Principles of Microeconomics

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Acknowledgements

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About this Book

About this Book

Principles of Microeconomics – First Edition highlights the behavior of an individual household or business in a particular market. The textbook discusses choices that individuals make in allocation of resources. It provides a concise yet comprehensive account of the core topics of microeconomics, including theories of the consumer and of the firm, market structure, and market failures caused by externalities. This OER uses many current examples from the Canadian economy to balance theory and its application of economic concepts. It explains all the concepts, tools, and techniques in a lucid language targeted for undergraduate students.

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- Key terms are highlighted(bolded) within the text, and appear in the key terms list at the end of each chapter.
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CHAPTER 1: INTRODUCTION

Chapter Outline

1.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Define Economics
- Distinguish between Micro and Macro Economics
- Recognize Key Economic terms

Economic issues dominated the news in 2022, just as they dominate the news in most years. What happens to economic phenomena such as growth, unemployment, gasoline and food prices, house values, and the national debt matters—and these phenomena matter a great deal.

While the investigation of these problems surely falls within the province of economics, economics encompasses a far broader range of issues. Ultimately, economics is the study of choice. Because choices range over every imaginable aspect of human experience, so does economics. Economists have investigated the nature of family life, the arts, education, crime, sports, law—the list is virtually endless because so much of our lives involves making choices.

In Perspective

Consider some of the choices you face. Would you like better grades? More time to relax? More time watching movies? Getting better grades probably requires more time studying, and perhaps less relaxation and entertainment. Not only must we make choices as individuals, we must make choices as a society. Do we want a cleaner environment? Faster economic growth? Both may be desirable, but efforts to clean up the environment may conflict with faster economic growth. Society must make choice

Economists have a way of looking at the world that differs from the way scholars in other disciplines look at the world. It is the *economic way of thinking*; this chapter introduces that way of thinking.

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1.1 Economics

Definitions:

Economics is a social science that examines how people choose among the alternatives available to them. It is social because it involves people and their behaviour. It is a science because it uses, as much as possible, a scientific approach in its investigation of choices.

Scarcity means that human wants for goods, services and resources exceed what is available. Because of scarcity, we need to make choices.

Choices mean that one alternative is selected over another. Selecting among alternatives involves three ideas central to economics: scarcity, choice, and opportunity cost.

Scarcity

If you look around carefully, you will see that scarcity is a fact of life. Our resources are limited. At any one time, we have only so much land, so many factories, so much oil, so many people. But our wants, our desires for the things that we can produce with those resources, are unlimited. We would always like more and better housing, more and better education—more and better of practically everything.

Photo by PxHere, CC0 1.0

If our resources were also unlimited, we could say yes to each of our wants—and there would be no economics. Because our resources are limited, we cannot say yes to everything. To say yes to one thing requires that we say no to another. Whether we like it or not, we must make choices.

Our unlimited wants are continually colliding with the limits of our resources, forcing us to pick some activities and to reject others. Scarcity is the condition of having to choose among alternatives. A scarce good is one for which the choice of one alternative use of the good requires that another be given up.

Consider a parcel of land. The parcel presents us with several alternative uses. We could build a house on it. We could put a gas station on it. We could create a small park on it. We could leave the land undeveloped in order to be able to make a decision later as to how it should be used.

Suppose we have decided the land should be used for housing. Should it be a large and expensive house or several modest ones? Suppose it is to be a large and expensive house. Who should live in the house? If the Matthews live in it, the Nguyens cannot. There are alternative uses of the land both in the sense of the type of

use and also in the sense of who gets to use it. The fact that land is scarce means that society must make choices concerning its use.

Virtually everything is scarce. Consider the air we breathe, which is available in huge quantity at no charge to us. Could it possibly be scarce?

The test of whether air is scarce is whether it has alternative uses. What uses can we make of the air? We breathe it. We pollute it when we drive our cars, heat our houses, or operate our factories. In effect, one use of the air is as a garbage dump. We certainly need the air to breathe. But just as certainly, we choose to dump garbage in it. Those two uses are clearly alternatives to each other. The more garbage we dump in the air, the less desirable—and healthy—it will be to breathe. If we decide we want to breathe cleaner air, we must limit the activities that generate pollution. Air is a scarce good because it has alternative uses.

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1.2 Microeconomics & Macroeconomics

Economics is concerned with the well-being of *all* people, including those with jobs and those without jobs, as well as those with high incomes and those with low incomes. Economics acknowledges that the production of useful goods and services can create problems of environmental pollution. It explores the question of how investing in education helps to develop workers' skills. It probes questions like how to tell when big businesses or big labour unions are operating in a way that benefits society as a whole and when they are operating in a way that benefits their owners or members at the expense of others. It looks at how government spending, taxes, and regulations affect decisions about production and consumption.

It should be clear by now that economics covers considerable ground. We can divide that ground into two parts: microeconomics and macroeconomics.

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Microeconomics focuses on the actions of individual agents within the economy, like households, workers, and businesses. Some examples of microeconomics include: What determines the products, and how many of each, a firm will produce and sell? What determines the prices a firm will charge? What determines how a firm will produce its products? What determines how many workers it will hire? How will a firm finance it's business? When will a firm decide to expand, downsize, or even close?

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Macroeconomics looks at the economy as a whole. Microeconomics and macroeconomics are not separate subjects, but rather complementary perspectives on the overall subject of the economy. What determines the level of economic activity in a society? In other words, what determines how many goods and services a nation actually produces? What determines how many jobs are available in an economy? What determines a nation's standard of living?

We can determine an economy's macroeconomic health by examining a number of goals: growth in the standard of living, low unemployment, and low inflation, to name the most important.

Definitions

Microeconomics focuses on the actions of individual agents within the economy, like households, workers, and businesses.

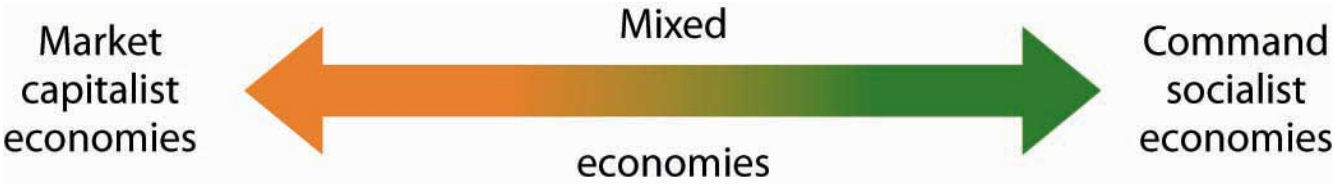
Macroeconomics looks at the economy as a whole

Organizing Economies

Think about what a complex system a modern economy is. It includes all production of goods and services, all buying and selling, all employment. The economic life of every individual is interrelated, at least to a small extent, with the economic lives of thousands or even millions of other individuals. Who organizes and coordinates this system? Who ensures that the right number of employees work in the electronics industry?

There are at least three ways that societies organize an economy.

Command economy	The government decides what goods and services will be produced and what prices it will charge for them. The government decides what methods of production to use and sets wages for workers. The government provides many necessities like healthcare and education for free. Currently, Cuba and North Korea have command economies.
Market economy	A market is an institution that brings together buyers and sellers of goods or services, who may be either individuals or businesses. The New York Stock Exchange is a prime example of a market that brings buyers and sellers together. In a market economy, decision-making is decentralized. Market economies are based on the private enterprise: the private individuals or groups of private individuals own and operate the means of production (resources and businesses). (In a command economy, by contrast, the government owns resources and businesses). A person's income is based on his or her ability to convert resources (especially labour) into something that society values. The more society values the person's output, the higher the income (think Lady Gaga or Justin Bieber). In this scenario, market forces, not governments, determine economic decisions.
Mixed economy	Most economies in the real world are mixed. They combine elements of command and market systems. The Canadian economy is positioned toward the market-oriented end of the spectrum. Some countries in Europe (Belarus) and Latin America (Venezuela), while primarily market-oriented, have a greater degree of government involvement in economic decisions than the Canadian economy. China and Russia, while over the past several decades have moved more in the direction of having a market-oriented system, remain closer to the command economy end of the spectrum.



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1.3 Scarcity and the Fundamental Economic Questions

The choices we confront in the society as a result of scarcity raise three sets of issues. Every economy must answer the following BIG questions:

1. *What should be produced?* Using the economy's scarce resources to produce one thing requires giving up another. Producing better education, for example, may require cutting back on other services, such as health care. A decision to preserve a wilderness area requires giving up other uses of the land. Every society must decide what it will produce with its scarce resources.
2. *How should goods and services be produced?* There are all sorts of choices to be made in determining how goods and services should be produced. Should a firm employ a few skilled or a lot of unskilled workers? Should it produce in its own country, or should it use foreign plants? Should manufacturing firms use new or recycled raw materials to make their products? Goods and services are produced by factors of production.
3. *For whom should goods and services be produced?* If a good or service is produced, a decision must be made about who will get it. Who gets the good or service depend on the income that people earn.

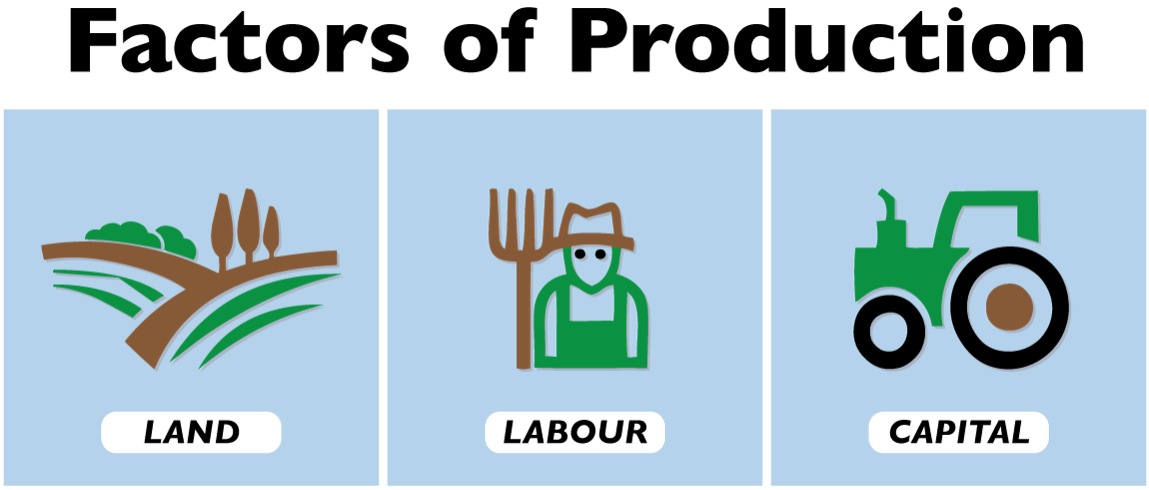
Definitions

The factors of production in an economy are its labour, capital, and natural resources.

Labour is the human effort that can be applied to the production of goods and services. People who are employed—or are available to be—are considered part of the labour available to the economy.

Capital is a factor of production that has been produced for use in the production of other goods and services. Office buildings, machinery, and tools are examples of capital. Natural resources are the resources of nature that can be used to produce goods and services.

Natural Resources have two essential characteristics, first is that they are found in nature and the second is that they can be used to produce goods and services.



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Labour earns wages and salaries, capital earns interest, natural resources such as land earns rent, and entrepreneurship earns a profit. Below we look at the factors of production in greater detail.

Labour

Labour is the human effort that can be applied to production. People who work to repair tires, pilot airplanes, teach children, or enforce laws are all part of the economy's labour. People who would like to work but have not found employment—who are unemployed—are also considered part of the labour available to the economy.

> In some contexts, it is useful to distinguish two forms of labour. The first is the human equivalent of a natural resource. It is the natural ability an untrained, uneducated person brings to a particular production process. But most workers bring far more. Skills a worker has as a result of education, training, or experience that can be used in production are called human capital. Students are acquiring human capital. Workers who are gaining skills through experience or through training are acquiring human capital.

Capital

We know that very early on, however, they began shaping stones into tools, apparently for use in butchering animals. Those tools were the first capital because they were produced for use in producing other goods—food and clothing. Modern versions of the first stone tools include saws, meat cleavers, hooks, and grinders; all are used in butchering animals. Tools such as hammers, screwdrivers, and wrenches are also capital. Transportation equipment, such as cars and trucks, is capital. Facilities such as roads, bridges, ports, and airports are capital. Buildings, too, are capital; they help us to produce goods and services.

Capital does not consist solely of physical objects. Computer software used by business firms or government agencies to produce goods and services is capital. Capital may thus include physical goods and intellectual discoveries.

Natural Resources

There are two essential characteristics of natural resources. The first is that they are found in nature—that no human effort has been used to make or alter them. The second is that they can be used to produce goods and services. That requires knowledge; we must know how to use the things we find in nature before they become resources.

Oil in the ground is a natural resource because it is found (not manufactured) and can be used to produce goods and services. In the mid-nineteenth century, a method was found for refining oil into kerosene that could be used to generate energy, transforming oil into a natural resource. Oil is now used to make all sorts of things, including clothing, drugs, gasoline, and plastic. It became a natural resource because people discovered and implemented a way to use it. Another type of natural resource is land on which factories are built to produce goods and services.

Defining something as a natural resource only if it can be used to produce goods and services does not mean that a tree has value only for its wood or that a mountain has value only for its minerals. If people gain utility from the existence of a beautiful wilderness area, then that wilderness provides a service. The wilderness is thus a natural resource.

Technology and Entrepreneurship

Goods and services are produced using the factors of production available to the economy. Two things play a crucial role in putting these factors of production to work. The first is technology, the knowledge that can be applied to the production of goods and services. The second is an individual who plays a key role in a market economy: the entrepreneur. An entrepreneur is a person who, operating within the context of a market economy, seeks to earn profits by finding new ways to organize factors of production.

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1.4 Choices

In Perspective

What motivates people as they make choices?

Choices made in Pursuing Self-Interest

Perhaps more than anything else, it is the economist's answer to this question that distinguishes economics from other fields. Economists assume that individuals make choices that they expect will create the maximum value of some objective, given the constraints they face. Furthermore, economists assume that people's objectives will be those that serve their own self-interest. Economists assume, for example, that the owners of businesses seek to maximize profit. Given the assumed goal of profit maximization, economists can predict how firms in an industry will respond to changes in the markets in which they operate. Due to relatively higher labour costs in the West, for example, economists are not surprised to see firms moving some of their manufacturing operations overseas. Similarly, in studying consumers, economists assume that individual consumers make choices aimed at maximizing their level of satisfaction.

Choices, Opportunity Cost, and Trade–Off

It is within the context of scarcity that economists define, perhaps the most important concept in all of economics, the concept of opportunity cost. Opportunity cost is the value of the best alternative forgone in making any choice.

The opportunity cost is the value of the best other use to which you could have put your time. If you choose to spend $20 on a potted plant, you have simultaneously chosen to give up the benefits of spending the $20 on pizzas or a paperback book or a night at the movies. If the book is the most valuable of those alternatives, then the opportunity cost of the plant is the value of the enjoyment you otherwise expected to receive from the book.

The concepts of scarcity, choice, and opportunity cost are at the heart of economics. A good is scarce if the choice of one alternative requires that another be given up. The existence of alternative uses forces us to make choices. The opportunity cost of any choice is the value of the best alternative forgone in making it. This is the trade-off that individuals face in making choices. As decision-makers, we have to make trade-offs on what we do with finite resources.

Choices and Marginal Thinking

Economists argue that most choices are made "at the margin." The margin is the current level of activity. Think of it as the edge from which a choice is to be made. A choice at the margin is a decision to do a little more or a little less of something. Assessing choices at the margin can lead to extremely useful insights.

Example: Water Conservation Choice

Consider, for example, the problem of curtailing water consumption when the amount of water available falls short of the amount people now use. Economists argue that one way to induce people to conserve water is to raise its price. A common response to this recommendation is that a higher price would have no effect on water consumption because water is a necessity. But choices in water consumption, like virtually all choices, are made at the margin. Individuals do not make choices about whether they should or should not consume water. Rather, they decide whether to consume a little more or a little less water.

Household water consumption in Canada totals about 329 litres per person per day (McGill University, 2020). Think of that starting point as the edge from which a choice at the margin in water consumption is made. Could a higher price cause you to use less water brushing your teeth, take shorter showers, or water your lawn less? Could a higher price cause people to reduce their use, say, to 328 gallons per person per day? To 327? When we examine the choice to consume water at the margin, the notion that a higher price would reduce consumption seems much more plausible. Prices affect our consumption of water because choices in water consumption, like other choices, are made at the margin.

"Water Conservation" by GDJ, CC0 1.0

Marginal Benefit and Marginal Cost

Most decisions involve doing a little more or a little less of something. Such as: should you watch an extra hour of TV, or study instead? Marginal cost and benefit (MC and MB): the additional cost or benefit associated with a small addition to some action. Comparing MC and MB is known as Marginal Analysis.

Definition: Marginal Analysis

Marginal analysis is the process of breaking down a decision into a series of 'yes or no' decisions. More formally, it is an examination of the additional benefits of an activity compared to the additional costs incurred by that same activity. If benefits > costs, this is the right choice for a rational thinker.

Marginal analysis is an essential concept for everything we learn in economics because it lies at the core of why we make decisions. We have just scratched the surface of it now but will go more in-depth in Chapter 2.

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McGill University. (2022). *Water is Life! How much are we using?* https://www.mcgill.ca/waterislife/waterathome/how-much-are-we-using

1.5 Economics - Social Science & Policy Tool

Economics is not a form of moral instruction. Rather, it seeks to describe economic behavior as it actually exists. Philosophers draw a distinction between positive statements, which describe the world as it is, and normative statements, which describe how the world should be.

- A statement of fact or a hypothesis is a **positive statement**. Although people often disagree about positive statements, such disagreements can ultimately be resolved through investigation such as "the unemployment rate in Canada is 6 percent," or "It is raining outside" or "Microsoft is the largest producer of operating systems for personal computers in the world." They may be true or false, but we can test them, at least in principle.

- There is another category of assertions, however, for which investigation can never resolve differences. A **normative statement** is one that makes a value judgment. Such a judgment is the opinion of the speaker; no one can "prove" that the statement is or is not correct. Here are some examples of normative statements in economics: "We ought to do more to help the poor." "People in Canada should save more." "The government should raise minimum wages." The statements are based on the values of the person who makes them. They cannot be proven false.

When economists are trying to explain the world, they are scientists. They use positive statements to describe the world and when they are trying to change the world, they are policy advisors. They use normative statements about how the world should be

Video: Positive Vs Normative

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://ecampusontario.pressbooks.pub/principlesofmicroeconomicscdn/?p=37#oembed-1

Episode 5: Positive vs Normative by mgmfoodie [1:24]

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1.6 Economic Model

Economists see the world through a different lens than anthropologists, biologists, classicists, or practitioners of any other discipline. They analyze issues and problems using economic theories that are based on particular assumptions about human behaviour. These assumptions tend to be different than the assumptions an anthropologist or psychologist might use.

Definitions:

A **theory** is a simplified representation of how two or more variables interact with each other.

A **hypothesis** is an assertion of a relationship between two or more variables that could be proven to be false.

The purpose of a theory is to take a complex, real-world issue and simplify it down to its essentials. If done well, this enables the analyst to understand the issue and any problems around it. A good theory is simple enough to understand, while complex enough to capture the key features of the object or situation you are studying. Sometimes economists use the term model instead of theory. Strictly speaking, a theory is a more abstract representation, while a model is a more applied or empirical representation Models in economics also help us to generate hypotheses about the real world.

The statement "Increased solar radiation increases the rate of plant growth" is a hypothesis; experiments could be done to show the relationship between solar radiation and plant growth. If solar radiation were shown to be unrelated to plant growth or to retard plant growth, then the hypothesis would be demonstrated to be false. If a test reveals that a particular hypothesis is false, then the hypothesis is rejected or modified. In the case of the hypothesis about solar radiation and plant growth, we would probably find that more sunlight increases plant growth over some range but that too much can actually retard plant growth. Such results would lead us to modify our hypothesis about the relationship between solar radiation and plant growth. Economists often use statistical methods to test a hypothesis.

If the tests of a hypothesis yield result consistent with it, then further tests are conducted. A hypothesis that has not been rejected after widespread testing and that wins general acceptance is commonly called a **theory**. A theory that has been subjected to even more testing and that has won virtually universal acceptance becomes a **law**.

We will examine the economic model of Production Possibilities Frontier in the next chapter and study two economic laws in chapter 3.

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1.7 Key Terms

Key Terms

Capital

Choices

Command Economy

Economics

Hypothesis

Labour

Macroeconomics

Marginal Analysis

Market Economy

Microeconomics

Mixed Economy

Normative Statement

Positive Statement

Scarcity

Technology and Entrepreneurship

Theory

CHAPTER 2: SCARCITY AND CHOICES

Chapter Outline

2.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Describe how market systems work
- Analyze Production Possibilities Frontier (PPF) and opportunity cost
- Explain Comparative Advantage and Trade

In 1968, the Rolling Stones recorded "You Can't Always Get What You Want." Economists chuckled because they had been singing a similar tune for decades.

English economist Lionel Robbins (1898–1984), in his *Essay on the Nature and Significance of Economic Science* in 1932, described not always getting what you want in this way:

> *The time at our disposal is limited. There are only twenty-four hours in the day. We have to choose between the different uses to which they may be put. … Everywhere we turn, if we choose one thing we must relinquish others which, in different circumstances, we would wish not to have relinquished. Scarcity of means to satisfy given ends is an almost ubiquitous condition of human nature.*

Because people live in a world of scarcity, they cannot have all the time, money, possessions, and experiences they wish. Neither can society.

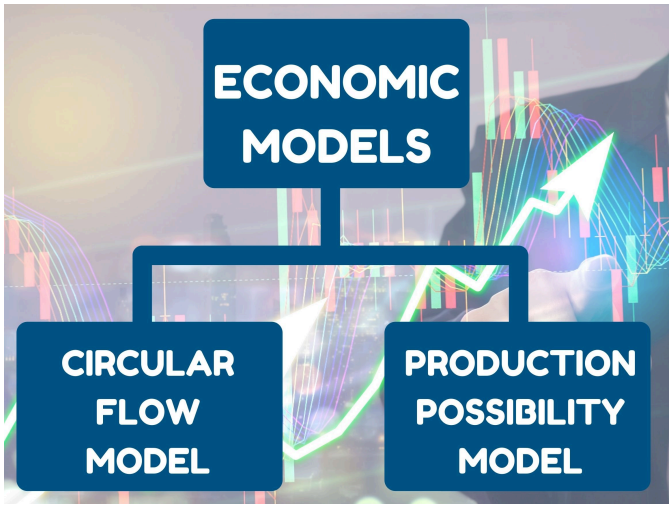
This chapter will continue our discussion of scarcity and the economic way of thinking by introducing the critical concepts of Production Possibility Frontier (PPF), Opportunity Cost, and Comparative Advantage as the basis for international trade.

Attribution

2.1 Economic Model

An economic model is a simplified framework that is designed to illustrate complex processes. Oftentimes in introductory Microeconomics, these models seem oversimplified because they hold certain variables constant. While one should remain aware of this, these models are still useful. Holding some information constant can help us understand a concept without being overwhelmed by a vast number of influencing factors. Economic models are the building blocks of most modern economic theories. By understanding these models, we can develop a mindset to understand the economic world.

The two basic Economic Models we shall consider here are:



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- Circular Flow Model
- Production Possibility Model

Video: Economic Models & Theories

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Episode 5A: Models & Theories by mgmfoodie [3:26]

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"2.2 Production Possibility Frontier" in Principles of Microeconomics by Dr. Emma Hutchinson, University of

2.2 Circular Flow Model

A good model to start within economics is the **Circular Flow Diagram** (Fig 2.1). It pictures the economy as consisting of two groups—households and firms—that interact in two markets: the *goods and services market* in which firms sell and households buy and the *labour market* in which households sell labour to business firms or other employees.

