meat R60.00 a kilogram, but now fish is R100.00 a kilogram.		
2	The income-consumption curve can only be derived when there is a change in the real income of the consumer.		
3	Drawing the price-consumption curve, it must start or end at the origin of the graph.		

### Multiple-choice questions

- The change in the price of one good has no effect on the quantity demanded of another good. These goods are ...
  - substitutes.
  - both inferior.
  - both Giffen goods.
  - none of the above.
- Which of the following is **TRUE** regarding income along a price-consumption curve?
  - Income is increasing.
  - Income is decreasing.
  - Income is constant.
  - The level of income depends on the level of utility.

<sup>13</sup> This curve is based on Engel's law and was named after the statistician Ernst Engel (1821–1896). According to this law, given preferences, when income increases the proportions of income spent on food decrease. This can happen even if the actual spending on food increases. It is thus about relative quantities. One can use this law of Engel in interesting ways. For example, when a household or country is very rich, spending on food, as a percentage of total spending, is very low. This is because rich households and countries have different spending patterns from poor households and countries. Poor households and countries have a high spending, as a percentage of total income, on food.

3. Which of the following pairs of goods are **NOT** complements?
- [1] Hockey sticks and hockey pucks.
  - [2] Computer CPUs and computer monitors.
  - [3] On-campus student housing and off-campus rental apartments.
  - [4] All of the above.
4. The price of good A goes up. As a result the demand for good B shifts to the left. From this we can infer that ...
- [1] good A is a normal good.
  - [2] good B is an inferior good.
  - [3] goods A and B are substitutes.
  - [4] goods A and B are complements.
5. If an Engel curve has a positive slope,
- [1] both goods are normal.
  - [2] the good on the horizontal axis is normal.
  - [3] as the price of the good on the horizontal axis increases, more of both goods is consumed.
  - [4] as the price of the good on the vertical axis increases, more of the good on the horizontal axis is consumed.

#### Questions with written answers

- (1) Discuss how you would use the price-consumption curve for tomatoes and potatoes and derive the demand curve for tomatoes. (10)
- (2) Explain, by referring to a graph, how it is possible to derive an income-consumption curve by increasing the income of the consumer or by decreasing the prices of the two products. (10)
- (3) Explain, by using price-consumption and income-consumption curves, the difference between moving along the demand curve and the moving off the demand curve. (10)

#### 4.2 *Income and Substitution Effects*

##### **STUDY**

Pages 120 to 123 and  
Example 4.2.

According to the **law of demand**, quantity demanded will increase (decrease) when the price of the product decreases (increases).<sup>14</sup> The question now is: Why does the consumer behave like this? What are the behavioural reasons? We have already indicated that, for the purposes of this learning unit, we assume that there are only two determinants of quantity demanded (although,

<sup>14</sup> See learning unit 2, section 2.1.2.

in fact, there are many) namely the price of the product and the income of the consumer.

If there is, for example, a decrease in the price of a product (food), the quantity demanded of that product will increase, because of two effects (or behavioural reasons):

- Owing to the decrease in price, the relative prices between the two products changed, the one becoming cheaper in relation to the other. The consumer substitutes the more expensive product for the cheaper product. This is called the **substitution effect**. The level of utility is held constant; the consumer therefore stays on the same indifference curve ( $U_1$  in Figure 4.6, 4.7 & 4.8 [Pindyck & Rubinfeld, 2009:120–123]).
- The decrease in price also caused an increase in consumers' real purchasing power. They are better off; with the same amount of money they can buy more of the two products. This is called the **income effect**. With this effect, relative prices are held constant; there is a parallel movement from one budget line to another budget line.

For this reason the law of demand can be stated with some certainty. In the textbook (Pindyck & Rubinfeld, 2009:121) these two aspects (i.e. the substitution effect and the income effect) are discussed separately, but they happen simultaneously.

The discussion in the textbook is summarised in the following table.

**TABLE SG4.1:** The substitution, income and price effects

Type of effect	Characteristics of effect	Direction of effect		
		Normal product	Inferior product	Giffen product
<b>Substitution effect</b>	Relative prices change; slope of budget line changes; stay on original indifference curve <sup>15</sup>	Negative	Negative	Negative
<b>Income effect</b>	Purchasing power changes; move to new budget line and new indifference <sup>16</sup> curve	Positive	Negative	Negative
<b>Price effect</b>	Movement from original equilibrium point to final/new equilibrium point	Negative	Negative	Positive

<sup>15</sup> See Figure 4.1 (Pindyck & Rubinfeld, 2009:112). The slope of each of the budget lines changes as the relative prices between clothing and food change. This happens with a decrease in the price of food, while the price of clothing stays the same.

<sup>16</sup> See Figure 4.2 (Pindyck & Rubinfeld, 2009:115). With each increase (decrease) in the budget of the consumer, there is a parallel outward (inward) movement of the budget line. Note that the slope of the budget lines does not change; thus the relative price relationships between clothing and food stay the same for each new budget line.

## Activity 4.2

Decide whether the following statements are **True** or **False**.

		T	F
1	A Giffen good is the special subset of inferior goods in which the income effect dominates the substitution effect.		
2	The substitution effect of a decrease in price will always lead to an increase in consumption.		

### Multiple-choice questions

- Good A is a normal good. The demand curve for good A ...
  - slopes downwards.
  - usually slopes downwards, but could slope upwards.
  - slopes upwards.
  - usually slopes upwards, but could slope downwards.
- Refer to the following two statements in answering this question:
  - All Giffen goods are inferior goods.
  - All inferior goods are Giffen goods.
  - I and II are true.
  - I is true, and II is false.
  - I is false, and II is true.
  - I and II are false.
- The change in the quantity demanded of a good resulting from a change in relative price with the level of satisfaction held constant is called the \_\_\_\_\_ effect.
  - Giffen
  - real price
  - income
  - substitution
- For an inferior good, the income and substitution effects ...
  - work together.
  - work against each other.
  - can work together or in opposition to each other depending upon their relative magnitudes.
  - always exactly cancel each other.
- The substitution effect of a price change for product X is the change in consumption of X associated with a change in ...
  - the price of X, with the level of utility held constant.

- [2] the price of X, with the level of real income not considered.
- [3] the price of X, with the prices of other goods changing by the same percentage as that for product X.
- [4] income, with prices of other goods held constant.

**Questions with written answers**

In Africa charcoal is an important source of heat for cooking. Travelling through the rural parts of Africa, one finds bags of charcoal next to the roads waiting to be transported to the cities. Using charcoal as a source of energy has serious environmental consequences. The path of charcoal in and around Goma, a city on the eastern border of the Democratic Republic of the Congo, acts as an illustration to some of these environmental problems. Old-growth hardwood trees are used, as charcoal derived from them gives more heat and burns longer, with the result that natural forests – an important habitat for gorillas – are thinned out. Increased competition for sources of hardwood has led to the slaughter of gorillas by striving gangs, and air pollution from charcoal in city areas causes health problems (98% of households use charcoal for energy).<sup>17</sup> Suppose that low cost hydro-electricity is introduced and that households find it more convenient to use this electricity, even when the price of charcoal decreases due to the competition from electricity as a source for energy.

Explain, by referring to graphs, to officials of the World Bank which of these sources of energy can be considered to be an inferior product. Also explain why consumers behave like this, not taking environmental reasons into account. (10)

**4.3 Market Demand**

**STUDY**  
 Pages 125 to 129 and  
 Example 4.3.

The market demand is the **horizontal summation** of the demands of each individual consumer (see Figure 4.10 in Pindyck and Rubinfeld (2009:126)). The market demand is the collective demand curve of the individuals, as factors which influence them as a collective group will also influence the market demand.

We have already discussed elasticity of (individual) demand, and the same applies to market demand. What is new, is the idea of an **isoelastic demand**. In this case, the price elasticity of demand is the same or constant along the curve. A special case of an isoelastic demand curve would be where the price elasticity of demand is, -1 (remember we ignore the minus sign). In such a case total expenditure remains the same after a change in price.

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<sup>17</sup> **Source:** Who murdered the Virunga gorillas? 2008. *National Geographic* 214 (1):34.

In table 4.3 (Pindyck & Rubinfeld, 2009:129) the relationship between the nature of the price elasticity of demand and total expenditure is summarised. Table 4.3 can be expanded by filling in information regarding the income of the seller (also see table SG4.2 below.)

**TABLE SG4.2:** Price elasticity, consumer expenditure and income (*Table 4.3 in Pindyck and Rubinfeld (2009:129)*)

Demand	If price increases		If price decreases	
	Expenditure	Income for seller	Expenditure	Income for seller
Inelastic	increases	increases	decreases	decreases
Unit elastic	is unchanged	is unchanged	is unchanged	is unchanged
Elastic	decreases	decreases	increases	Increases

**Regarding the income of the seller:** a decrease in price on the inelastic part of the demand curve will result in the percentage change in price is bigger than the percentage change in quantity demanded. The income of the seller (the firm) will decrease.

A decrease in price on the elastic part of the demand curve will result in the percentage change in price to be bigger than the percentage change in quantity demanded. The income of the seller (the firm) will increase.

Another way of stating it is:

**Inelastic part:**  $\% \downarrow \text{ in } P > \% \uparrow \text{ in } Q_D$ , therefore income  $\downarrow$ .

**Elastic part:**  $\% \downarrow \text{ in } P < \% \uparrow \text{ in } Q_D$ , therefore income  $\uparrow$ .

### Activity 4.3

#### Multiple-choice questions

- Refer to the following two statements to answer this question:
  - The price elasticity of demand is constant along the entire length of a linear demand curve.
  - The price elasticity of demand is the special name that economists give to the slope of a demand curve.
  - I and II are true.
  - I is true, and II is false.
  - I is false, and II is true.
  - I and II are false.
- In a recent article, two economists estimated that the 37.5% increase in the price of cigarettes that would result from a tax increase of 75 cents per packet of 20, would lead to a 30% decrease in smoking among college students. What can you conclude about the demand for cigarettes among college students it is ...

- [1] price elastic.
  - [2] price inelastic.
  - [3] unit elastic.
  - [4] perfectly inelastic.
- 3 As the price of good X increases from R5.00 to R8.00, quantity demanded falls from 100 to 80. Based upon this information, we can conclude that the demand for X is ...
- [1] elastic.
  - [2] inelastic.
  - [3] unit inelastic.
  - [4] insufficient information for judgment.
- 4 The demand for sirloin steak is probably more elastic than the demand for all meat, because ...
- [1] sirloin steak is very expensive.
  - [2] people are worried about cholesterol.
  - [3] cattle-raising is not very profitable.
  - [4] there are more substitutes for sirloin steak than for all meats.
5. Which of the following is **TRUE** about the demand for petrol?
- [1] It is probably more price elastic in the long run because price will increase by a higher percentage.
  - [2] It is probably more price elastic in the long run because it is easier to find substitutes for petrol in the long run.
  - [3] It is probably more price elastic in the short run because price will increase by a higher percentage.
  - [4] It is probably more price elastic in the short run because it is easier to find substitutes for petrol in the short run.

#### Questions with written answers

- (1) Describe and illustrate by means of graphs how the market demand can be constructed from the demand of four individuals. (10)

#### 4.4 Consumer Surplus

**STUDY**  
Pages 132 to 134 and  
Example 4.5.

People consume products because it makes them feel better off. The consumer surplus measures to which extent they feel better off. Knowing the demand curve of different consumers, we can calculate an individual's consumer surplus



and that of the market. Looking at Figure 4.13 or 4.14 (Pindyck & Rubinfeld, 2009:132–133) we see that the total or aggregate consumer surplus is the addition of the marginal surplus per unit of the product consumed. Another way of describing the concept of consumer surplus is that it is the difference between what the consumer is willing to pay and what he or she actually has to pay for the good.

We will return to this concept in learning unit 9.

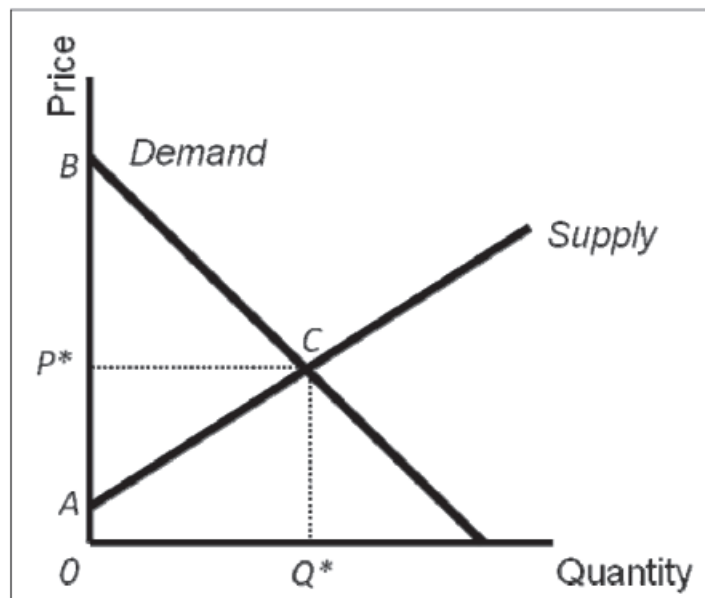
### Activity 4.4

Decide whether the following statements are **True** or **False**.

		T	F
1	The difference between what a consumer is willing to pay for a unit of a good and what must be paid when actually buying it, is called consumer surplus.		
2	The area below the demand curve and above the price line measures the total value obtained from consuming the good or service.		

### Multiple-choice questions

- The price of beef and quantity of beef traded are  $P^*$  and  $Q^*$ , respectively. Given this information, consumer surplus is the area ...



**FIGURE SG4.1:** Figure for question (1)

- [1]  $OBCQ^*$
- [2]  $ABC$
- [3]  $ACP^*$
- [4]  $CBP^*$

2. When the price of wood (which is an input in the production of furniture) falls, the consumer surplus associated with the consumption of furniture ...
- [1] increases.
  - [2] decreases.
  - [3] does not change.
  - [4] could be any of the above.

#### 4.5 Network Externalities

##### STUDY

Pages 136 to 138.

Up to now it was assumed that the demand of a consumer depends on variables which are specific to that consumer. The possible influence of other consumers on the demand of a consumer is described by **network externalities**. Owing to the growth in purchases by the consumer, two types of network externalities can be identified, namely:

- **Positive network externalities:** Such externalities exist when the quantity of a product demanded by a consumer increases owing to the growth in purchases by other consumers.
- **Negative network externalities:** Such externalities exist when the quantity of a product demanded by a consumer decreases owing to the growth in purchases of other consumers.

The **bandwagon effect** is an example of positive network externalities (see Figure 4.16 in Pindyck and Rubinfeld (2009:137)).<sup>18</sup> “Everyone is getting on the bandwagon” is a sentence commonly heard. This effect is used in many social sciences, like politics and sociology. In economics it means that the growth in an individual consumer’s demand is a response to the growth in purchases by other consumers. In many societies this can be seen by the behaviour of the youth. Cell phones and sunglasses are products without which any young person refuses to be seen.

The **snob effect** is the opposite of the above, as the quantity demanded of a snob good is directly related to the number of people owning it (when fewer people own a snob good, the quantity demanded increases – see Figure 4.17 in

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<sup>18</sup> The bandwagon and snob effects are part of a group of effects that have a close relationship with the Veblen good and the behavioural characteristics which are known as “conspicuous consumption”. Thorstein Veblen (1857–1929) was a Norwegian-American economist famous for his book *Theory of the leisure class*, first published in 1899. “Conspicuous consumption” was Veblen’s term to describe the lifestyle of the American consumer, meaning that consumption was used to gain and determine status in a community. A Veblen good is a product of which the quantity demanded increases with an increase in price. The Veblen effect thus points to behaviour that causes people to buy more of a product when a price increases.

Pindyck and Rubinfeld (2009:138)). It is therefore a negative network externality. Works of art, exclusive cars and antique furniture are typical products where the value increases when owned by fewer people.

**Note:** the bandwagon effect makes the market demand relatively more elastic and the snob effect makes the market demand less elastic (in other words inelastic).

### Activity 4.5

Decide whether the following statements are **True** or **False**.

		T	F
1	When negative network externalities are present, the demand curve is less elastic than otherwise.		
2	The snob effect corresponds best to a negative network externality.		

### Multiple-choice questions

- The bandwagon effect corresponds best to which of the following?
  - Snob effect.
  - External economy.
  - Negative network externality.
  - Positive network externality.
- Which of these is an example of a negative network externality?
  - Bandwagon effect.
  - Pollution.
  - Snob effect.
  - Two-part tariff.

### 4.6 Empirical Estimation of Demand

**OMIT**

Pages 140 to 144.

### Economics in Action Revisited

Various aspects of consumer behaviour were discussed in the learning unit. Two viewpoints are important here. Firstly, there are many determinants of consumer behaviour. Secondly, it must be clear that using models to describe consumer behaviour is necessary because of these many determinants. By using different policy measures (fiscal and monetary policies), the policy makers try to influence the behaviour of consumers.

## **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

## **Answers to Some of the Questions**

### ■ **Activity 4.1**

**True/False:** True: 1 and 2.  
False: 3.

**Multiple-choice questions:** 1. [4]  
2. [3]  
3. [3]  
4. [4]  
5. [2]

### ■ **Activity 4.2**

**True/False:** True: 1, 2  
False: None.

**Multiple-choice questions:** 1. [1]  
2. [2]  
3. [4]  
4. [2]  
5. [1]

### ■ **Activity 4.3**

**True/False:** No questions.

**Multiple-choice questions:** 1. [4]  
2. [2]  
3. [2]  
4. [4]  
5. [2]

### ■ **Activity 4.4**

**True/False:** True: 1  
False: 2

- Multiple-choice questions:**
1. [4]
  2. [1]

### ■ **Activity 4.5**

- True/False:**
- True: 1 and 2.  
False: None

- Multiple-choice questions:**
1. [4]
  2. [3]

## Uncertainty and Consumer Behaviour

**OMIT**

Pages 159 to 193.

# Production

## *Contents*

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Activity 6.4

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## ***Learning Outcomes***

We said at the beginning of learning unit 2 that one way of looking at the economy is to say that it consists of two types of role players, namely suppliers (producers) and demanders (consumers). We discussed the behaviour of consumers in learning unit 4. In this learning unit and the next one we focus on the production or supply side in the economy. Because production takes place in the firm, we can say that we are going to discuss the **theory of the firm**.

This learning unit contains a few technical aspects that you may find difficult to understand. To begin with, it is very important to realise that **the discussions in this learning unit and learning unit 7 are directly related to the contents of Figure 7.9 in Pindyck and Rubinfeld (2009:247). In this Figure, the cost structures for both the short run and the long run are indicated.**

Another important point that you have to keep in mind is that we can use two methods to approach the production and related cost in the theory of the firm, namely **the total production function method** and **the isoquant production function method**.<sup>19</sup> The total production function method can be used in the short run, while the isoquant production function method can be used in both

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<sup>19</sup> A production function is a function that shows the highest output that a firm can produce for every specified combination of inputs. Such a production function can be illustrated by an equation ( $q = F(K,L)$ , see (Pindyck & Rubinfeld, 2009:197); a schedule (see tables 6.1 and 6.4 in Pindyck and Rubinfeld (2009:199 & 207)) or a graphical illustration, namely an isoquant curve, as mentioned in the text.

the short and the long run. We will refer to different sections of chapters 6 and 7 in Pindyck and Rubinfeld (2009:195–270), but not always in the same sequence. The arguments will follow the discussion in the study guide.

Another aspect of production and cost is that there are many similarities between descriptions of the consumer and descriptions of production. These similarities will be pointed out to you.

**Once you have studied learning unit 6 you should be able to:**

- describe the role of technology in production;
- differentiate between production in the short run and production in the long run;
- explain the implications of returns to scale in production.

### **Economics in Action**

#### **Feeding the job generator**

An adequate and properly functioning electricity supply is important for more reasons than making a hot bath possible for the remaining 20% of South Africans without electricity. Securing a US\$3,75 bn loan from the World Bank to help fund construction of the Medupi power station and some renewable energy projects is only one of many targets Eskom needs to meet to satisfy SA's increasing appetite for electricity.

An adequate and properly functioning electricity supply is important for more reasons than making a hot bath possible for the remaining 20% of South Africans without electricity. It means more investment in industry and more jobs – which generates more taxes.

Investec economist Annabel Bishop says that “without creating an enabling environment at the macro level for job creation, SA will be hampered in curing the country's biggest ill: unemployment”.

Medupi will be the second power station in the Waterberg area after Matimba and will be supplied with coal from Exxaro Resources' Grootgeluk mine.