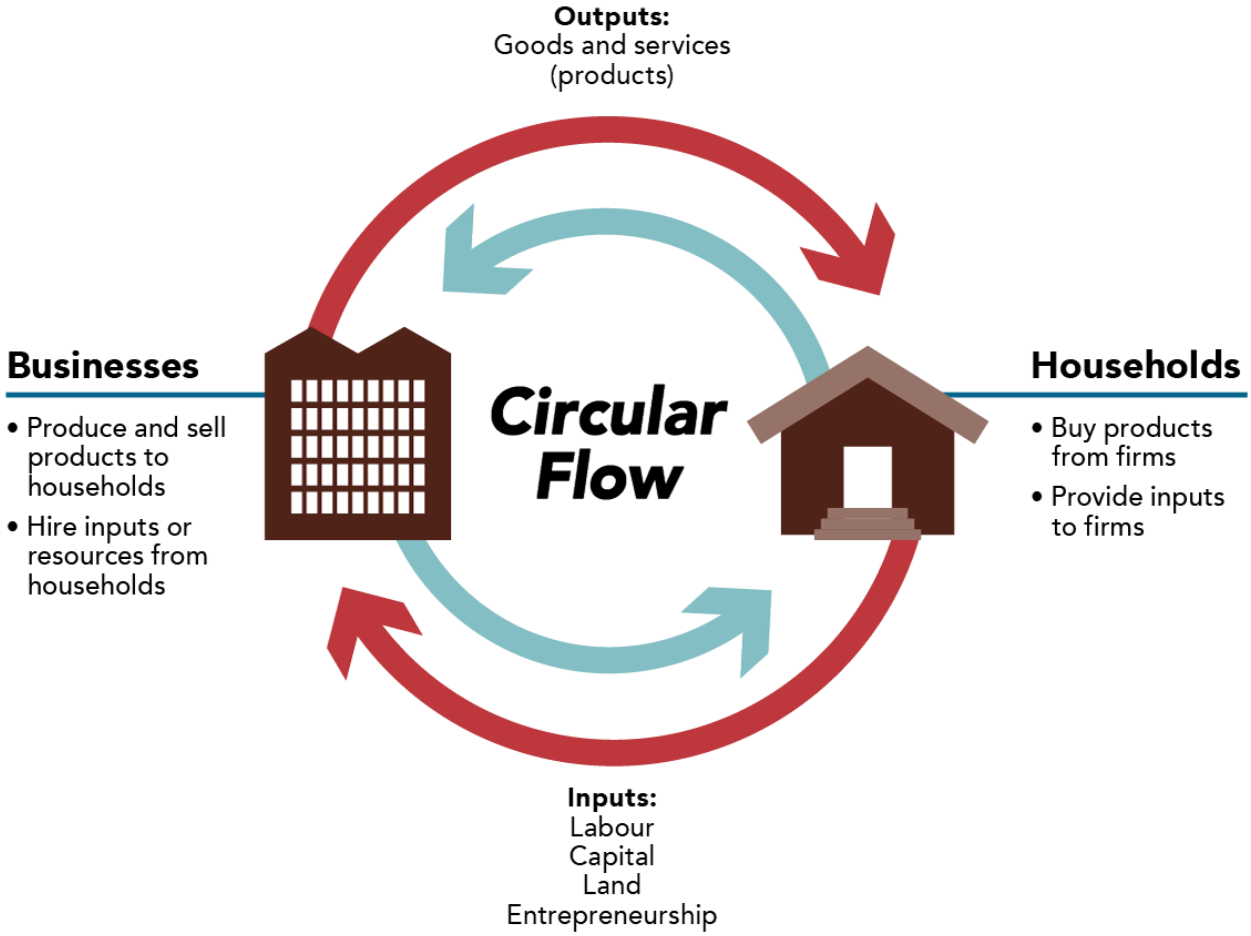

Figure 2.1. Circular Flow Model. Households and firms interact in two markets. By Fanshawe College, CC-BY-NC-SA 4.0

Clockwise arrows show Firms produce and sell goods and services to households in the market for goods and services (or product market). Households provide the labour and other resources (e.g. land, capital, raw materials) firms need to produce goods and services in the market for inputs (or factors of production). Next, households pay for goods and services, which becomes the revenues to firms. This is the anticlockwise arrow going from firms to households. The anti clockwise arrows indicate the payments: firms pay for the inputs (or resources) they use in the form of wages and other factor payments. And households earn income from these payments that allow them to pay for the goods and services they produce.

There are many different markets for goods and services and markets for many different types of labour. The circular flow diagram simplifies this to make the picture easier to grasp. In the diagram, firms produce goods

and services, which they sell to households in return for revenues. The outer circle shows this, and represents the two sides of the product market (for example, the market for goods and services) in which households demand and firms supply. Households sell their labour as workers to firms in return for wages, salaries, and benefits. The inner circle shows this and represents the two sides of the labour market in which households supply and firms demand.

This version of the circular flow model is stripped down to the essentials, but it has enough features to explain how the product and labour markets work in the economy. We could easily add details to this basic model if we wanted to introduce more real-world elements, like financial markets, governments, and interactions with the rest of the globe (imports and exports).

Attribution

2.3 Production Possibility Model

Just as individuals cannot have everything they want and must instead make choices, society as a whole cannot have everything it might want, either. This section of the chapter will explain the constraints society faces, using a model called the **Production Possibilities Frontier (PPF).**

In perspective

"Pineapple" by Twitter Emoji, CC BY 4.0.

You are stranded on a tropical island alone. On this island, there are only two foods: pineapples and crabs.

In other words, you face a trade-off: any time you spend harvesting pineapples is time that cannot be spent looking for crabs. You are forced to make a decision on how to allocate the scarce resource of time.

While this is an extreme example, it is reflective of a common problem in production. Since there are only a certain number of hours in the day, time is a scarce resource. This scarcity limits the amount of total production.

Possibilities	P	C
A	0	15
B	10	12
C	20	8
D	30	0

You
Fig. 2.2

Fig 2.2 – By Fanshawe College, CC-BY-NC-SA 4.0

Figure 2.2 displays a table showing several different combinations of goods that can be harvested in a given week. The table is very logical – if you spend all your time catching crabs, you will have no pineapples. Notice that you can produce either all crabs, all pineapples, or a mix of the two.

Assume you choose to only catch crabs. How many would have to be given up in order to obtain ten pineapples? In this example, three. This is an important concept; even though our scarce resource is time, we can measure the cost of a good, in this case, pineapples, in terms of the foregone good, in this cases crabs.

> This concept is called the **Marginal (Opportunity) Cost** of an action. In this case, since you have to give up three crabs to produce 10 pineapples, the marginal cost for one pineapple is 3/10 of a crab.

Notice how the marginal cost changes as you harvest more pineapples. To produce the next ten pineapples, it costs four crabs, and the next ten costs eight. Now there are no more crabs to give up. While marginal opportunity cost is not always increasing, it is intuitive to think that the more pineapples you pick, the harder they will be to find, and therefore the more time you will have to give up to harvest 10 more.

While much useful analysis can be conducted with a chart, it is often useful to represent our models graphically. **A Production Possibility Frontier (PPF)** is the graphical representation of Figure 2.2. It represents the maximum combination of goods that can be produced given available resources and technology. Each point represents one of the combinations from Figure 2.2.

In our example, while we would love to produce 30 pineapples and 30 crabs, this is out of our realm of possible production. In other words, it is not a point on our PPF.

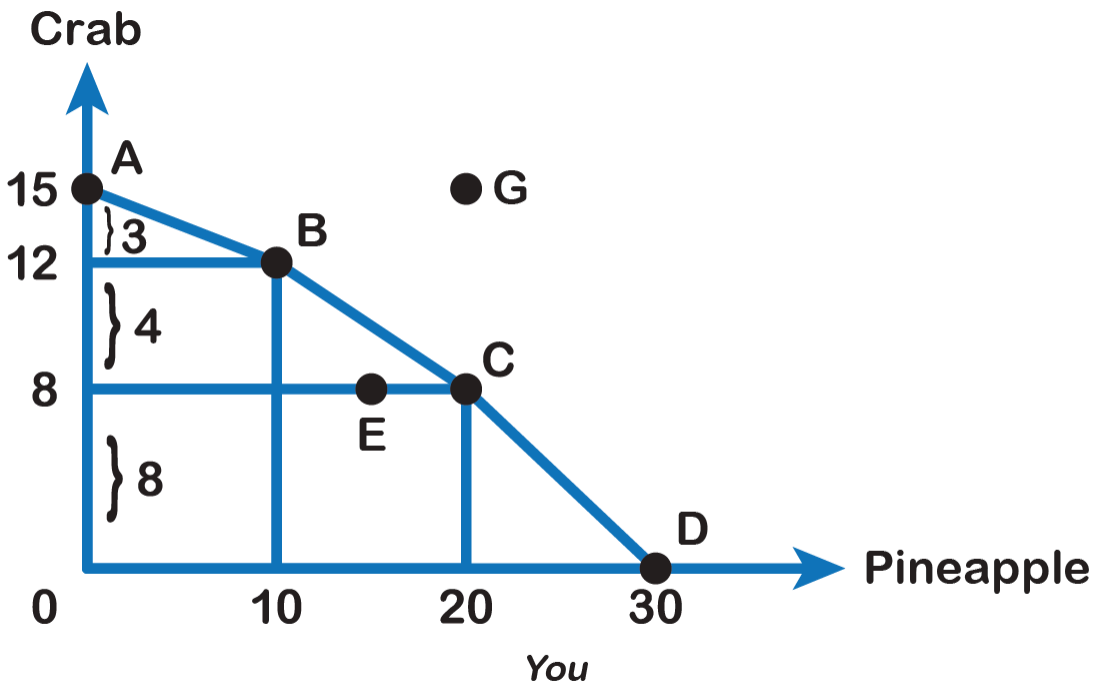

Fig 2.3 – By Fanshawe College, CC-BY-NC-SA 4.0

Using our terminology from before, each point along our PPF (i.e. Point A) is *efficient* (in a one-person world) since there is no way to get more pineapples without giving up some crabs and vice-versa. If we are inside the PPF (i.e. Point B), we are not fully using our resources. In this case, we can produce more pineapples without having to give up any more crabs. This point is **inefficient**. Points outside the PPF (i.e. Point C), while preferable, are *unattainable* given constraints in resources and time.

PPF and Increasing Opportunity Cost

Using our analysis of Marginal Cost (MC) from before, we see that the Slope (absolute value) of the PPF is the amount of the good on the vertical axis given up to obtain additional units of the good on the horizontal axis. Recall that slope is calculated using rise overrun. From Fig 2.2, we see that to gain 10 additional pineapples (from 10 to 20 units), we give up 4 crabs (12 to 8 units). To obtain another 10 units of pineapples (from 20 to 30

units), we give up 8 crabs (8 to 0 units). As we move down the PPF, the slope and MC increase. This pattern is common enough that economists have given it a name: **the law of increasing opportunity cost.**

Definition: law of increasing opportunity cost

The law of increasing opportunity cost – which holds that as the production of a good or service increases, the marginal opportunity cost of producing it increases as well.

This happens because some resources are better suited for producing certain goods and services instead of others. When the producer wants to obtain more pineapples and devotes more resources (time and effort) to it, there will be fewer resources available for obtaining the other goods, crab. Therefore, more pineapples result in the greater sacrifice of crabs.

Our government spends a certain amount of funds on reducing crime. However, additional increases typically cause relatively larger increases in the opportunity cost of reducing crime, and paying for enough police and security to reduce crime to nothing at all would be a tremendously high opportunity cost.

The curvature of the production possibilities frontier shows that as we add more resources to pineapples, moving from left to right along the horizontal axis, the original increase in opportunity cost is fairly small, but gradually increases. In this way, the law of increasing opportunity cost produces the outward-bending shape of the production possibilities frontier.

Attribution

2.4 Economic Growth

Shifting a PPF

An increase in the physical quantity or in the quality of factors of production available to an economy or a technological gain will allow the economy to produce more goods and services; it will shift the economy's production possibilities curve outward. The process through which an economy achieves an outward shift in its production possibilities curve is called economic growth. An outward shift in a production possibilities curve is illustrated in Fig 2.4. In Panel (a), a point such as N is not attainable; it lies outside the production possibilities curve. Growth shifts the curve outward, as in Panel (b), making previously unattainable levels of production possible. **Economic Growth** allows countries, individuals, or firms to reach points outside their PPF. Factors that allow shifts in countries' PPF, resulting in a change in attainable output include:

- *Advancement in Technology* . If you were to invent a computer system that showed the location of crabs and pineapples on the island, you would be able to produce more of both goods, shifting the PPF outward.
- *More Physical capital, Education or Training*. If you were to become more skilled at harvesting pineapples or crabs and obtain more equipment, your attainable output would increase, shifting the PPF outward.

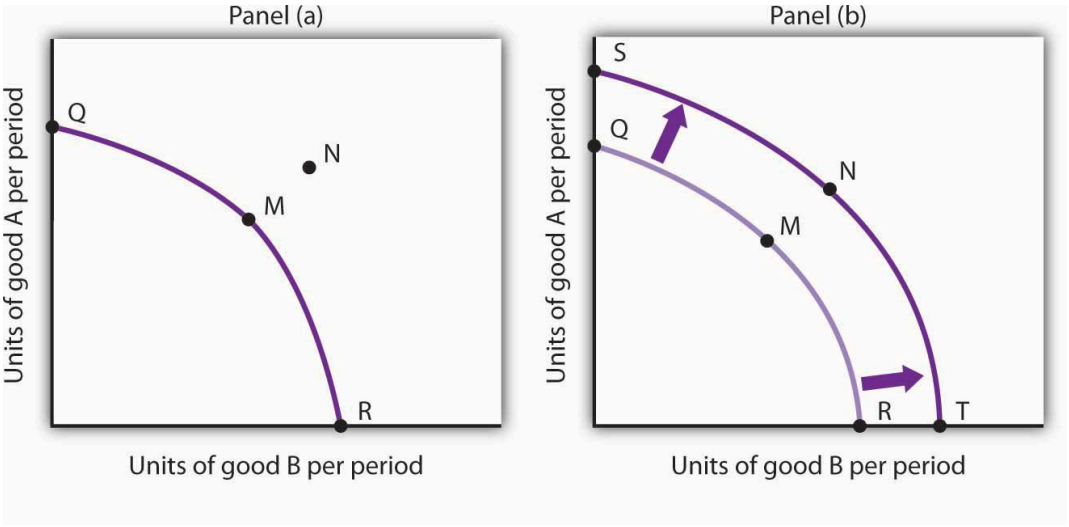

Fig 2.4 "Economic Growth and the Production Possibilities Curve" by University of Minnesota, CC BY-NC-SA 4.0.

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"2.2 Production Possibility Frontier" in Principles of Microeconomics by Dr. Emma Hutchinson, University of Victoria is licensed under a Creative Commons Attribution 4.0 International License, except where otherwise noted.

"2.3 Applications of the Production Possibilities Model" in Principles of Macroeconomics by University of

2.5 PPF and International Trade

"Globalization Networking" by faith.e.murphy Murphy, Public Domain.

One of the most important implications of the concepts of the production possibilities curve relates to international trade. The evidence that international trade confers overall benefits on economies is very strong. Trade has accompanied economic growth in Canada and around the world. Many economies that have shown the most rapid growth in the last few decades—for example, Japan, South Korea, China, and India—have done so by dramatically orienting their economies toward international trade. To understand the benefits of trade, or why we trade in the first place, we need to understand the concepts of comparative and absolute advantage.

In the previous section on the production possibilities frontier, we stated that points outside the PPF were not possible given our constraints. With trade, these constraints can change. Continuing the pineapple and crab example from Fig 2.2, suppose another person, Jamie, becomes stranded on the island with you. You could choose to avoid him and live your own separate lives, or you could work together to improve each other's well-being. It turns out Jamie has different skills than you – he is *better* at producing crabs and you are *better* at growing pineapples. Jamie's production possibilities are shown in the table below (Fig 2.5).

Possibilities	P	C
A^1	0	20
B^1	5	15
C^1	10	9
D^1	15	0

Jamie
Fig. 2.5

Fig 2.5 – By Fanshawe College, CC-BY-NC-SA 4.0

In this case, where one person or group is *better* at producing a good, we say they have an **Absolute Advantage** in the production of the good. In this example, from Fig 2.2 and 2.5, Jamie has an absolute advantage in the production of crab as he can produce a maximum of 20 crabs while you can produce a maximum of 15 crabs, and you have an absolute advantage in producing pineapples as you can grow a maximum of 30 pineapples while Jamie can produce a maximum of 15 only. The graph below (Fig 2.6) shows Jamie's production possibilities.

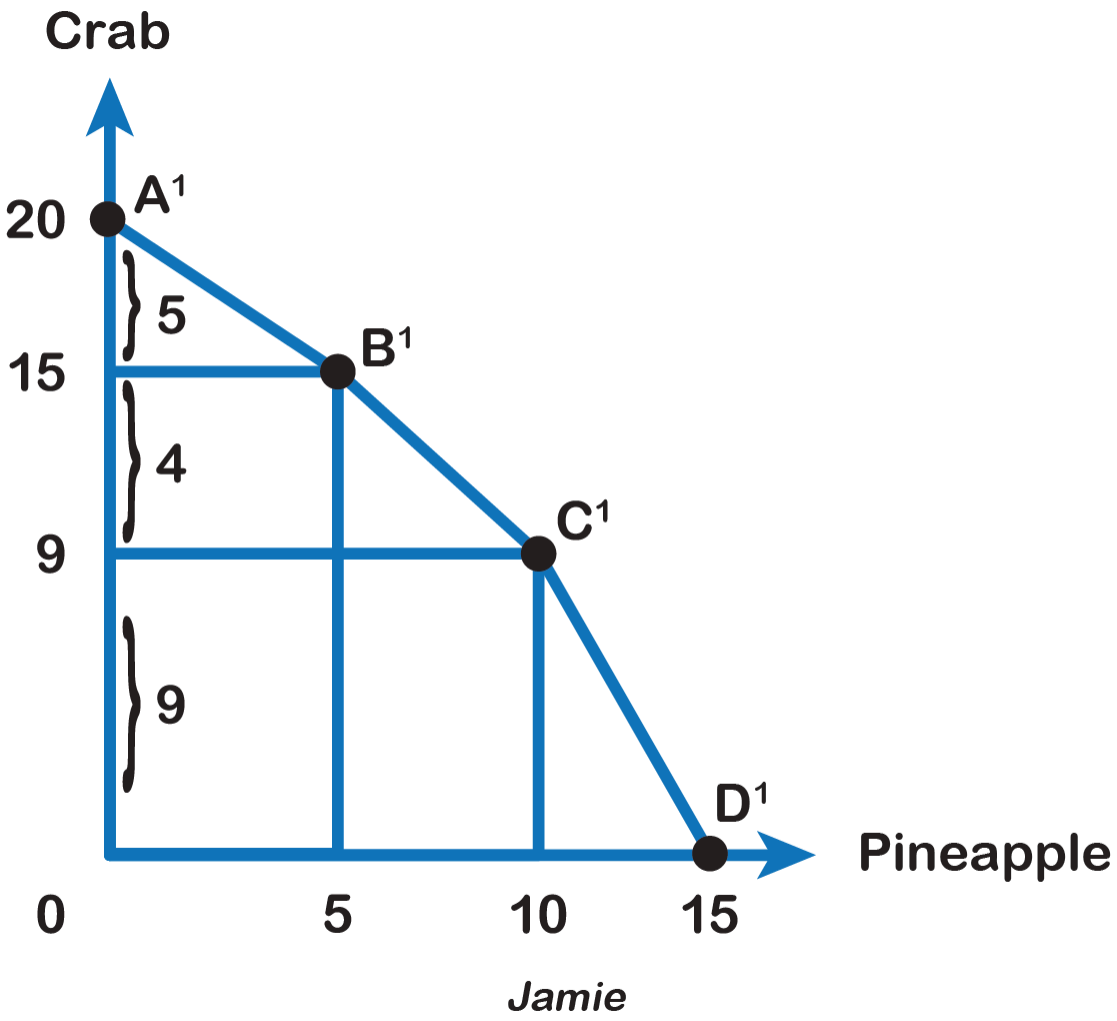

Fig 2.6 – By Fanshawe College, CC-BY-NC-SA 4.0

The basis for trade is **Comparative Advantage**. When one is able to produce a good at a lower opportunity cost than another, the person is said to be efficient or have a comparative advantage in producing that good.

Finding Out Comparative Advantage

Refer to Fig 2.3. When you produce 15 crabs, you give up 30 pineapples. So your opportunity cost of producing 1 crab is 2 pineapples. Referring to Fig 2.6, when Jamie produces 20 crabs, he gives up 15

pineapples. So Jamie's opportunity cost of producing 1 crab is 0.75 pineapples. Because Jamie has a lower opportunity cost in producing crabs, he has a **comparative advantage** in crabs. Similarly, we can find your opportunity cost in producing 1 pineapple is 0.5 crabs and Jamie's opportunity cost is 1.33 crabs. Therefore, we can infer you have a lower opportunity cost or **comparative advantage** in producing pineapples.

Comparative Advantage and Specialization

When one has a comparative advantage in producing a good, that person should specialize in producing that good. This **specialization** in production results in gains from trade, as each person or country, can focus on what it can produce at the lowest cost and trade it with its partner.

Note that even though Jamie had the absolute advantage in both goods, his opportunity cost of producing crabs was still higher, since opportunity or marginal cost is based on a trade-off between the two goods. We can liken this example to trade between Canada and a developing country. Canada may be better at producing both computers and textiles (the absolute advantage) but the advantages we have in producing computers are far greater. Any hour we have to give up to produce textiles comes at a much higher cost to us than it would to a developing country, giving us the comparative advantage at producing computers, and the developing country the advantage at producing textiles.

The island example is no different. Even though Jamie is better at producing pineapples, what Jamie is really an expert at is producing crabs, so having to give up time spent catching crabs comes at a high cost. Therefore, you should specialize in producing pineapples and export them to Jamie while Jamie should specialize in producing crabs and export them to you.

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2.6 Gains from Trade

Trade Example

Suppose, before trade you choose to produce 20 pineapples and 8 crabs and Jamie chooses to produce 10 pineapples and 9 crabs. Because you have a comparative advantage in growing pineapples, you should specialize in pineapples and can grow a maximum of 30 pineapples. Jamie specializes in crabs and produces a maximum of 20 crabs. In this situation, both players are producing only the goods they have the comparative advantage in.

Before Trade Production Possibilities:

Fig 2.7

	Pineapple	**Crab**
You	20	8
Jamie	10	9

Exchange: If You and Jamie choose to trade 10 pineapples for 9 crabs, then after trade You are left with 20 pineapples and 9 crabs (point S in Fig 2.8 Panel (A)) while Jamie is left with 10 pineapples and 11 crabs (Point S^1 in Fig 2.8 Panel (B)). Therefore, after the trade, You gain +1 crab, and Jamie gains +2 crabs. Both trading partners move to a point outside their current PPF, resulting in economic growth. Figure 2.8 (Panels (A) and (B)) and Fig 2.9 below show Yours and Jamie's production possibilities both before and after the trade. After trade, you move to S from C, while Jamie moves to S^1 from C^1.

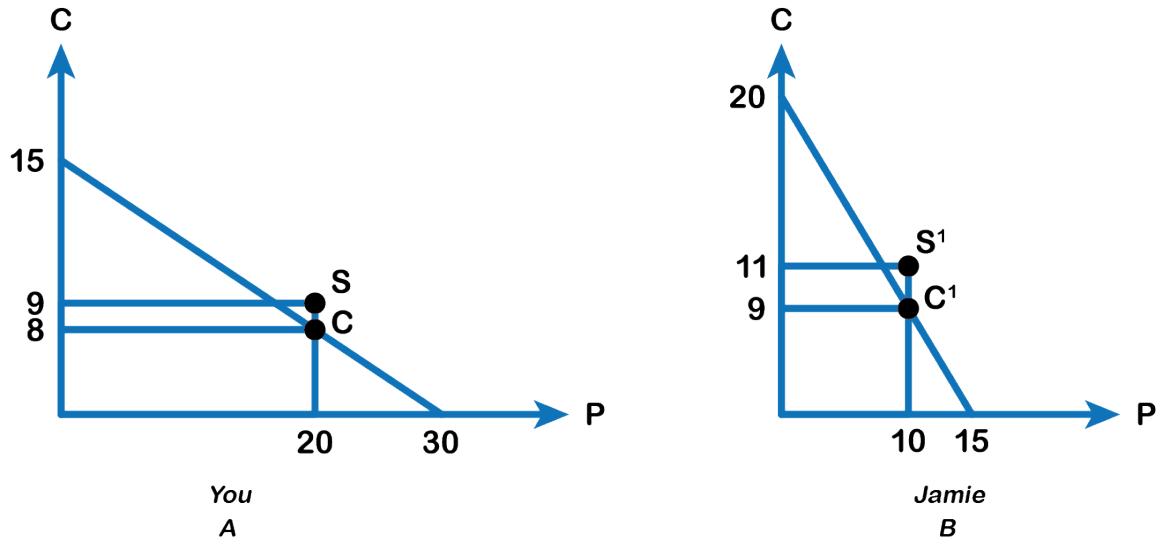

Fig 2.8 – By Fanshawe College, CC-BY-NC-SA 4.0

	You		Jamie	
	Pineapples	**Crabs**	**Pineapples**	**Crabs**
Before trade production	20	8	10	9
Specialization	30	0	0	20
After trade production and consumption	20	9	10	11
Gains from trade	-	+1	-	+2

Fig 2.9

The **implications** of our model for trade are that
(a) trade is mutually beneficial
(b) certainly redistributes resources among the two trading partners
(c) leads to specialization and greater skills.
This reallocation of resources produces enormous benefits, but they do not come without costs.