It will cost about R145 bn for a life span of about 50 years. It will be a dry-cooled plant, which uses less water, with installed capacity of 4788MW. When it comes on stream in 2012 it will add another 10% to Eskom's baseload.

Eskom's five-year programme of new building, currently estimated to cost R385 bn, includes the Kusile power station and the Ingula pumped storage scheme. Though the third new power station is expected to be nuclear, no decisions have been taken.

Chris Yelland of EE Publishers estimates the current shortfall in funding for the new build programme is R67 bn–R87 bn after the World Bank loan. About R45 bn is needed for Kusile.

**(Source:** Mathews, C. 2010. Feeding the job generator. Available at: <http://www.fm.co.za/Article.aspx?id=106299> [accessed on 15/05/2010].)



This extract from an article in the *Financial Mail* is referring to the supply of electricity in South Africa and can be regarded as a summary of learning units 6 and 7 (the next learning unit). The supply of electricity is based on a decision on how to produce electricity (thus production) and this production depends on costs. (That is why the funding of production is the issue: tariffs or loans?) Production or supply, the topic of this learning unit, is therefore determined by costs, which will be discussed in the next learning unit.

## 6.1 The Technology of Production

### STUDY

Pages 195 to 198.

The theory of the firm is based on three variables, namely:

- The nature of the technology used in production
- Cost constraints
- How much of each input (factors of production) must be used for producing a certain level of output

The first variable is shown by the **production function**. This function describes the highest output that a firm can produce with a specific number of inputs. The following equation describes the production function:

$$q = F(K,L)$$

This equation describes the relationship between output ( $q$ ) and the two inputs capital ( $K$ ) and labour ( $L$ ). Note the following regarding the abovementioned production function:

- Inputs and outputs are flows.
- The production function applies to a given technology.
- The production function describes what is technically feasible when the firm operates efficiently.

In production theory we make a distinction between the **short and the long run**. This distinction is based on the question of how long it takes to change an input. It would be quite easy to change the number of workers (assuming that the right quantity and quality is available). However, changing capital will take much longer. One cannot build a factory in a week or even a month. When we refer to the short run, one input is fixed, usually capital. When all the inputs are variable, we are referring to the long run.

### Activity 6.1

Questions concerning this section will be incorporated in later sections of this learning unit.

## 6.2 Production with One Variable Input (Labour)

### STUDY

Pages 198 to 207.

Because one input is fixed, it means that we are referring to the short run. The only way a firm can increase output is by using more of the variable input, labour. This is illustrated in table 6.1 (Pindyck & Rubinfeld, 2009:199), where the amount of capital stays the same (10 units in the table), but the amount of labour changes. We also see in the table that **total output** increased from 0 to 100.

We use this total output ( $TP$ ) to determine the average product ( $AP$ ) of labour and the marginal product ( $MP$ ) of labour.

The **average product** ( $AP$ ) is equal to the total product divided by the quantity of labour ( $q/L$ ). From the table we see that average product increased from 10 to a maximum of 20 and then decreased to 10 again. The average product measures the productivity of the labourers or workforce in terms of how much each worker produces on average.

The **marginal product** ( $MP$ ) measures the additional output produced as the labour input is increased by 1 unit ( $\Delta q/\Delta L$ ). The marginal product first increases from 10 to 30 and then decreases to -8. The marginal product of labour depends on the amount of capital used. Although capital is fixed in the short run, the marginal product of labour will increase as soon as the amount of capital increases.

The information in table 6.1 is plotted in Figure 6.1 (Pindyck & Rubinfeld, 2009:200). Note that there are specific **relationships between the total, average and marginal product**. The most notable are:

- The decrease in total output (the dotted line in Figure 6.1[a]) starts when more than 8 workers are employed. The marginal product becomes negative when total product decreases (the dotted line in Figure 6.1[b]).
- When the marginal product is greater than the average product, the average product is increasing.
- When the marginal product is less than the average product, the average product is decreasing.
- The slope of a line drawn from the origin to a point on the total product curve is equal to the average product for that point on the total product curve (point B or C in Figure 6.1[a]).
- The marginal product is equal to the slope of a line drawn tangent to the total product (point A in Figure 6.1[a]).

The **law of diminishing marginal returns** holds for most production processes and is associated with both the short and the long run.<sup>20</sup> Note the following about this law:

- The law has nothing to say on the quality of labour.
- It does not necessarily describe a negative return; rather a declining return.
- The law applies to a given level of production technology.
- When the level of production technology increases, the total product curve will shift upwards (see Figure 6.2 and read example 6.1 in Pindyck and Rubinfeld (2009:203–204)). Note that with such a shift, the law of diminishing marginal returns remains relevant.

The question now is: What is the relationship between production and costs in the short run? This question will be answered in the next learning unit.

## Activity 6.2

Decide whether the following statements are **True** or **False**.

		T	F
1	Labour is an input which is variable in the long run.		
2	The marginal product of an input is the increase in total output owing to the addition of the last unit of an input, holding all other inputs constant.		
3	When the average product is decreasing, marginal product is increasing.		
4	Technological improvement can hide the presence of diminishing returns.		

## Multiple-choice questions

- A production function assumes a given ...
  - technology.
  - set of input prices.
  - ratio of input prices.
  - amount of capital and labour.
- A function that indicates the maximum output per unit of time that a firm can produce, for every combination of inputs with a given technology, is called a(n) ...
  - isoquant.
  - production possibility curve.
  - production function.
  - isocost function.

<sup>20</sup>We will discuss this again in the next section.

3. A farmer uses  $L$  units of labour and  $K$  units of capital to produce  $Q$  units of corn using a production function  $F(K,L)$ . A production plan that uses  $K' = L' = 10$  to produce  $Q'$  units of corn where  $Q' < F(10, 10)$  is said to be technically ...
- [1] feasible and efficient.
  - [2] unfeasible and efficient.
  - [3] feasible and inefficient.
  - [4] unfeasible and inefficient.
4. The short run is ...
- [1] less than a year.
  - [2] three years.
  - [3] the time it takes to produce the planned output.
  - [4] a time period in which at least one input is fixed.
5. Writing total output as  $Q$ , change in output as  $\Delta Q$ , total labour employment as  $L$ , and change in labour employment as  $\Delta L$ , the marginal product of labour can be written algebraically as ...
- [1]  $\Delta Q$  multiply  $L$ .
  - [2]  $Q / L$ .
  - [3]  $\Delta L / \Delta Q$ .
  - [4]  $\Delta Q / \Delta L$ .
6. The slope of the total product curve is the ...
- [1] average product.
  - [2] slope of a line from the origin to the point.
  - [3] marginal product.
  - [4] marginal rate of technical substitution.
7. The law of diminishing returns refers to diminishing ...
- [1] total returns.
  - [2] marginal returns.
  - [3] average returns.
  - [4] all of these.
8. When labour usage is at 12 units, output is 36 units. From this we may infer that ...
- [1] the marginal product of labour is 3.
  - [2] the total product of labour is  $1/3$ .
  - [3] the average product of labour is 3.
  - [4] none of the above.

**Questions with written answers**

(1) Complete the following table:

<b>Quantity Of Variable Input</b>	<b>Total Output</b>	<b>Marginal Product of Variable Input</b>	<b>Average Product of Variable Input</b>
0	0		
1			50
2		30	
3	90		
4			24
5		4	
6	96		

(6)

**6.3 Production with Two Variable Inputs (Labour and Capital)****STUDY**

Pages 207 to 214 and  
Example 6.3.

We now move to the **long run**, as both inputs are variable. To describe this kind of production, economists have developed the **isoquant production function**. This concept is in essence the same as the indifference curve in consumer theory.<sup>21</sup> The **isoquant** is a curve that shows all the possible combinations of inputs (assume capital and labour for discussion purposes) that yields the same output. In Figure 6.4 (Pindyck & Rubinfeld, 2009:208) three isoquants are drawn and they are collectively called an **isoquant map**.

We see that the isoquant the **furthest from the origin illustrates the highest production**, namely 90 units. One can imagine that a producer would prefer to be on isoquant  $q_3$  in Figure 6.4 (Pindyck & Rubinfeld, 2009:208), since

<sup>21</sup> See learning unit 3, section 3.1. Note the following similarities between indifference curves and isoquants. In consumer theory we worked with satisfaction or utility illustrated by the indifference map. In production theory we work with production and production is illustrated by the isoquant map. The indifference curve the furthest from the origin is preferred, as is the case with isoquants. Indifference curves and isoquants both slope downwards and are convex. The slope of the indifference curve is the diminishing marginal rate of substitution is between two consumer products and the slope of the isoquant is the diminishing marginal rate of technical substitution between two inputs. The most obvious difference is that we cannot put a numerical value on indifference curves, but we can do it with isoquants.

(ignoring costs and demand limitations), the more the producer can produce the higher his or her income will be (*income = quantity × price*).

As all the points on an individual isoquant give the same level or quantity of production, they **cannot intersect**. The three isoquants in Figure 6.4 (Pindyck & Rubinfeld, 2009:208) give 55, 75 and 90 units of production respectively. We can put a numerical value (cardinal value) on an isoquant, the reason being that isoquants illustrate production as a physical activity. We know for example how many cars, tons of maize and number of textbooks are produced annually.

Diminishing marginal returns are applicable to both capital and labour, thus also in the long run. The slope of the isoquant indicates how the quantity of one input can be traded off against the quantity of the other input while output is held constant. This slope, ignoring the negative sign, is the **marginal rate of technical substitution (MRTS)**. This rate of labour for capital is the amount by which the input of capital can be reduced when one extra unit of labour is used, and output is held constant.

Another important conclusion is that the marginal rate of technical substitution between two inputs is equal to the ratio of the marginal products of the inputs. This can be described in the following equation:

$$(MP_L)/(MP_K) = -(\Delta K/\Delta L) = MRTS$$

Figure 6.6 illustrates an isoquant map where the inputs are perfect **substitutes**, and Figure 6.7 illustrates an isoquant map where the inputs can only be used in fixed quantities, which means that the inputs are **complements** (Pindyck & Rubinfeld, 2009:212). The latter is also called the **Leontief production function**.<sup>22</sup>

An aspect not directly mentioned in the textbook is that isoquants can also be used in the short run, when one input is fixed. We will pursue this in the next learning unit.

### Activity 6.3

Decide whether the following statements are **True** or **False**.

		T	F
1	As we move downward along a typical isoquant, the slope of the isoquant becomes steeper.		
2	The rate at which one input can be reduced per additional unit of the other input, while holding output constant, is measured by the marginal rate of technical substitution.		
3	The marginal rate of technical substitution is equal to the slope of the total product curve.		

<sup>22</sup> Wassily Wassilyovich Leontief (5 August 1905 [Munich]–5 February 1999 [New York]), was a Russian-American economist who won the Nobel prize for economics in 1973. (It is interesting to note that three of his doctoral students, Paul Samuelson [1970], Robert Solow [1987] and Vernon Smith [2002] also received this prize.) Leontief was known for his research on how changes in one economic sector affects other sectors (the method of input-output analysis).

**Multiple-choice questions**

1. An isoquant ...
  - [1] must be linear.
  - [2] cannot have a negative slope.
  - [3] is a curve that shows all the combinations of inputs that yield the same total output.
  - [4] is a curve that shows the maximum total output as a function of the level of labour input.
  
2. Refer to the following two statements to answer this question:
  - I. Isoquants cannot cross one another.
  - II. An isoquant that is twice the distance from the origin, represents twice the level of output.
  - [1] Both I and II are true.
  - [2] I is true, and II is false.
  - [3] I is false, and II is true.
  - [4] Both I and II are false.
  
3. Refer to the following two statements to answer this question.
  - I. The numerical labels attached to indifference curves are meaningful only in an ordinal way.
  - II. The numerical labels attached to isoquants are meaningful only in an ordinal way.
  - [1] Both I and II are true.
  - [2] I is true, and II is false.
  - [3] I is false, and II is true.
  - [4] Both I and II are false.
  
4. An upward sloping isoquant ...
  - [1] can be derived from a production function with one input.
  - [2] can be derived from a production function that uses more than one input where reductions in the use of any input always reduce output.
  - [3] cannot be derived from a production function when a firm is assumed to maximize profits.
  - [4] can be derived whenever one input to production is available at zero cost to the firm.
  
5. Refer to the following two statements to answer this question:
  - I. If the marginal product of labour is zero, the total product of labour is at its maximum.
  - II. If the marginal product of labour is at its maximum, the average product of labour is falling.

- [1] Both I and II are true.
- [2] I is true, and II is false.
- [3] I is false, and II is true.
- [4] Both I and II are false.

**Questions with written answers**

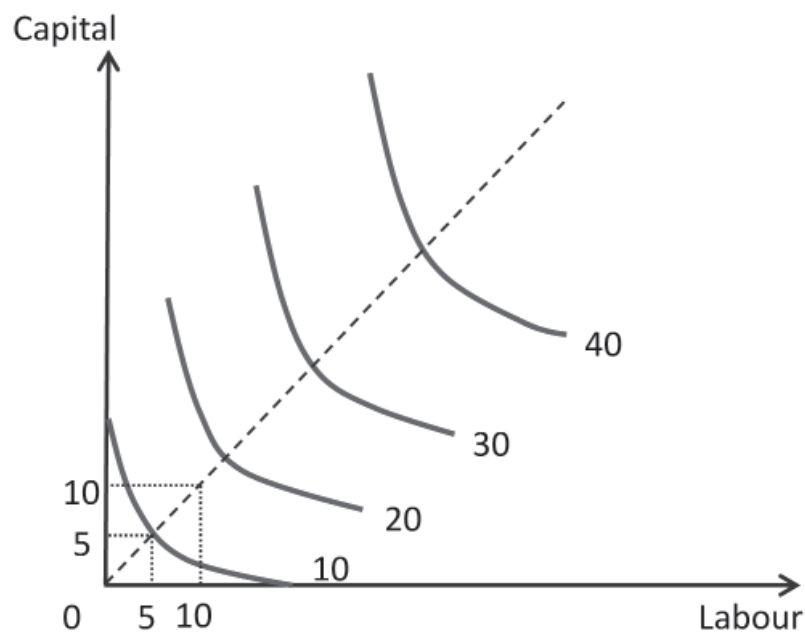
- (1) Explain and illustrate a Leontief production function. (6)
- (2) Explain and illustrate why isoquants cannot intersect. (6)

**6.4 Returns to Scale**

**STUDY**  
Pages 215 to 216.

The last topic in this learning unit is **returns to scale**, which is the rate at which output increases as inputs are increased proportionately. One can also say that returns to scale is to change the scale of the production by increasing all the inputs to production in proportion. Suppose a student studies for four hours before sitting his or her microeconomics examination and obtains a final mark of 50%. The question now is: If he or she studies for eight hours, will the examination mark increase to 100%?

The different forms of returns to scale are adequately discussed in the textbook (Pindyck & Rubinfeld, 2009:215–216). The following Figure illustrates decreasing returns to scale and is not in the textbook.



**FIGURE SG6.1:** Decreasing returns to scale



## Activity 6.4

### Multiple-choice questions

1. In a production process, all inputs are increased by 10%, but output increases by less than 10%. This means that the firm experiences ...
  - [1] decreasing returns to scale.
  - [2] constant returns to scale.
  - [3] increasing returns to scale.
  - [4] negative returns to scale.
  
2. Increasing returns to scale in production means ...
  - [1] more than 10% as much of all inputs are required to increase output by 10%.
  - [2] less than twice as much of all inputs are required to double output.
  - [3] more than twice as much of only one input is required to double output.
  - [4] isoquants must be linear.
  
3. With increasing returns to scale, isoquants for unit increases in output become ...
  - [1] farther and farther apart.
  - [2] closer and closer together.
  - [3] the same distance apart.
  - [4] none of the above.
  
4. Refer to the following two statements to answer this question:
  - I. "Decreasing returns to scale" and "diminishing returns to a factor of production" are two phrases that mean the same thing.
  - II. Diminishing returns to all factors of production implies decreasing returns to scale.
  - [1] Both I and II are true.
  - [2] I is true, and II is false.
  - [3] I is false, and II is true.
  - [4] Both I and II are false.
  
5. If input prices are constant, a firm with increasing returns to scale can expect ...
  - [1] costs to double as output doubles.
  - [2] costs to more than double as output doubles.
  - [3] costs to go up less than double as output doubles.
  - [4] to hire more and more labour for a given amount of capital, since marginal product increases.

## ■ **Economics in Action Revisited**

Production or supply was the topic of this learning unit. A distinction was made between the short run and the long run. As with Eskom, a power station cannot be built in the short run; it implies long-term cost. In the next learning unit we move from production to costs.

### **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### ■ **Activity 6.1**

No questions

#### ■ **Activity 6.2**

**True/False:** True: 1 and 2.  
False: 3 and 4.

**Multiple-choice questions:** 1. [1]  
2. [3]  
3. [3]  
4. [4]  
5. [4]  
6. [3]  
7. [2]  
8. [3]

#### ■ **Activity 6.3**

**True/False:** True: 2.  
False: 1 and 3.

**Multiple-choice questions:** 1. [3]  
2. [2]  
3. [2]  
4. [3]  
5. [2]

■ **Activity 6.4**

**True/False:**

No questions

**Multiple-choice questions:**

1. [1]
2. [2]
3. [2]
4. [4]
5. [3]

# The Cost of Production

## *Contents*

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## ***Learning Outcomes***

This learning unit is a continuation of learning unit 6, discussing supply in an economy. Here we focus more closely on describing and analysing the cost of production. Again, as mentioned in the previous learning unit, it is very important to get to grips with the fact that **the discussions in the previous learning unit and in this one are both aimed at the contents of Figure 7.9 in Pindyck and Rubinfeld (2009:247). In this Figure, the cost structures for both the short run and the long run are indicated.**

***Once you have studied learning unit 7 you should be able to:***

- *define the different concepts of costs in economics;*
- *discuss cost in the short run;*
- *discuss cost in the long run;*
- *compare short-run cost with long-run cost;*
- *describe economies of scope.*

## Economics in Action

Cost functions are derived functions. They are derived from the production function, which describes the available efficient methods of production at any one time.

(Source: Koutsoyiannis, A. 1994. *Modern microeconomics*. London: McMillan:105.)

We are moving from production functions to cost functions in this learning unit. How is this possible? The managers of the firm must first decide which production process is technologically efficient. Their second decision is based on minimising the cost of that technologically efficient production process. Hereby economic efficiency is attained. Cost of production relates to the prices the producers must pay for inputs.

### 7.1 Measuring Cost: Which Costs Matter?

#### STUDY/OMIT/READ

Study Pages 221 to 228.

Omit Example 7.1.

Read Example 7.2.

This section is self-explanatory and focuses on the viewpoints of economists regarding costs. The main concepts of costs are summarised in the table below.

**TABLE SG7.1:** Summarising costs

Name	Definition
Economic cost	Opportunity costs which are not shown = implicit costs. Economic costs include implicit and explicit costs.
Accounting cost	The cost of buying production factors (explicit costs).
Opportunity cost	The opportunities forgone by not putting the firm's resources to their best alternative use.
Sunk cost	Expenditure that has been made and cannot be recovered.
Total cost ( $TC$ )	The total cost incurred to produce an output (fixed cost [ $FC$ ] + variable costs [ $VC$ ]).
Average total cost ( $ATC$ )	Total cost divided by the firm's level of output ( $ATC = TC/q$ )
Fixed costs ( $FC$ )	Costs that do not vary with output (capital, rent, etc.).
Average fixed cost ( $AFC$ )	Fixed cost divided by output ( $FC/q$ ).
Variable cost ( $VC$ )	Cost that varies as output varies (labour)

Average variable cost (AVC)	Variable cost divided by output ( $AVC/q$ )
Marginal cost (MC)	The change in total cost that result from producing one extra unit of output.  In the case of the short-run marginal cost is equal to the change in the variable cost (labour) ( $MC = \Delta TC/\Delta q = \Delta VC/\Delta q$ ).  (MC can thus be calculated from the TC or VC.)

### Activity 7.1

Decide whether the following statements are **True** or **False**.

		T	F
1	Fixed costs are fixed with respect to changes in output.		
2	Mary knows the average total cost and the average variable costs for a given level of output. She cannot determine the total cost, given this information.		

### Multiple-choice questions

- Which of the following statements is **TRUE** regarding the differences between economic and accounting costs?
  - Accounting costs include all implicit and explicit costs.
  - Economic costs include implicit costs only.
  - Accountants consider only implicit costs when calculating costs.
  - Accounting costs include only explicit costs.
- Peter purchased 100 shares of IBM stock several years ago for R150.00 per share. The price of these shares has fallen to R55.00 per share. Peter's investment strategy is "buy low, sell high." Therefore, he will not sell his IBM stock until the price rises above R150.00 per share. If he sells at a price lower than R150.00 per share he will have "bought high and sold low." Peter's decision is ...
  - correct and shows a solid command of the nature of opportunity cost.
  - incorrect because the original price paid for the shares is a sunk cost and should have no bearing on whether the shares should be held or sold.
  - incorrect because when the price of a stock falls, the law of demand states that he should buy more shares.
  - incorrect because it treats the price of the shares as an explicit cost.