In Chapter 2, we have explored the production possibility model in-depth, looking at a simplified version of trade and deepening our understanding of opportunity costs. Now, we can take our knowledge of basic economic modelling and examine one of the most important of microeconomics: supply and demand.

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2.7 Key Terms

Key Terms

Absolute Advantage

Circular Flow Diagram

Comparative Advantage

Economic Growth

Economic Model

Production Possibility Frontier (PPF)

Specialization

The law of increasing opportunity cost

CHAPTER 3: DEMAND AND SUPPLY

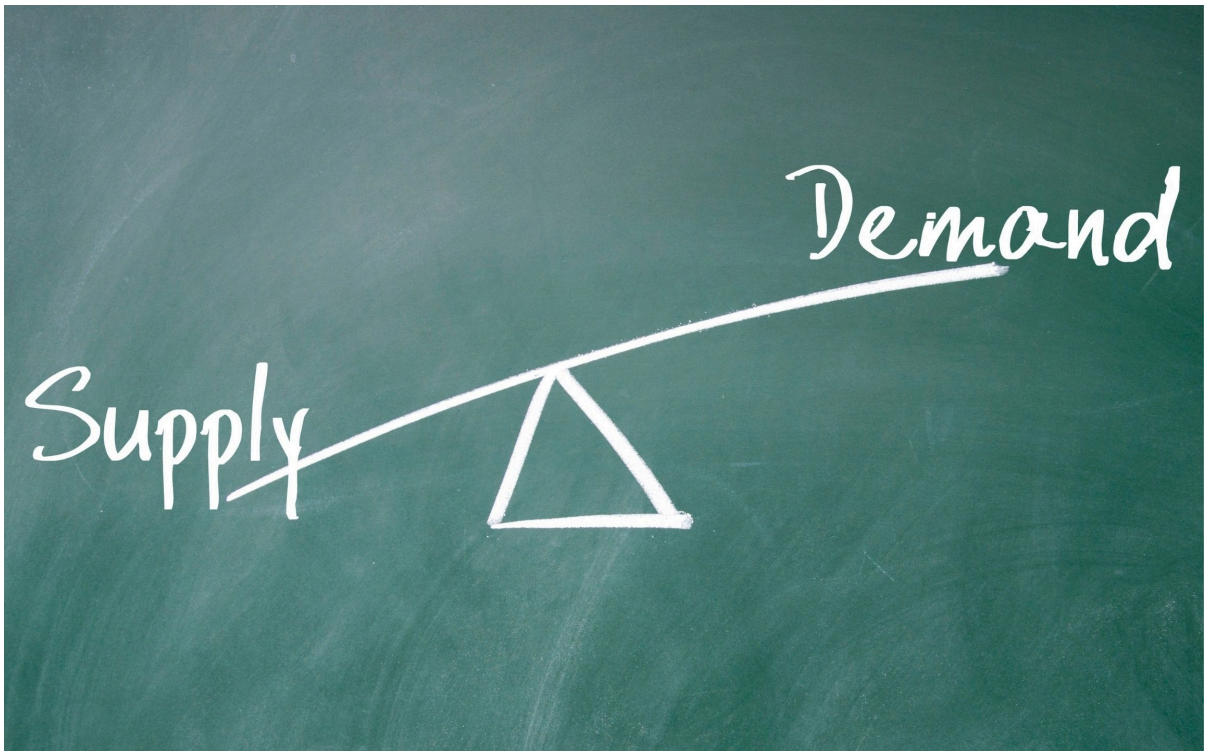
Chapter Outline

3.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Explain Demand and Quantity demanded
- Discuss variables that influence demand
- Describe Supply and Quantity supplied
- Elaborate variables that influence supply
- Illustrate Market Equilibrium
- Use demand-supply graphs to predict changes in price and quantity



"Supply and Demand" by Fanshawe College, CC-BY-NC-SA 4.0

When economists talk about prices, they are less interested in making judgments than in gaining a practical understanding of what determines prices and why prices change.

In perspective

Consider a price most of us contend with weekly: that of a litre of gas. Why was the average price of gasoline in Canada $1.39 per litre in July 2021? Why did the price for gasoline fall sharply to 77.8 cents per litre in April 2020? To explain these price movements, economists focus on the determinants of what gasoline buyers are willing to pay and what gasoline sellers are willing to accept.

Usually, the price of gasoline in June of any given year is nearly always higher than the price in January. Over recent decades, gasoline prices in midsummer have averaged about 10 cents per gallon more than their midwinter low. The likely reason is that people drive more in the summer, and are also willing to pay more for gas, but that does not explain how steeply gas prices fell. Other factors were at work during those 18 months, such as increases in supply and decreases in the demand for crude oil.

This chapter introduces the economic model of demand and supply—one of the most powerful models in all of economics. The discussion here begins by examining how demand and supply determine the price and the quantity sold in markets for goods and services, and how changes in demand and supply lead to changes in prices and quantities.

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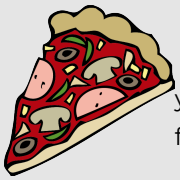
3.1 Demand

Price and Quantity Demanded

While different variables play different roles in influencing the demands for different goods and services, economists pay special attention to one: *the price of the good or service*. Given the values of all the other variables that affect demand, a higher price tends to reduce the quantity people demand, and a lower price tends to increase it.

In perspective



"Slice of pizza" by OpenClipart, Public Domain.

A medium pizza typically sells for $5 to $10. Suppose the price was $30. Chances are, you would buy fewer pizzas at that price than you do now. Suppose pizzas typically sold for $2 each. At that price, people would be likely to buy more pizzas than they do now.

We will discuss first how price affects the quantity demanded of a good or service and then how other variables affect demand. Because people will purchase different quantities of a good or service at different prices, economists must be careful when speaking of the "demand" for something. They have therefore developed some specific terms for expressing the general concept of demand.

The quantity demanded of a good or service is the quantity buyers are willing and able to buy at a particular price during a particular period, all other things unchanged ("ceteris paribus" in Latin).

Example: Demand

Suppose, for example, that 100,000 movie tickets are sold each month in a particular town at a price of $8 per ticket. That quantity—100,000—is the quantity of movie admissions demanded per month at a price of $8. If the price were $12, we would expect the quantity demanded to be less. If it were $4, we would expect the quantity demanded to be greater. The quantity demanded at each price would be different if other things that might affect it, such as the population of the town, were to change. That is why we add the qualifier that *other things have not changed* to the definition of quantity demanded.

A demand schedule is a table that shows the quantities of a good or service demanded at different prices during a particular period, all other things unchanged. To introduce the concept of a demand schedule, let us consider the demand for coffee in Canada. The table in the figure below shows quantities of coffee that will be demanded each month at prices ranging from $9 to $4 per pound; the table is a demand schedule. We see that the higher the price, the lower the quantity demanded and vice versa.

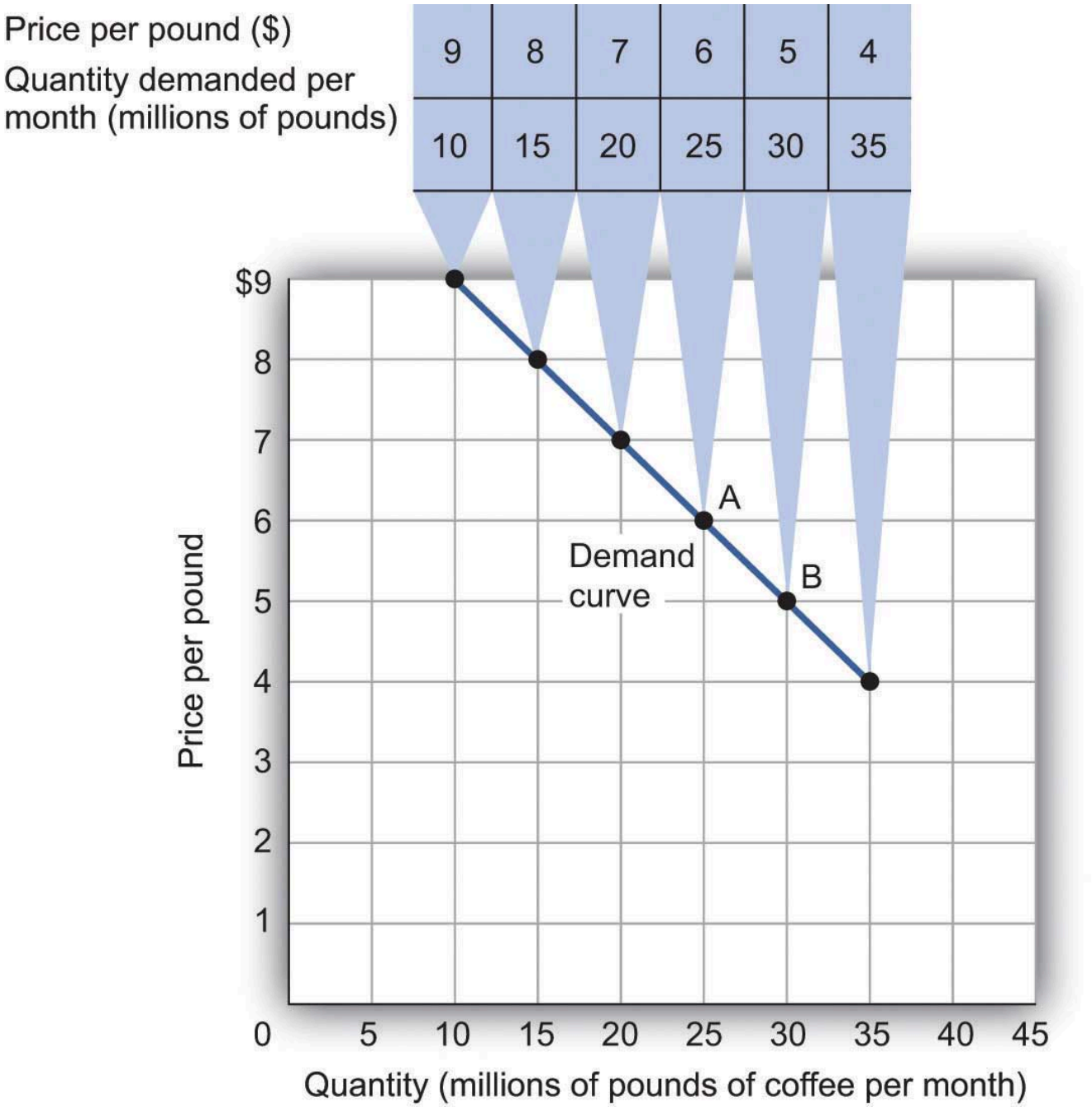


Fig 3.1. "A Demand Schedule and a Demand Curve" by University of Minnesota, CC BY-NC-SA 4.0.

The information given in a demand schedule can be presented with a demand curve, which is a graphical representation of a demand schedule. A demand curve thus shows the relationship between the price and

quantity demanded of a good or service during a particular period, all other things unchanged. The demand curve in the above figure shows the prices and quantities of coffee demanded that are given in the demand schedule. At point A, for example, we see that 25 million pounds of coffee per month are demanded at a price of $6 per pound. By convention, economists graph price on the vertical axis and quantity on the horizontal axis.

A change in price, with no change in any of the other variables that affect demand, results in a movement along the demand curve. If the price of coffee falls from $6 to $5 per pound, consumption rises from 25 million pounds to 30 million pounds per month. That is a movement from point A to point B along the demand curve in Fig 3.1. A movement along a demand curve that results from a change in price is called a **change in quantity demanded.** Note that a change in quantity demanded is not a change or shift in the demand curve; it is a movement along the demand curve.

All other things unchanged, the Law of demand holds that, for virtually all goods and services, a higher price leads to a reduction in quantity demanded and a lower price leads to an increase in quantity demanded. The law of demand is called a law because the results of countless studies are consistent with it. Given the values of other variables that influence demand, a higher price reduces the quantity demanded. A lower price increases the quantity demanded. Demand curves, in short, slope downward, as seen in the graph above.

Attributions

3.2 Changes in Demand

Price alone does not determine the quantity of a good or service that people consume.

Coffee consumption, for example, will be affected by such variables as income and population. Preferences also play a role. We also expect other prices to affect coffee consumption. People often eat doughnuts or bagels with their coffee, so a reduction in the price of doughnuts or bagels might induce people to drink more coffee. An alternative to coffee is tea, so a reduction in the price of tea might result in the consumption of more tea and less coffee. Thus, a change in any one of the variables held constant in constructing a demand schedule will change the quantities demanded at each price. The result will be a shiftin the entire demand curve rather than a movement along the demand curve. A shiftin a demand curve is called a changein demand.

Factors that change demand:

Prices of Related Goods and Services

In general, if a reduction in the price of one good increases the demand for another, the two goods are called **complements**. If a reduction in the price of one good reduces the demand for another, the two goods are called **substitutes**. These definitions hold in reverse as well: two goods are complements if an increase in the price of one reduces the demand for the other, and they are substitutes if an increase in the price of one increases the demand for the other. Doughnuts and coffee are complements; tea and coffee are substitutes.

Refer to Fig 3.2, when the price of tea, a substitute for coffee rises, more coffee is demanded at each price, as people substitute away from tea and consume more coffee. The result is a shift in demand from the original curve D1 to D2. The quantity of coffee demanded at a price of $6 per pound rises from 25 million pounds per month (point A) to 35 million pounds per month (point A'). Note, that a change in quantity demanded, ceteris paribus, refers to a movement along the demand curve, while a change in demand refers to a shift in the demand curve. A *rightward* shift of the demand curve is called an *increase* in demand.

Price	Old quantity demanded	New quantity demanded
$9	10	20
8	15	25
7	20	30
6	25	35
5	30	40
4	35	45

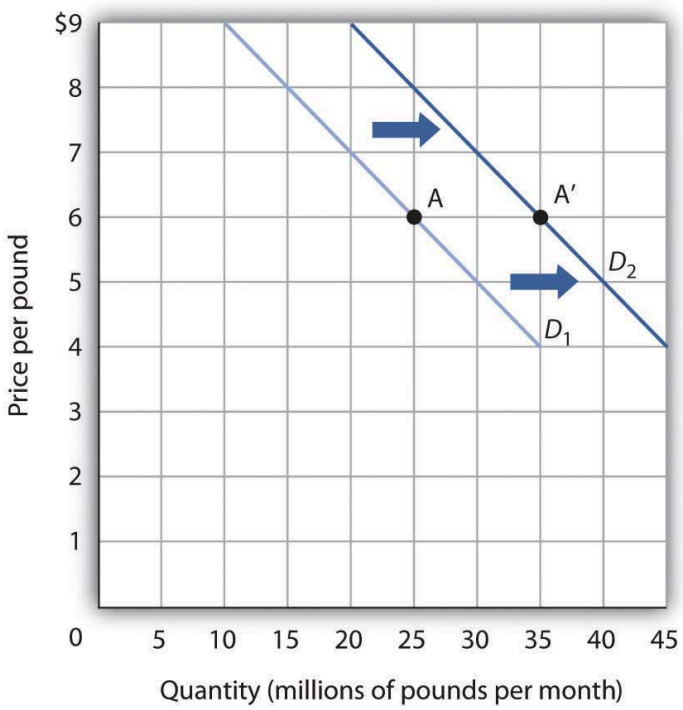


Fig 3.2 "An Increase in Demand" by University of Minnesota, CC BY-NC-SA 4.0.

Refer to Fig 3.3, when the price of tea, a substitute for coffee falls, less coffee is demanded at each price, as people substitute away from coffee because tea is relatively cheaper. The result is a shift in demand from the original curve D1 to D3. The quantity of coffee demanded at a price of $6 per pound falls from 25 million pounds per month (point A) to 15 million pounds per month (point A"). Note, again, that a change in quantity demanded, ceteris paribus, refers to a movement along the demand curve, while a change in demand refers to a shift in the demand curve. A *leftward* shift of the demand curve is called a *decrease* in demand.

Price	Old quantity demanded	New quantity demanded
$9	10	0
8	15	5
7	20	10
6	25	15
5	30	20
4	35	25

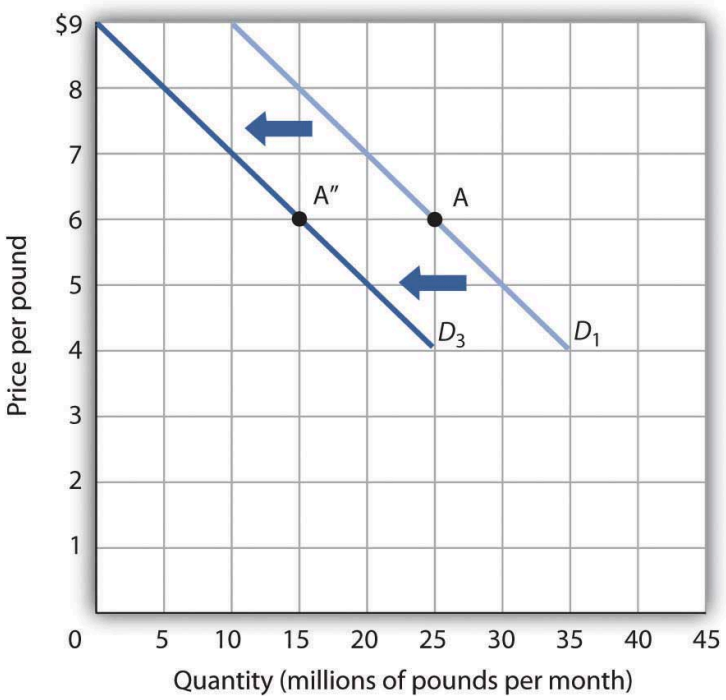


Fig 3.3 "A Reduction in Demand" by University of Minnesota, CC BY-NC-SA 4.0.

Income

As incomes rise, people increase their consumption of many goods and services, and as incomes fall, their consumption of these goods and services falls. An increase in income is likely to raise the demand for gasoline, ski trips, new cars, and jewellery. There are, however, goods and services for which consumption falls as income rises—and rises as income falls. As incomes rise, for example, people tend to consume more fresh fruit but less canned fruit.

A good for which demand increases when income increases is called a normal good. A good for which demand decreases when income increases is called an inferior good. An increase in income shifts the demand curve for fresh fruit (a **normal** good) to the right; it shifts the demand curve for canned fruit (an **inferior** good) to the left.

Preferences

Changes in preferences of buyers can have important consequences for demand. An example is reduced demand for cigarettes caused by concern about the effect of smoking on health. A change in preferences that makes one good or service more popular will shift the demand curve to the right. A change that makes it less popular will shift the demand curve to the left.

Demographic Characteristics

The number of buyers affects the total quantity of a good or service that will be bought; in general, the greater

the population, the greater the demand. Other demographic characteristics can affect demand as well. As the share of the population over age 65 increases, the demand for medical services increases. When birth rates increase, this raises the demand for such things as infant supplies, elementary school teachers, soccer coaches, in-line skates, and college education. Demand can thus shift as a result of changes in both the number and characteristics of buyers.

Buyer Expectations about future prices

The consumption of goods that can be easily stored, or whose consumption can be postponed, is strongly affected by buyer expectations. The expectation of newer TV technologies, such as high-definition TV, could slow down sales of regular TVs. If people expect gasoline prices to rise tomorrow, they will fill up their tanks today to try to beat the price increase. The same will be true for goods such as automobiles and washing machines: an expectation of higher prices in the future will lead to more purchases today. If the price of a good is expected to fall, however, people are likely to reduce their purchases today and await tomorrow's lower prices. The expectation that computer prices will fall, for example, can reduce current demand.

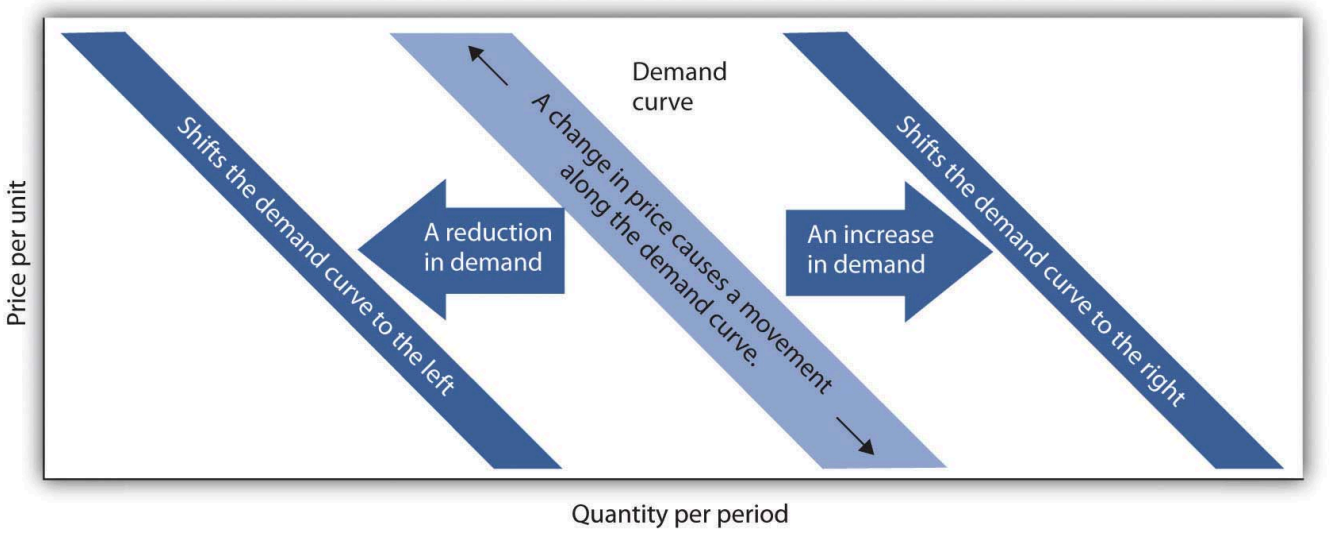


Fig 3.4 Figure by University of Minnesota, CC BY-NC-SA 4.0

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3.3 Supply

Price and Quantity Supplied

In Perspective

What determines the quantity of a good or service sellers are willing to offer for sale?

Price is one factor; ceteris paribus, a higher price is likely to induce sellers to offer a greater quantity of a good or service. Production cost is another determinant of supply. Variables that affect production cost include the prices of factors used to produce the good or service, returns from alternative activities, technology, the expectations of sellers, and natural events such as weather changes. We will discuss first how price affects the quantity supplied of a good or service and then how other variables affect supply.

Definition: Quantity supplied

The **quantity supplied**of a good or service is the quantity sellers are willing to sell at a particular price during a particular period, all other things unchanged. Ceteris paribus, the receipt of a higher price increases profits and induces sellers to increase the quantity they supply. In general, an increase in price results in an increase in quantity supplied, and this relationship is often referred to as the **Law of supply**, other factors remaining unchanged.

The relationship between price and quantity supplied is suggested in a supply schedule, a table that shows quantities supplied at different prices during a particular period, all other things unchanged. Fig 3.5below gives a supply schedule for the quantities of coffee that will be supplied per month at various prices, ceteris paribus. At a price of $4 per pound, for example, producers are willing to supply 15 million pounds of coffee per month. A higher price, say $6 per pound, induces sellers to supply a greater quantity—25 million pounds of coffee per month.

A supply curve thus shows the relationship between the price and quantity supplied of a good or service during a particular period, all other things unchanged. Because the relationship between price and quantity supplied is generally positive, supply curves are generally upward sloping.