3. In order for a taxicab to be operated in Johannesburg, it must have a medallion on its hood (bonnet). Medallions are expensive, but can be resold, and are therefore an example of a(n) ...
- [1] fixed cost.
  - [2] variable cost.
  - [3] implicit cost.
  - [4] opportunity cost.
4. Which of the following statements correctly uses the concept of opportunity cost in decision-making?
- I. "Because my secretary's time has already been paid for, my cost of taking on an additional project is lower than it otherwise would be."
  - II. "Since NASA is running under budget this year, the cost of another space shuttle launch is lower than it otherwise would be."
- [1] I is true, and II is false.
  - [2] I is false, and II is true.
  - [3] I and II are both true.
  - [4] I and II are both false.
5. Which of the following costs always declines as output increases?
- [1] Average cost.
  - [2] Marginal cost.
  - [3] Fixed cost.
  - [4] Average fixed cost.

## 7.2 Cost in the Short Run

### STUDY

Pages 228 to 234 and  
Example 7.3.

To move from production to costs, we use a firm which can hire as much labour as it wishes at a fixed wage  $w$ . The reasoning is as follows:

According to table SG7.1, marginal cost is equal to the change in variable cost (labour), with a 1-unit change in output ( $\Delta VC/\Delta q$ ).

The change in variable cost ( $\Delta VC$ ) is the 'per unit' cost of the extra labour  $w$  times the amount of extra labour needed to produce the extra output  $\Delta L$ .

$$MC = \Delta VC/\Delta q = w\Delta L/\Delta q$$

From learning unit 6 you will recall that the marginal product of labour ( $MP_L$ ) is the change in output from a 1-unit change in labour input ( $\Delta q/\Delta L$ ). Now, the extra labour needed to produce an extra unit of output is  $\Delta L/\Delta q$  and this is equal to  $1/MP_L$ .

$$MC = w/MP_L$$

Thus, when there is just one variable input, the marginal cost is equal to the price of the input divided by its marginal product.

The implication of this equation is that when the marginal product of labour decreases the marginal cost of production increases, and vice versa (see table 7.1 (Pindyck & Rubinfeld, 2009:228)).

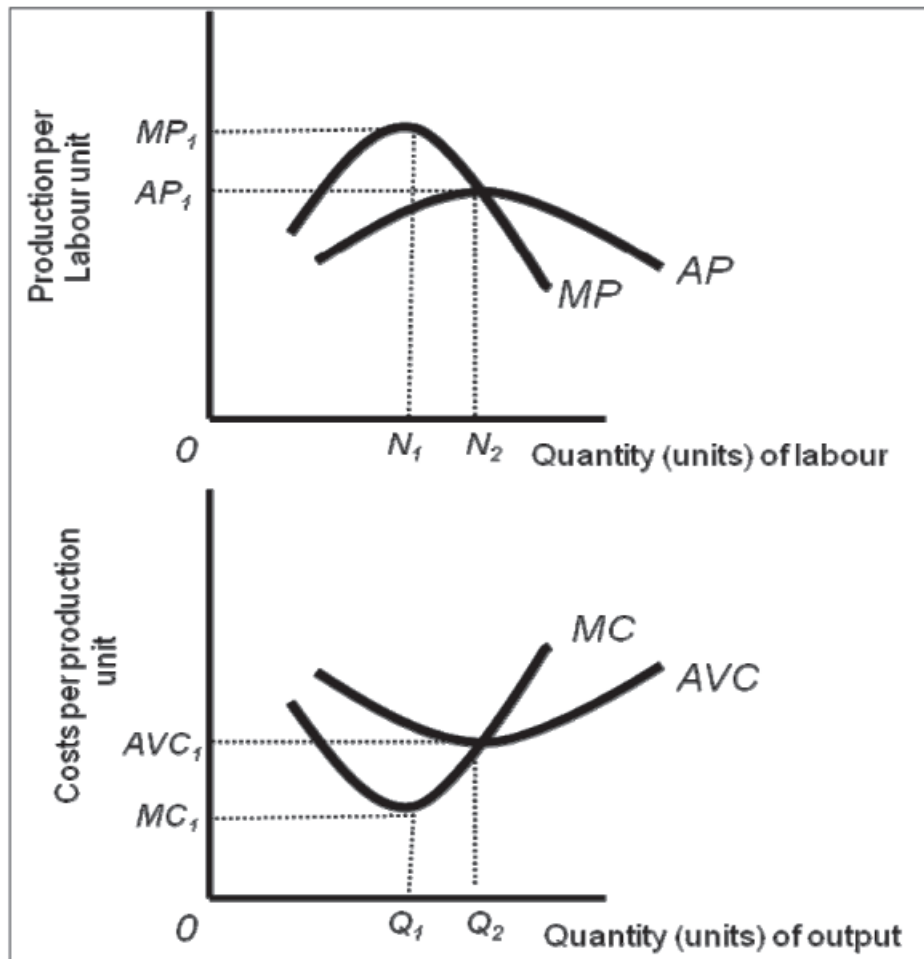
It can also be proved, when there is just one variable input, that the average cost is equal to the price of the input divided by its average product, thus:

$$AVC = w/AP_L$$

Looking at table 7.1 (Pindyck & Rubinfeld, 2009:228) we see that the marginal product of labour declines as the quantity of labour employed increases. The decrease in the marginal product is owing to **the law of diminishing marginal returns**. According to this law, marginal cost will increase as output increases. As in the case of marginal cost, the law of diminishing marginal returns is also applicable to the average variable cost.

Therefore, the shape of the marginal cost curve and the average cost curve is determined by the relationship between these cost curves and the production function of labour, and the law of diminishing marginal returns. This is shown in the Figure below.





**FIGURE SG7.1:** The relationship between production and costs

(Source: Adapted from Mohr, P., Fourie, L. & Associates. 2008. *Economics for South African students*, Pretoria: Van Schaik: 224.)

Figure 7.1 (Pindyck & Rubinfeld, 2009:228) must be studied together with table 7.1 (Pindyck & Rubinfeld, 2009:228) and table SG7.1 in this learning unit. The characteristics of these short-term cost curves are summarised in the table 7.2.

**TABLE SG7.2:** The characteristics of these short-run cost curves

Curve	Characteristic
Fixed cost (FC)	FC does not vary with output. $FC = TC$ at zero output.
Variable cost (VC)	VC is zero when output is zero.
Average fixed cost (AFC)	AFC decreases as output increases.
Relationship between marginal (MC) and average cost curves (ATC).	When $MC < ATC$ , then ATC decreases. When $MC > ATC$ , then ATC increases. ATC at minimum, then $MC = ATC$ . Normal profit earned and point of efficiency.

Average total cost (ATC), average variable cost (AVC) and average fixed cost (AFC).	$ATC = AVC + AFC.$ Distance between ATC and AVC decreases as AFC decreases and output increases.
---	---

We therefore used Figure 6.1 (Pindyck & Rubinfeld, 2009:200), which illustrates production, to derive Figure SG7.1, which illustrates costs. This is in accordance with our quote at the beginning of this learning unit, that costs are derived from functions of production.

## ■ Activity 7.2

### Multiple-choice questions

1. In a short-run production process, the marginal cost is rising and the average variable cost is falling as output is increased. Thus,
  - [1] average fixed cost is constant.
  - [2] marginal cost is above average variable cost.
  - [3] marginal cost is below average fixed cost.
  - [4] marginal cost is below average variable cost.
  
2. Which always increase(s) as output increases?
  - [1] Marginal Cost only
  - [2] Fixed Cost only
  - [3] Total Cost only
  - [4] Total Cost and Variable Cost
  
3. If a factory has a short-run capacity constraint (e.g., an auto plant can only produce 800 cars per day at maximum capacity), the marginal cost of production becomes \_\_\_\_\_ at the capacity constraint.
  - [1] infinite
  - [2] zero
  - [3] highly elastic
  - [4] less than the average variable cost

### Questions with written answers

- (1) Anna believes the production of a dress requires 4 labour hours and 2 machine hours to produce. If Anna decides to operate in the short run, she must spend R500 to lease her business space. Also, a labour hour costs R15 and a machine hour costs R35. What is Anna's cost of production as a function of dresses produced? (4)

### 7.3 Cost in the Long Run

#### STUDY

Pages 234 to 243 and  
Example 7.4.

We have already discussed isoquants in learning unit 6.<sup>23</sup> Isoquants are production functions where both the inputs are variable. It therefore illustrates the long run. We continue with section 7.3 (“Cost in the long run”) in the textbook (Pindyck & Rubinfeld, 2009:234–236). In this section the user **cost of capital** and the **cost-minimising input of capital** are discussed.

To identify this cost-minimising point for the firm, we have to develop the **isocost line**. This line shows all possible combinations of labour and capital that can be purchased at a given total cost. With two inputs, the total cost ( $TC$ ) will be the cost of labour ( $wL$ ) and the capital cost ( $rK$ ), thus

$$TC = wL + rK$$

We can rewrite this for an equation for a straight line as follows:

$$K = TC/r - (w/r)L$$

The slope of this isocost curve is  $(\Delta K/\Delta L)$  or  $-(w/r)$ , and is similar to the budget line of the consumer.<sup>24</sup>

An isocost curve can be constructed in the same way as a budget line (see Figure 7.3 in Pindyck and Rubinfeld (2009:234–236)). Suppose a production budget is R100.00 ( $TC$ ); the price of labour is R5.00 ( $w$ ) per unit and that of capital R10.00 ( $r$ ) per unit. If the total production budget is spent on labour, then 20 units of labour will be used ( $TC/w$ ). These 20 units of labour will be the intercept of the isocost curve on the X-axis. Similarly, if only capital was used as an input then 10 units of capital will be used ( $TC/r$ ). These 10 units of capital will be the intercept of the isocost curve on the Y-axis.

The extent to which a producer can produce products is limited by the **production budget** and the **prices** of the inputs.

The cost-minimising point is illustrated in Figure 7.3 (Pindyck & Rubinfeld, 2009:237), using the isoquant curve and the isocost curve. Note that the slope of the isocost curve does not change when the production budget increases or decreases. It will only change when the price of one input changes relative

<sup>23</sup> See learning unit 6, section 6.3.

<sup>24</sup> In consumer theory we worked with the budget line and in production theory with the isocost curve. The budget line serves as a limitation on the extent to which the consumer can satisfy his or her needs and the isocost curve serves as a limitation on the production capabilities of the producer.

to the price of the other input.<sup>25</sup> This is illustrated in Figure 7.4 (Pindyck & Rubinfeld, 2009:238).

In learning unit 6, section 6.3, we saw that the marginal rate of technical substitution of labour for capital is equal to the negative slope of the isoquant and is equal to the marginal product of labour and capital.

$$(MP_L)/(MP_K) = -(\Delta K/\Delta L) = MRTS$$

As the slope of the isocost curve is  $(\Delta K/\Delta L) = -(w/r)$ , then  $MP_L/MP_K = w/r$ , and this can be rewritten as

$$MP_L/w = MP_K/r$$

In the case of cost-minimising, quantities are chosen in such a way that the last monetary value of the input added to the production process yields the same amount of extra output. Work through the example on page 239 in Pindyck and Rubinfeld (2009:239). The core principle is that the manager of a firm will continue using this input if it is more productive than another input. This process will continue until the productivity of all the inputs are even.

### Activity 7.3

Decide whether the following statements are **True** or **False**.

		T	F
1	An isocost curve reveals the input combinations that can be purchased with a given outlay of funds.		
2	Production budgets and input prices determine the position of isocost curves.		

### Multiple-choice questions

- When an isocost curve is just tangent to an isoquant, we know that ...
  - output is being produced at minimum cost.
  - output is not being produced at minimum cost.
  - the two products are being produced at the least input cost to the firm.
  - the two products are being produced at the highest input cost to the firm.
- A firm's expansion path is ...
  - the firm's production function.
  - a curve that makes the marginal product of the last unit of each input equal for each output.

<sup>25</sup> This parallel movement or the change in the isocost and the change in the slope of the isocost line are based on the same principles as those for the budget line.

- [3] a curve that shows the least-cost combination of inputs needed to produce each level of output for given input prices.
- [4] none of the above.
3. At the optimum combination of two inputs,
- [1] the slopes of the isoquant and isocost curves are equal.
- [2] costs are minimised for the production of a given output.
- [3] the marginal rate of technical substitution equals the ratio of input prices.
- [4] all of the above.
4. A plant uses machinery and waste water to produce steel. The owner of the plant wants to maintain an output of 10,000 tons a day, even though the government has just imposed a R100.00 per 3.79 liters tax on using waste water. The reduction in the amount of waste water that results from the imposition of this tax depends on the ...
- [1] amount of waste water used before the tax was imposed.
- [2] cost to the firm of using waste water before the tax was put in place.
- [3] rental rate of machinery.
- [4] ratio of the marginal product of waste water to the marginal product of machinery.
5. Suppose our firm produces chartered business flights with capital (planes) and labour (pilots) in fixed proportion (i.e., one pilot for each plane). The expansion path for this business will ...
- [1] increase at a decreasing rate because we will substitute capital for labour as the business grows.
- [2] follow the 45-degree line from the origin.
- [3] not be defined.
- [4] be a vertical line.

#### 7.4 Long-Run versus Short-Run Costs

##### STUDY

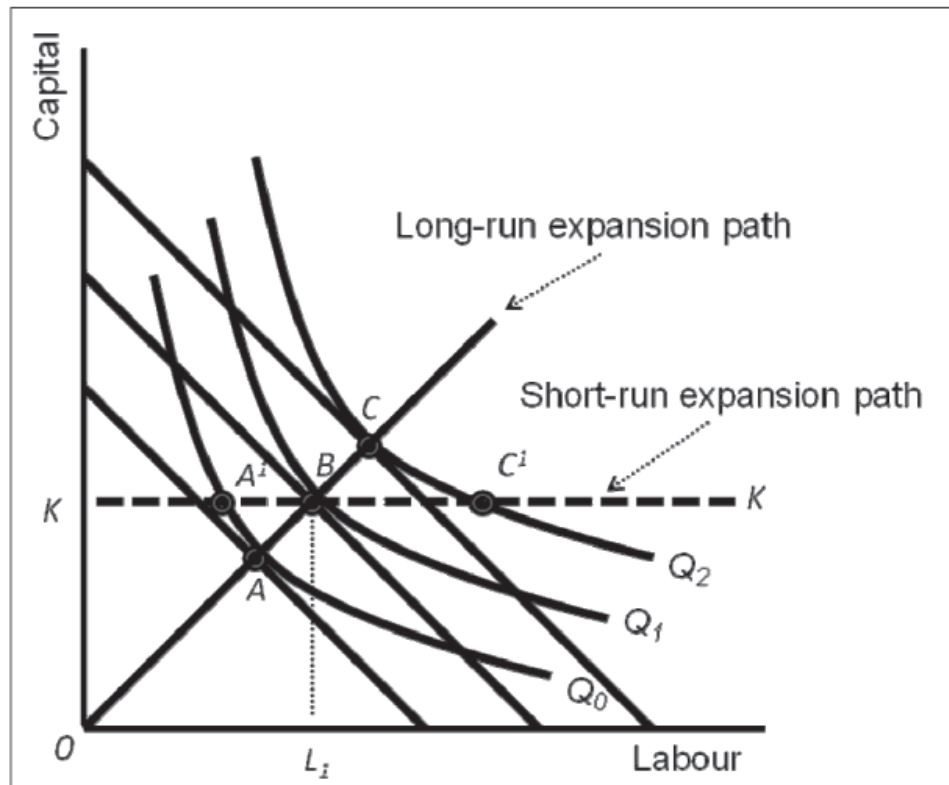
Pages 243 to 248.

#### The long and short-run expansion path

We are still using a firm with two variable inputs, thus the long run. If we suppose that the firm has various output levels, using capital and labour as inputs, then we have different cost minimising points. This is illustrated in Figure 7.6(a) (Pindyck & Rubinfeld, 2009:242). The curve passing through the tangent points of the isoquant curves and isocost curves, the cost-minimising

points, is the **long-run expansion path**.<sup>26</sup> Remember **this is for the long run**. Unfortunately this Figure is a bit confusing. The isoquant curve running through the cost-minimising point *A* in Figure 7.6(a) (Pindyck & Rubinfeld, 2009:242) is for a production of 100 units (point *B* is for 200 units and point *C* for 300 units).

This is where we stop working in the long run and move to Figure 7.7 (Pindyck & Rubinfeld, 2009:244). This Figure is repeated below, but note that we have made a few changes.



**FIGURE SG7.2:** The short-run expansion path

(Source: Adapted from: Glahe, F.R. & Lee, D.R. 1989. *Microeconomics*. London: Harcourt Brace Jovanovich College Publishers. p. 250.)

We do have the isoquant and isocost curves, both running through points *A*, *B* and *C*. When we work in the short run, one input (capital) is constant. This is illustrated by the point *K* on the vertical line (y-axis) in the above Figure. Because capital is constant, only the input labour (*L*) can increase (from 0 on the x-axis) as production increases from isoquant  $Q_0$  to  $Q_2$ . As labour increases, the quantity of capital stays the same. It follows that the line *KK* is the **short-run expansion path** of the firm. Line *KK* in the above Figure is the same as the short-run expansion path in Figure 7.7 (running from  $K_1$  through *P*) in the textbook (Pindyck & Rubinfeld, 2009:244).

Note that we now have isoquant and isocost curves which illustrate the short-run cost-minimising points, *A'*, *B* and *C'*. We can draw isocost curves

<sup>26</sup> Remember the income consumption curve. See learning unit 4, section 4.1.

through points  $A'$  and  $C'$ .<sup>27</sup> The above discussion on the long-run and short-run expansion path is summarized in table SG7.3.

**TABLE SG7.3:** The long and short-run expansion path: a summary

Time period	Expansion path	Reasons
Short-run	Horizontal	One input fixed (capital) and one input variable (labour).
Long-run	Sloping upwards from left to right, going through cost-minimising lines.	All inputs are variable.

This short-run expansion path ( $KK$  in Figure SG7.2 or from  $K_1$  through  $P$  in Figure 7.7 (Pindyck & Rubinfeld, 2009:244)) contains two sources of information that we can use to construct the short-run total cost curve ( $TC$ ) as illustrated in Figure 7.1(a) (Pindyck & Rubinfeld, 2009:230). These two sources of information are the production quantity related to each isoquant curve,  $Q_{0'}$ ,  $Q_1$  to  $Q_{2'}$ , and the cost illustrated by the isocost curves going through points  $A'$ ,  $B$  and  $C'$ . Putting the production quantities on the X-axis and the corresponding costs on the Y-axis we can derive the **short-run total cost curve** for the firm. This short-run total cost curve is the same as the one in Figure 7.1 (Pindyck & Rubinfeld, 2009:230). We can now go back to the discussion of this Figure, together with table 7.1 (Pindyck & Rubinfeld, 2009:228) and table SG7.1.

It follows then that we can use isoquant production functions and isocost curves (with the short-run expansion path) to derive the short-run cost structure of the firm.

The long-run average and marginal cost is given in Figure 7.8 (Pindyck & Rubinfeld, 2009:245).

Figure 7.9 (Pindyck & Rubinfeld, 2009:247) is our final destination in constructing and comparing the short-run and long-run cost structures of the firm. What we see, is that the long run (represented by the  $LAC$  and  $LMC$ ), consists of a number of short-run periods (which is represented by  $SAC_{1-3}$  and  $SMC_{1-3}$ ). One can imagine that each short-run curve is a single factory; as this factory expands, another single factory is build, and so on. In the long run all these small factories make one big factory.

## Activity 7.4

### Multiple-choice questions

1. Consider the following statements when answering this question.
  - I. A technology with increasing returns to scale will generate a long-run average cost curve that has economies of scale.

<sup>27</sup> You should see that points  $A'$  and  $C'$  lie on higher isocost lines than the isocost lines running through points  $A$  and  $C$ .  $A$  and  $C$  (together with  $B$ ) are the long-run cost-minimising points. The long run is thus more efficient than the short-run – a fact that we will return to later.