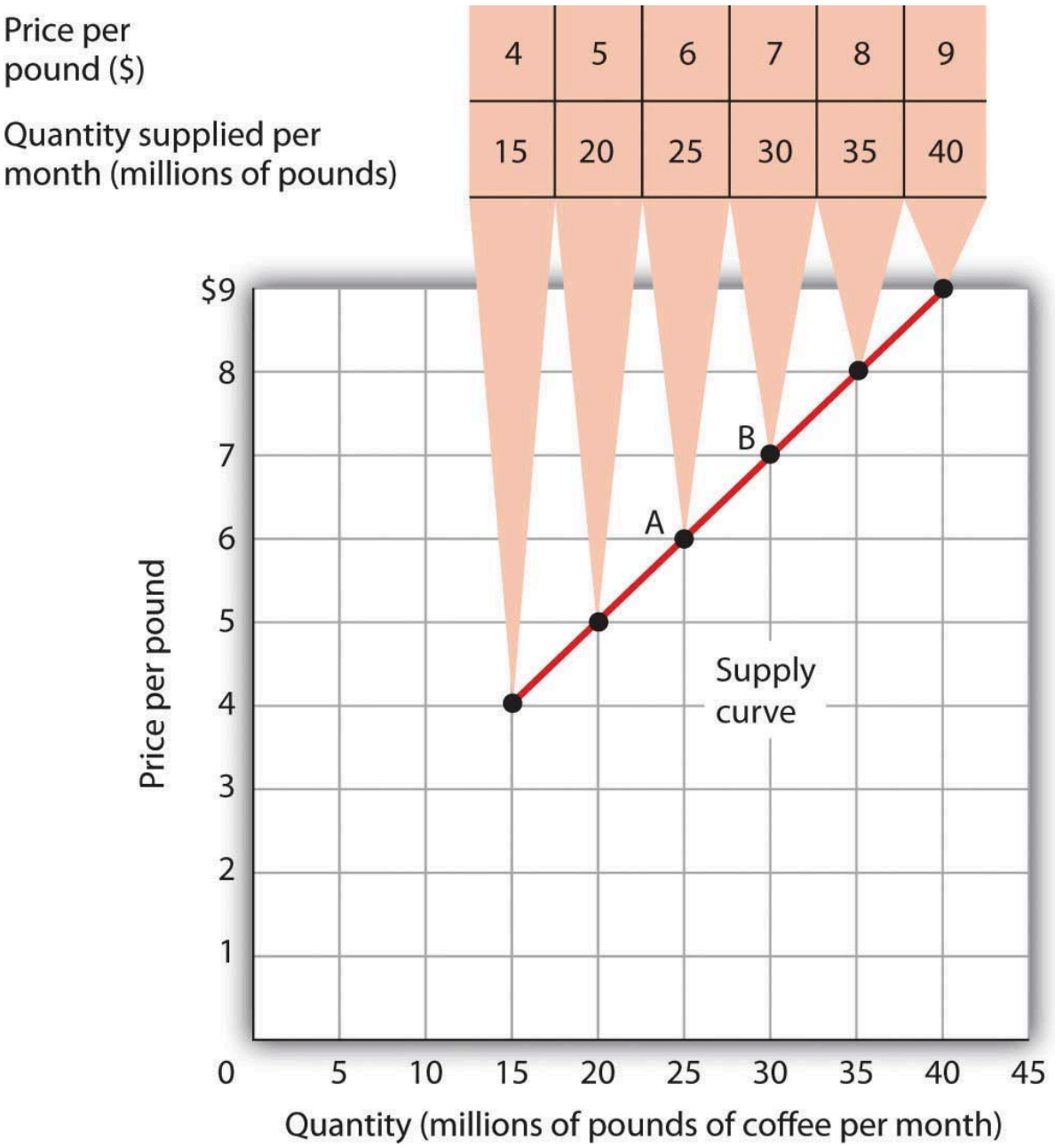

Fig 3.5 Change in the Quantity Supplied

A change in price causes a movement alongthe supply curve; such a movement is called a change in quantity supplied. As is the case with a change in quantity demanded, a change in quantity supplied does not shift the supply curve. By definition, it is a movement along the supply curve. For example, if the price rises from $6 per pound to $7 per pound, the quantity supplied rises from 25 million pounds per month to 30 million pounds per month. That's a movement from point A to point B along the supply curve in Fig 3.6.

Attribution

3.4 Changes in Supply

Definition: Change in Supply

When we draw a supply curve, we assume that other variables that affect the willingness of sellers to supply a good or service are unchanged. It follows that a change in any of those variables will cause a change in supply, which is a shift in the supply curve. Suppose the cost of producing coffee decreases due to a drop in the price of coffee beans. This increases the quantity of coffee supplied at each price and the result is a shift in the supply curve to the right. This *shift*in the supply curve is called a **changein supply.**

Factors that change Supply:

Prices of Factors of Production

Suppose, for example, that the price of coffee beans falls. That will reduce the cost of producing coffee and thus increase the quantity of coffee producers will offer for sale at each price. The supply schedule in Fig 3.7 shows an increase in the quantity of coffee supplied at each price increase graphically as a shift in the supply curve from S1to S2. We see that the quantity supplied at each price increases by 10 million pounds of coffee per month. At point A on the original supply curve S1, for example, 25 million pounds of coffee per month are supplied at a price of $6 per pound. After the increase in supply, 35 million pounds per month are supplied at the same price (point A' on curve S2).

Price	Old quantity supplied	New quantity supplied
$4	15	25
5	20	30
6	25	35
7	30	40
8	35	45
9	40	50

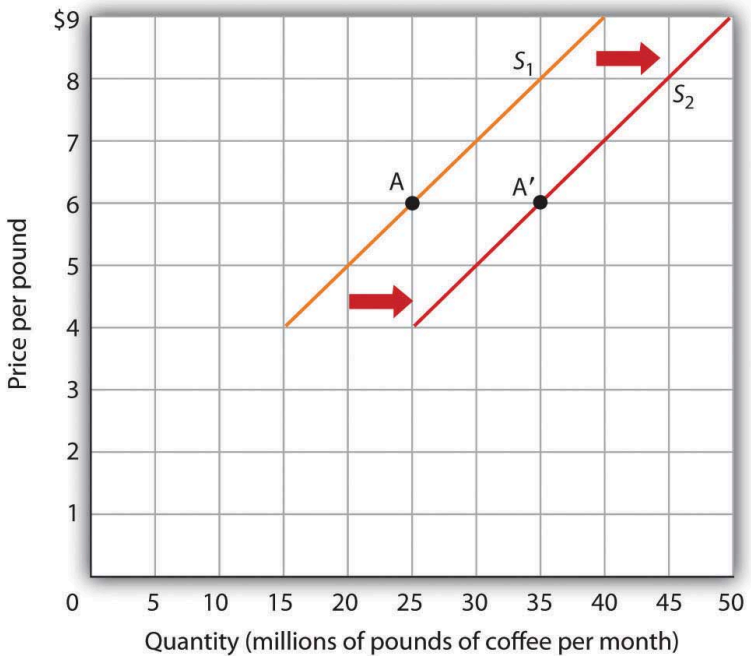

Fig 3.7 "An Increase in Supply" by University of Minnesota, CC BY-NC-SA 4.0

An event that reduces the quantity supplied at each price shifts the supply curve to the left. Adverse weather such as excessive rain that reduces the yields from coffee plants are examples of events that might reduce supply. Fig 3.8 shows a reduction in the supply of coffee. We see in the supply schedule that the quantity of coffee supplied falls by 10 million pounds of coffee per month at each price. The supply curve thus shifts from S1 to S3.

Price	Old quantity supplied	New quantity supplied
$4	15	5
5	20	10
6	25	15
7	30	20
8	35	25
9	40	30

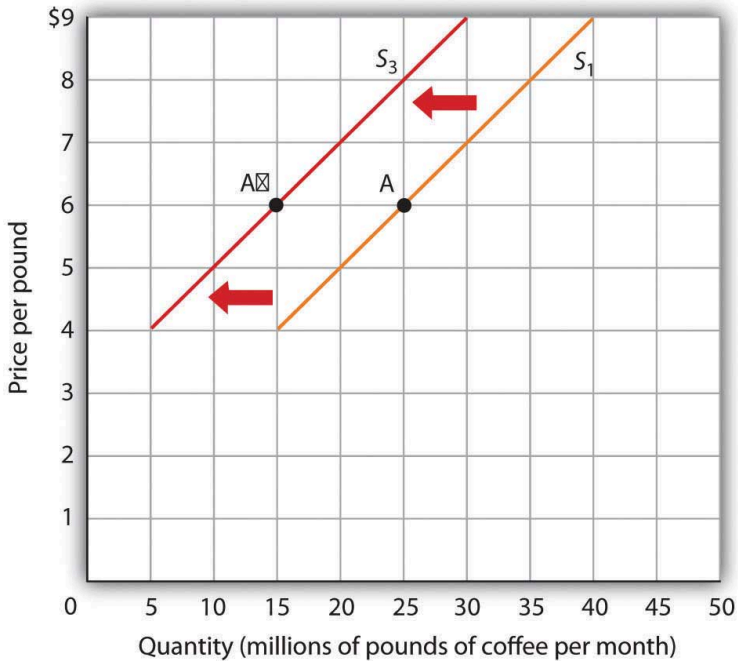

Fig 3.8 "A Reduction in Supply" by University of Minnesota, CC BY-NC-SA 4.0.

Prices of related goods

Like demand, there could be substitutes in production as well. Suppose, a producer makes cupcakes and cookies. If the relative price of cupcakes rises, the producer tends to devote more time and resources to producing cupcakes, because that is more profitable, so the number of cupcakes supplied increases. At the same time, the opportunity cost of producing cupcakes increases. The opportunity cost of producing a cupcake is not producing cookies. So the supply of cookies decreases and the supply curve of cookies shifts leftward due to a rise in the price of a related (substitute) good.

Seller expectations about future prices

Like demand, expectations of the supply price affect production decisions. Production decisions are a lot like playing the stock market; if we are producing cupcakes and cookies to sell to the store tomorrow, we have to produce based on the current knowledge we have about those prices. Normally, you will be confident that these prices will stay relatively stable, but if you have reason to believe the prices of cupcakes will drastically rise from next week, you may devote less of your attention to producing them today and increase the quantity supplied next week when the price rises. Expectations are usually based on some form of evidence or signal and can cause supply shifts quite suddenly. If the firm expects future prices to rise, supply will decrease today. If the firm expects future prices to fall, supply will increase in the current period.

Number of producers

An increase in the number of sellers supplying a good or service shifts the supply curve to the right; a reduction in the number of sellers shifts the supply curve to the left. If for example, four new coffee-producing stores enter the market, more will be supplied at each price. The market for cellular phone service has been affected by an increase in the number of firms offering the service. Over the past decade, new cellular phone companies emerged, shifting the supply curve for cellular phone service to the right.

Technology

A change in technology alters the combinations of inputs or the types of inputs required in the production process. An improvement in technology usually means that the same amount of input can now produce more due to increased productivity from the advanced technology. With more produced at every price, the supply curve will shift to the right, meaning an increase in supply.

Impressive technological changes have occurred in the computer industry in recent years. Computers are much smaller and are far more powerful than they were only a few years ago due to innovation. The result has been a huge increase in the supply of computers, shifting the supply curve to the right.

Natural events

Storms, insect infestations, and drought affect agricultural production and thus the supply of agricultural goods. If something destroys a substantial part of an agricultural crop, the supply curve will shift to the left. The

terrible cyclone that killed more than 50,000 people in Myanmar in 2008 also destroyed some of the country's prime rice-growing land. That shifted the supply curve for rice to the left. If there is an unusually good harvest, the supply curve will shift to the right.

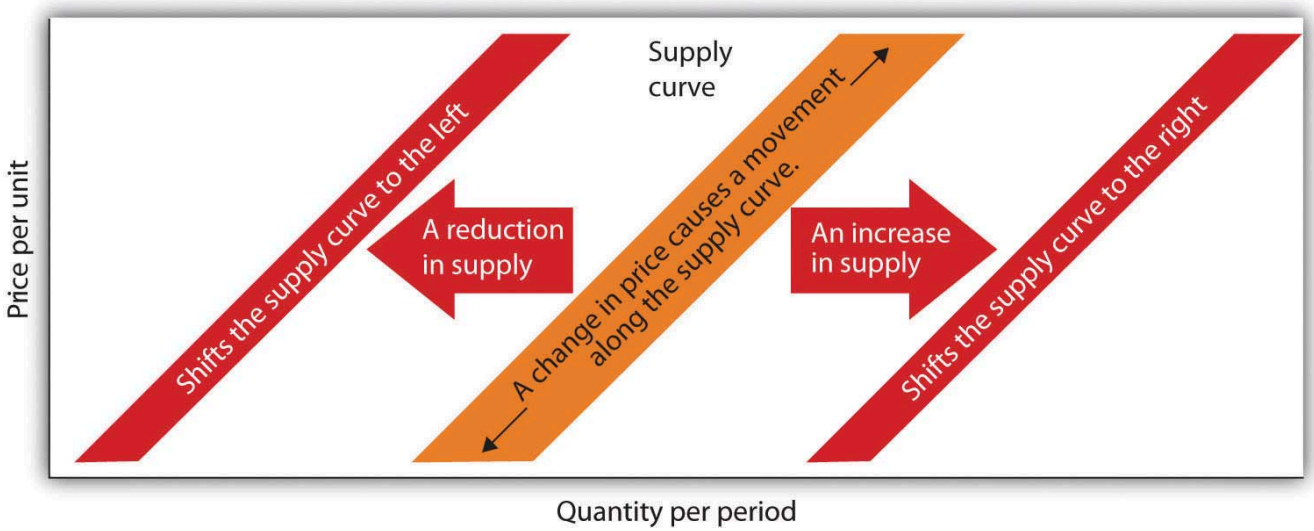

Fig 3.9 Figure by University of Minnesota, CC BY-NC-SA 4.0.

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3.5 Demand, Supply and Equilibrium

The logic of the model of demand and supply is simple. The demand curve shows the quantities of a particular good or service that buyers will be willing and able to purchase at each price during a specified period. The supply curve shows the quantities that sellers will offer for sale at each price during that same period. By putting the two curves together, we should be able to find a price at which the quantity buyers are willing and able to purchase equals the quantity sellers will offer for sale.

Fig 3.10 combines the demand and supply data introduced in Fig3.1 and Fig3.8. Notice that the two curves intersect at a price of $6 per pound—at this price the quantities demanded and supplied are equal. Buyers want to purchase, and sellers are willing to offer for sale, 25 million pounds of coffee per month. The market for coffee is in equilibrium. Unless the demand or supply curve shifts, there will be no tendency for price to change. The equilibrium price in any market is the price at which quantity demanded equals quantity supplied. The equilibrium price in the market for coffee is thus $6 per pound. The equilibrium quantity is the quantity demanded and supplied at the equilibrium price. At a price above the equilibrium, there is a natural tendency for the price to fall. At a price below the equilibrium, there is a tendency for the price to rise.

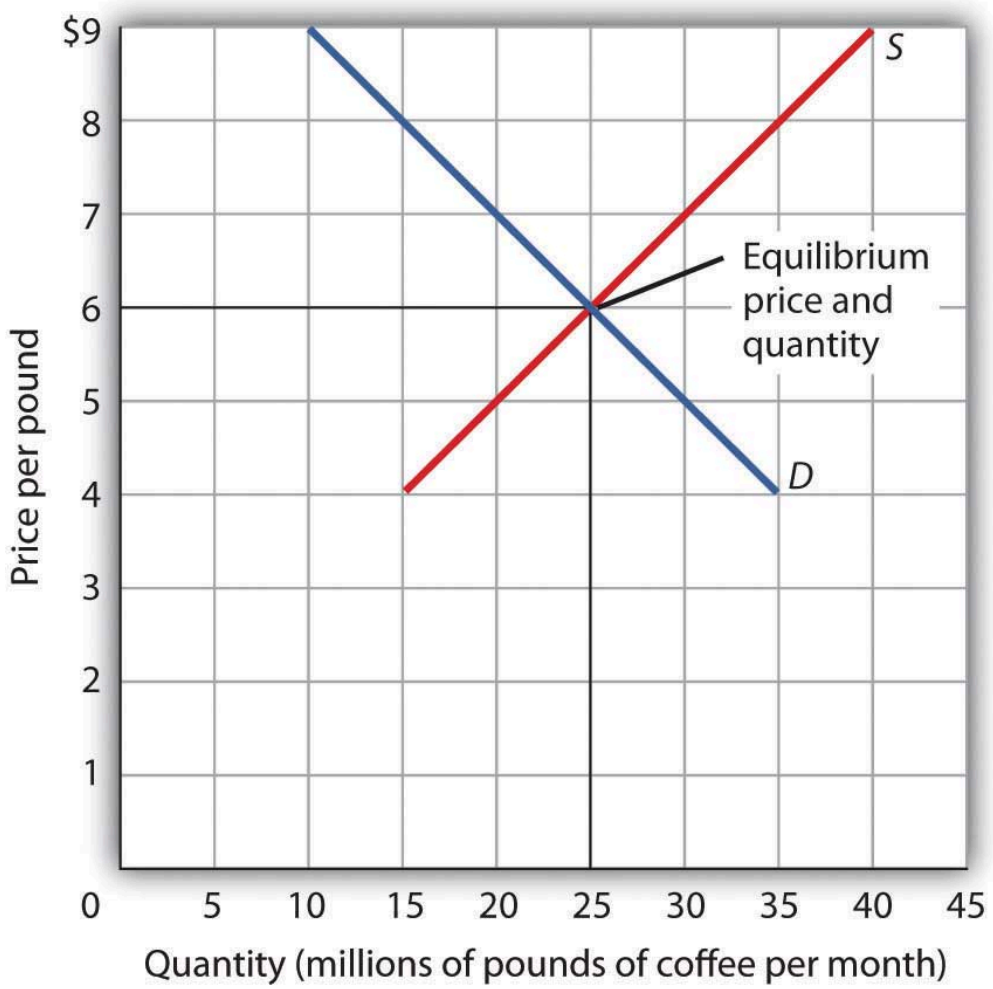

Fig 3.10 "The Determination of Price and Quantity" by University of Minnesota , CC BY-NC-SA 4.0.

With an upward-sloping supply curve and a downward-sloping demand curve, there is only a single price at which the two curves intersect. This means there is only one price at which equilibrium is achieved. It follows that at any price other than the equilibrium price, the market will not be in equilibrium. We next examine what happens at prices other than the equilibrium price.

Surplus

Fig 3.11 shows the same demand and supply curves we have just examined, but this time the initial price is $8 per pound of coffee. Because we no longer have a balance between quantity demanded and quantity supplied, this price is not the equilibrium price. At a price of $8, the quantity of coffee consumers will be willing to buy—15 million pounds per month. The supply curve tells us what sellers will offer for sale—35 million pounds per month. The difference, 20 million pounds of coffee per month, is called a **surplus**.

Definition: Surplus

More generally, a **surplus** is the amount by which the quantity supplied exceeds the quantity demanded at the current price. A surplus occurs only if the current price exceeds the equilibrium price.

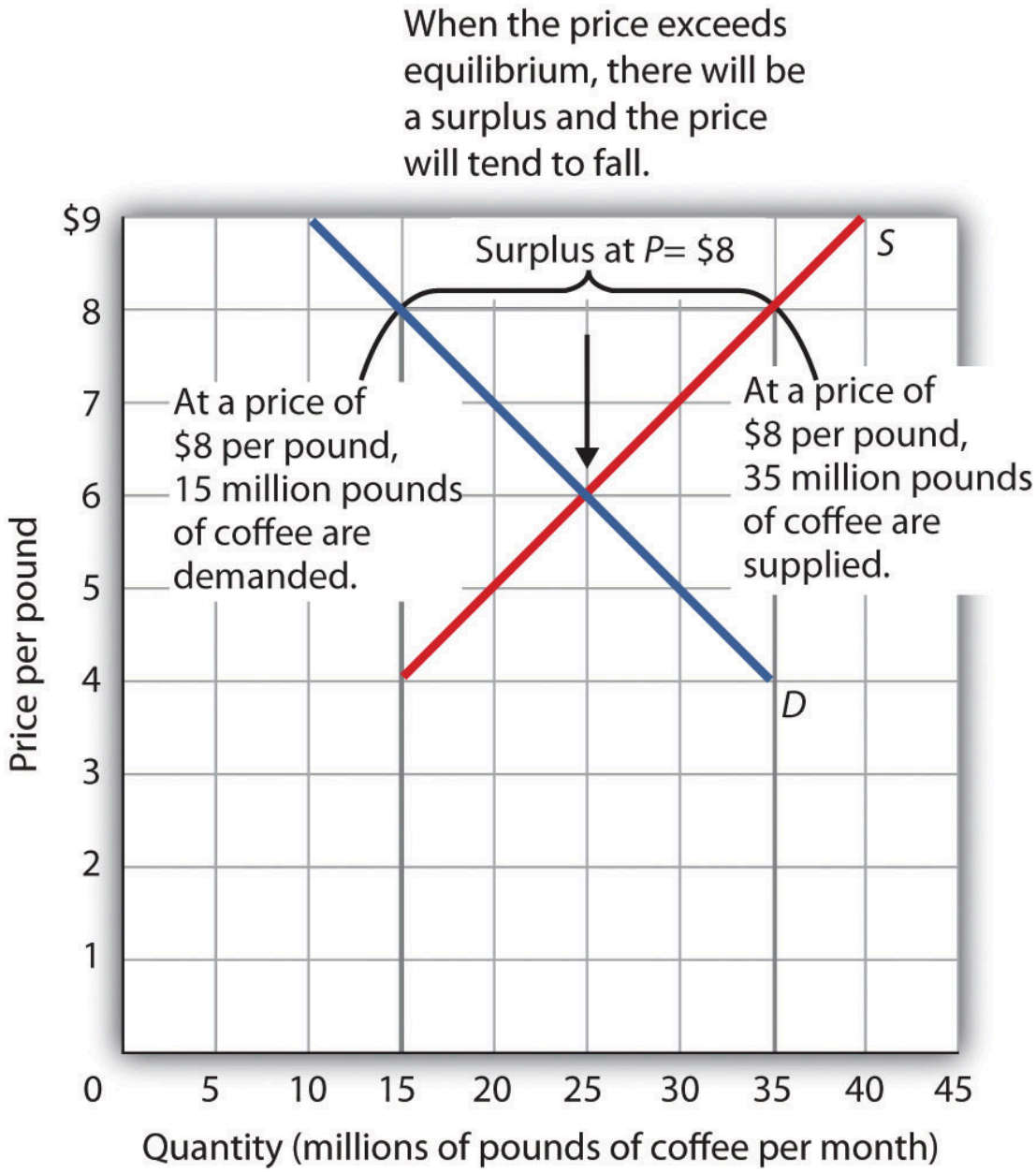

Fig 3.11 "A Surplus in the Market for Coffee" by University of Minnesota, CC BY-NC-SA 4.0.

A surplus in the market for coffee will not last long. With unsold coffee on the market, sellers will begin to reduce their prices to clear out unsold coffee. As the price of coffee begins to fall, the quantity of coffee supplied begins to decline. At the same time, the quantity of coffee demanded begins to rise. Remember that the reduction in quantity supplied is a movement along the supply curve—the curve itself does not shift in response to a reduction in price. Similarly, the increase in quantity demanded is a movement along the demand curve—the demand curve does not shift in response to a reduction in price. Price will continue to fall until it reaches its equilibrium level, at which the demand and supply curves intersect. At that point, there will be no tendency for prices to fall further. In general, surpluses in the marketplace are short-lived. The prices of most goods and services adjust quickly, eliminating the surplus.

Shortage

Just as a price above the equilibrium price will cause a surplus, a price below equilibrium will cause a shortage.

Definition: Shortage

A **shortage** is the amount by which the quantity demanded exceeds the quantity supplied at the current price.

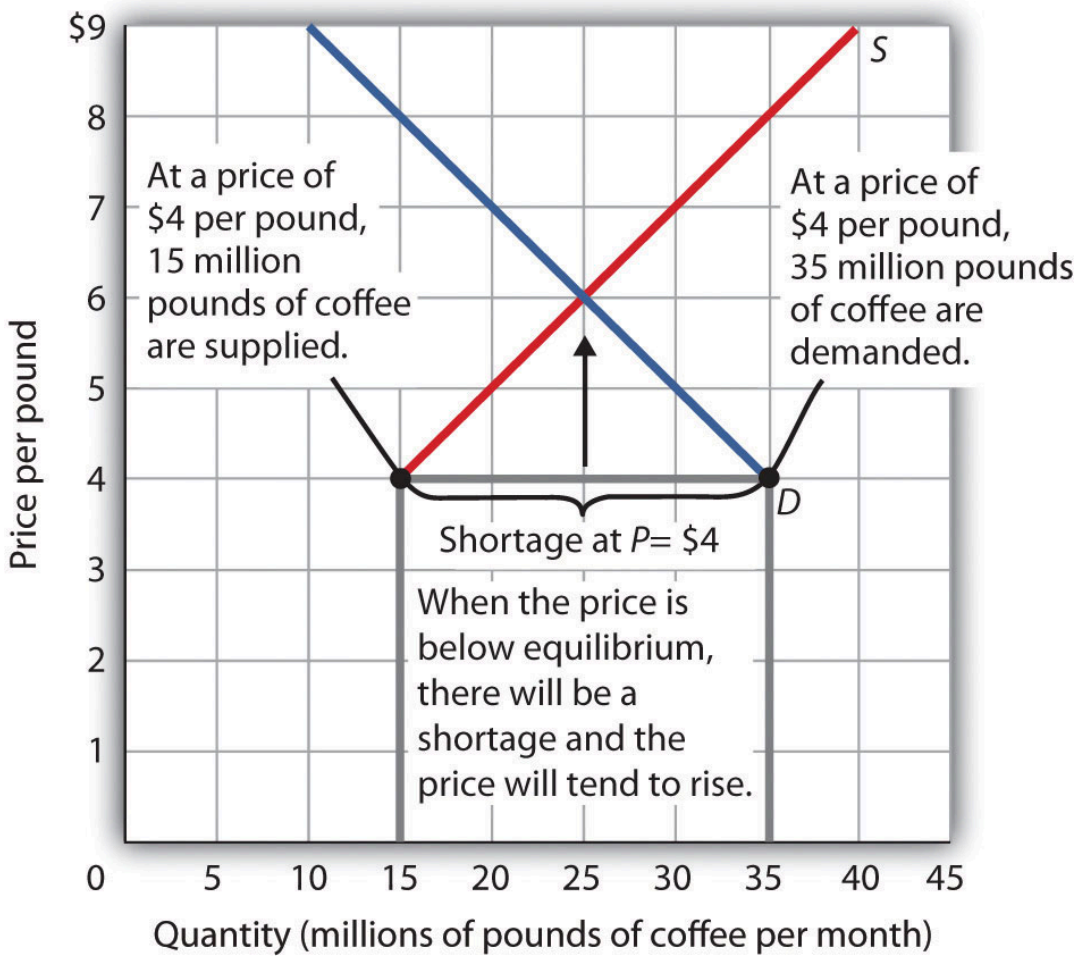

Fig 3.12 "A Shortage in the Market for Coffee" by University of Minnesota, CC BY-NC-SA 4.0

Fig 3.12 shows a shortage in the market for coffee. Suppose the price is $4 per pound. At that price, 15 million pounds of coffee would be supplied per month, and 35 million pounds would be demanded per month. When the quantity demanded exceeds the quantity supplied, there is a **shortage**. In the face of a shortage, sellers are likely to begin to raise their prices. As the price rises, there will be an increase in the quantity supplied (but not a change in supply) and a reduction in the quantity demanded (but not a change in demand) until the equilibrium price is achieved.

Attributions

3.6 Shifts in Demand and Supply

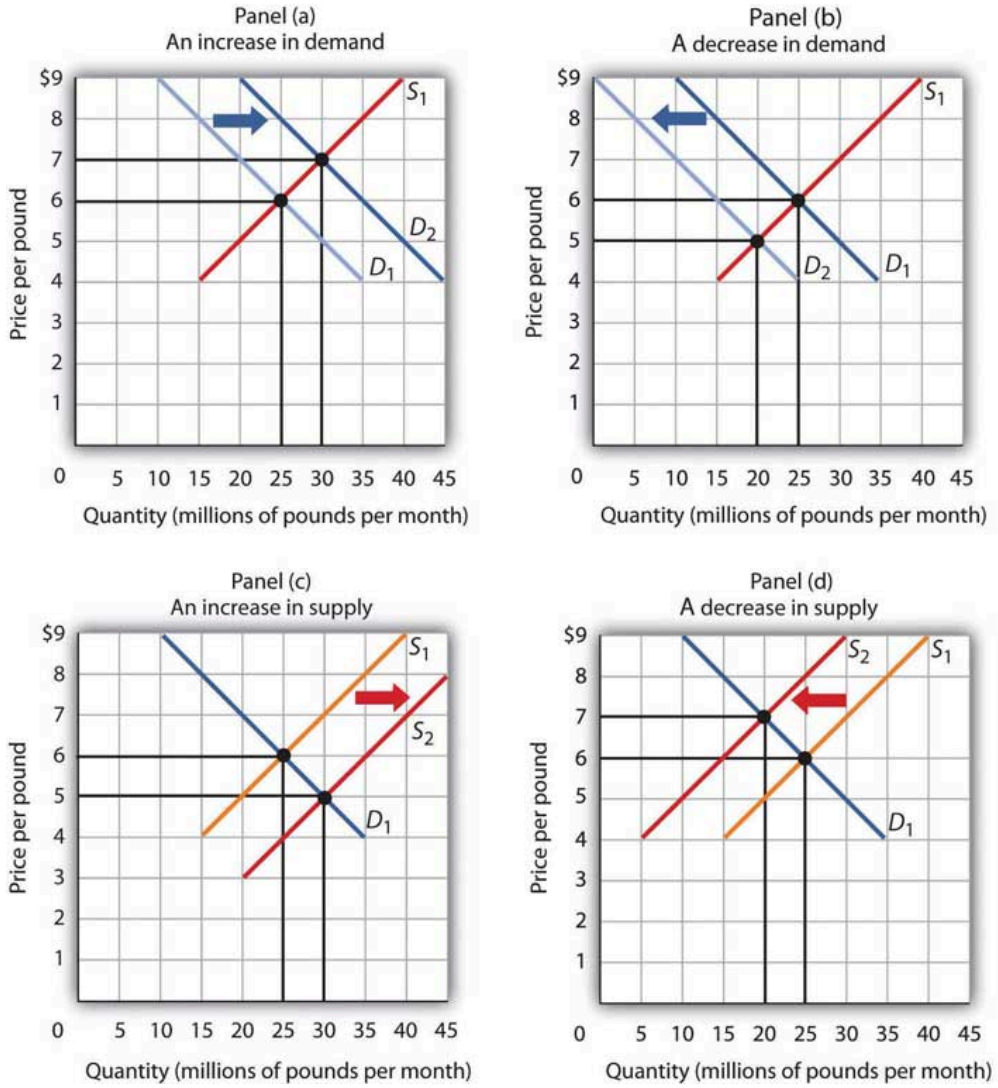

Figure 3.13 "Changes in Demand and Supply" by University of Minnesota, CC BY-NC-SA 4.0.

The above graphs show the market for coffee. Refer to Panel A, suppose the original equilibrium price and quantity of coffee are $6 and 25 pounds respectively. Now assuming Coffee is a normal good, an increase in income, with no change in the price of coffee and/or other factors, will increase the demand for coffee and shift the demand curve to the right. The equilibrium price of coffee rises to $7 and the equilibrium quantity increases to 30 pounds. Panel B shows the decrease in the demand for coffee when income decreases and the demand curve shifting to the left. The equilibrium price of coffee falls and the equilibrium quantity decreases.

Refer to Panel C, suppose the initial equilibrium price and quantity of coffee are $6 and 25 pounds respectively. If the cost of producing coffee decreases, ceteris paribus, the supply of coffee increases and shifts the supply curve to the right resulting in a fall in the equilibrium price of coffee to $5 and an increase in the equilibrium quantity to 30 pounds. Panel D shows the decrease in the supply of coffee when the production

cost increases and the supply curve shifting to the left. The equilibrium price of coffee rises and the equilibrium quantity decreases.

Simultaneous shifts in Demand and Supply

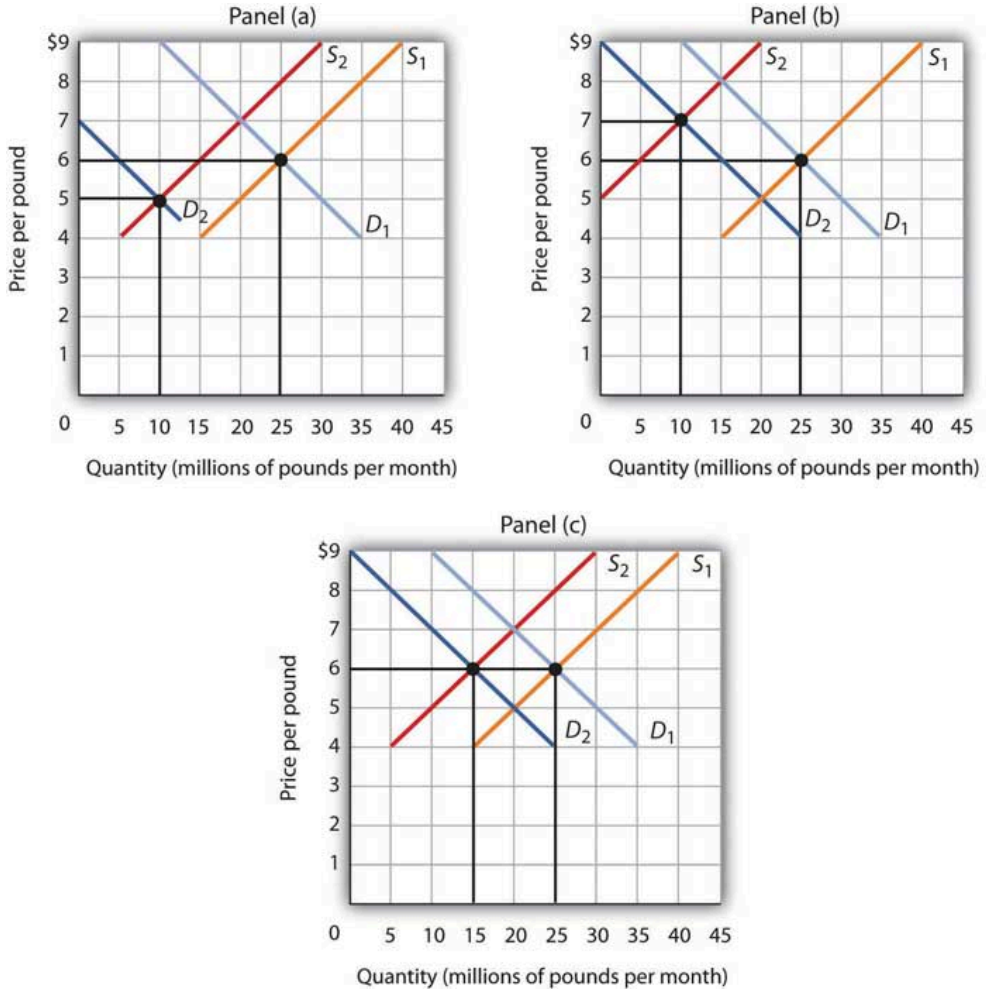

Fig 3.14 "Simultaneous Decreases in Demand and Supply" by University of Minnesota, CC BY-NC-SA 4.0.

As we have seen, when either the demand or the supply curve shifts, the results are unambiguous; that is, we know what will happen to both equilibrium price and equilibrium quantity, so long as we know whether demand or supply increased or decreased. However, in practice, several events may occur at around the same time that causes both the demand and supply curves to shift. To figure out what happens to equilibrium price and equilibrium quantity, we must know not only in which direction the demand and supply curves have shifted but also the relative amount by which each curve shifts. Of course, the demand and supply curves could shift in the same direction or in opposite directions, depending on the specific events causing them to shift.

Example: Shifts in Demand and Supply

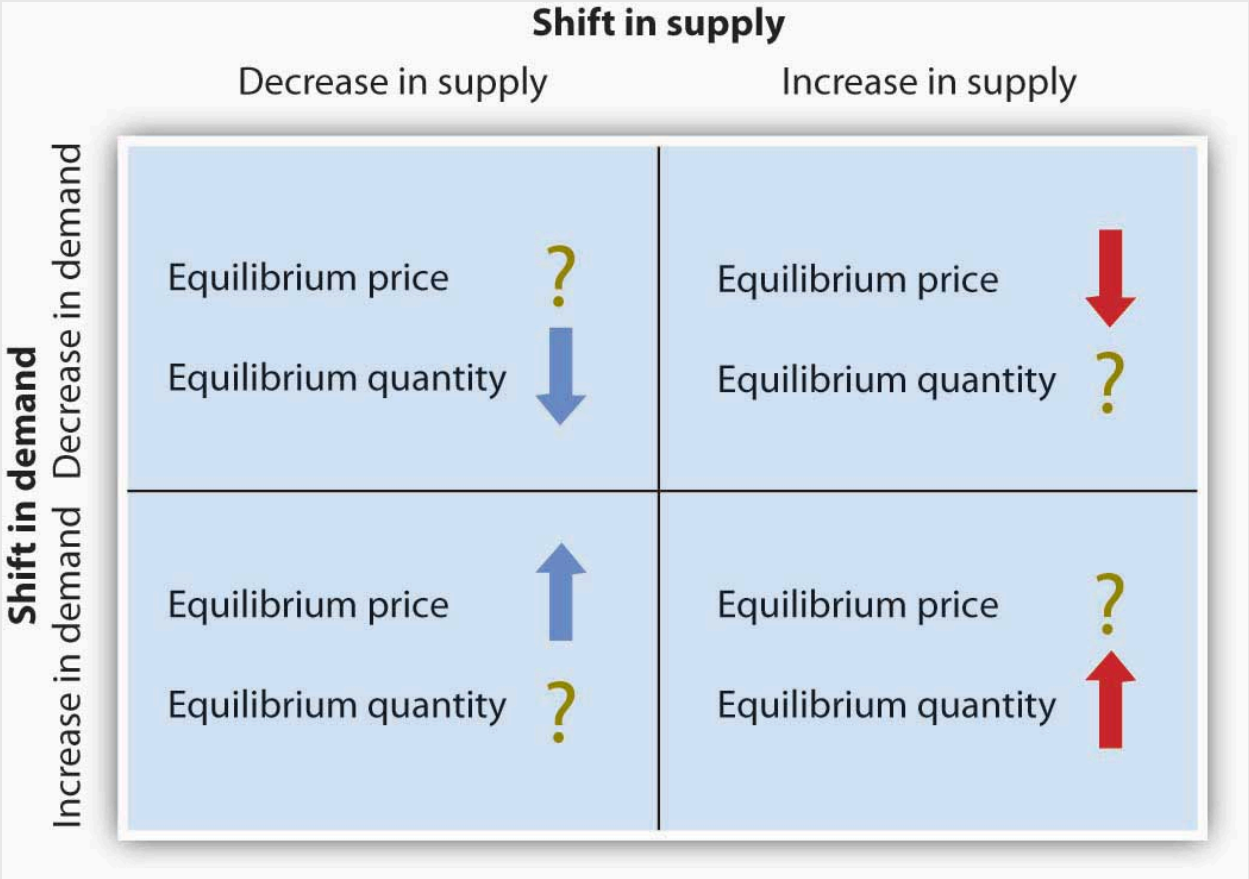

Fig 3.15 "Simultaneous Shifts in Demand and Supply" by University of Minnesota, CC BY-NC-SA 4.0.

All three panels of Fig 3.15 show a decrease in demand for coffee (caused perhaps by a decrease in the price of a substitute good, such as tea) and a simultaneous decrease in the supply of coffee (caused perhaps by bad weather). Since reductions in demand and supply, considered separately, each cause the equilibrium quantity to fall, the impact of both curves shifting simultaneously to the left means that the new equilibrium quantity of coffee is less than the old equilibrium quantity. The effect on the equilibrium price, though, is ambiguous. Whether the equilibrium price is higher, lower, or unchanged depends on the extent to which each curve shifts.

If the demand curve shifts farther to the left than does the supply curve, as shown in Panel A of Fig 3.15, then the equilibrium price will be lower than it was before the curves shifted. In this case, the new equilibrium price falls from $6 per pound to $5 per pound. If the shift to the left of the supply curve is greater than that of the demand curve, the equilibrium price will be higher than it was before, as

shown in Panel B. In this case, the new equilibrium price rises to $7 per pound. In Panel C, since both curves shift to the left by the same amount, the equilibrium price does not change; it remains $6 per pound.

Regardless of the scenario, changes in equilibrium price and equilibrium quantity resulting from two different events need to be considered separately. If both events cause equilibrium price or quantity to move in the same direction, then clearly price or quantity can be expected to move in that direction. If one event causes price or quantity to rise while the other causes it to fall, the extent by which each curve shifts is critical to figuring out what happens. Fig 3.15 summarizes what may happen to equilibrium price and quantity when demand and supply both shift.

Attribution

3.7 Summary

The Demand Shocks are summarized in the table below: [1]

Demand Shock	Increase in Demand, Shifts curve to the Right	Decrease in Demand, Shifts curve to the Left
Price of a Substitute	Increases	Decreases
Price of a complement	Decreases	Increases
Buyers' Expectations about Future Prices	Increases (normal good)	Decreases (normal good)
Preferences	Increases	Decreases
Demographic Characteristics (Population)	Increases	Decreases
Buyers' Expectations about Future Prices	Increases	Decreases

The Supply shocks are summarized in the table below:

Supply Shock	Increase in Supply, Shifts curve to the Right	Decrease in Supply, Shifts curve to the Left
Price of factors of production	Decreases	Increases
Price of a Substitute	Decreases	Increases
Sellers' Expectations about Future Prices	Decreases	Increases
Number of Producers	Increases	Decreases

Reference

Published by Statista Research Department, & 4, F. (2022, February 4). *Retail prices gasoline Canada 2021*. Statista. https://www.statista.com/statistics/444194/average-retail-price-for-regular-unleaded-gasoline-in-canada/

1. The best way to learn these shifts is not to memorize them, but to practice shifts on the diagram to view their effects.

3.8 Key Terms

Key Terms

Change in Demand

Change in Quantity Demanded

Change in Quantity Supplied

Change in Supply

Complements

Inferior Goods

Movement Along The Supply Curve

Normal Goods

Shortage

Substitutes

Surplus

CHAPTER 4: COMPETITIVE EFFICIENCY

Chapter Outline

4.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Describe consumer surplus and producer surplus
- Explain the economic efficiency
- Discuss the economic impact of government-imposed price floors and price ceilings
- Demonstrate the economic impact of taxes

The familiar demand and supply diagram holds within it the concept of economic efficiency. One typical way that economists define efficiency is when it is impossible to improve the situation of one party without imposing a cost on another. Conversely, if a situation is inefficient, it becomes possible to benefit at least one party without imposing costs on others.

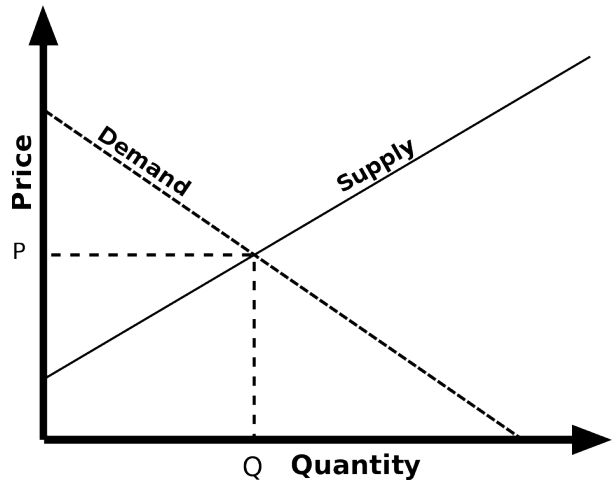

Fig 4.1 "Simple supply and demand graph" by Dallas.Epperson, CC BY-SA 3.0.

Efficiency in the demand and supply model has the same basic meaning: The economy is getting as much benefit as possible from its scarce resources and all the possible gains from trade have been achieved. In other words, the optimal amount of each good and service is produced and consumed.

The demand and supply model emphasizes that prices are not only set by demand or supply, but also by the interaction between the two. In 1890, the famous economist Alfred Marshall wrote that asking whether supply or demand determined a price was like arguing "*whether it is the upper or the under blade of a pair of scissors*

that cuts a piece of paper." The answer is that both blades of the demand and supply scissors are always involved.

Attribution

4.1 Demand and Consumer Surplus

Demand is based on needs and wants, and while consumers can differentiate between a need and a want, from an economist's perspective, they are the same thing. Demand is also based on the ability to pay. If you cannot pay for it, you have no effective demand. This concept of a consumer's maximum **willingness to pay** (**WTP**) serves as a starting point for the demand curve. A consumer's maximum Willingness to Pay is equal to that consumer's Marginal Benefit (MB). This is useful information if we want to use Marginal Analysis.

As we learned in Chapter 1, Marginal Analysis or "thinking on the margin" is how consumers decide whether or not to buy an additional unit. It is the process of considering the additional benefits and costs of an activity to make a decision. Therefore, when we say a consumer is willing to pay x dollars for another good, we are stating that the consumer believes they will receive x amount of benefit. As long as the consumer's marginal benefit is greater than their marginal cost, they will purchase the good. Therefore, the maximum amount a consumer is willing to pay is equal to their marginal benefit.

Recall Demand

Demand refers to the amount (price) consumers are willing and able to purchase goods or services at.

Suppose, there are five people, each of whose maximum WTP for a tablet computer is given below:

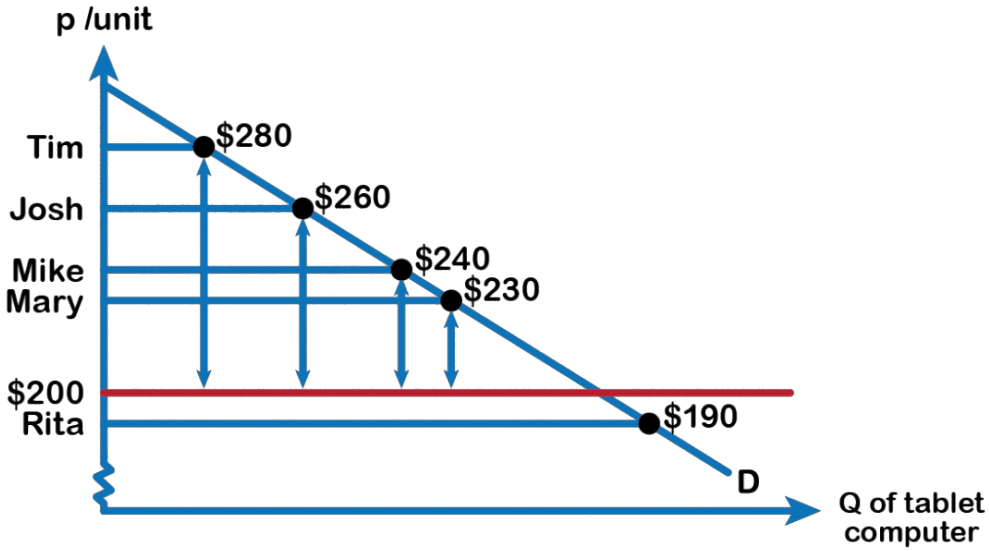

Fig 4.2 Figure by Fanshawe College, CC-BY-NC-SA 4.0

Fig 4.3

	Maximum WTP
Tim	$280.00
Josh	$260.00
Mike	$240.00
Mary	$230.00
Sam	$200.00
Rita	$190.00

By examining the WTP at each level of consumption, we can measure a consumer's total net benefit from their purchase, or their consumer surplus. **Total net benefit or Consumer surplus** is the difference between the consumer's willingness to pay and the amount (price) they actually pay for a given quantity.

As noted from fig 4.2, the market price for a tablet computer is $200, therefore Tim's consumer surplus is $80 ($280 minus $200), Josh's consumer surplus is $60 ($260 – $200), and so on. Referring to the figure, we also find that Sam's maximum willingness to pay is the same as the price, so Sam's consumer surplus is zero. However, as long as the price coincides with his willingness to pay, the consumer can still purchase the good. Rita's maximum willingness to pay is $190, which is below the price of the tablet, and therefore she does not obtain the good.

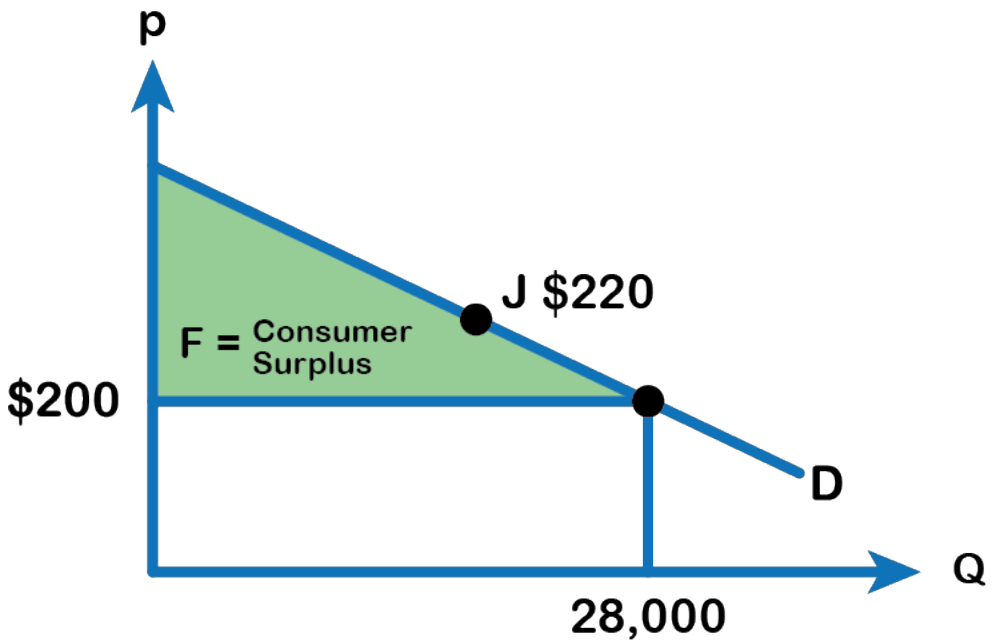

Fig 4.4 – By Fanshawe College, CC-BY-NC-SA 4.0

Consider the demand curve for tablet computers, as Figure 4.4 shows. The price of a tablet computer is $200 and the quantity demanded at that price is 28 million. To see the benefits to consumers, look at the segment of the demand curve above the price line and to the left. This portion of the demand curve shows that at least some consumers would have been willing to pay more than $200 for a tablet, as shown in the table in fig 4.3. Each point on the demand curve shows the consumers' maximum willingness to pay for that quantity.