- II. Diminishing returns determine the slope of the short-run marginal cost curve, whereas returns to scale determine the slope of the long-run marginal cost curve.
- [1] I is true, and II is false.  
 [2] I is false, and II is true.  
 [3] Both I and II are true.  
 [4] Both I and II are false.
2. To model the input decisions for a production system, we plot labour on the horizontal axis and capital on the vertical axis. In the short run, labour is a variable input and capital is fixed. The short-run expansion path for this production system is ...
- [1] a vertical line.  
 [2] a horizontal line.  
 [3] equal to the 45-degree line from the origin.  
 [4] not defined.
3. Refer to the following statements to answer this question:
- I. The long-run average cost (*LAC*) curve is the envelope of the short-run average cost (*SAC*) curves.  
 II. The long-run marginal cost (*LMC*) curve is the envelope of the short-run marginal cost (*SMC*) curves.
- [1] I and II are true.  
 [2] I is true and II is false.  
 [3] II is true and I is false.  
 [4] I and II are false.
4. The *LAC* and *LMC* curves in Figure 7.8 (Pindyck & Rubinfeld, 2009:245) and the diagram below are consistent with a production function that exhibits ...
- [1] decreasing returns to scale.  
 [2] constant returns to scale.  
 [3] increasing returns to scale.  
 [4] increasing returns to scale for small levels of output, then constant returns to scale, and eventually decreasing returns to scale as output increases.
5. Assume that a firm's production process is subject to increasing returns to scale over a broad range of outputs. Long-run average costs over this output will tend to ...
- [1] increase.  
 [2] decline.  
 [3] remain constant.  
 [4] fall to a minimum and then rise.



**Questions with written answers**

- (1) Describe and illustrate with isoquants and isocost lines that why production in the long run is more cost efficient than production in the short run. (8)

**7.5 Production with Two Outputs – Economies of Scope****STUDY/READ/OMIT**

Study Pages 248 to 251 and

Read Example 7.5.

Omit “The Degrees of Economies of Scope” Page 250.

We paid attention to the concept **returns to scale** in the previous learning unit.<sup>28</sup> Together with returns to scale, there are two other related concepts that need attention, namely:

- **Economies of scale:** A firm experiences economies of scale when costs per unit decline as production increases.
- **Economies of scope:** A firm experiences economies of scope when the joint output of two different products is higher than when these products are produced in separate factories or firms.

**Activity 7.5****Multiple-choice questions**

1. When a product transformation curve is bowed outward, there are \_\_\_\_\_ in production.
  - [1] economies of scope
  - [2] economies of scale
  - [3] diseconomies of scope
  - [4] diseconomies of scale
2. Economies of scope refer to ...
  - [1] changes in technology.
  - [2] the very long run.
  - [3] multiproduct firms.
  - [4] single product firms that utilise multiple plants.
3. A firm produces leather handbags and leather shoes. If there are economies of scope, the product transformation curve between handbags and shoes will be ...

<sup>28</sup> See learning unit 6, section 6.4.

- [1] a straight line.
- [2] bowed outward (concave).
- [3] bowed inward (convex).
- [4] a rectangle.

### Questions with written answers

- (1) Explain the difference between returns to scale, economies of scale and economies of scope. (6)

## 7.6 *Dynamic Change in Costs – The Learning Curve*

**OMIT**  
Pages 251 to 256.

## 7.7 *Estimating and Predicting Costs*

**OMIT**  
Pages 256 to 260.

## **■** *Economics in Action Revisited*

We have discussed quite a number of concepts since the beginning of learning unit 6. The basic point of departure is that cost structures are derived from production functions. A list of concepts from learning units 6 and 7 is given below, which can serve as a summary of all the concepts.

### **Short-run (ST)**

One production factor cannot change: total production function and ST isoquant production function.

#### *ST production function*

- Total product
- Average product
- Marginal product

**Note:** The law of diminishing returns determines the cost structure.

#### *Instruments to determine ST costs:*

- Isoquant
- Isocosts
- Optimal input combination
- Expansion path

*Costs*

- *ST* total costs
  - + Total fixed costs
  - Average fixed costs
  - + Total variable costs
  - Average variable costs
- *ST* average costs
- *ST* marginal costs

**Long-run (*LT*)**

All production factors can change: isoquant production function.

*Instruments to determine LT costs:*

- Isoquant
- Isocosts
- Optimal input combination
- Expansion path

*Costs*

- *LT* total costs
- *LT* average costs
- *LT* marginal costs

**Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

**Answers to Some of the Questions**

### ■ Activity 7.1

**True/False:** True: 1.  
False: 2.

**Multiple-choice questions:** 1. [4]  
2. [2]  
3. [1]  
4. [4]  
5. [4]

## ■ **Activity 7.2**

Multiple-choice questions: 1. [4]  
2. [4]  
3. [1]

## ■ **Activity 7.3**

True/False: True: 1 and 2.  
False: None.

Multiple-choice questions: 1. [1]  
2. [3]  
3. [4]  
4. [4]  
5. [2]

## ■ **Activity 7.4**

True/False: No questions

Multiple-choice questions: 1. [3]  
2. [2]  
3. [2]  
4. [4]  
5. [2]

## ■ **Activity 7.5**

True/False: No questions

Multiple-choice questions: 1. [1]  
2. [3]  
3. [2]

## ■ **Activity 7.6**

No questions

## ■ **Activity 7.7**

No questions

# Profit Maximisation and Competitive Supply

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### **Economics in Action Revisited**

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## ***Learning Outcomes***

This learning unit is the first of various future learning units where the demand and supply is put together in a certain environment or market structure. Until now we had discussed demand and supply separately. In general we are going to ask the following questions:

- What is the equilibrium price, quantity demanded and supplied?
- What is the profit position of the firm?

These questions are not exclusive to this learning unit. We will answer them in many future learning units.

### ***Once you have studied learning unit 8 you should be able to:***

- *define perfectly competitive markets*

- *define the profit-maximisation position of the firm*
- *define and relate marginal revenue, marginal cost and profit maximisation to one another*
- *derive the short-run market supply curve*
- *define, describe and illustrate how output decisions by the firm is made in the short and long run*
- *derive the long-run market supply curve*

## **Economics in Action**

### **View of the South African Competition Commission**

The new South African government signaled its intention to review the South African competition law regime in the White Paper on Reconstruction and Development in 1994 (Notice 1954 Gazette 16085 of 23 November 1994). The need for a new competition policy in South Africa must be seen in the context of a historical legacy of excessive economic concentration and ownership, collusive practices by enterprises and the abuse of economic power by firms in dominant positions. It was also recognized, however, that the South African economy and society was in a state of transition, in terms of a broader restructuring of the economy, the effects of globalization and trade liberalization and the need to redress past inequality and non-participation in the national economy. A fundamental principle of competition policy and law in South Africa thus is the need to balance economic efficiency with socio-economic equity and development.

**(Source:** South African Competition Commission. Available at:

<http://www.compcom.co.za/about-us/> [accessed on 15/05/2010].)

We will see in this learning unit that economic competition or market competition is an important concept which is determined by many factors. When a firm makes “abnormal” (economic) profits, the market will rectify the problem. Economic efficiency will therefore be reinstated. However, according to the South African Competition Commission, competition or economic efficiency is not a purpose in itself, but must be balanced against other goals.

### **8.1 Perfectly Competitive Markets**

#### **STUDY**

Pages 271 to 273.

This section describes the assumptions on which the model of **perfect competition** is based and the general characteristics of such a model. Remember that these assumptions are applicable to the consumer and the supplier (the firm).

An important question is: How real and relevant are these assumptions? Economists differ on the answer to this question. Pindyck and Rubinfeld (2009:273), for instance, argue that highly competitive markets exist in certain industrial sectors where some of these assumptions are absent. Some economists even suggest that the assumptions are not relevant at all; according to them, what is relevant is the accuracy of the predictions of this model. These different viewpoints pose no problem, however, so the model can be used to formulate policy, like competition policy.

### Activity 8.1

Decide whether the following statements are **True** or **False**.

		T	F
1	Firms often use patent rights as a way to achieve perfect competition.		
2	A few sellers may behave if they operate in a perfectly competitive market if the market demand is very elastic.		

### Multiple-choice questions

1. A price taker is ...
  - [1] a perfectly competitive firm.
  - [2] a firm that cannot influence the market price.
  - [3] a firm that accepts different prices from different customers.
  - [4] both [1] and [2].
  
2. Which of following is an example of a homogeneous product?
  - [1] Petrol.
  - [2] Copper.
  - [3] Personal computers.
  - [4] both [1] and [2].
  
3. Which of following is a key assumption of a perfectly competitive market?
  - [1] Firms can influence market price.
  - [2] Commodities have few sellers.
  - [3] It is difficult for new sellers to enter the market.
  - [4] Each seller has a very small share of the market.
  
4. Several years ago, Alcoa was effectively the sole seller of aluminum because the firm owned nearly all of the aluminum ore reserves in the world. This market was not perfectly competitive, because this situation violated the ...
  - [1] price-taking assumption.
  - [2] homogeneous product assumption.

[3] free entry assumption.

[4] [1] and [3] are correct.

5. Refer to the following statements to answer this question:

I. Markets that have only a few sellers cannot be highly competitive.

II. Markets with many sellers are always perfectly competitive.

[1] I and II are true.

[2] I is true and II is false.

[3] II is true and I is false.

[4] I and II are false.

## 8.2 Profit Maximisation

### STUDY

Pages 274 to 276 and

Example 8.1.

One of the basic assumptions in Neoclassical Economics is that “more is better”.<sup>29</sup> This is applicable to the consumer and the owners or managers of the firm. The consumers maximise utility or satisfaction and the decision-makers in the firm maximise profit.<sup>30</sup>

In this section, the question is whether the assumption of profit maximisation is correct. A distinction is made between small firms and big corporations. Sometimes it is argued that, in the case of big corporations, managers are more concerned with revenue growth, the payment of dividends and, according to some economists, their own public image.

In the case of small firms, one can generally accept that the maximisation of profit is the main goal of the owner or manager. Even in the case of big corporations, profit maximisation should at least be one of a possible number of goals. In a competitive environment, firms must generate profit to survive.

### Activity 8.2

#### Multiple-choice questions

1. If managers do not choose to maximise profit, but to pursue some other goal such as revenue maximisation or growth they are ...

[1] more likely to become takeover targets of profit-maximising firms.

[2] less likely to be replaced by stockholders.

<sup>29</sup>In general one can say that Neoclassical Economics focus on the positive role that the market mechanism can play.

<sup>30</sup>See learning unit 1.



- [3] less likely to be replaced by the board of directors.
  - [4] more likely to have higher profit than if they had pursued that policy explicitly.
2. Owners and managers ...
- [1] must be the same people.
  - [2] may be different people with different goals, and in the long run firms that do best are those in which the managers are allowed to pursue their own independent goals.
  - [3] may be different people with different goals, but in the long run firms that do best are those in which the managers pursue the goals of the owners.
  - [4] may be different people with different but exactly complementary goals.

### 8.3 Marginal Revenue, Marginal Cost, and Profit Maximization

#### STUDY

Pages 276 to 279.

Here the important equilibrium condition for profit maximisation is derived for the firm. In Figure 8.1 (Pindyck & Rubinfeld, 2009:277) the condition is illustrated where the distance between the revenue curve ( $R[q]$ ) and the cost curve ( $C[q]$ ) is the biggest (the distance between points  $A$  and  $B$ ). The slope of a line tangent to these two curves gives us marginal quantities. Therefore, for the revenue curve ( $R[q]$ ) it is the marginal revenue ( $MR[q]$ ) and for the cost curve ( $C[q]$ ) it is ( $MC[q]$ ). Also note that the slope of the tangent lines at points  $A$  and  $B$ , respectively, is the same. It therefore follows that

$$MR(q) = MC(q) \text{ or } MR = MC^{31}$$

This equation illustrates the generally accepted convention in economics that nobody will produce something if it costs more than the revenue generated from the selling of that product. Production will take place as long as the revenue generated by the selling of the product is higher than the cost of producing that product. Production will continue until the production unit is reached where revenue is equal to cost.

The next section deals with the **demand, marginal and average revenue for a competitive firm**. The assumption for a competitive firm is that the firm cannot influence the price of the product because there too many of them. The demand curve facing the firm is therefore a horizontal line. Here it is important to note that we are referring to the demand curve which the firm is facing. However, in Figure 8.2 (Pindyck & Rubinfeld, 2009:278) it is shown

<sup>31</sup> Note that the ( $q$ ) in  $MR(q) = MC(q)$  is only used to show that revenue and cost depend on output. Later the ( $q$ ) will be omitted and it will be assumed that revenue and cost depend on output.

that the demand curve for the industry shifts from left to right (thus a normal demand curve).

For the competitive firm the price ( $P$ ) is equal to marginal revenue ( $MR$ ) and also to average revenue ( $AR$ ). Therefore:

$$P = MR = AR$$

The equilibrium profit-maximisation point for a competitive firm (or a firm in a perfect competitive market) is, as previously indicated,  $MR = MC$ . As price is equal to marginal revenue, the equilibrium point is:

$$MC = MR = P$$

### Activity 8.3

Decide whether the following statements are **True** or **False**.

		T	F
1	If current output is less than the profit-maximising output, then marginal revenue is greater than marginal cost.		
2	Marginal profit is equal to marginal revenue minus marginal cost.		
3	At the profit-maximising level of output, marginal profit is also maximised.		

### Multiple-choice questions

- Revenue is equal to price times ...
  - quantity.
  - quantity minus total cost.
  - quantity minus average cost.
  - quantity minus marginal cost.
- Marginal revenue, graphically, is the ...
  - slope of a line from the origin to a point on the total revenue curve.
  - slope of a line from the origin to the end of the total revenue curve.
  - slope of the total revenue curve at a given point.
  - vertical intercept of a line tangent to the total revenue curve at a given point.
- A firm maximises profit by operating at the level of output where ...
  - average revenue equals average cost.
  - average revenue equals average variable cost.
  - total costs are minimised.
  - marginal revenue equals marginal cost.

4. When the TR and TC curves have the same slope (see Figure 8.1 in Pindyck and Rubinfeld (2009:277)) ...
- [1] they are the furthest from each other.
  - [2] they are closest to each other.
  - [3] they intersect each other.
  - [4] profit is negative.
5. If current output is less than the profit-maximising output, then the next unit produced will ...
- [1] decrease profit.
  - [2] increase cost more than it increases revenue.
  - [3] increase revenue more than it increases cost.
  - [4] increase revenue without increasing cost.

**Questions with written answers**

- (1) The following table contains information for a price taking competitive firm. Complete the table and determine the profit maximising level of output (round your answer to the nearest whole number). (8)

Output	Total Cost	Marginal Cost	Fixed Cost	Average Cost	Total Revenue	Average Revenue	Marginal Revenue
0			25				
1	35						
2				30			
3		45					
4	185						
5				57			
6		120			240		

- (2) Explain why a firm would stop producing after the point is reached where marginal profit equals marginal revenue. (6)

**8.4 Choosing Output in the Short Run**

**STUDY**  
 Pages 279 to 284 and  
 Example 8.2 and 8.3.

Now we are going to bring the consumer (demand) and producer (supply) together, first in the short run and then in the long run.

In Figure 8.3 (Pindyck & Rubinfeld, 2009:280) the demand curve ( $AR = MR = P$ ) is illustrated together with the cost curves ( $MC$ ,  $ATC$  and  $AVC$ ).<sup>32</sup> The equilibrium position is point  $A$ , where  $MR = MC$ . Now an additional **condition for profit maximisation** can be formulated, namely that **MR = MC on the rising part of the MC curve**.

Together with the profit maximisation point of the firm, the extent of the profit and whether losses are possible are also important.

Let us consider the profit position of the firm. **The profit is average revenue (AR), minus average total cost (ATC)**,<sup>33</sup> so the total profit is square  $ABCD$ . For the unit  $q^*$  the profit is the amount equal to the distance  $A$  to  $B$ .

Figure 8.4 (Pindyck & Rubinfeld, 2009:281) illustrates the position where the firm is making a loss in the short run.<sup>34</sup> This is possible because of the future possibility that the firm can make profit. The possible profit or loss equilibrium positions of the firm are summarised in the table below.

**TABLE SG8.1:** Profit and loss positions of the firm

Equilibrium point	Revenue (price) versus costs	Status of operation
Economic profit (only in the short run)	$P = AR > ATC$	Continue
Normal (zero economic) profit (in the long run)	$P = AR = ATC$	Continue
Loss	$P = AR < ATC$ , but $P = AR > AVC$	Continue, but part of $FC$ not covered
Loss	$P = AR = AVC$	Continue, but $FC$ is not covered
Loss	$P = AR < AVC$	Close down, $FC$ and $AVC$ are not covered

## Activity 8.4

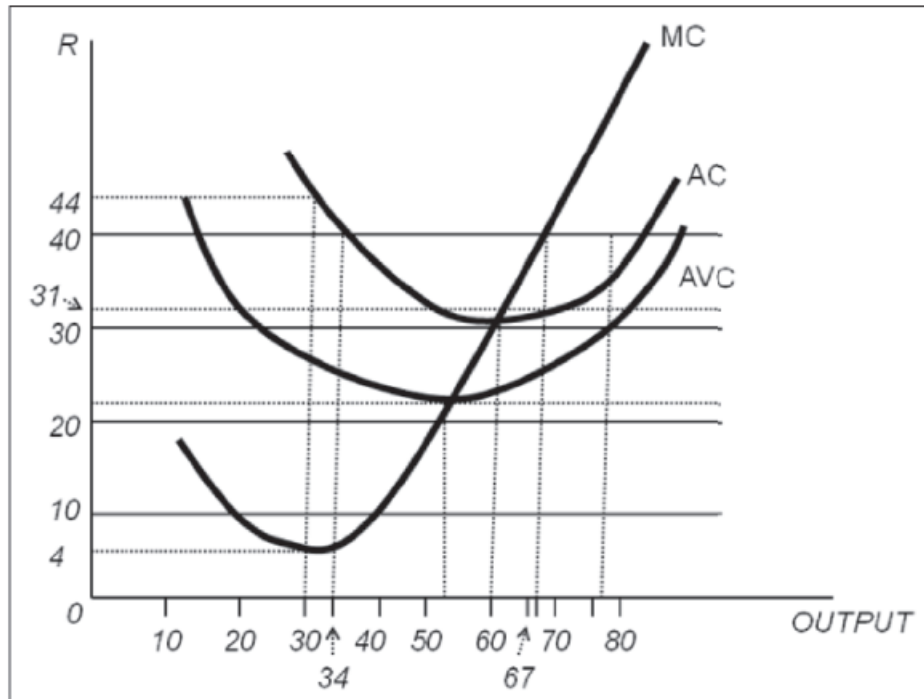
### Multiple-choice questions

Consider the following Figure where a perfectly competitive firm faces a price of R40.00

32 Note that the curves  $ATC$  and  $AVC$  are moving towards each other as output increases. Why? Average total cost ( $ATC$ ) consists of fixed cost ( $AFC$ ) and average variable cost ( $AVC$ ) in the short run. As output ( $q$ ) increases, the average fixed cost must decrease, because average fixed cost is (constant) fixed cost divided by output, thus  $AFC/q$ .

33 Equilibrium is where  $MR = MC$ , on the rising part of the  $MC$  curve – this also gives the equilibrium price and quantity. When we look at the profit situation of the firm, we look at the average curves, thus the difference between  $AR$  and  $ATC$ ,  $AVC$  and  $ATC$ .

34 Note that the line running from  $D$  through  $A$  to  $P = MR$  can also be defined as  $P = MR = AR$ .



**FIGURE SG8.1:** Figure for questions 1 to 5

1. Refer to Figure SG8.1. The profit-maximising output is ...
  - [1] 30.
  - [2] 54.
  - [3] 60.
  - [4] 67.
  
2. Refer to Figure SG8.1. At what output does the firm earn zero profit?
  - [1] 0.
  - [2] 34 and 79.
  - [3] 54.
  - [4] 60.
  
3. Refer to Figure SG8.1. At 67 units of output, profit is ...
  - [1] maximised and zero.
  - [2] maximised and negative.
  - [3] maximised and positive.
  - [4] not maximised, and zero.
  
4. Refer to Figure SG8.1. At the profit-maximising level of output, ATC is ...
  - [1] R26.00.
  - [2] R30.00.
  - [3] R31.00.
  - [4] R40.00.

5. Refer to Figure SG8.1. At the profit-maximising level of output, AVC is ...
- [1] R22.00.
  - [2] R26.00.
  - [3] R30.00.
  - [4] R32.00.

### Questions with written answers

Refer to table SG8.1 to describe and illustrate all the profit and loss positions of the firm (table SG8.1). (10)

## 8.5 The Competitive Firm's Short-Run Supply Curve

**STUDY**  
Pages 284 to 287 and  
Example 8.4.

From the discussion in the previous section it must be clear that the firm will continue operation until  $P = AR = AVC$ . When  $P = AR < AVC$ , the firm will close down. The **short-run supply curve** of the firm is therefore the “crosshatched” portion of the  $MC$  curve in Figure 8.6 (Pindyck & Rubinfeld, 2009:285).

If the cost of production increases, we know that the supply curve will move to the left, with the result that less will be produced. This is illustrated in Figure 8.7 (Pindyck & Rubinfeld, 2009:285), where the supply curve or marginal cost curve  $MC_1$  moves to  $MC_2$ .<sup>35</sup> Profit also decreased because output decreased.

### Activity 8.5

#### Multiple-choice questions

1. The short run supply curve for a competitive firm is ...
  - [1] its entire MC curve.
  - [2] the upward-sloping portion of its MC curve.
  - [3] its MC curve above the minimum point of the AVC curve.
  - [4] its MC curve above the minimum point of the ATC curve.
  
2. Higher input prices result in ...
  - [1] upward shifts of MC and reductions in output.
  - [2] upward shifts of MC and increases in output.
  - [3] downward shifts of MC and reductions in output.
  - [4] downward shifts of MC and increases in output.

<sup>35</sup> This Figure is basically the same as Figure 2.1 (Pindyck & Rubinfeld, 2009:22).

**Questions with written answers**

Note that a question on the short-run supply curve of the firm will usually be combined with questions on section 8.4 (the previous section). (10)

**8.6 The Short-Run Market Supply Curve****STUDY**

Pages 287 to 292 and  
Example 8.5.

The short-run market supply curve is the total output that the industry will produce for each price. This is shown in Figure 8.9 (Pindyck & Rubinfeld, 2009:288).<sup>36</sup> The elasticity of supply normally follows the pattern that it is low while firms are adapting to sudden increases in MC. With a perfectly inelastic supply curve, output can only increase if a new plant is built. Marginal cost is constant when the supply curve is perfectly elastic.

The **producer surplus** is the sum of the difference between the price of the product and the marginal cost of production, over all units produced. This is illustrated in Figure 8.11 (Pindyck & Rubinfeld, 2009:291). The producer surplus is also equal to the total variable cost.

A distinction is made between a producer surplus and profit. Producer surplus is revenue minus variable cost, and profit is revenue minus variable cost and fixed cost. That is why producer surplus is also called variable profit.

**Activity 8.6****Multiple-choice questions**

1. Producer surplus in a perfectly competitive industry is the difference between ...
  - [1] profit at the profit-maximising output and profit at the profit-minimising output.
  - [2] revenue and total cost.
  - [3] revenue and variable cost.
  - [4] revenue and fixed cost.
  
2. The shutdown decision can be restated in terms of producer surplus by saying that a firm should produce in the short run as long as ...
  - [1] revenue exceeds producer surplus.

<sup>36</sup> There is a mistake in the caption for this Figure. The sentence "Because the third firm has a lower **average variable cost curve** than the first two firms, ..." should read "Because the third firm has a **lower marginal cost** than the first two firms, ...".

- [2] producer surplus is positive.
  - [3] producer surplus exceeds fixed cost.
  - [4] producer surplus exceeds variable cost.
3. A firm's producer surplus equals its economic profit when ...
- [1] average variable costs are minimised.
  - [2] average fixed costs are minimised.
  - [3] marginal costs equal marginal revenue.
  - [4] fixed costs are zero.

## 8.7 Choosing Output in the Long Run

### STUDY

Pages 292 to 298.

We now move to the long run, where all the inputs are variable. In Figure 8.13 (Pindyck & Rubinfeld, 2009:293) the cost structure of both the short and long run is illustrated.<sup>37</sup> The equilibrium condition in the long run is the same as in the short run, namely  $P = MR = AR = MC$ . In the Figure the short-run equilibrium point is  $A$  and the long-run is  $E$ .

When the equilibrium position of the short run is compared with that of the long run, two aspects stand out. Both have to do with the level of production efficiency for the firm between these two time periods.

The first is that the **profit in the short run is smaller**, namely  $ABCD$ , compared to the  $EFCD$  profit in the long run. The second aspect is that, although the price is the same in both time periods, the **equilibrium quantity is higher in the long run than the short run** ( $q_1$  against  $q_3$ ). Both aspects show that the firm is more efficient in the long run than in the short run.

However, the profit situation of the firm will not prevail in the long run. It is extremely important at this point that you take notice of the profit positions of the firm.<sup>38</sup> As background, think about the following situation as illustrated in Figure 8.14 (Pindyck & Rubinfeld, 2009:295):

- A number of firms are in a specific industry, each making a high profit. This is illustrated in panel (a) of Figure 8.14, at a price of \$40. That horizontal line at \$40, namely line  $P_1$ , is also the  $MR$  and  $AR$  for the firm. The difference between the curves  $AR$  and  $LAC$  is the high profit that the individual firm is making. This high profit is called a **positive economic profit** or just **economic profit**.
- For the industry the demand ( $D$ ) and supply ( $S_1$ ) are illustrated in panel (b) of Figure 8.14.

<sup>37</sup> The short run illustrated here is the same as the equilibrium position of the firm in the short run in Figure 8.3 (Pindyck & Rubinfeld, 2009:280).

<sup>38</sup> See table SG8.1 for a summary of profit positions of the firm.

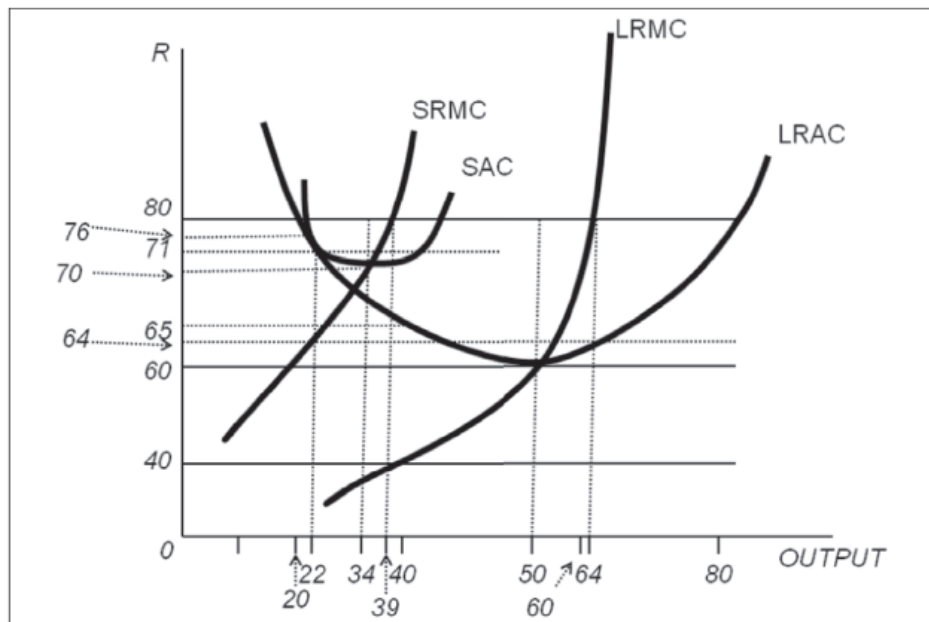


- As we are working in an environment which is defined as perfect competition, free exit and entrance to the market/industry exists.
- Because of this free exit and entrance and the high profits, new firms will enter this market.
- These new firms increase the supply of the industry; thus the supply curve for the industry moves to the right (from supply curve  $S_1$  to  $S_2$ ), as illustrated in panel (b) of Figure 8.14.
- When this happens, the price of the product decreases (from  $P_1$  to  $P_2$ ) for the industry or \$40 to \$30 for the firm and the profit of the industry decreases, as well as the profit of the individual firms. The economic profit decreases as the curve  $P_1$  (which is also the  $MR$  and  $AR$  in panel [a]) moves to  $P_2$ . (Alternatively the price decreased from \$40 to \$30 in Figure 8.12 (Pindyck & Rubinfeld, 2009:293)). This profit is now called a **normal or zero economic profit**. This firm covers all the opportunity costs and the zero economic profit can be considered to be adequate to such an extent that the firm has no incentive to leave the industry.

**Economic rent** is the amount that firms are willing to pay for an input less the minimum amount necessary to obtain it. Note that economic rent can be high while the firm earns zero economic profit. This is illustrated in Figure 8.15 (Pindyck & Rubinfeld, 2009:298). We return to this concept in learning unit 14, section 14.2.

### Activity 8.7

#### Multiple-choice questions



**FIGURE SG8.2:** Figure for questions 1 to 5

1. Refer to Figure SG8.2. At  $P = \$80$ , the profit-maximising output in the short run is ...

[1] 22.

- [2] 34.  
[3] 39.  
[4] 50.
2. Refer to Figure SG8.2. At  $P = R80.00$ , how much is profit in the short run?
- [1] R88.00.  
[2] R306.00.  
[3] R351.00.  
[4] R1 000.00.
3. Refer to Figure SG8.2. If the firm expects R80.00 to be the long-run price, how many units of output will it plan to produce in the long run?
- [1] 22.  
[2] 34.  
[3] 64.  
[4] 65.
4. Refer to Figure SG8.2. How much profit will the firm earn if the price stays at R80?
- [1] R306.00.  
[2] R312.00.  
[3] R1024.00.  
[4] R1040.00.
5. Refer to Figure SG8.2. As the firm makes its long-run adjustment, which of the following statements must be **TRUE**?
- [1] It takes advantage of increasing returns to scale.  
[2] It suffers from decreasing returns to scale.  
[3] It takes advantage of increasing marginal product.  
[4] It takes advantage of economies of scale.
6. Refer to Figure SG8.2. As the competitive industry, not just the firm in question, moves toward long-run equilibrium, the firm will be forced to operate at what level of output?
- [1] 22.  
[2] 34.  
[3] 38.  
[4] 50.
7. Refer to Figure SG8.2. As the competitive industry, not just the firm in question, moves toward long-run equilibrium, what will the price be?
- [1] R60.00.  
[2] R64.00.

[3] R70.00.

[4] R71.00.

## 8.8 The Industry's Long-Run Supply Curve

### STUDY

Pages 299 to 305 and  
Example 8.6 and 8.7.

We cannot analyse the long-run supply curve in the same way as the short-run. The shape of the long-run supply curve depends on the extent to which input prices will change when output of the industry increases or decreases. Input prices can increase, decrease or stay the same. The result will be an increase in the cost of production, a decrease in cost or cost that stays constant.

This behaviour of input prices gives us **constant-cost industries, increasing-cost industries and decreasing-cost industries**. These are explained by Figures 8.16 and 8.17 in Pindyck and Rubinfeld (2009:300–301), and what you should keep in mind is that input prices stay constant, increase or decrease after an increase in demand in the industry (in both the mentioned Figures there is a movement of the demand curve from  $D_1$  to  $D_2$ .) Then higher profits are made by the firms. (The price moves from  $P_1$  to  $P_2$ .) New firms join the industry. (Therefore the supply curves move from  $S_1$  to  $S_2$ .) The shape of the industry supply curve will then depend on the behaviour of cost; does it stay constant, increase or decrease?

The last topic in this learning unit is the **effects of a tax on output**. These effects are illustrated in Figures 8.18 and 8.19 (Pindyck & Rubinfeld, 2009:303–304) respectively. The principle applicable here is that tax is a cost of production. We know that an increase in the cost of production will decrease supply, illustrated by a movement to the left of the MC curve (Figure 8.18) and the supply curve (Figure 8.19). Note that it is a per unit tax, a tax that is applicable to each unit of production.

### Activity 8.8

#### Multiple-choice questions

**Consider the following scenario:** Yachts are produced by a perfectly competitive industry in Dystopia. Industry output (Q) is currently 30,000 yachts per year. The government, in an attempt to raise revenue, places a R20,000.00 tax on each yacht. Demand is highly, but not perfectly, elastic.

1. Refer to the above scenario. The result of the tax in the long run will be that ...

[1] Q falls from 30,000; P rises by less than R20,000.00.

[2] Q falls from 30,000; P rises by R20,000.00.

- [3] Q falls from 30,000; P does not change.
  - [4] Q stays at 30,000; P rises by R20,000.00.
2. Refer to the above scenario. The more elastic the demand for yachts, the ...
- [1] more Q will fall and the more P will rise.
  - [2] less Q will fall and the more P will rise.
  - [3] more Q will fall and the less P will rise.
  - [4] less Q will fall and the less P will rise.

### **Economics in Action Revisited**

We have seen that competition can play different roles, in the long or the short run, where the firm makes economic profits, normal profits and losses. The equilibrium price, quantity and profit are at the core of all these possibilities, and should be balanced with societal efficiency and development.

### **Further Reading**

The website of the South African Competition Commission has interesting information on the role of competition in the economy.

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### **Activity 8.1**

**True/False:** True: 2.  
False: 1.

**Multiple-choice questions:** 1. [4]  
2. [4]  
3. [4]  
4. [4]  
5. [4]

#### **Activity 8.2**

**True/False:** No questions.

**Multiple-choice questions:** 1. [1]  
2. [3]

**Activity 8.3**

**True/False:** True: 1 and 2.  
False: 3.

**Multiple-choice questions:** 1. [1]  
2. [3]  
3. [4]  
4. [1]  
5. [3]

**Activity 8.4**

**True/False:** No questions.

**Multiple-choice questions:** 1. [4]  
2. [2]  
3. [3]  
4. [3]  
5. [2]

**Activity 8.5**

**True/False:** No questions.

**Multiple-choice questions:** 1. [3]  
2. [1]

**Activity 8.6**

**True/False:** No questions.

**Multiple-choice questions:** 1. [3]  
2. [2]  
3. [4]

**Activity 8.7**

**True/False:** No questions.

**Multiple-choice questions:** 1. [3]  
2. [3]  
3. [3]  
4. [3]

5. [4]
6. [4]
7. [1]

### ■ **Activity 8.8**

**True/False:**

No questions.

**Multiple-choice questions:**

1. [1]
2. [3]

# The Analysis of Competitive Markets

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Activity 9.5

### Answers to some of the questions

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## Learning Outcomes

This learning unit builds on learning unit 2 and describes the behaviour of competitive markets. We therefore use supply and demand analysis and apply it to a number of economic problems.

### **Once you have studied learning unit 9 you should be able to:**

- use consumer and producer surplus to evaluate government policies
- determine the efficiency of a competitive market
- describe the effects of the implementation of minimum prices
- describe the effects of price support and production quotas
- describe the effects of import quotas and tariffs
- describe the effects of a tax or subsidy

## Economics in Action

“It can generally be accepted that all policy measures from government involve a trade-off between alternative policy measures. Which policy measure will be used, depends on the relative strength of vested interest groups like consumers and producers.”

*(Anonymous)*

The paragraph quoted above states how policy measures are decided upon. Analysing the positive and negative consequences (externalities) of each policy is important.

### 9.1 Evaluating the Gains and Losses from Government Policies – Consumer and Producer Surplus

**STUDY**  
 Pages 309 to 315  
 Example 9.1.

We have already discussed the concepts of consumer surplus and producer surplus.<sup>39</sup> We are now going to use these two concepts to explain the “gains and losses” when government intervenes in markets and the efficiency of markets.

The consumer surplus and producer surplus are illustrated in Figure 9.1 (Pindyck & Rubinfeld, 2009:310).<sup>40</sup> You must be able to identify the winners (gainers) and losers. Remember that the government implemented a ceiling price, which was below the equilibrium price.<sup>41</sup> Table SG9.1 summarises Figure 9.2 (Pindyck & Rubinfeld, 2009:312).

**TABLE SG9.1:** Change in consumer and producer surplus from price control

Consumer/producer	Win/lost	Why?	What?
Consumer	Winner	Better, because new ceiling price was lower than market equilibrium price ( $P_0$ to $P_{max}$ )	Receive rectangle <i>An</i> extra (remember, they have already received the part of the old consumer surplus, the white part below the demand curve)
	Loser	Rationed out as ceiling price decreased quantity supplied ( $Q_0$ to $Q_1$ )	Triangle <i>B</i> .
	Winners and losers		Rectangle <i>A</i> minus triangle <i>B</i> . ( $A - B$ ) The net change was positive

<sup>39</sup> Learning unit 4, section 4.4, and learning unit 8, section 8.6.

<sup>40</sup> This Figure is a combination of Figure 4.14 (Pindyck & Rubinfeld, 2009:133), the consumer surplus, and Figure 8.12 (Pindyck & Rubinfeld, 2009:292), the producer surplus.

<sup>41</sup> A ceiling price was discussed in learning unit 2, section 2.7.



Producer	Loser 1	Stayed in market but received lower price	Lost rectangle A
	Loser 1 + Loser 2.	Production also decreased and there was additional loss of producer surplus for those in market (loser 1) and those who left (loser 2)	Lost triangle C
Consumer + producer		Deadweight loss, both consumer and producer lost	Triangle B + C $(A - B) + (-A - C) = -B - C$

In the above table, owing to government intervention, both the consumer and the producer lose. Remember that government intervention in markets can usually be ascribed to a political decision. Politicians decide that the equilibrium price in that particular market is too high and it must be lower. Politicians usually have vested interests in certain constituencies and must adhere to the demands of their constituents.

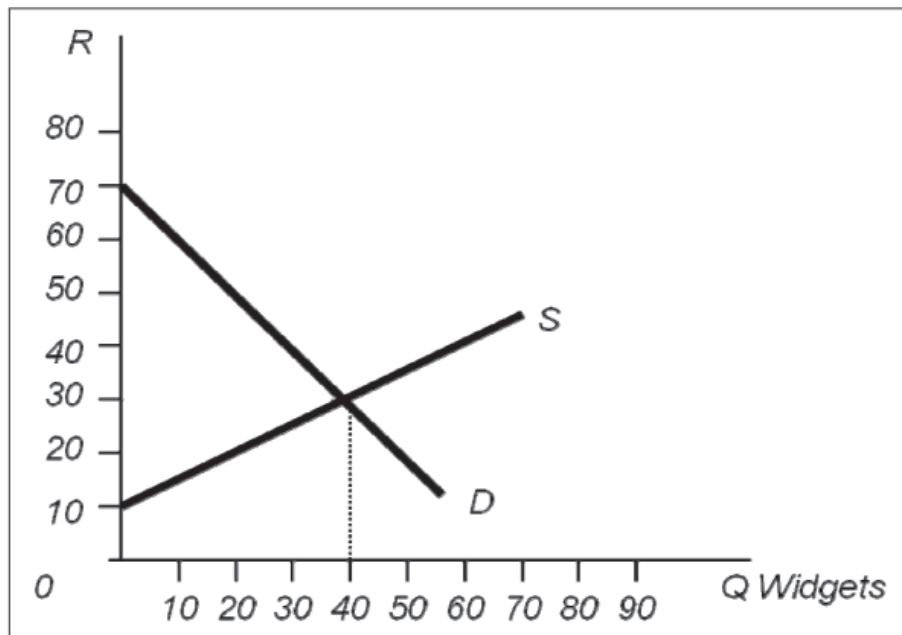
The economic consequences of the implementation of a ceiling price depend on the price elasticity of demand (or the price elasticity of supply). Figure 9.3 (Pindyck & Rubinfeld, 2009:313) illustrates the consequences of a very inelastic demand curve. A net loss of consumer surplus is the result.

### Activity 9.1

Decide whether the following statements are **True** or **False**.

		T	F
1	Consumer surplus measures the benefits that consumers receive from a good or service beyond what they pay.		
2	Producer surplus is measured as the area under the demand curve above market price.		

### Multiple-choice questions



**FIGURE SG9.1:** This Figure has a bearing on the following questions

1. Refer to Figure SG9.1. If the market is in equilibrium, the consumer surplus earned by the buyer of the 1st unit is \_\_\_\_\_.  
[1] R5.00.  
[2] R15.00.  
[3] R22.50.  
[4] R40.00.
2. Refer to Figure SG9.1. If the market is in equilibrium, the producer surplus earned by the seller of the 1st unit is \_\_\_\_\_.  
[1] R5.00.  
[2] R10.00.  
[3] R15.00.  
[4] R20.00.
3. Refer to Figure SG9.1. If the market is in equilibrium, total consumer surplus is ...  
[1] R30.  
[2] R70.  
[3] R400.  
[4] R800.
4. Refer to Figure SG9.1. If the market is in equilibrium, total producer surplus is ...  
[1] R30.

- [2] R70.  
 [3] R400.  
 [4] R1 000.
5. Refer to Figure SG9.1. If the market is in equilibrium, total consumer and producer surplus is ...
- [1] R0.  
 [2] R100.  
 [3] R800.  
 [4] R1 200.