For example, point (J) shows that those consumers who would be willing to pay $220, for a tablet (based on the benefit they expect to receive from it) were able to pay the price of $200, clearly received a benefit beyond what they had to pay. Remember, the demand curve traces consumers' willingness to pay for different quantities.

Definition: Consumer Surplus

The amount that individuals would have been willing to pay, minus the amount that they actually paid, is called **Consumer Surplus**. Consumer surplus is the area labelled F—that is, the area above the price and below the demand curve. The value of Consumer surplus is calculated as the Area of the triangle represented by F.

Consumer Surplus = (base × height) ÷ 2

Attribution

4.2 Supply and Producer Surplus

When economists talk about **supply**, they mean the amount of some good or service a producer is willing to supply at each price. The supply curve shows the quantity that firms are willing to supply at each price. Price is what the producer receives for selling one unit of a good or service and willingness to supply depends on the marginal cost of producing each unit. A producer will be willing to supply a quantity as long as the price is at least equal to the marginal cost of production.

Example

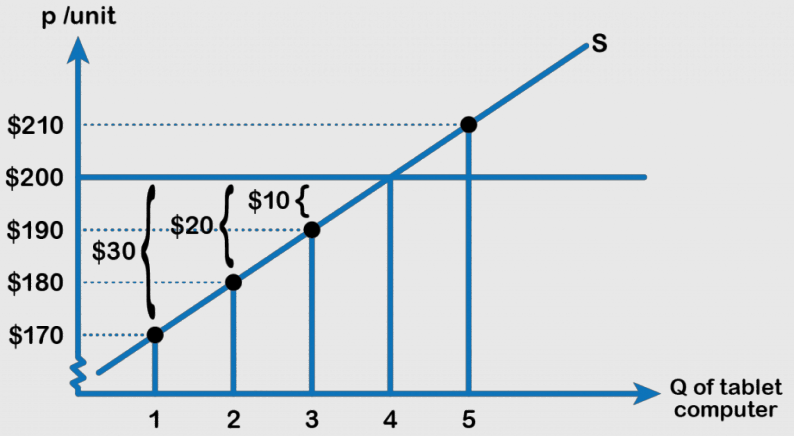

Fig 4.5 – By Fanshawe College, CC-BY-NC-SA 4.0

Consider a firm that produces tablet computers. Suppose the price received from selling a computer is $200. Refer to Fig 4.5, the marginal cost of producing the first tablet is $170, the same for the second and third tablets are $180 and $190 respectively. The marginal cost of producing the fourth tablet is $200 and for the fifth tablet is $210. Producer surplus is the difference between the price received from the sale of a good minus the cost of producing that unit. Therefore, the producer surplus from the first, second and third tablets are respectively, $30, $20 and $10. The producer can still manage to produce the fourth tablet, even though the surplus gets to zero because the price is still able to cover the marginal cost of production. However, the producer is unwilling to supply the fifth tablet, as the marginal cost ($210) exceeds the price ($200).

Consider the supply curve for tablet computers in Fig 4.5 below. The price received from the sale of a computer is $200 and the quantity supplied is 28 million. Each point on the supply curve shows the quantity the firm is willing to supply and the willingness depends on the marginal cost of production. The firm would

be willing to supply a quantity as long as the price is just enough to cover or exceed the marginal cost of production.

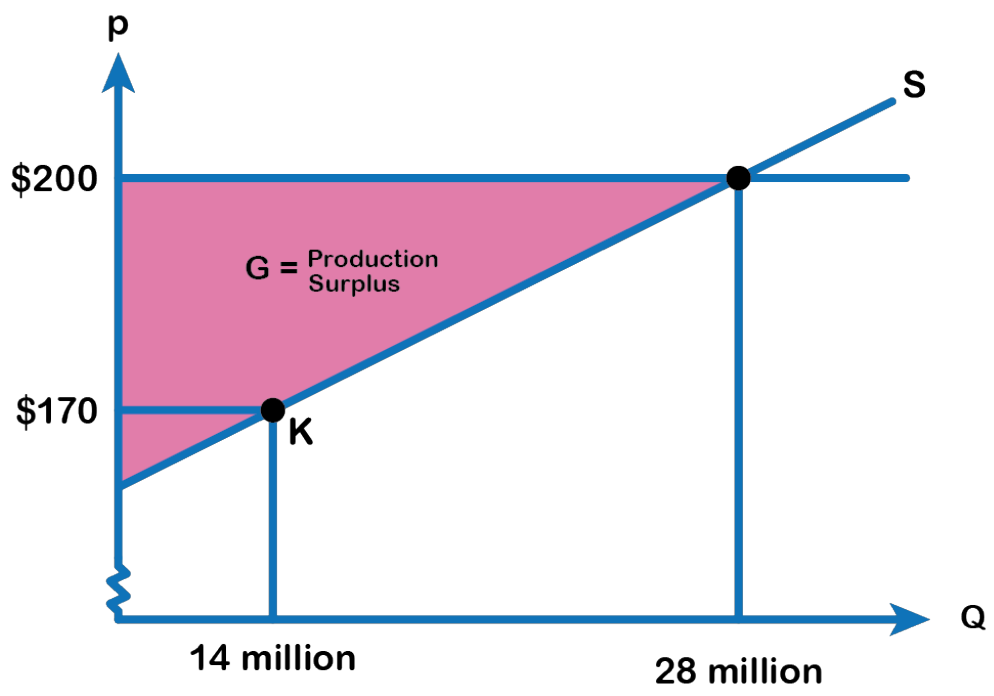

Fig 4.6 – By Fanshawe College, CC-BY-NC-SA 4.0

For example, point (K) in Fig 4.6 illustrates that, at $170, firms would still have been willing to supply a quantity of 14 million. Those producers who would have been willing to supply the tablets at $170, but who were instead able to charge a price of $200, clearly received an extra benefit beyond what they required in order to supply the product.

Definition: Producer Surplus

The amount that a seller is paid for a good minus the seller's actual cost is called **producer surplus**. In Figure 4.6, producer surplus is the area labelled G—that is, the area between the market price and the segment of the supply curve below the price.

The value of Producer surplus is calculated as the Area of the triangle represented by G.

Producer Surplus = (base × height) ÷ 2

Total Surplus

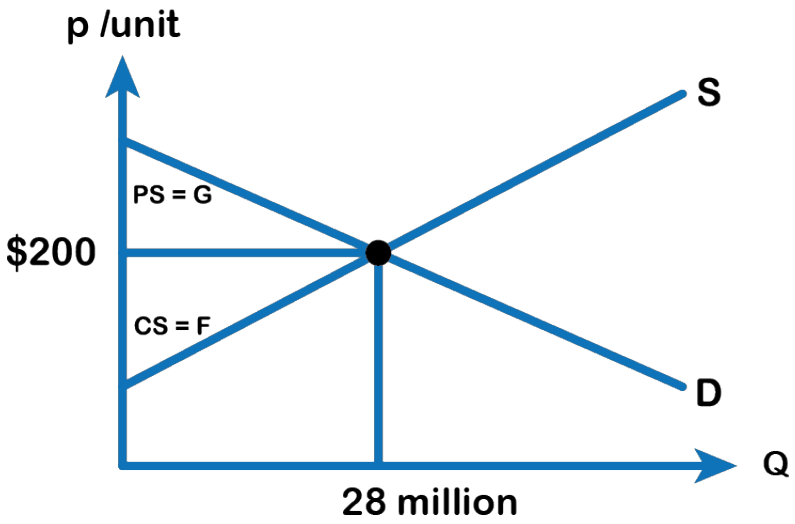

Fig 4.7 – By Fanshawe College, CC-BY-NC-SA 4.0

The sum of consumer surplus and producer surplus is social surplus, also referred to as **economic surplus** or **total surplus**. In Fig 4.7, we show social surplus as the area F + G. Social surplus is larger at equilibrium quantity and price than it would be at any other quantity. This demonstrates the **economic efficiency** of the market equilibrium where the marginal benefit from a good just equals the marginal cost of producing it. At the efficient level of output which is also called the competitive equilibrium, it is impossible to produce greater consumer surplus without reducing producer surplus, and it is impossible to produce greater producer surplus without reducing consumer surplus.

Attribution

4.3 Inefficiency of Price Floor and Price Ceiling

To this point in the chapter, we have been assuming that markets are free, that is, they operate with no government intervention. In this section, we will explore the outcomes, both anticipated and otherwise, when the government does intervene in a market either to prevent the price of some good or service from rising "too high" or to prevent the price of some good or service from falling "too low".

In perspective

Economists believe there are a small number of fundamental principles that explain how economic agents respond in different situations. Two of these principles, which we have already introduced, are the laws of demand and supply. Governments can pass laws affecting market outcomes, but no law can negate these economic principles. Rather, the principles will become apparent in sometimes unexpected ways, which may undermine the intent of the government policy. This is one of the major conclusions of this section.

The imposition of or a **price ceiling** a **price floor** will prevent a market from adjusting to its equilibrium price and quantity, and thus will create an inefficient outcome. However, there is an additional twist here. Along with creating inefficiency, price floors and ceilings will also transfer some consumer surplus to producers, or some producer surplus to consumers.

Price Ceiling

A common example of a price ceiling is the rental market. Consider a rental market with an equilibrium of $600/month. If the government wishes to decrease this price to make it more affordable for renters, it may place a binding price ceiling of $400/month. This policy means the landlords cannot charge more than $400 per month. What will this do to our equilibrium? Refer to Fig 4.8. Whereas before 300 homes were rented, there is now a housing shortage. At the lower price of $400/month, the quantity supplied is only 200 housing units and the quantity demanded is 400 housing units. This means that 200 renters who want to rent can no longer find homes! This is important because when quantity demanded and quantity supplied are unequal, the market is restrained by the lower value.

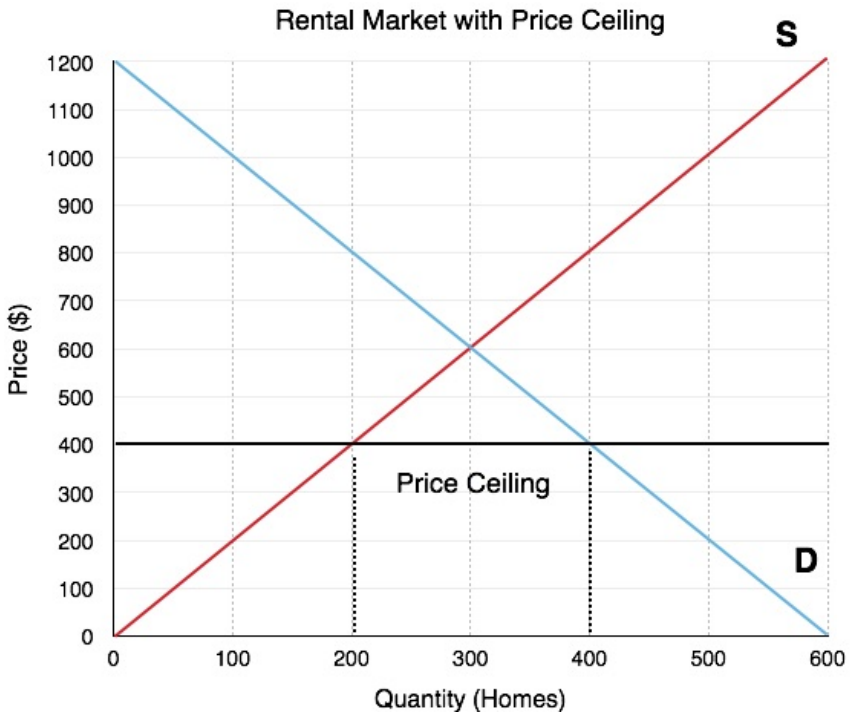

Fig 4.8 "Rental Market with Price Ceiling" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0

Calculating Market Surplus

To find out the impact of the government's price ceiling, we must calculate market surplus before, and after a policy. This method will be an important gauge for all our policy analysis on this topic. Consider Fig 4.9 (A & B), where the effects of the Price Ceiling are shown.

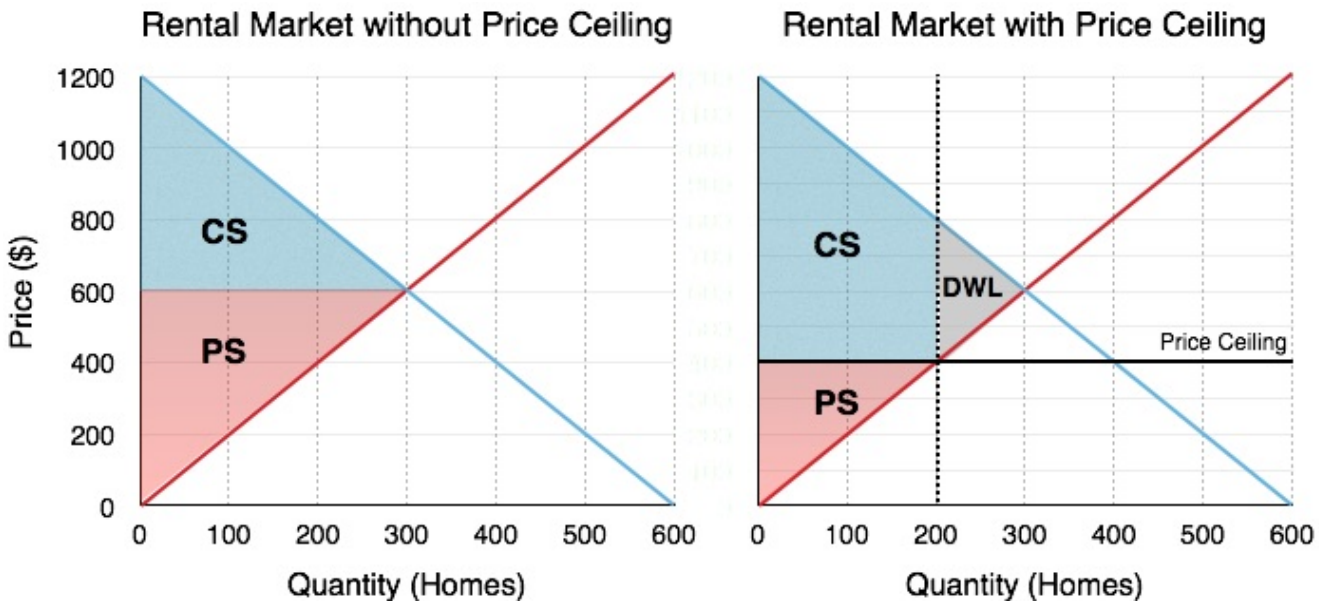

Fig 4.9 (A) *Fig 4.9 (B)*
"Rental Market without and with Price Ceiling" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Before the Ceiling

The calculation of market surplus before policy intervention should be straightforward by now. Market surplus is equal to the sum of consumer surplus and producer surplus, calculated from Fig 4.9 (A):

- Consumer Surplus (Blue Area): [(1200 − 600) × 300] ÷ 2 = $90,000
- Producer Surplus (Red Area): [(600) × 300] ÷ 2 = $90,000
- Total Surplus: $180,000

After the ceiling

The calculation of market surplus after the intervention is less obvious. Consumers have lost surplus in some areas, but gained surplus in others (we will look at this closely in the next Fig 4.10). Producers have lost surplus. From Fig 4.9 (B),

- Consumer Surplus (Blue Area): [(1200 − 800) × 200] ÷ 2] + (400 × 200) = $120,000
- Producer Surplus (Red Area): [(600) × 300] ÷ 2 = $40,000
- Total Surplus: $160,000

The rent ceiling results in a loss in the total surplus to the society.

What about Redistribution?

It's easy to look at the total numbers and show that market (total) surplus has decreased, but how does this change affect individual consumers and firms?

In Fig 4.10, the areas which change as a result of the policy, are shown.

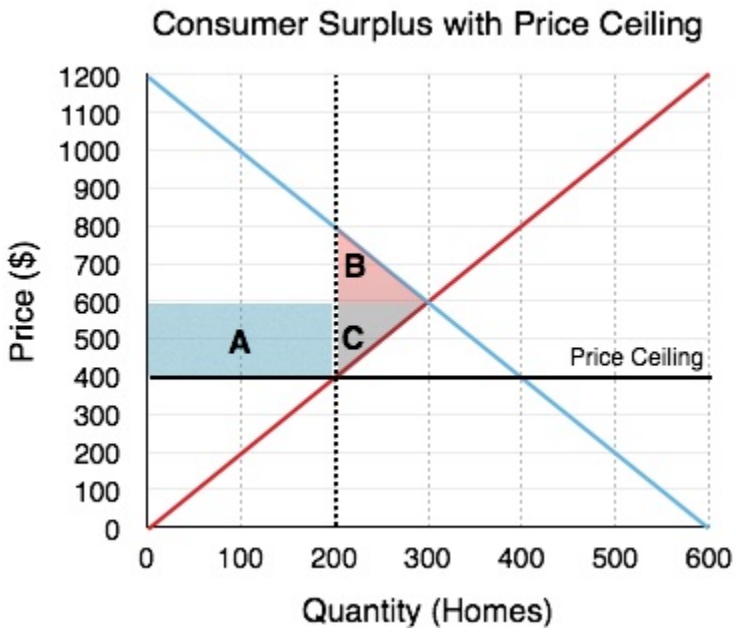

Fig 4.10 "Consumer Surplus with Price Ceiling", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0

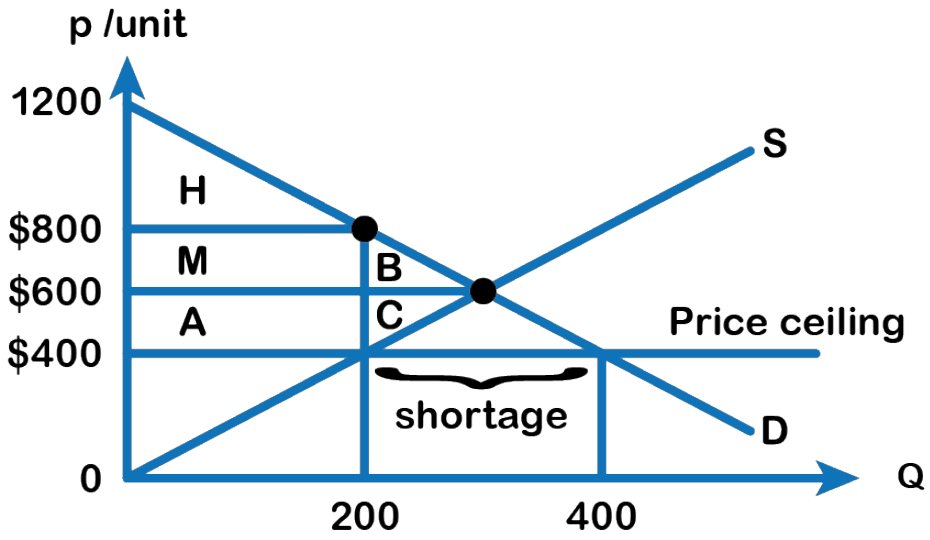

Fig 4.11 – Fanshawe College, CC-BY-NC-SA 4.0

Consumers	Consumers gain an area of A and lose an area of B. As mentioned previously, the quantity supplied in the market decreases from 300 rental units to 200 under the price ceiling, and also there is a shortage of 200 homes due to this policy. We can assume that some consumers get the advantage of the price ceiling are benefitted. They are now paying $400 a month instead of the earlier rent of $600 a month for a rental home. This is shown in Fig 4.11 as area A. A price ceiling, as observed from Fig 4.11 above, shows a loss in consumer surplus, identified as area B, and a gain in consumer surplus shown as area A.
Producers	Producers lose areas C and A. The price ceiling causes the landlords to reconsider staying in the rental market, as fewer landlords can make a profit with the lower price. Due to the ceiling, 100 landlords leave the market, thus reducing their producer surplus identified as area B in Fig 4.11. Like consumers, some producers will remain in the market, but these producers now have to face the reality of lower rent revenue and therefore they lose area A. This area which used to be a part of producer surplus, prior to the rent ceiling, is now transferred to the consumers or renters.
Black Market due to Rent Ceiling	However, the shortage increases the difficulty of finding a rental unit. This could result in some consumers willing to pay most for the homes, a rent as high as $800, to ensure the availability of a rental unit, therefore violating government's price ceiling. This is a black market transaction. If the tenants engage in black market activity by paying a rent of $800, then consumer surplus shrinks to area H. The areas M + A get transferred from renters (consumers) to producers (landlords), as shown in Fig 4:11.
Deadweight Loss	The deadweight loss or a loss in total surplus to the society due to a price ceiling arises because there are players who are no longer able to be a part of the market. 100 renters and 100 landlords all lose a varied amount based on their willingness to pay and marginal cost. This was a fairly lengthy explanation of price ceilings, but it is one that will lead to the discussion of all policies. Every policy we will look at in microeconomics has both a quantity effect and a price effect, and it is important to understand how the policy impacts individual market players. Some people gain while some people lose as a result of this government policy. Therefore, we can infer price ceiling has a mixed effect and there is a loss of economic efficiency which is represented by areas B + C.

Price Floor in the Labour Market (Minimum Wage Law)

While the price floor has a very similar analysis to the price ceiling, it is important to look at it separately. A

common example of a price floor is a minimum wage policy. The labour market is unique in that the workers are the producers of labour and the firms are consumers of labour. Price can be denominated in hourly wage, with the quantity of workers on the x-axis. If the government sets a binding minimum wage (price floor), it must be set above the equilibrium price.

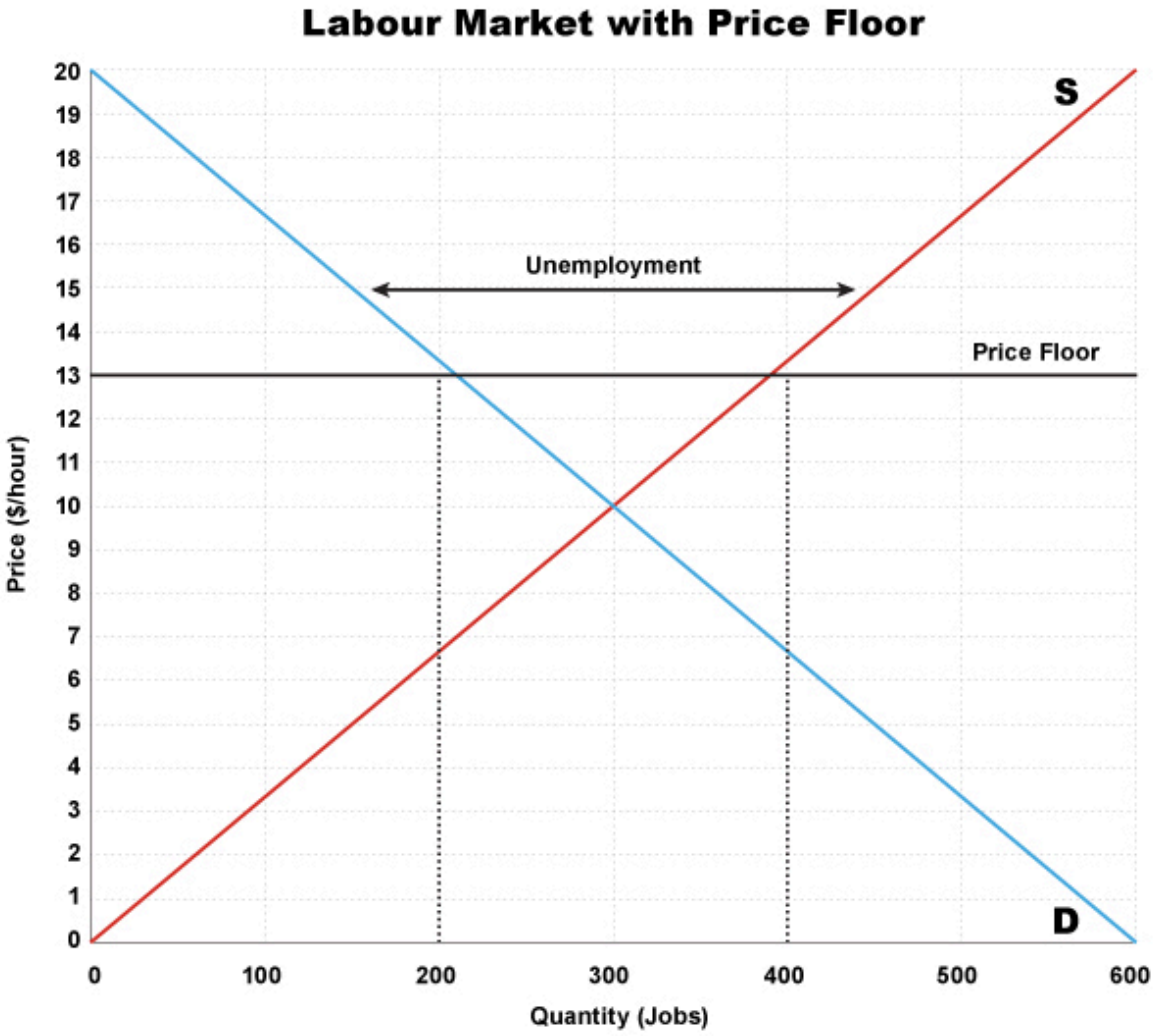

Fig 4.12 "Labour Market with Price Floor", by by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0

In Fig 4.12, the equilibrium wage is shown as $10/hour. This is where the demand for labour is equal to the number of workers who want to find jobs. At this level there is no unemployment. However, if the government sets a minimum wage of $13/hour, this will change. The Quantity of Labour Supplied (workers looking for jobs) will be 400, but the quantity demanded will be 200. This means that 200 workers will be unemployed! Again, this is not enough information to determine whether the market is inefficient – we have to calculate the change in total surplus!