### Questions with written answers

- (1) Explain the influence which government intervention in the form of a ceiling price will have on consumer and production surpluses. (9)

## 9.2 The Efficiency of a Competitive Market

### STUDY

Pages 315 to 319 and  
 Example 9.2.

**Economic efficiency means the maximisation of aggregate consumer and producer surplus.** If this does not happen (economic efficiency) there is usually a **market failure**. In such failures prices do not reflect for consumers and producers the real scarcity value of production factors.<sup>42</sup> An unregulated market is, in such a case, inefficient. Two reasons for market failures are the existence of **externalities** (positive and negative) and the **lack of information**.

In Figure 9.5 (Pindyck & Rubinfeld, 2009:316) an example of a market failure is given. In the previous section we used a ceiling price (maximum price), but in the mentioned Figure 9.5 a floor price (minimum price) is used. Going through same steps as in table 9.1 in the previous section it can be shown that  $B$  and  $C$  are deadweight loss:  $(-A - B) + (A - C) = -B - C$ .

### Activity 9.2

#### Multiple-choice questions

1. Governments may successfully intervene in competitive markets in order to achieve economic efficiency ...
- [1] in cases of positive externalities only.  
 [2] in cases of negative externalities only.

<sup>42</sup> A floor price was discussed in learning unit 2, section 2.7.

- [3] in cases of both positive and negative externalities.
  - [4] at no time; competitive markets are always efficient without government intervention.
2. Government intervention can increase total welfare when ...
- [1] there are costs or benefits that are external to the market.
  - [2] consumers do not have perfect information about product quality.
  - [3] a high price makes the product unaffordable for most consumers.
  - [4] a and b.
3. Which of the following policies could lead to a deadweight loss?
- [1] Ceiling prices.
  - [2] Floor prices.
  - [3] Policies prohibiting human cloning.
  - [4] All of the above.

### 9.3 *Minimum Prices*

**STUDY**  
 Pages 319 to 321 and  
 Example 9.3.

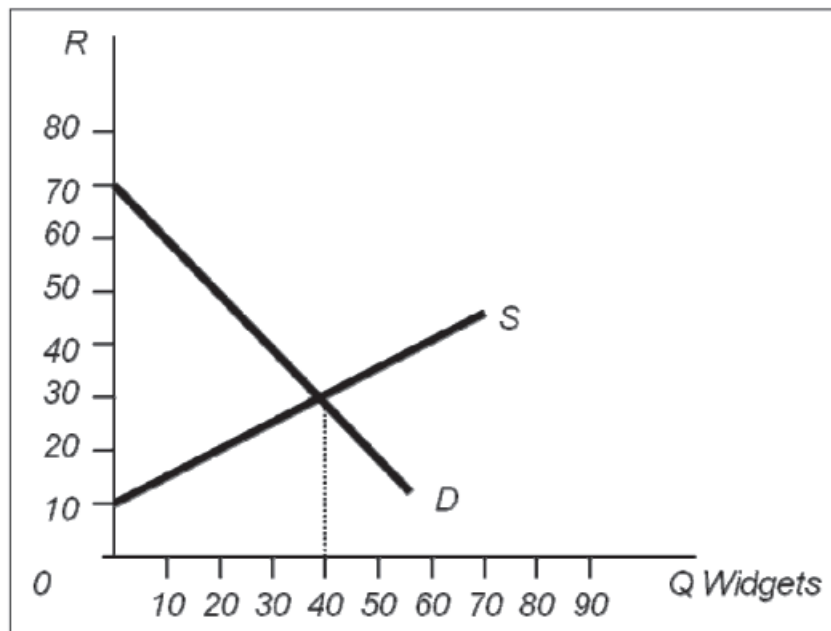
This section is basically the same as the previous one. In Figure 9.7 (Pindyck & Rubinfeld, 2009:320) use is also made of a floor price (minimum price) and the change in consumer and producer surplus is the same with the following exception: it is now assumed that the producers will produce at  $Q_2$  because the price ( $P_{min}$ ) is so high. Owing to a lack of demand because of the high price the producers cannot sell quantity  $Q_3 - Q_2$ . The yellow part under the supply curve is the cost of producing quantity  $Q_3 - Q_2$  and the end result will be:

$$(-A - B) + (A - C - D) = -B - C - D.$$

#### ■ **Activity 9.3**

Work through the questions for review and the exercises at the end of the relevant chapter in the textbook (Pindyck & Rubinfeld, 2009). Note that some answers to the exercises appear in the back of the textbook (Pindyck & Rubinfeld, 2009:711).

## Multiple-choice questions



**FIGURE SG9.2:** This Figure has a bearing on the questions below

1. Suppose the market in Figure SG9.2 is currently in equilibrium. If the government establishes a price floor of R50, how many widgets will be sold?
  - [1] 20.
  - [2] 30.
  - [3] 40.
  - [4] 50.
  
2. Suppose the market in Figure SG9.2 is currently in equilibrium. If the government establishes a price floor of R40, consumer surplus will ...
  - [1] fall by R50.
  - [2] fall by R350.
  - [3] remain the same.
  - [4] rise by R50.
  
3. Refer to Figure SG9.2. If the government establishes a price floor of R40 and government purchases the surplus over quantity demanded, producer surplus will ...
  - [1] fall by R275.
  - [2] fall by R500.
  - [3] rise by R275.
  - [4] rise by R500.

4. Refer to Figure SG9.2. If the government establishes a price floor of R40 and government purchases the surplus over quantity demanded, the resulting deadweight loss will be ...
- [1] R15.
  - [2] 10 widgets.
  - [3] R1,050.
  - [4] R1,200.
5. Refer to Figure SG9.2. If the government establishes a price floor of R40 and purchases the surplus, total consumer and producer surplus will be ...
- [1] R15.
  - [2] R1,200.
  - [3] R1,350
  - [4] 30 widgets.

### Questions with written answers

- (1) Discuss and illustrate the difference between a ceiling price and a floor price. Indicate clearly why the government would implement such policy measures. (8)

## 9.4 Price Supports and Production Quotas

### STUDY/OMIT

Study Pages 324 to 330.

Omit Example 9.4.

### 9.4.1 Price Supports

Price support is also a type of government intervention and is exactly the same as minimum prices, which we discussed in the previous section. “Price support” is just another descriptive word for “minimum prices”, although price support does imply that somebody is helping somebody else. In this case the government implements a minimum price as a price support for, usually, a specific product or industrial sector.<sup>43</sup> The reasoning is therefore the same as in the case of minimum prices. The only difference is that the **government is now prepared to buy the difference between the quantity supplied by the producers and the quantity demanded by the consumers**. In Figure 9.10 (Pindyck & Rubinfeld, 2009:324) it is the difference between quantity supplied ( $Q_2$ ) and quantity demanded ( $Q_1$ ). The cost involved to buy this oversupply is  $(Q_2 - Q_1)P_s$ .<sup>44</sup> With this government intervention it gives us:

43 An industrial sector where price support measures are usually found, is the agricultural sector.

44 Remember, profit or cost is the quantity ( $Q$ ) times ( $P$ ) of the product, or  $Q \times P$ .

a change in consumer surplus  $\Delta CS = -A - B$

and

a change in producer surplus  $\Delta PS = A + B + D$

The final result is:

$(\Delta CS) + (\Delta PS) - \text{cost to government}$

$(-A - B) + (A + B + D) - (Q_2 - Q_1)P_s$

$D - (Q_2 - Q_1)P_s$

### 9.4.2 Production Quotas

In the case of price supports, the government **artificially increases demand**; here the government is artificially decreasing demand by limiting production. The government pays producers for not producing. In Figure 9.11 (Pindyck & Rubinfeld, 2009:326) note that in the vertical supply curve ( $S'$ ), the payments for not producing are equal to  $+B + C + D$ . The total gains and losses are:

$\Delta CS = -A - B$

and

$\Delta PS = A - C + \text{payments for not producing}$

or  $\Delta PS = A - C + B + C + D = A + B + D$

Note that the latter result  $\Delta PS = A + B + D$  is the same as the  $\Delta PS$  for a policy of price supports (discussed in the previous section). The farmers (gaining) should therefore be indifferent to the two policies, and the consumers (losing) will also be indifferent, as  $\Delta CS$  is the same for both policies. Which policy should the government prefer? It depends on which is the largest:  $B + C + D$  (payments for not producing), or  $(Q_2 - Q_1)P_s$  (cost involved to buy this surplus supply). A third policy alternative is to give the money to the farmers (Pindyck and Rubinfeld 2009:327).

## Activity 9.4

### Questions with written answers

- (1) Explain and illustrate the difference between a policy of minimum prices and a price support policy by means of a graph. (8)

## 9.5 Import Tariffs and Quotas

### STUDY/OMIT

Study Pages 331 to 333 and

Omit Example 9.5.

Import tariffs and quotas are policy instruments used in international trade. Many countries, including South Africa, went through a period where growth of the domestic manufacturing sector was stimulated by limiting imports. The idea was to satisfy domestic demand for manufacturing goods by manufacturing these goods in the country itself. The policy measure is known as a **policy of import substitution**. The result of this policy was not very encouraging, as competition was curtailed by higher local production cost.<sup>45</sup> Although import substitution as a main policy aim was discarded, tariffs and quotas are still part of trade policies.

The starting point for understanding the welfare effects of tariffs and quotas is the realisation that a country will import a product when the world price is lower than the domestic price. This is illustrated in Figure 9.14 (Pindyck & Rubinfeld, 2009:331). With no imports, the change in consumer surplus is:

$$\Delta CS = -A - B - C$$

Note that the consumer is losing, as the product is available internationally at a lower price. The producer gains because the domestic price is high:

$$\Delta PS = A$$

The total change in surplus is  $(\Delta CS) + (\Delta PS)$ :

$$\begin{aligned} (\Delta CS) + (\Delta PS) &= (-A - B - C) + (A) \\ &= -B - C = \text{deadweight} \end{aligned}$$

Using a tariff or a quota, the deadweight loss will again be  $-B - C$ . Note that the choice between a tariff and a quota will depend on  $D$  (the amount of the tariff or producer surplus going to foreign producers).

## ■ Activity 9.5

### Multiple-choice questions

1. Import tariffs generally result in ...
  - [1] less consumer surplus.
  - [2] more producer surplus for domestic producers.
  - [3] a deadweight loss.
  - [4] all of the above.
  
2. Compared to a tariff, an import quota, which restricts imports to the same amount as the tariff, will leave the country as a whole ...
  - [1] worse off than a comparable tariff.
  - [2] not as badly off as a comparable tariff.
  - [3] about the same as a comparable tariff.
  - [4] Any of the above can be true.

<sup>45</sup> The textile industry in South Africa usually lobbies for the imposition of import tariffs against cheap Chinese imports.



3. Although rice is a staple of the Japanese diet, the Japanese government has long restricted the importation of rice into Japan. The result of this import quota is to ...
- [1] decrease the price of rice to the Japanese people.
  - [2] decrease the consumer surplus of Japanese rice consumers.
  - [3] decrease the producer surplus of Japanese rice producers.
  - [4] secure a welfare gain for the Japanese people.

**OMIT**

Pages 335 to 345.

### ***Answers to Some of the Questions***

#### **Activity 9.1**

**True/False:** True: 1  
False: 2

**Multiple-choice questions:** 1. [4]  
2. [4]  
3. [4]  
4. [3]  
5. [4]

#### **Activity 9.2**

**True/False:** No questions

**Multiple-choice questions:** 1. [3]  
2. [4]  
3. [4]

#### **Activity 9.3**

**True/False:** No questions

**Multiple-choice questions:** 1. [1]  
2. [2]  
3. [4]  
4. [3]  
5. [3]

### ■ **Activity 9.4**

**True/False:** No questions  
**Multiple-choice questions:** No questions

### ■ **Activity 9.5**

**True/False:** No questions  
**Multiple-choice questions:** 1. [4]  
2. [1]  
3. [2]

# Market Power: Monopoly and Monopsony

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### **Economics in Action Revisited**

#### **Further reading**

#### **Answers to some of the questions**

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## **Learning Outcomes**

In this learning unit, we are moving to the other extreme of market power. Until now we have worked with perfect competition, where no single buyer or seller can affect the price of a product. Here we are working with the market situation, where the price of the product can be affected by the market player, the monopolist or the monopsonist.

As this is the other extreme market position, it is important to note what happens to equilibrium prices and quantities. It is for this reason that we study these market structures; we want to compare the different equilibrium positions of the market structures.

### **Once you have studied learning unit 10 you should be able to:**

- *define monopoly market power;*
- *identify sources of monopoly power;*
- *determine the social cost of monopoly power; and*
- *define monopsony market power.*

## Economics in Action

“Over the past decade, then, China created some large companies. More than a dozen is in the *Fortune* 500 list, though almost all of those are domestic monopolies or near-monopolies such as telecom operators or big commodity producers.”

(Source: *The Economist*. 2005. 8 January: 58.)

Monopolies or near monopolies are market structures which are readily found in many countries. Although there are “good economic reasons” for their existence, the equilibrium prices and quantities of monopolies are generally higher and smaller than those found in other market structures. That is why their operating methods are always watched with skepticism.

### 10.1 Monopoly

#### STUDY/OMIT

Study Pages 349 to 361.

Omit “A Rule of Thumb for Pricing and Example 10.1.

The **monopolist is the sole provider of a product**. This does not mean the monopolist can sell products at any price it wishes. The managers of a firm that operates as a monopolist must first determine its cost, and the characteristics of market demand. The price the monopolist receives follows from this market demand.

#### 10.1.1 Average Revenue and Marginal Revenue

The average revenue (*AR*) of the monopolist is the market demand curve. The monopolist is the only supplier and is confronted with the whole market demand curve. The marginal revenue has a specific form. With a downward-sloping market demand curve the price or average revenue must be greater than the marginal revenue (*MR*), because all the units are sold at the same price. The relationship between *AR* and *MR* is shown in table 10.1 and illustrated in Figure 10.1 (Pindyck & Rubinfeld, 2009:351). Note that the *MR* curve has twice the slope of the demand (*AR*) curve.

#### 10.1.2 The Monopolist’s Output Decision in the Short Run

Now we combine demand (Figure 10.1 in Pindyck & Rubinfeld, 2009:351) and cost (Figure 10.2 in Pindyck & Rubinfeld, 2009:352) and the question is: At which price and quantity must the monopolist produce? In other words, what is the equilibrium price and quantity? When we discussed the condition for equilibrium in the case of the firm in perfect competition, it was defined as follows: marginal revenue (*MR*) equals marginal cost (*MC*). We also said

that this condition was always applicable, the market structure did not matter. It follows that this is also the **equilibrium condition** for the monopolist and is illustrated in Figure 10.2 (Pindyck & Rubinfeld, 2009:352), where  $MR = MC$  (at  $Q^*$ ). Note that producing less or more than equilibrium quantity  $Q^*$  will both lead to a loss in profit. (Therefore production at  $Q_1$ :  $MR > MC$  will increase production, and production at  $Q_2$ :  $MR < MC$ , will decrease production.)<sup>46</sup>

The relationship between the revenue, cost and profit is shown in Figure 10.3 (Pindyck & Rubinfeld, 2009:354). If we start at panel (a), we see that profit is maximised at a quantity of 10. Profit is maximised as the vertical distance between the revenue curve ( $R$ ), and the cost curve ( $C$ ) is the biggest. The slope of the two points on the  $R$  curve and the  $C$  curve at quantity 10 is equal and give respectively the  $MR$  and  $MC$ .<sup>47</sup> Where  $MR = MC$  is the equilibrium point where profit is maximised and this is the case in both panels (a) and (b) at quantity 10. The profit can be seen in panel (b) as the difference between  $AR$  and  $AC$  at quantity 10. This is in the **short run**.

When we go back to table SG8.1, we see that in the case of the perfect competitor economic profit is in the short run, but normal (zero economic profit) is made in the long run.<sup>48</sup> What is the position of the monopolist in the **long run**? The monopolist makes **economic profit** in the long run. The reason is that, per definition, a monopolist does not have competition in the long run. Figure 10.2 and 10.3 (Pindyck & Rubinfeld, 2009:352 & 354) are therefore applicable to both the short run and the long run.

### 10.1.3 Shifts in Demand

The monopolist does not have a unique supply curve. In other words, there is no one-to-one relationship between price and the quantity produced. This is illustrated in Figure 10.4 (Pindyck & Rubinfeld, 2009:358).

### 10.1.4 The Effect of a Tax

There is a difference between the effect of a tax on a firm in a perfect competitive market and a firm which operates as a monopoly. The effect on a monopolist is shown in Figure 10.5 (Pindyck & Rubinfeld, 2009:359). Note that the price can increase more than the quantity of the tax, which will be impossible in a competitive market.

### 10.1.5 The Multi-plant Firm

The question now is: What must the output level be for a firm with two manufacturing plants with different cost structures? The same condition for

<sup>46</sup> The algebraical proof is not needed.

<sup>47</sup> See learning unit 8, section 8.3, where this method is discussed.

<sup>48</sup> Remember that economic profits attract competitors, and as they enter the market competition increases, the equilibrium price decreases and quantity demanded increases.

equilibrium that is applicable to a one-plant firm, namely  $MR = MC$ , is also applicable to a multiplant firm. A multiplant firm must change output so that the marginal cost is the same in each manufacturing plant. In Figure 10.6 (Pindyck & Rubinfeld, 2009:360)  $MR = MC_1 + MC_2$  at quantities  $Q_1$ ,  $Q_2$  and  $Q_T$ .

### Activity 10.1

Decide whether the following statements are **True** or **False**.

		T	F
1	Monopoly price is determined from the demand curve.		
2	A monopolist can charge as high a price as it likes.		
3	When a per unit tax is imposed on the sale of a monopolist's product, the resulting price increase will not always be less than the tax.		

### Multiple-choice questions

- When the demand curve for the monopolist is downward-sloping, marginal revenue is ...
  - equal to price.
  - equal to average revenue.
  - less than price.
  - more than price.
- Compared to the equilibrium price and quantity sold in a competitive market, a monopolist will charge a \_\_\_\_\_ price and sell a \_\_\_\_\_ quantity.
  - higher; larger
  - lower; larger
  - higher; smaller
  - lower; smaller
- Assume that a profit-maximising monopolist is producing such a quantity that marginal revenue exceeds marginal cost. We can conclude that the ...
  - firm is maximising profit.
  - firm's output is smaller than the profit maximising quantity.
  - firm's output is larger than the profit maximising quantity.
  - firm's output does not maximise profit, but we cannot conclude whether the output is too large or too small.
- To find the profit-maximising level of output, a firm finds the output level where ...
  - price equals marginal cost.

- [2] marginal revenue equal average total cost.  
 [3] price equals marginal revenue.  
 [4] none of the above.
5. As the manager of a firm you calculate that the marginal revenue is R152.00 and marginal cost is R200.00. You should ...
- [1] expand output.  
 [2] do nothing without information about your fixed costs.  
 [3] reduce output until marginal revenue equals marginal cost.  
 [4] expand output until marginal revenue equals zero.
6. Suppose that a firm can produce its output at either of two plants. If profits are maximised, which of the following statements is **TRUE**?
- [1] The marginal cost at the first plant must equal marginal revenue.  
 [2] The marginal cost at the second plant must equal marginal revenue.  
 [3] The marginal cost at the two plants must be equal.  
 [4] All of the above.
7. Refer to the following two statements to answer this question:
- I. For a monopolist, at every output level, average revenue is equal to price.  
 II. For a monopolist, at every output level, marginal revenue is equal to price.
- [1] Both I and II are true.  
 [2] I is true, and II is false.  
 [3] I is false, and II is true.  
 [4] Both I and II are false.

### Questions with written answers

- (1) Explain why the monopolist makes economic profit in the short and the long run, while the perfect competitor makes economic profit only in the short run. (10)
- (2) Discuss and illustrate what the influence of a tax would be on the equilibrium price and quantity of a monopolist. (8)

## 10.2 Monopoly Power

### STUDY/OMIT

Study Pages 361 to 366.

Omit "A Rule of Thumb for Pricing and Example 10.2 and 10.3.

The question is: Does a firm in markets with more than one firm have monopoly power or not? This question is important, as a pure monopoly very rarely exists.

One can measure monopoly power by means of the **Lerner index of monopoly power**.<sup>49</sup> This index is calculated using the following formula (the difference between price and marginal cost, divided by price):

$$L = (P - MC)/P$$

This index can also be expressed in terms of elasticity (the price elasticity of the firm's demand curve), namely:

$$L = (P - MC)/P = -1/E_d$$

Make sure what is meant by the index, which falls between 0 and 1, in both the abovementioned formulas.