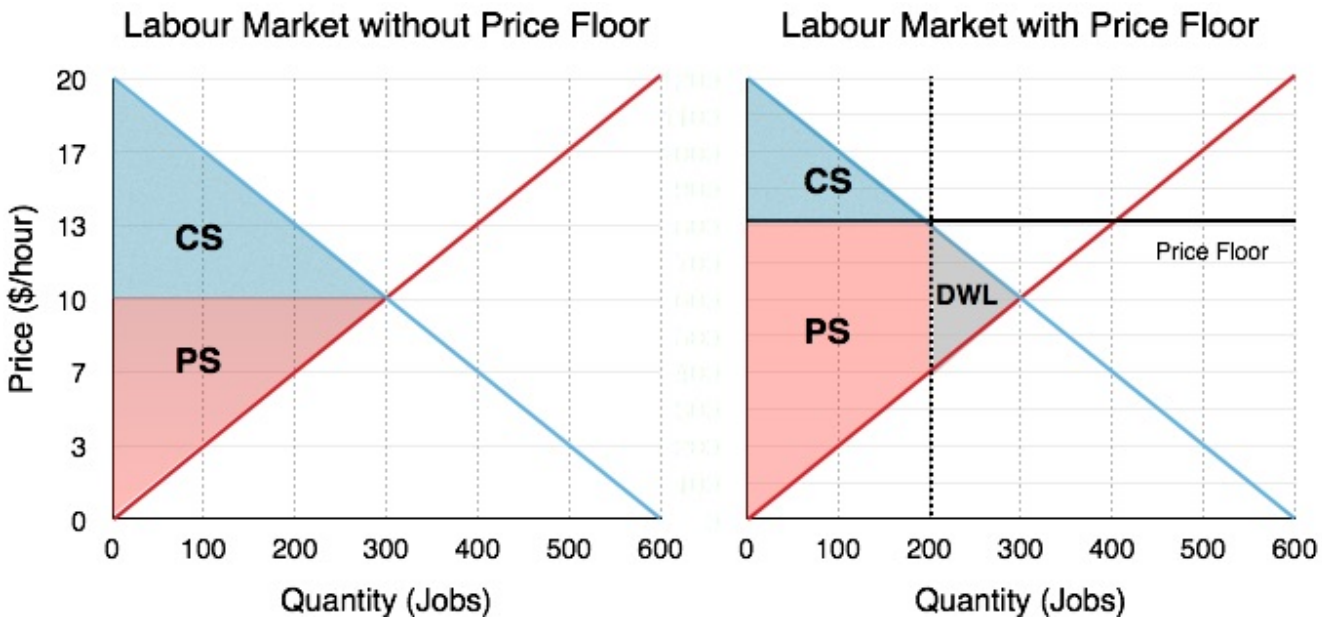

Fig 4.13(A) *Fig 4.13 (B)*
"Labour Market without and with Price Floors", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0

Using the same process as before:

Before (from Fig 4.13 A)

- Consumer Surplus (Blue Area): [(20 − 10) × 300] ÷ 2 = $1500
- Producer Surplus (Red Area): [(10) × 300] ÷ 2 = $1500
- Total (Market) Surplus: $3000

After (from Fig 4.13 B)

- Consumer Surplus (Blue Area): [(20 − 13) × 200] ÷ 2= $700
- Producer Surplus (Red Area): [(13 − 7) × 200] + (7 × 200) ÷ 2 = $1900
- Total Surplus: $2600

Since the total surplus after the policy is less than the total surplus before, there is a deadweight loss!

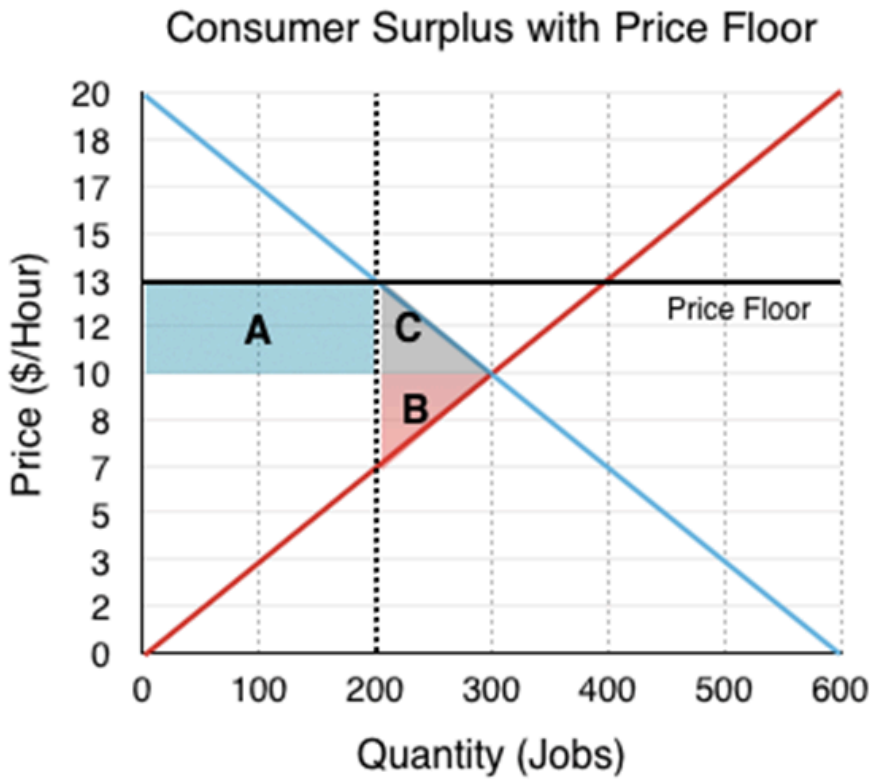

Fig 4.14 "Consumer Surplus with Price Floor", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0

Again, the changes in the market can be categorized as a transfer and a deadweight loss. This time, the transfer is from consumers (firms) to producers (workers), since the workers who are able to find work are better off. This causes no change to market surplus in isolation but is coupled with the deadweight loss caused by workers who are no longer able to find jobs as firms leave the market. The deadweight loss is represented by areas B + C.

Price Floor in the Market for Movie Theatres

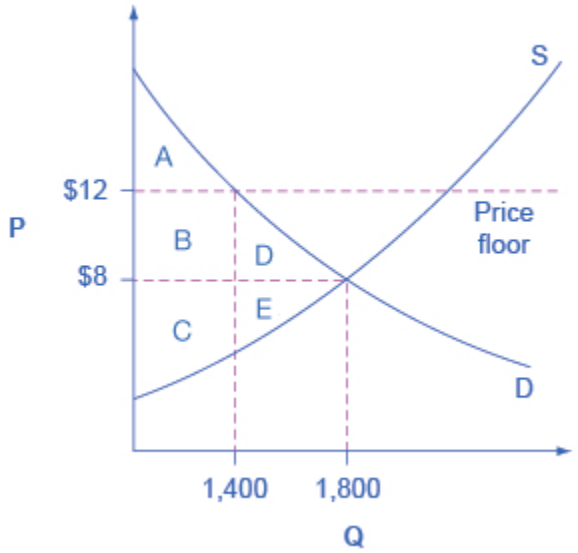

Fig 4.15 Adapted from "Efficiency and Price Floors and Ceilings" by Terianne Brown, Cynthia Foreman, Thomas Scheiding, and OpenStax, CC BY 4.0.

Fig 4.15 shows a price floor example using a string of struggling movie theatres, all in the same city. The current equilibrium is $8 per movie ticket, with 1,800 people attending movies. The original consumer surplus is A + B + D, and original the producer surplus is C + E. The city government is worried that movie theatres will go out of business, reducing the entertainment options available to citizens, so it decides to impose a price floor of $12 per ticket. As a result, the quantity demanded of movie tickets falls to 1,400. The new consumer surplus is A, and the new producer surplus is C + B. In effect, the price floor causes area B to be transferred from consumers to producers but also causes a deadweight loss of D + E.

The above analysis shows that a price ceiling (including rent controls) and price floor, will transfer some producer surplus to consumers—which helps to explain why consumers often favour them. Conversely, a price floor, like a guarantee that workers and theatre owners will receive a certain price for their good or service, will transfer some consumer surplus to producers, which explains why producers often favour them. However, both price floors and price ceilings block some transactions that buyers and sellers would have been willing to make and create deadweight loss. Removing such barriers, so that prices and quantities can adjust to their equilibrium level, will increase the economy's social surplus.

In the next section, we will see the economic impact of a tax policy, which also results in a deadweight loss.

Attributions

4.4 Taxes and Deadweight Loss

"Taxes" by GotCredit, CC BY 2.0.

Taxes are not the most popular policy, but they are often necessary. We will look at two methods to understand how taxes affect the market: by shifting the curve and using the wedge method.

When the government sets a tax, it must decide whether to levy the tax on the producers or the consumers. This is called legal tax incidence. The most well-known taxes are ones levied on the consumer, such as Government Sales Tax (GST) and Provincial Sales Tax (PST). The government also sets taxes on producers, such as the gas tax, which cuts into their profits. The legal incidence of the tax is actually irrelevant when determining who is impacted by the tax. When the government levies a gas tax, the producers will pass some of these costs on as an increased price. Likewise, a tax on consumers will ultimately decrease quantity demanded and reduce producer surplus.

When the government imposed a gas tax for example, from the producer's perspective, any tax levied on them is just an increase in the marginal costs per unit. To illustrate the effect of a tax, let's look at the oil market again.

Example

If the government levies a $3 gas tax on producers, the supply curve will shift up by $3. As shown in Fig 4.16 below, a new equilibrium is created at P=$5 and Q=2 million barrels. Note that producers do not receive $5, they now only receive $2, as $3 has to be sent to the government. From the consumer's perspective, this $1 increase in price is no different than a price increase for any other reason and responds by decreasing the quantity demanded the higher priced good.

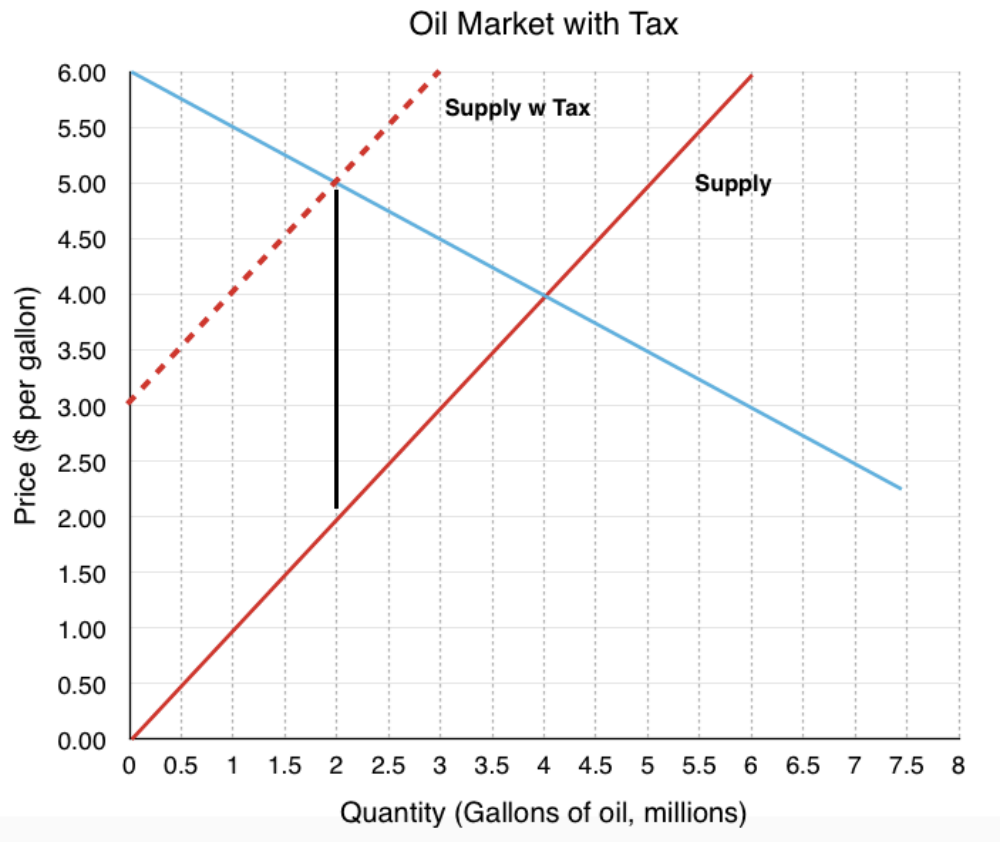

Fig 4.16 "Oil Market with Producer Tax", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

What if the legal incidence of the tax is levied on the consumers? Since the demand curve represents the consumers' willingness to pay, the demand curve will shift down as a result of the tax, as shown in Fig 4.17 below. If consumers are only willing to pay $4/gallon for 4 million gallons of oil but know they will face a $3/gallon tax, they will only purchase 4 million gallons if the ticket price is $1. This creates a new equilibrium where

consumers pay a $2 ticket price, knowing they will have to pay a $3 tax for a total of $5. The producers will receive the $2 paid before taxes.

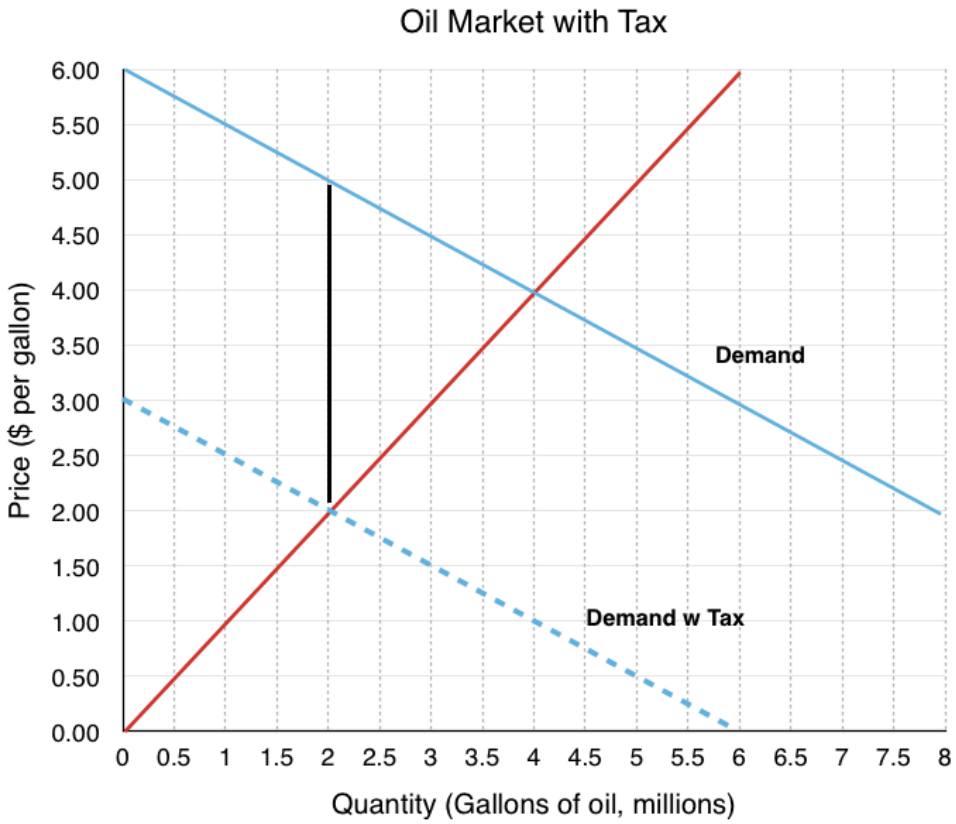

Fig 4.17 "Oil Market with Consumer Tax", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Tax Wedge

Another method to view taxes is through the wedge method. This method recognizes that who pays the tax is ultimately irrelevant. Instead, the wedge method illustrates that a tax drives a wedge between the price consumers pay and the revenue producers receive, equal to the size of the tax levied.

As illustrated below in Fig 4.18, to find the new equilibrium, one simply needs to find a $3 wedge between the curves. The first wedge tested is only $0.7, followed by $1.5, until the $3.0 tax is found.

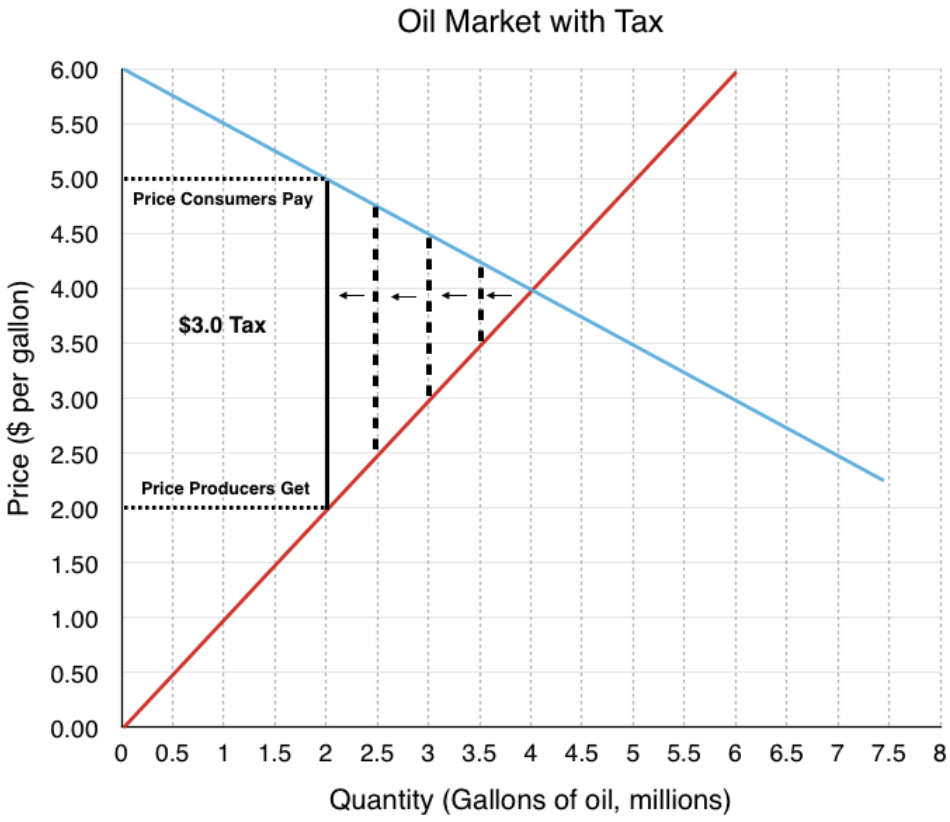

Fig 4.18 "Oil Market with Tax, Wedge Method", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Economic Impact of tax

Like with price and quantity controls, one must compare the market surplus before and after a price change to fully understand the effects of a tax policy on surplus. Before the tax is imposed, economic surplus or market surplus is maximized as shown in Fig 4.19 A below.

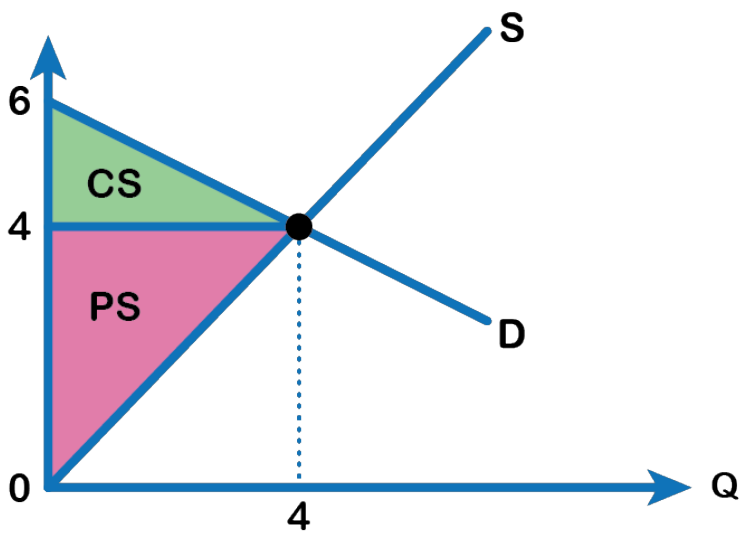

Fig 4.19 (A) – Fanshawe College, CC-BY-NC-SA 4.0

Before

The market surplus before the tax can be calculated from Fig 4.19 A. Ensure you understand how to get the following values:

- Consumer Surplus = $4 million
- Producer Surplus = $8 million
- Market Surplus = $12 million

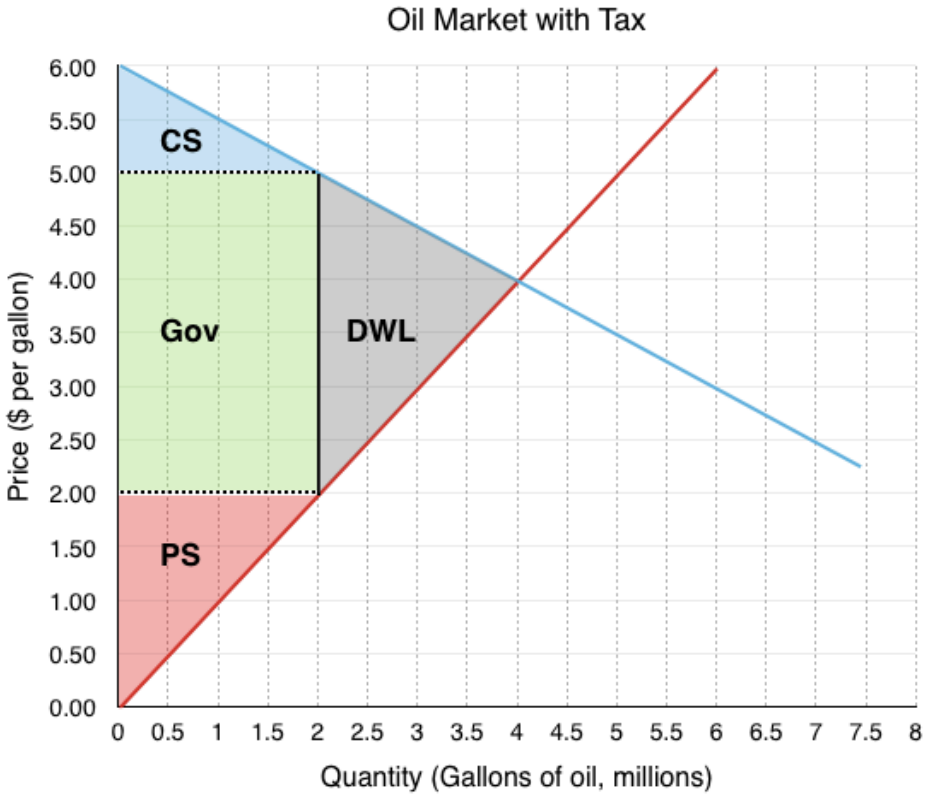

Fig 4.19 (B) "Oil Market with Tax, Market Surplus", by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

After

The market surplus after the policy can be calculated in reference to Fig 4.19 B.