### ■ **Activity 10.2**

Questions concerning this section will be incorporated later in this learning unit.

## **10.3 Sources of Economic Power**

### **STUDY**

Pages 366 to 368.

Monopoly power is the ability to set price above marginal cost. The amount by which price exceeds marginal cost is inversely related to the elasticity of demand facing the firm. The source of economic power is therefore related to the elasticity of demand for the firm. Three factors that can influence this elasticity are discussed here, namely the elasticity of the market demand, the number of firms and interaction between firms.

### ■ **Activity 10.3**

#### **Multiple-choice questions**

1. The \_\_\_\_\_ elastic a firm's demand curve, the greater its \_\_\_\_\_.
  - [1] less; monopoly power
  - [2] less; output
  - [3] more; monopoly power
  - [4] more; costs

<sup>49</sup> See footnote 6 in Pindyck and Rubinfeld (2009:363) for problems associated with this index.



2. What is the value of the Lerner index under perfect competition?
- [1] 1
  - [2] 0
  - [3] infinite
  - [4] two times the price
3. The more elastic the demand facing a firm, the ...
- [1] higher the value of the Lerner index.
  - [2] lower the value of the Lerner index.
  - [3] less monopoly power it has.
  - [4] higher its profit.
4. Which of the following is **NOT** associated with a high degree of monopoly power?
- [1] A relatively inelastic demand curve for the firm.
  - [2] A small number of firms in the market.
  - [3] Significant price competition among firms in the market.
  - [4] Significant barriers to entry.

#### 10.4 Social Cost of Monopoly Power

##### STUDY

Pages 368 to 373.

In a competitive market price equals marginal cost. This is not the case with a firm that operates as a monopoly. The result is that **in the case of a monopoly the equilibrium price is higher and the quantity supplied lower if it is compared with a perfectly competitive firm**. This can be seen in Figure 10.10 (Pindyck & Rubinfeld, 2009:369). Compare the equilibrium price and quantity,  $P_m$  and  $Q_m$ , with that of the perfect competitor,  $P_c$  and  $Q_c$ . The deadweight loss is social cost of inefficiency. (Also remember the different profit positions of the perfect competitor and the monopolist.)

**Rent seeking** may take place, which implies that the monopolist is trying to maintain its dominant position in the market.

A government may also introduce **price regulation** to regulate the monopolist. In the case of the perfect competitor, price regulation<sup>50</sup> always results in a deadweight loss. This does not have to be the case with a monopolist, as the deadweight loss can be eliminated by regulations. This is illustrated in Figure 10.11 (Pindyck & Rubinfeld, 2009:371).

<sup>50</sup>Price ceilings and floor prices. See learning unit 9, where these topics are discussed.

A **natural monopoly** produces goods or services at a lower price than several firms producing goods and services. Usually economies of scale are present, illustrated in Figure 10.12 (Pindyck & Rubinfeld, 2009:372) by the downward-bending average and marginal curves. Note the three pricing and quantity supplied options. The specific reason why price ( $P$ ) is taken is that this is the lowest price at which average revenue and average cost still intersect. Here is also no monopolistic profit.

The regulation of monopolies in practice is not easy. Alternatives to the option described in the previous section are rate-of-return regulation and price caps. There is, however, also the problem of a lack of information.

## ■ **Activity 10.4**

### **Multiple-choice questions**

1. With respect to monopolies, deadweight loss refers to the ...
  - [1] socially unproductive amounts of money spent to obtain or acquire a monopoly.
  - [2] net loss in consumer and producer surplus due to a monopolist's pricing strategy/policy.
  - [3] lost consumer surplus from monopolistic pricing.
  - [4] none of the above
  
2. The monopolist that maximises profit ...
  - [1] imposes a cost on society because the selling price is above marginal cost.
  - [2] imposes a cost on society because the selling price is equal to marginal cost.
  - [3] does not impose a cost on society because the selling price is above marginal cost.
  - [4] does not impose a cost on society because price is equal to marginal cost.
  
3. Deadweight loss from monopoly power is expressed on a graph as the area between the ...
  - [1] competitive price and the average revenue curve bounded by the quantities produced by the competitive and monopoly markets.
  - [2] competitive price line and the marginal cost curve bounded by the quantities produced by competitive and monopoly markets.
  - [3] competitive price line and the monopoly price line bounded by zero output and the output chosen by the monopolist.
  - [4] average revenue curve and the marginal cost curve bounded by the quantities produced by competitive and monopoly markets.

4. Which of the following is **TRUE** when the government imposes a price ceiling on a monopolist?
- [1] Marginal revenue becomes horizontal.
  - [2] Marginal revenue is linear.
  - [3] Marginal revenue is kinked-horizontal and then downward-sloping.
  - [4] Marginal revenue is kinked – downward-sloping and then horizontal.
5. If the regulatory agency sets a price where  $AR = AC$  for a natural monopoly, output will be ...
- [1] equal to the competitive level.
  - [2] equal to the monopoly profit maximising level.
  - [3] greater than the monopoly profit maximising level and less than the competitive level.
  - [4] greater than the competitive level.
6. If a monopolist's profits were taxed away and redistributed to its consumers, ...
- [1] inefficiency would remain because output would be lower than under competitive conditions.
  - [2] inefficiency would remain, but not because output would be lower than under competitive conditions.
  - [3] efficiency would be obtained because output would be increased to the competitive level.
  - [4] efficiency would be obtained because output would be increased and profits removed.

### 10.5 Monopsony

**OMIT**  
Pages 373 to 376.

### 10.6 Monopsony Power

**OMIT**  
Pages 376 to 381.

## 10.7 Limiting Market Power: The Antitrust Laws

**OMIT**

Pages 381 to 387.

### ■ **Economics in Action Revisited**

In this learning unit, we saw how monopolies determine their equilibrium prices, quantities demanded and supplied. Owing to the inherent nature of the activities of this type of firm, it is usually unacceptable to both government and the community. However, we saw that there could be a place for natural monopolies in an economy. According to the quote at the beginning of this learning unit, it seems that monopolies in China also invest overseas. Could it be that a firm without competition at home, thus operating as a monopoly, needs this organisational form to invest overseas? Without competition at home, it could gather enough resources to invest successfully overseas.

### **Further Reading**

The South African Competition Commission has a website with information on their activities (see <http://www.compcom.co.za/>). Their activities are also reported regularly in newspapers.

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### ■ **Activity 10.1**

**True/False:** True: 1 and 3.  
False: 2.

**Multiple-choice questions:**

1. [3]
2. [3]
3. [2]
4. [4]
5. [3]
6. [4]
7. [2]

■ **Activity 10.2**

**True/False:** No questions

**Multiple-choice questions:** No questions

■ **Activity 10.3**

**True/False:** No questions

**Multiple-choice questions:**

1. [1]
2. [2]
3. [2]
4. [3]

■ **Activity 10.4**

**True/False:** No questions

**Multiple-choice questions:**

1. [2]
2. [1]
3. [4]
4. [3]
5. [3]
6. [1]

## Pricing with Market Power

### ***Contents***

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#### **11.2 Price Discrimination**

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#### **11.3 Intertemporal Price Discrimination and Peak-Load Pricing**

#### **11.4 The Two-Part Tariff**

#### **11.5 Advertising**

Activity 11.5

#### **Economics in Action Revisited**

#### **Further reading**

#### **Answers to some of the questions**

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### ***Learning Outcomes***

This learning unit discusses how the managers or owners of firms can use their market power effectively to determine price.

#### ***Once you have studied learning unit 11 you should be able to:***

- *explain why and how consumer surplus is captured;*
- *discuss how price discrimination is used to capture consumer surplus; and*
- *discuss the use of advertising by firms.*

**Economics in Action****Press Release****06 May 2010****Competition Commission raids four electric cable manufacturers**

The Competition Commission is currently conducting a search and seizure operation at the premises of four electrical cables manufacturers and suppliers on suspicion of price fixing, market allocation and collusive tendering.

The companies are Aberdare Cables (Pty) Ltd, Alvern Cables (Pty) Ltd, South Ocean Electric Wire Company (Pty) Ltd, and Tulisa Cables (Pty) Ltd which are all based in Gauteng. This follows a complaint initiated by the Commission on 16 March 2010.

The companies produce both high voltage cables for industrial use and low and medium voltage cables for households.

Important customers include power supply authorities, municipalities, railway and transport authorities and construction companies.

In terms of section 48 of the Competition Act, the Commission is authorised to enter and search premises and seize documents which have a bearing on an investigation. Section 46(2) (b) of the Act authorises a judge or magistrate to issue the Commission with a warrant allowing them and accompanying police officers to enter and search such premises.

**(Source:** <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Final-electric-cables-Release.pdf> [accessed on 15 May 2010].)

**11.1 Capturing Consumer Surplus****STUDY**

Pages 391 to 393.

The core question in this section is: How do managers of firms with market power capture more consumer surplus and transfer it to the producer? To remind yourself of the existing loss of consumer surplus at the monopolist's equilibrium point, go back to Figure 10.10 (Pindyck & Rubinfeld, 2009:369). In Figure 11.1 (Pindyck & Rubinfeld, 2009:392) the question is: How can the consumer surplus of sections *A* and *B* on the demand curve be captured?

This is done with different price strategies, of which the core is to ask different prices for different customers.

## ■ **Activity 11.1**

### **Multiple-choice questions**

1. Which of the following strategies are used by business firms to capture consumer surplus?
  - [1] Price discrimination.
  - [2] Bundling.
  - [3] Two-part tariffs.
  - [4] All of the above.
  
2. Rather than charging a single price to all customers, a firm charges a higher price to men and a lower price to women. By engaging in this practice, the firm is ...
  - [1] trying to reduce its costs and therefore increase its profit.
  - [2] engaging in an illegal activity.
  - [3] attempting to convert producer surplus into consumer surplus.
  - [4] attempting to convert consumer surplus into producer surplus.

### **Questions with written answers**

- (1) Refer to Figure 11.1 (Pindyck & Rubinfeld, 2009:392) and explain how the manager of the firm will try to get more consumer surplus. (8)

## **11.2 Price Discrimination**

### **STUDY**

Pages 393 to 403 and  
Example 11.1 and 11.2.

Price discrimination is **the charging of different prices to different consumers for similar goods**. Price discrimination take three forms, namely first-, second-, and third-degree price discrimination.

### **11.2.1 First-degree Price Discrimination**

Perfect price discrimination is illustrated in Figure 11.2 (Pindyck & Rubinfeld, 2009:394), where the difference between the demand curve and the marginal cost curve is the consumer surplus, which is transferred to the producer. This is called variable profit, which goes to the producer. Take note of footnote 2 (Pindyck & Rubinfeld, 2009:394) and the related discussion in learning unit 10 (Pindyck & Rubinfeld, 2009:353).



It is clear from the above that perfect price discrimination is almost never possible. There are two reasons for this: firstly, it is nearly impossible to ask each customer for his or her **reservation price** and secondly, we do not know what this reservation price for each customer is.

A solution to the above problem is imperfect (second-degree) price discrimination. It is possible to offer a few different prices to categories of customers with certain reservation prices. Examples are the prices or fees charged by professionals (doctors, lawyers, etc.). This type of price discrimination is illustrated in Figure 11.3 (Pindyck & Rubinfeld, 2009:396).

### 11.2.2 Second-degree Price Discrimination

Second-degree price discrimination means charging different prices for different quantities of the same good. This is a very familiar form of price discrimination; at the greengrocer's, for instance, one often sees signs like, "Buy one carton of tomatoes and get a second one free".

Forms of this type of price discrimination are quantity discounts and block discounts, which are illustrated in Figure 11.4 (Pindyck & Rubinfeld, 2009:397).

### 11.2.3 Third-degree Price Discrimination

This is where consumers are divided in different groups, according to certain socio-economic characteristics; each group has its own demand curve and is charged a different price. The question now is: Which price should the customers per group be charged? The familiar equilibrium condition is again relevant, namely (assuming two customer groups):

$$MR_1 = MR_2 = MC$$

This is illustrated in Figure 11.5 (Pindyck & Rubinfeld, 2009:397). Note that the price for the group with the less elastic demand curve ( $D_1$ ) is the higher price ( $P_1$ ). Example 11.1 and table 11.1 (Pindyck & Rubinfeld, 2009:400–402) explain how consumers can be divided into different groups according to the group's price elasticity of demand.

Figure 11.6 (Pindyck & Rubinfeld, 2009:400) shows the case where it is not worthwhile to sell to more than one group of consumers as the costs may outweigh the revenue.

## Activity 11.2

Decide whether the following statements are **True** or **False**.

		T	F
1	Discrimination based upon the quantity consumed is called second-degree price discrimination.		

2	Third-degree price discrimination involves the use of increasing block rate pricing.		
3	The maximum price that a consumer is willing to pay for a good is called the market price.		

### Multiple-choice questions

1. An electric power company uses block pricing for electricity sales. Block pricing is an example of ...
  - [1] first-degree price discrimination.
  - [2] second-degree price discrimination.
  - [3] third-degree price discrimination.
  - [4] None of the above.
  
2. When a firm charges each customer the maximum price that the customer is willing to pay, the firm ...
  - [1] engages in a discrete pricing strategy.
  - [2] charges the average reservation price.
  - [3] engages in second-degree price discrimination.
  - [4] engages in first-degree price discrimination.
  
3. The maximum price that a consumer is willing to pay for each unit bought is the \_\_\_\_\_ price.
  - [1] market
  - [2] reservation
  - [3] consumer surplus
  - [4] auction
  
4. Second-degree price discrimination is the practice of charging ...
  - [1] the reservation price to each customer.
  - [2] different prices for different quantity blocks of the same good or service.
  - [3] different groups of customers different prices for the same products.
  - [4] each customer the maximum price that he or she is willing to pay.
  
5. A firm is charging a different price for each unit purchased by a consumer. This is called ...
  - [1] first-degree price discrimination.
  - [2] second-degree price discrimination.
  - [3] third-degree price discrimination.
  - [4] fourth-degree price discrimination.

**Questions with written answers**

- (1) Define a reservation price. (3)
- (2) Explain each of the different forms of price discrimination by using an illustration (see Figures 11.3, 11.4 & 11.5 in Pindyck and Rubinfeld (2009:396–397 & 399)). (12)

**11.3 Intertemporal Price Discrimination and Peak-Load Pricing**

**OMIT**  
Pages 403 to 406.

**11.4 The Two-Part Tariff**

**OMIT**  
Pages 406 to 407.

**11.5 Advertising**

**STUDY/OMIT**  
Study Pages 424 to 426  
Omit “A Rule of Thumb for Advertising and Example 11.7.

Although pricing is important for a firm with market power, advertising is also an important instrument for firms to increase their profit. Two questions are raised in this section, namely: Is advertising worth it and how much must the firm spend on advertising?

Concerning the first question: in Figure 11.20 (Pindyck & Rubinfeld, 2009:425) it is shown that firms who advertise increase their profit. (Compare the size of Theta 1 with Theta 2.) Note the contents of footnote 21 (Pindyck & Rubinfeld, 2009:424). A perfectly competitive firm does not have to advertise, as a firm in such a market sells all their products anyway.

Concerning the second question: the same marginal rule is applicable here, namely  $MR_{ads} = \text{full MC of advertising}$ . The implication of the concept “full MC of advertising” is that when more products are manufactured – due to higher sales from advertising – the higher production also implies cost. It is not just the higher advertising cost that is important, but also the higher production cost.

## ■ **Activity 11.5**

### Questions with written answers

- (1) Discuss and illustrate that it can be proved that profit will increase with advertising. (8)

## ■ **Economics in Action Revisited**

In general, using market power to determine prices is illegal in most countries. This does not mean that the methods described in this learning unit are illegal. Our goal in this learning unit was to introduce you to the many innovative methods to determine prices. These methods do raise questions, as pointed out by the South African Competition Commission, about “restrictive business practices, abuse of dominant positions and mergers (which limits efforts) to achieve equity and efficiency in the South African economy.”<sup>51</sup>

### **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### ■ **Activity 11.1**

**True/False:** No questions

**Multiple-choice questions:** 1. [4]  
2. [4]

#### ■ **Activity 11.2**

**True/False:** True: 1  
False: 2 and 3

**Multiple-choice questions:** 1. [2]  
2. [4]  
3. [2]  
4. [2]  
5. [1]

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51 See <http://www.compcom.co.za/> (accessed on 15/05/2010.)

# Monopolistic Competition and Oligopoly

## *Contents*

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### **Economics in Action**

#### **12.1 Monopolistic Competition**

Activity 12.1

#### **12.2 Oligopoly: Setting the Quantity**

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#### **12.3 Oligopoly: Setting the Price (Price Competition)**

##### **12.3.1 Homogeneous products**

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Activity 12.4

#### **12.5 Implications of Prisoner's Dilemma for Oligopolistic Pricing**

Activity 12.5

#### **12.6 Cartels**

Activity 12.6

### **Economics in Action Revisited**

#### **Further reading**

#### **Answers to some of the questions**

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## ***Learning Outcomes***

In this learning unit we examine market structures which fall between perfect competition on the one hand, and monopoly, on the other. If you are viewing this material for the first time, you may feel overwhelmed by the number of models presented, as no less than ten models (with some overlap) will be discussed in this learning unit, namely:

- monopolistic competition
- Cournot
- Stackelberg
- Bertrand
- price competition with differentiated products
- prisoners' dilemma
- kinked demand
- price leadership
- dominant firm
- cartels

Keep in mind that the reason for all these models is that **there is no single oligopoly model**. However, since oligopoly theory is still evolving, it is an exciting area to study.

**Once you have studied learning unit 12 you should be able to:**

- *define and explain monopolistic competition;*
- *define and explain oligopoly market structures;*
- *define and explain price competition;*
- *describe the difference between competition and collusion; and*
- *discuss oligopolistic pricing.*

### **Economics in Action**

#### **Steel makers to fight 'ore oligopoly'**

STEEL makers are fighting back against attempts by the 200bn iron ore mining industry to raise the cost of their main raw material, calling for regulators to investigate an "oligopoly" that inflates prices.

Mining of iron ore, essential for making steel, is dominated by Vale, Rio Tinto Group and BHP Billiton, which control about two-thirds of the trade. Brazil's Vale, the largest supplier, set a precedent last week by breaking a 40-year custom of selling ore on a yearly contract at a fixed rate and won a 90% price increase from Japanese mills.

"There is an urgent need, now a very urgent need, for the competition authorities around the world to examine the market for iron ore and the market behaviour of the three companies," World Steel Association spokesman Nicholas Walters said.

The 180-member group includes 19 of the top 20 steel makers and produces 85% of global output.

"There are key regulators involved in this around the world. Their ears are very much open".

Gordon Moffat, director-general of Eurofer, representing European steel makers said: "We have an oligopoly controlling the market and they can therefore dictate prices." Cost increases "feed through into steel prices and into the finished product market – cars, washing machines, consumer products".

The European Commission said it had received a letter from Eurofer last Tuesday seeking an investigation into the market.

**(Source:** <http://www.businessday.co.za/Articles/Content.aspx?id=105335> (accessed on 16/05/2010).

You will find the oligopoly market structure in many sectors of the economy, from the mining sector (mentioned in the above report), to the manufacturing sector and the financial sector. In spite of the fact that it is such a relevant

market form, there is no single theory describing the setting of equilibrium prices and quantities by oligopolistic firms, as we shall see.

### 12.1 Monopolistic Competition

**STUDY**  
Pages 443 to 448 and  
Example 12.1.

The name of this market structure, “monopolistic competition”, is derived from the following characteristics: “monopolistic” from the fact that the firm has some control over price, owing to a downward-sloping demand curve, and “competition” from free entry into the market (like being in a perfectly competitive market).

The general characteristics of this market structure are given in the next table.

**Table SG12.1:** Monopolistic competition

Market type	Type of product	Examples of products <sup>52</sup>	Consumer behaviour	Nature of demand curve	Entry and exit	Profit	Number of firms
Monopolistic competition	Differentiated, but substitutable	Toothpaste	Perspective of differentiation. Can easily substitute products	Fairly elastic	Free	Short-run: economic profit Long-run: zero profit	Many

In Figure 12.1 (Pindyck & Rubinfeld, 2009:445) the short-run and long-run equilibrium positions of the firm are given (equilibrium is where  $MR = MC$ ).<sup>52</sup> Note that profit is made in the short run, but in the long run, owing to free entrance to the markets, more firms enter and profit decreases to zero economic profit or normal profit (profit is the difference between  $AR$  and  $AC$ ).<sup>53</sup>

**The following is important to note:**

*Short-run:*

- Figure 12.1(a) in Pindyck and Rubinfeld (2009:445) is basically the same as Figure 10.2 in Pindyck and Rubinfeld (2009:352).
- The monopolist in Figure 10.2 (Pindyck & Rubinfeld, 2009:352) makes economic profit.

<sup>52</sup> Profit maximization position.

<sup>53</sup> In Figure 12.1 (Pindyck & Rubinfeld, 2009:445) panels (a) and (b), the curves  $D_{SR}$  and  $D_{LR}$  are also the average revenue ( $AR$ ) curves for the short and the long run, respectively.

- The monopolistic competitor in Figure 12.1(a) (Pindyck & Rubinfeld, 2009:445) also makes economic profit.
- The only difference between Figures 12.1(a) and 10.2 is that the  $D = AR$  and  $MR$  curves are more inelastic (less elastic) in the case of the monopolist (Figure 10.2) than in the case of the monopolistic competitor (Figure 12.1[a]).

A comparison between monopolistic competition and perfect competition (see Figure 12.2 in Pindyck and Rubinfeld (2009:447)) clearly shows the inefficiencies of this market structure in the long run. The two sources of inefficiency in a monopolistic market are the deadweight loss (panel [b] in Figure 12.2) and the presence of excess capacity.

### Activity 12.1

Decide whether the following statements are **True** or **False**.

		T	F
1	A monopolistically competitive firm in long-run equilibrium will make zero economic profit.		
2	Firms in both perfect and monopolistic competition face a downward-sloping demand curve.		

### Multiple-choice questions

- For which of the following market structures is it assumed that there are barriers to entry?
  - Perfect competition.
  - Monopolistic competition.
  - Monopoly.
  - All of the above.
- Refer to the following two statements about monopolistic competition to answer this question.
  - In the long run, the price of the good will equal the minimum of the average cost.
  - In the short run, firms may earn a profit.
  - I and II are true.
  - I is true, and II is false.
  - I is false, and II is true.
  - I and II are false.
- A market with few entry barriers and with many firms that sell differentiated products is ...
  - purely competitive.
  - a monopoly.



- [3] monopolistically competitive.
  - [4] oligopolistic.
4. The most important factor in determining the long-run profit potential in monopolistic competition is ...
- [1] free entry and exit.
  - [2] the elasticity of the market demand curve.
  - [3] the elasticity of the firm’s demand curve.
  - [4] the reaction of rival firms to a change in price.
5. Monopolistically competitive firms have monopoly power because they ...
- [1] face downward-sloping demand curves.
  - [2] are great in number.
  - [3] have freedom of entry.
  - [4] are free to advertise.

**Questions with written answers**

- (1) Explain and illustrate the difference between the profit positions of the monopolistic competitor in the short run and the long run. (8)

**12.2 Oligopoly: Setting the Quantity**

**STUDY**  
Pages 449 to 456.

The general characteristics of this market structure are given in the next table.

**Table SG12.2:** Oligopoly

Market type	Type of product	Examples of products	Consumer behaviour	Nature of demand curve	Entry and exit	Profit	Number of firms
Oligopoly	May or may not be differentiated	Automobiles Steel	Follow advertising	Depend on nature of market structure	Barriers to entry: natural factors; scale economies; patents; access to technology; name recognition	Substantial profits	Few

Decision-making on price and output levels depends on numerous factors, one of which is the behaviour of other firms in this oligopolistic market. **The behaviour of other firms is always taken into account**, especially the anticipated behaviour of other firms. To develop a “rule” or “condition” for equilibrium in an

oligopoly market, we can consider the conditions for equilibrium in competitive and monopolistic markets: in equilibrium, firms are doing best they can and there is no reason to change price and output.

Similarly, the equilibrium for a firm in an oligopoly market is a **Nash equilibrium, which implies that each firm is doing the best it can, given what its competitors are doing.**<sup>54</sup>

Note that the discussion assumes a duopoly market, but the principles are also applicable to markets with more than two firms. The **basic duopoly model of Cournot** is illustrated in Figure 12.3 (Pindyck & Rubinfeld, 2009:451).<sup>55</sup> Note that the behaviour of firm 1 depends on the assumed behaviour of the other competitor in this duopoly market.<sup>56</sup> This reaction or market behaviour of firm 1 is illustrated by the reaction curve ( $Q_1^*[Q_2]$ ) in Figure 12.4 (Pindyck & Rubinfeld, 2009:452) and that of firm 2 by the reaction curve ( $Q_2^*[Q_1]$ ).

The **Cournot equilibrium** is the intersection of the two reaction curves of firms 1 and 2. This is an example of a Nash equilibrium; each firm is maximising profit and does not want to change its position. This model clearly has shortcomings: we need other models to show the adjustment process towards equilibrium.

Where it was assumed in the Cournot model that the two firms make their output decisions simultaneously, in the **Stackelberg model** one firm sets its output first.<sup>57</sup> Note that a firm now has the opportunity to react. The questions now are: Is it advantageous to go first? How much will each firm produce? The answers are that it is indeed advantageous to go first, and that the first mover produces much more and makes more profit than the follower.

Both the Cournot and Stackelberg models are alternative representations of oligopolistic behaviour. In the last paragraph of this section attention is given to the relevance of each model.

## Activity 12.2

Decide whether the following statements are **True** or **False**.

		T	F
1	A reaction curve shows how much a firm will produce as a function of how much it thinks its competitors will produce.		
2	The market structure in which there is interdependence among firms is perfect competition.		

<sup>54</sup>The modern-day formulator of this equilibrium condition was John Forbes Nash (1928), hence the name. He is an American economist and mathematician who shared the 1994 Nobel Memorial Prize in Economic Sciences with game theorists Reinhard Selten and John Harsanyi. Nash is the subject of the Hollywood film, *A Beautiful Mind*.

<sup>55</sup>Antoine Augustin Cournot (1801–1877) was a French economist, philosopher and mathematician.

<sup>56</sup>Note the equilibrium point for firm 1 is the familiar equilibrium condition,  $MR = MC$ .

<sup>57</sup>Heinrich Freiherr von Stackelberg (1905–1946) was a German economist who described the model in his book entitled *Market structure and equilibrium (Marktform und Gleichgewicht)* in 1934. Because one firm can set its output first, the model is also called the Stackelberg leadership model.

3	In comparing the Cournot equilibrium with the competitive equilibrium, profit is higher, and output level is lower in the competitive equilibrium.		
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### Multiple-choice questions

1. The market structure in which strategic considerations are most important is ...
  - [1] monopolistic competition.
  - [2] oligopoly.
  - [3] pure competition.
  - [4] pure monopoly.
  
2. In the Cournot duopoly model, each firm assumes that ...
  - [1] rivals will match price cuts but will not match price increases.
  - [2] rivals will match all reasonable price changes.
  - [3] the price of its rival is fixed.
  - [4] the output level of its rival is fixed.
  
3. A situation in which each firm selects its best action, given what its rivals are doing, is called a ...
  - [1] Nash equilibrium.
  - [2] Cooperative equilibrium.
  - [3] Stackelberg equilibrium.
  - [4] zero sum game.
  
4. Which of the following can be regarded as a barrier to entry?
  - [1] Scale economies.
  - [2] Patents.
  - [3] Strategic actions by incumbent firms.
  - [4] All of the above.
  
5. In the \_\_\_\_\_, each firm treats the output of its competitor as fixed and then decides how much to produce.
  - [1] Cournot model
  - [2] model of monopolistic competition
  - [3] Stackelberg model
  - [4] kinked-demand model

### Questions with written answers

- (1) Use two reaction curves and describe how a Cournot equilibrium can be established. (8)
- (2) Describe the difference between the Cournot model and the Stackelberg model. (6)

### 12.3 Oligopoly: Setting the Price (Price Competition)

#### STUDY/OMIT

Study Pages 456 to 461.

Omit Example 12.2.

#### 12.3.1 Homogeneous Products

The **Bertrand model**<sup>58</sup> was developed in 1883 and is applicable to firms which produce **homogeneous goods** and make their price decisions at the same time. (The firms choose prices and not quantities as in the previous section.) Because the goods are homogeneous, consumers will only buy from the lowest-price seller. If the two firms have different prices, the firm with the lowest price will supply the whole market. If the two firms have the same price, the consumers will not make a choice either way and each firm will supply half the market.

What is the Nash equilibrium? The Nash equilibrium is the competitive outcome where each firm sets a price equal to marginal cost, and both firms make zero economic profit. None of the firms have an incentive to deviate from this.

The difference between the outcomes of the Cournot model and Bertrand model is explained in the textbook, together with some criticism of the Bertrand model (Pindyck & Rubinfeld, 2009:457–458).

#### 12.3.2 Heterogeneous Products

In oligopolistic markets there are usually heterogeneous products. Market share is not only determined by prices, but also by the differences between the two products. By setting their prices simultaneously, a Nash equilibrium can be established and neither firm has an incentive to change its price. If firms collude, they can increase their price. The firm that moves first has a disadvantage (unlike the Stackelberg model), because it has to set prices; this means it can be undercut by the second firm.

### Activity 12.3

#### Multiple-choice questions

1. Which one of the following statements is a common criticism of the original Bertrand duopoly model?

<sup>58</sup>Joseph Louis François Bertrand (1822–1900, born and died in Paris) was a French mathematician who worked in the fields of number theory, differential geometry, probability theory, economics and thermodynamics. In the field of economics he reviewed the work on oligopoly theory, specifically the Cournot competition model produced by the French mathematician and economist Augustin Cournot. The Bertrand competition model argued that Cournot had reached a very misleading conclusion; upon reworking Cournot's duopoly model using prices rather than quantities as the strategic variables, it transpired that the equilibrium price was simply the competitive price. (For more information, see Wikipedia at [http://en.wikipedia.org/wiki/Joseph\\_Louis\\_Fran%C3%A7ois\\_Bertrand](http://en.wikipedia.org/wiki/Joseph_Louis_Fran%C3%A7ois_Bertrand) [accessed on 10/05/2010].)

- [1] Firms never choose optimal prices as strategic variables.
- [2] Firms would more naturally choose quantities if goods are homogeneous.
- [3] [1] and [2] are correct.
- [4] [2] and [3] are correct.
2. Is there a first-mover advantage in the Bertrand duopoly model with homogeneous products?
- [1] Yes, first-movers always hold the advantage over other firms.
- [2] Yes, first-movers may have an advantage, but it depends on the model assumptions.
- [3] No, first-movers cannot choose a profit maximising quantity because the second-mover can always produce a bit less and earn higher profits.
- [4] No, the second-mover would be able to set a slightly lower price and capture the full market share.
3. Collusion can earn higher prices and higher profits under the Bertrand model, but why is this, an unlikely outcome in practice?
- [1] Firms prefer to remain independent of other firms so that their pricing plans can be more flexible over time.
- [2] The collusive firms have an incentive to gain market share at the expense of the other firms by cutting prices.
- [3] The federal antitrust authorities have an easier time catching firms that collude on price rather than quantity.
- [4] None of the above.
4. Which oligopoly model(s) has/have the same results as the competitive model?
- [1] Cournot
- [2] Bertrand
- [3] Stackelberg
- [4] Both Cournot and Stackelberg

### 12.4 Competition versus Collusion: The Prisoner's Dilemma

#### STUDY

Pages 461 to 464 and  
Example 12.3.

The Nash equilibrium is a non-cooperative equilibrium. Why do managers of firms withhold cooperation without explicitly colluding? The reason is explained by means of a payoff matrix (see table 12.3 in Pindyck and Rubinfeld (2009:462)). This payoff matrix stems from the example of game theory, the

prisoner's dilemma (see table 12.4 in Pindyck and Rubinfeld (2009:463)). Oligopolistic firms often find themselves in a prisoners' dilemma. Compete or cooperate?

## Activity 12.4

### Multiple-choice questions

- The prisoners' dilemma is a particular type of game in which negotiation and enforcement of binding contracts are not possible, and such games are known as ...
  - cooperative games.
  - non-cooperative games.
  - collusive games.
  - cournot games.
- Two firms operating in the same market must choose between a collude price and a cheat price. Firm A's profit is listed before the comma, B's outcome after the comma. If each firm tries to choose a price that is best for it, regardless of the other firm's price, which of the following statements is/are correct?

		Firm B	
		Cheat Price	Collude Price
Firm A	Cheat Price	18,18	30,6
	Collude Price	6,30	24,24

- Firm A should charge a collude price, firm B should charge a cheat price.
- Firm A should charge a cheat price, firm B should charge a collude price.
- Both firms should charge a collude price.
- Both firms should charge a cheat price.

## 12.5 Implications of the Prisoner's Dilemma for Oligopolistic Pricing

**STUDY**  
Pages 464 to 469 and  
Example 12.4.

This section describes how firms will behave in an oligopolistic market. Study the section to get an idea of what could happen in this type of market.

Figure 12.7 (Pindyck & Rubinfeld, 2009:466) illustrates the market situation where price rigidity is experienced – typical in an oligopolistic market. The kinked demand curve model shows a discontinuous marginal revenue (*MR*) curve.<sup>59</sup> This *MC* curve can move upwards or downwards without resulting in a change of price. This model challenged the prevailing classical economic assumptions (it was formulated in 1939) of a perfectly competitive market.

Price signaling and price leadership are forms of behaviour of firms in oligopolistic markets, which are known for their uncertainty, distrust, suspicion and the possibility of government intervention in the form of legislation.

The dominant firm model is illustrated in Figure 12.9 (Pindyck & Rubinfeld, 2009:469). In this type of oligopolistic market, the dominant firm sets the price which maximises this firm's profit. The smaller firms in this market cannot influence the price and operate like perfect competitors.

### Activity 12.5

Decide whether the following statements are **True** or **False**.

		T	F
1	Under the kinked demand curve model, an increase in marginal cost will lead to a decrease in output level and no change in price.		
2	The demand curve facing the dominant firm equals market demand minus fringe firms' supply curve.		

### Multiple-choice questions

- The oligopoly model that predicts that oligopoly prices will tend to be very rigid is the \_\_\_\_\_ model.
  - Cournot
  - Stackelberg
  - dominant firm
  - kinked demand
- In the kinked demand curve model, if one firm reduces its price ...
  - other firms will also reduce their price.
  - other firms will compete on a non-price basis.

<sup>59</sup>This model was formulated nearly simultaneously in 1939 by Paul Sweezy (1910–2004) a Marxist economist from Harvard College, Cambridge, Massachusetts (USA), and Robert L. Hall (1901–1988) and Charles J. Hitch (1910–1995) from Queen's College, Oxford, England. The latter two economists were also the authors of the *Hall and Hitch Report* (1939), which was based on a survey in the manufacturing sector. The report criticised the assumptions of a perfect competitive market by stating that firms did not attempt to maximise their profits; they did not use the marginalised cost principle ( $MR = MC$ ), but the average cost principle ( $P = AVC + AFC + \textit{profit margin}$ ), and did not act as if in perfect competition – they were conscious of the reactions of their competitors.

- [3] other firms will raise their price.  
 [4] both a and b are correct.
3. Suppose that three oligopolistic firms are currently charging R12.00 for their product. The three firms are about the same size. Firm A decides to raise its price to R18.00, and announces to the press that it is doing so because higher prices are needed to restore economic vitality to the industry. Firms B and C go along with firm A and raise their prices as well. This is an example of ...
- [1] price leadership.  
 [2] collusion.  
 [3] the dominant firm model.  
 [4] the Stackelberg model.
4. A market structure in which there is one large firm that has a major share of the market and many smaller firms supplying the remainder of the market is called the ...
- [1] Stackelberg model.  
 [2] kinked demand curve model.  
 [3] dominant firm model.  
 [4] Cournot model.
5. In the dominant firm model, the smaller fringe firms behave like ...not
- [1] competitive firms.  
 [2] Cournot firms.  
 [3] Stackelberg firms.  
 [4] Bertrand firms.

## 12.6 Cartels

**STUDY/OMIT**  
 Study Pages 469 to 471.  
 Omit Page 472 (Fig. 12.11 and "Analyzing CIPEC") and  
 Example 12.5.

A specific characteristic of cartels is that they are based upon an **explicit agreement to cooperate in setting prices and output levels**. Not all the producers are necessarily part of the cartel – a reasonable number will suffice – and if the market demand is sufficiently inelastic, the cartel may drive price well above competitive levels.

The conditions for the successful operation of a cartel are, firstly, a stable cartel organisation, and secondly, the potential for monopoly power.



The Organisation of Petroleum Exporting Countries (OPEC) is the best-known cartel, as it influences the prices and output of one of the basic resources in the world, namely oil.<sup>60</sup> During the 1970s especially, OPEC had a considerable influence over the price and output levels of crude oil. It caused major instability in the economic performance of the industrial countries. OPEC's influence faded after the discovery and development of large oil reserves in Alaska, the North Sea, Canada and the Gulf of Mexico.

The determination of the equilibrium price and quantity of the OPEC Oil Cartel is illustrated in Figure 12.10 (Pindyck & Rubinfeld, 2009:471). We see that the OPEC price of  $P^*$  is much higher than the competitive price ( $P_c$ ).<sup>61</sup> In learning unit 2, section 2.4, mention<sup>9</sup> was made of the influence of time on the price elasticity of demand. The role of time on the price elasticity of demand for oil explains why OPEC could not maintain its high prices in the 1980s.

## Activity 12.6

### Multiple-choice questions

1. Which of the following is **NOT** conducive to the successful operation of a cartel?
  - [1] Market demand for the good is relatively inelastic.
  - [2] The cartel supplies all of the world's output of the good.
  - [3] Cartel members have substantial cost advantages over non-member producers.
  - [4] The supply of non-member producers is very price-elastic.
  
2. This market situation is much like a pure monopoly except that its member firms tend to cheat on agreed upon price and output strategies. What is it?
  - [1] Duopoly.
  - [2] Cartel.
  - [3] Market sharing monopoly.
  - [4] Natural monopoly.

<sup>60</sup>OPEC was founded in Baghdad, Iraq, with the signing of an agreement in September 1960 by five countries namely the Islamic Republic of Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. These countries were later joined by Qatar (1961), Indonesia (1962), Socialist People's Libyan Arab Jamahiriya (1962), the United Arab Emirates (1967), Algeria (1969), Nigeria (1971), Ecuador (1973), Gabon (1975) and Angola (2007). From December 1992 until October 2007, Ecuador suspended its membership. Gabon terminated its membership in 1995. Indonesia suspended its membership effective January 2009.

Currently, OPEC has a total of 12 member countries. (**Source:**

[http://www.opec.org/opec\\_web/en/about\\_us/25.htm](http://www.opec.org/opec_web/en/about_us/25.htm) [accessed on 01/04/2010].)

<sup>61</sup>Note that the reference to this competitive price ( $P_c$ ) is different in the text, the graph and the explanation beneath the graph.

## ■ **Economics in Action Revisited**

The vast number of market structures between the perfect competitor and the monopolist makes it difficult to determine the positive and negative externalities associated with each market structure. Each market structure must be analysed in its own right to determine the positive and negative aspects of a market structure.

### **Further Reading**

Estrin, S, Laidler, M & Dietrich, M. 2008. *Microeconomics*. London: Prentice Hall.  
Morgan, W, Katz, M & Rosen, H. 2009. *Microeconomics*. London: McGraw-Hill.

(There are a vast number of textbooks which focus on microeconomics available in the library.)

### **Answers to Some of the Questions**

#### ■ **Activity 12.1**

True/False: True: 1  
False: 2

Multiple-choice questions: 1. [3]  
2. [3]  
3. [3]  
4. [1]  
5. [1]

#### ■ **Activity 12.2**

True/False: True: 1  
False: 2 and 3

Multiple-choice questions: 1. [2]  
2. [4]  
3. [1]  
4. [4]  
5. [1]

#### ■ **Activity 12.3**

True/False: No questions

Multiple-choice questions: 1. [4]

2. [4]
3. [2]
4. [2]

#### ■ **Activity 12.4**

**True/False:** No questions

- Multiple-choice questions:**
1. [2]
  2. [4]

#### ■ **Activity 12.5**

**True/False:** True: 2  
False: 1

- Multiple-choice questions:**
1. [4]
  2. [1]
  3. [1]
  4. [3]
  5. [1]

#### ■ **Activity 12.6**

**True/False:** No questions

- Multiple-choice questions:**
1. [4]
  2. [2]

## Game Theory and Competitive Strategy

**OMIT**

Pages 479 to 520.

## Markets for Factor Inputs

**OMIT**

Pages 521 to 550.

## Investment, Time and Capital Markets

**OMIT**

Pages 551 to 582.

# General Equilibrium and Economic Efficiency

**OMIT**

Pages 585 to 616.

## Markets with Asymmetric Information

**OMIT**

Pages 617 to 644.



## Externalities and Public Goods

**OMIT**

Pages 645 to 693.