- Consumer Surplus (Blue Area) = $1 million
- Producer Surplus (Red Area) = $2 million
- Government Revenue (Green Area) = $6 million
- Market Surplus = $9 million

Transfer and Deadweight Loss

Let's look closely at the tax's impact on quantity and price to see how these components affect the market.

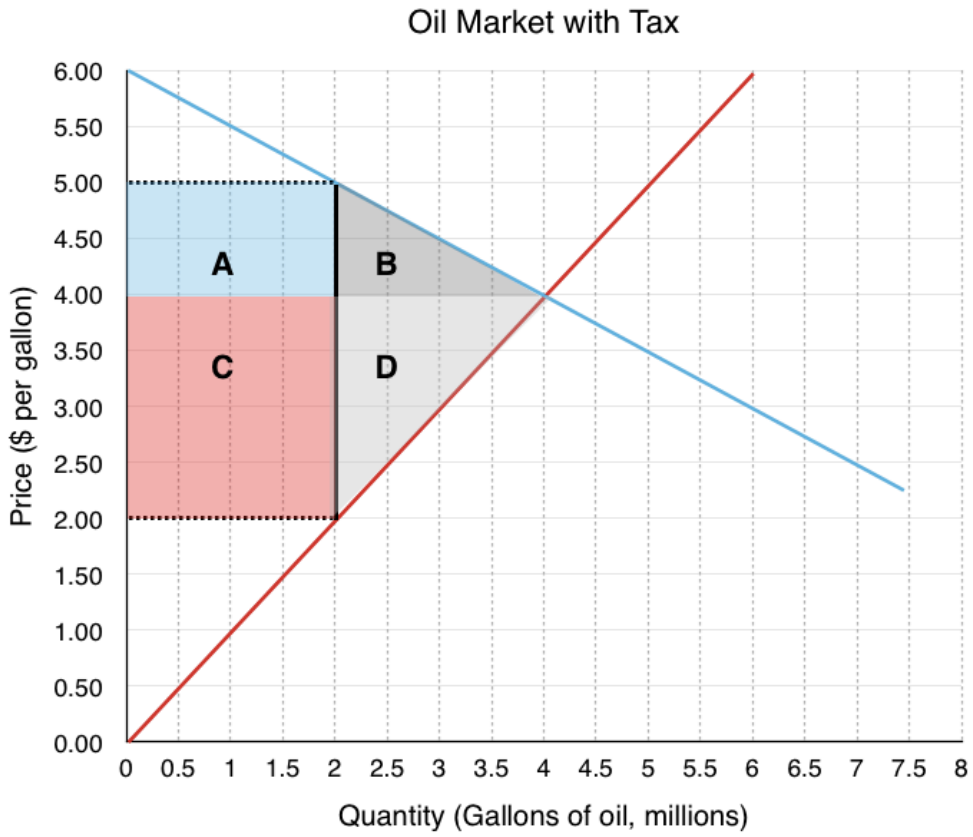

Fig 4.20 "Oil Market with Tax, Deadweight Loss" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Transfer – The Impact of Price

Due to the tax's effect on the price, areas A and C are transferred from consumer and producer surplus to government revenue.

- **Consumers to Government – Area A –** Consumers originally paid $4/gallon for gas. Now, they are paying $5/gallon. The $1 increase in price is the portion of the tax that consumers have to bear. This price change means the government collects $1 × 2 million gallons or $2 million in tax revenue from the consumers.
- **Producers to Government – Area C-** Originally, producers received revenue of $4/gallon for gas. Now, they receive $2/gallon. This $2 decrease is the portion of the tax that producers have to bear. This means that the government collects $2 × 2 million gallons or $4 million in tax revenue from the producers. This is a transfer from producers to the government.

Deadweight Loss – The Impact of Quantity

A higher price for consumers will cause a decrease in the quantity demanded, and a lower price for producers will cause a decrease in quantity supplied. This reduction from equilibrium quantity is what causes a

deadweight loss in the market since there are consumers and producers who are no longer able to buy and supply the good.

Taxes are more complicated than price control as they involve a third economic player: the government. As we saw, who the tax is levied on, is irrelevant when looking at how the market ends up. Note that the last three sections have painted a fairly grim picture about policy instruments. This is because our model currently does not include the external costs economic players impose on the macro-environment (pollution, disease, etc.). These concepts will be explored in more detail in the next chapter.

Attribution

4.5 Key Terms

Key Terms

Consumer Surplus

Demand

Economic Efficiency

Economic Surplus or Total Surplus

Price Ceiling

Price Floor

Producer Surplus

Supply

Tax Wedge

Willingness to Pay (WTP)

CHAPTER 5: EXTERNALITIES

Chapter Outline

5.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Describe positive and negative externalities
- Identify the economic impact of externalities
- Discuss the government policies to achieve efficiency in markets with externalities
- Explore coase theorem and private bargaining

In 1969, the Cuyahoga River in Ohio was so polluted that it spontaneously burst into flame. Air pollution was so bad at that time that Chattanooga, Tennessee was a city where, as an article from *Sports Illustrated* put it: "the death rate from tuberculosis was double that of the rest of Tennessee and triple that of the rest of the United States, a city in which the filth in the air was so bad it melted nylon stockings off women's legs, in which executives kept supplies of clean white shirts in their offices so they could change when a shirt became too gray to be presentable, in which headlights were turned on at high noon because the sun was eclipsed by the gunk in the sky."

Photo by James Thomas, Public Domain.

The problem of pollution arises for every economy in the world, whether high-income or low-income, and whether market-oriented or command-oriented. Every country needs to strike some balance between production and environmental quality. This chapter begins by discussing how firms may fail to take certain social costs, like pollution, into their planning if they do not need to pay these costs. Traditionally, policies for environmental protection have focused on governmental limits on how much of each pollutant could be emitted. While this approach has had some success, economists have suggested a range of more flexible, market-oriented policies that reduce pollution at a lower cost.

Attribution

5.1 Externalities

To this point, we have modelled **private markets**. Private markets only consider consumers, producers, and the government – the impacts on external parties are irrelevant. The perfectly competitive market in Chapters 3 and 4 we modelled, offered an efficient way to put buyers and sellers together and determine what goods are produced, how they are produced, and who gets them. The principle that voluntary exchange benefits both buyers and sellers is a fundamental building block of the economic way of thinking. But what happens when a voluntary exchange affects a third party who is neither the buyer nor the seller?

Example

Consider an example of a concert producer who wants to build an outdoor arena that will host country music concerts a half-mile from your neighbourhood. You will be able to hear these outdoor concerts while sitting on your back porch—or perhaps even in your dining room. In this case, the sellers and buyers of concert tickets may both be quite satisfied with their voluntary exchange, but you have no voice in their market transaction. The effect of market exchange on a third party who is outside or "external" to the exchange is called an **externality**. Because externalities that occur in market transactions affect other parties beyond those involved, they are sometimes called **spillovers**.

Externalities can be *negative or positive*. If you hate country music, then having it waft into your house every night would be a **negative externality**. If you love country music, then what amounts to a series of free concerts would be a **positive externality**.

Enriching Our Model

As discussed earlier, we have previously modelled private markets. Thus, the terminology we used in that analysis applies to private markets. The terms consumer surplus, producer surplus, market surplus, and the market equilibrium (note that this will be referred to interchangeably in this chapter as the unregulated market equilibrium) derive their meaning from an analysis of private markets and need to be adapted in a discussion where external costs or external benefitsare present.

For the purpose of this analysis, the following terminology will be used:

- Our chapter three demand curve is equivalent to the marginal private benefit curve or D.

- Our chapter three supply curve is equivalent to the marginal private cost curve or S.

We now want to develop a model that accounts for positive and negative externalities. To do so, we must consider the external costs and benefits. External costs and benefits occur when producing or consuming a good or service impose a cost/benefit upon a third party.

When we account for external costs and benefits, the following definitions apply:

- When we add external benefits to private benefits, we create a **marginal social benefit curve** or D-social. In the presence of a positive externality (with a constant marginal external benefit), this curve lies above the demand curve at all quantities.
- When we add external costs to private costs, we create a **marginal social cost curve** or S-social. In the presence of a negative externality (with a constant marginal external cost), this curve lies above the supply curve at all quantities.

When we were considering private markets, our objective was to maximize market surplus or total private benefits minus total private costs. Our new objective considering all impacted agents in society is to maximize social surplus or total social benefits minus total social costs.

A Negative Externality: Pollution

Photo by veeterzy, Unsplash License.

Pollution is a negative externality. Economists illustrate the social costsof production with a demand and supply diagram. The social costs include the private costs of production that a company incurs and the external costs of pollution that pass on to society.

Fig 5.1 shows the demand and supply for manufacturing refrigerators. The demand curve (D) shows the quantity demanded at each price. The supply curve (S) shows the quantity of refrigerators that all firms in the industry supply at each price assuming they are taking only their private costs into account and they are allowed to emit pollution at zero cost. The market equilibrium (E0), where quantity supplied equals quantity demanded, is at a price of $650 per refrigerator and a quantity of 45,000 refrigerators.

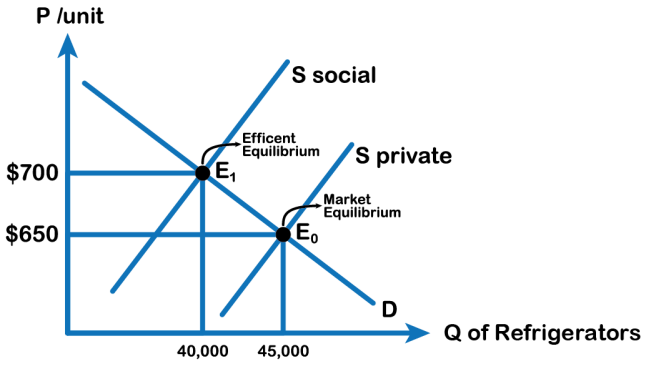

Fig 5.1 – Fanshawe College, CC-BY-NC-SA 4.0

However, as a by-product of the metals, plastics, chemicals, and energy that refrigerator manufacturers use, some pollution is created. Let's say that, if these pollutants were emitted into the air and

water, they would create costs of $100 per refrigerator produced. These costs might occur because of adverse effects on human health, or because of other negative impacts. In a market with no anti-pollution restrictions, firms can dispose of certain wastes absolutely free.

In perspective

Now imagine that firms that produce refrigerators must factor in these external costs of pollution—that is, the firms have to consider not only labour and material costs but also the broader costs to society of harm to health and other costs caused by pollution. If the firm is required to pay $100 for the additional external costsof pollution each time it produces a refrigerator, production becomes more costly and the entire supply curve shifts up by $100.

As the Fig. 5.1 above illustrates, the firm will need to receive a price of $700 per refrigerator and produce a quantity of 40,000—and the firm's new supply curve will be S-social (S plus external costs). The new efficient equilibrium will occur at E1. In short, taking the additional external costs of pollution into account results in a higher price, a lower quantity of production, and a lower quantity of pollution.

If no externalities existed, private costs would be the same as the costs to society as a whole, and private benefits would be the same as the benefits to society as a whole. Thus, if no externalities existed, the interaction of demand and supply will coordinate social costs and benefits. However, when the externality of pollution exists, the supply curve no longer represents all social costs. Because externalities represent a case where markets no longer consider all social costs, but only some of them, economists commonly refer to externalities as an example of market failure. When there is market failure, the private market fails to achieve efficient output, because firms do not account for all costs incurred in the production of output. In the case of pollution, at the market output, social costs of production exceed social benefits to consumers, and the market produces too much of the product.

We can see a general lesson here. If firms were required to pay the social costs of pollution, they would create less pollution but produce less of the product and charge a higher price. In the next section, we will explore the economic impact of positive externalities.

A Positive Externality: Flu Shot

Photo by Steven Cornfield, Unsplash License.

A **positive externality** occurs when the market interaction of others presents a benefit to non-market participants. The analysis of positive externalities is almost identical to negative externalities. The difference is that instead of the market equilibrium quantity is too much, the market will generate too little Q. Let's look at an example. Consider the following diagram of a market where a positive externality is present. When someone takes the flu shot, the person not only reduces her own risk of getting the flu but also reduces the chance of people around her contracting the flu. Economists illustrate the social benefits of production with a demand and supply diagram. The social benefits include the private benefits that an individual incurs from the flu shot plus the external benefits of the vaccine that pass on to the community around him.

Fig 5.2 shows the demand and supply of Flu shots. The demand curve (D) shows the quantity demanded at each price, taking only the private benefit of receiving the vaccine. The supply curve (S) shows the quantity of flu shots supplied at each price by the pharma industry. The market equilibrium (E0), where quantity supplied equals quantity demanded, is at a price of $10 per shot and a quantity of 10,000 flu shots.

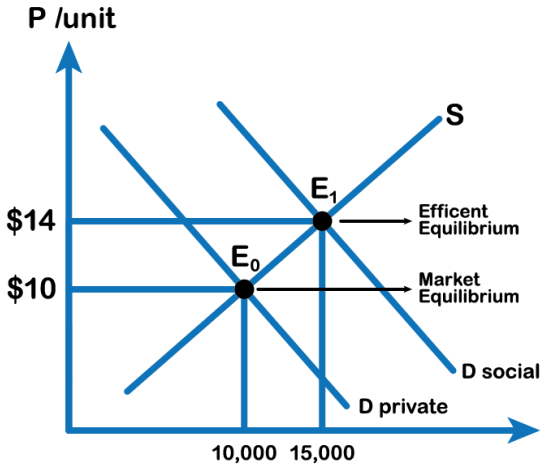

Fig 5.2 – Fanshawe College, CC-BY-NC-SA 4.0

Let's say that, flu shots create a positive externality by lowering other people's risk of getting the disease. Assuming that we factor in these external benefits of the flu vaccine. This creates a social demand curve D-social (D plus external benefits). The benefit to the society shifts the private demand curve D to the right by accounting for the social benefit.

As the Fig 5.2 above shows, the new efficient equilibrium will occur at E1. This is the efficient equilibrium. In short, taking the additional external benefit of the flu shot into account results in a higher price of $14 per shot, and a greater quantity of production (15,000 vaccines). In the case of a positive externality, at the market output, social benefits to consumers are less than the social cost of production, and the market produces too little of the product.

Attribution

5.2 (A)‘Internalizing’ an Externality: Pollution Tax

Now we know that an externality is a form of market failure that arises because market participants do not account for factors external to the market. This makes the market quantity is too low or too high relative to the socially optimal level of production. In Chapters 3 and 4, we learned a variety of policies that influence the number of goods exchanged in a market. We can use these to set quantity where D = S. If we create a policy correctly, we can bring the market back to the social surplus maximizing level of output.

We can either set the appropriate quantity directly through a price floor or price ceiling. More commonly, governments address the externality through a tax or subsidy. In this case, the government introduces a tax that will make market participants act as if they care about participants outside the market. In economic jargon, this is called internalizing the externality. A tax that addresses a negative externality by taxing the good instead of the actual external cost is called a **Pigouvian tax**.

Example

Consider the following figure of a market with a negative externality present

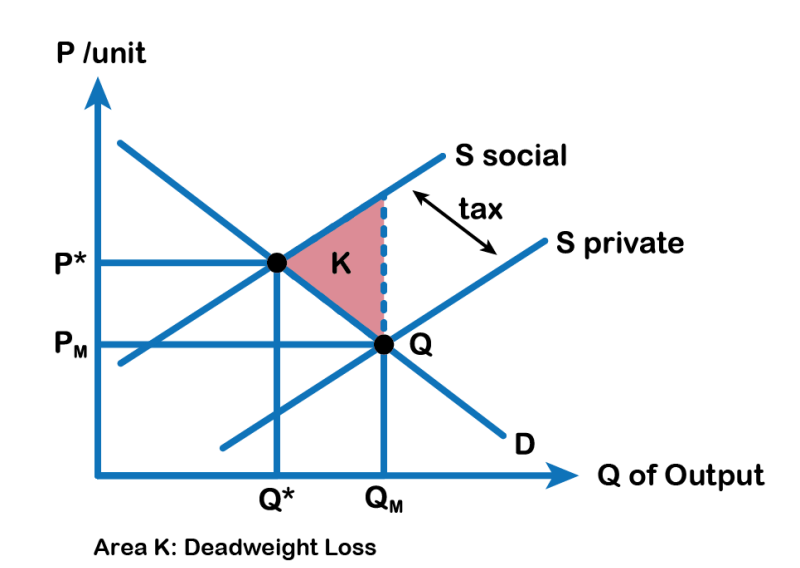

Fig 5.3 – Fanshawe College, CC-BY-NC-SA 4.0

We know that without regulation, the market will naturally tend to QM (where D-private = S-private)

and that this will result in a deadweight loss of area K. Ideally, we want the quantity exchanged to equal Q*, which is the social surplus optimizing the level of production since this level of output is where D-private = S-social. How can we force the market here? One way is to introduce a tax equal to the marginal external cost at the efficient quantity Q*. This makes the producer face a cost curve of S-private + tax, = S-social and since the tax is equal to external costs, this will just cause firms to act as though they recognize the externality.

A common misconception is that introducing a tax in this market eliminates external costs. This is incorrect. In some sense, we are aiming for an "optimal" level of external cost. To get a sense of this, consider the manufacturing industry. We could get external costs (like the adverse effects of carbon dioxide emissions) to equal zero if we stopped production entirely, but then we would have a world with little energy.

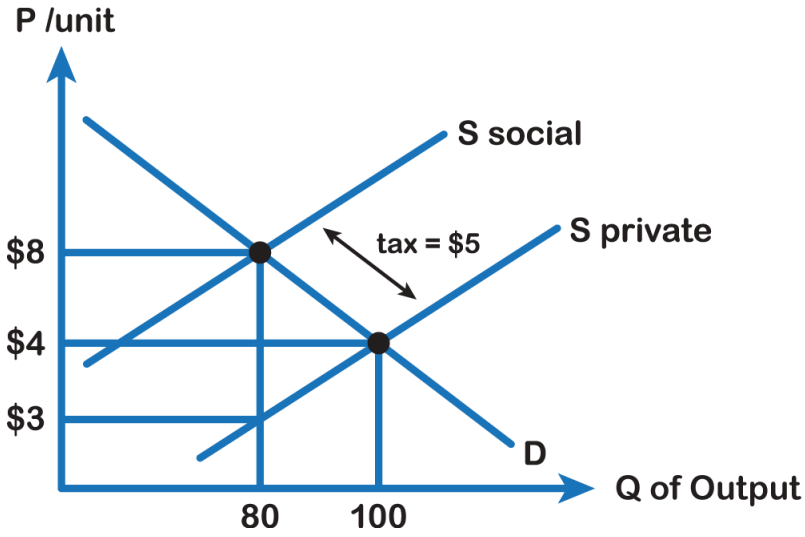

Fig 5.4 – Fanshawe College, CC-BY-NC-SA 4.0

In the above graph, the equilibrium quantity is 100 and the socially efficient level of output is 80. The intuition behind the policy response is the same as before, but we have to be careful about the amount of the tax as the marginal external cost is changing. We want to set the level of the tax equal to the marginal external cost at the socially efficient level of output. This value is 8 minus 3 or $5. We know that setting a tax equal to $5 will bring us to 80 units, where social welfare is maximized.

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5.2 (B) ‘Internalizing’ an Externality: Subsidizing post secondary education

The appropriate public policy response to a positive externality, like post-secondary education, is to help the party creating the positive externality receive a greater share of the social benefits. In the case of education, an effective policy might be to provide a subsidy to those who choose to get a college or university education.

Fig 5.5 below shows the market for post-secondary education. The market demand curve D for post-secondary education reflects only the marginal private benefits that the educated individuals receive such as better career prospects and income. Assuming that there are no spillover costs of education, the market supply curve is given by the marginal private cost of providing post-secondary education.

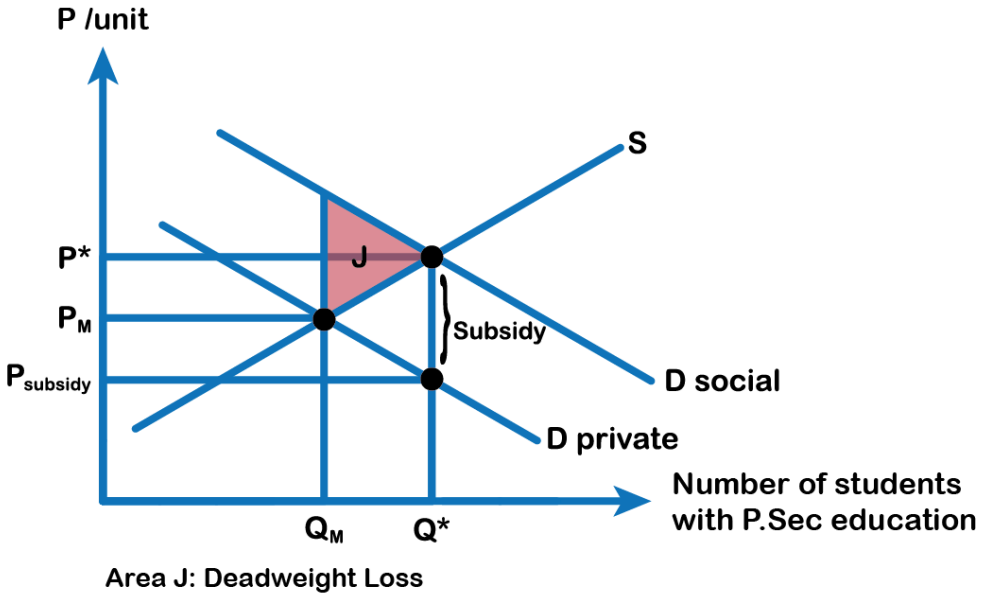

Fig 5.5 – Fanshawe College, CC-BY-NC-SA 4.0

The equilibrium quantity of people receiving post-secondary education in the market, where D = S is Q-Market and the price of post secondary education is P-Market. However, spillover benefits exist in this market because others, those who chose not to obtain higher education, receive a positive externality from those who attend college or university. When we add the spillover benefits to the marginal private benefit of post-secondary, the marginal social benefit of education is given by D-Social. We see that the socially optimal level of people receiving college/university education is greater than the market quantity (Q* exceeds Q-Market) and the corresponding price of post-secondary education, if the market were to produce Q*, would be at P*. Unfortunately, the marketplace does not recognize the positive externality and the number of people receiving college education tends to go under produced and under-consumed and generates a deadweight loss of area J.

How can government try to move the market level of output closer to the socially desirable level of output?

One policy would be to provide a subsidy to students who wish to get a post-secondary education. This subsidy would act as "income" that one could use to buy higher education and, if the subsidy were exactly equal to the per-unit spillover benefits, it would increase market equilibrium to the efficient quantity of Q* and the price to P* where D-social = S. Suppliers of higher education would receive payment of P* per student, while consumers of college education would only pay a price of P-Subsidy. When the government uses a subsidy in this way, it produces the socially optimal quantity of post-secondary education.

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5.3 Types of Private Solutions: Coase Theorem

Private actors will sometimes effectively address externalities and reach efficient outcomes without government intervention. Private players will sometimes arrive at their own solutions. The **Coase Theorem**, developed by Ronald Coase, states that parties will be able to bargain with each other to reach an efficient agreement that addresses externalities.

Definition: The Coase Theorem

The Coase theorem states that if property rights are well-defined, and negotiations among the actors are costless, the result will be a socially efficient level of the economic activity in question. It is one of the most important and influential theorems in economics.

The common feature of all externalities is that there are costs and/or benefits to economic activity that are not accounted for in the price of the activity. Suppose, a factory is causing a lot of air pollution in a neighbourhood that is making people sick and raising their medical expenses. The way Coase saw the problem was that **property rights**—the rights to control the use of a good or resource– are not well defined in the case of an air-polluting factory. That is, if neighbors do not have the well-defined right to clean air there is no incentive for the factory to pay for or take into account the neighbors' medical bills, and diminished quality of life due to the odor from the factory.

The Coase theorem states that if property rights are well-defined, and negotiations among the actors are costless, the result will be a socially efficient level of the economic activity in question. It is one of the most important and influential theorems in economics. However, the theorem assumes certain conditions for such a solution to occur, including low transaction costs and well-defined property rights. If the conditions are met, the bargaining parties are expected to reach an amicable agreement. In practice, however, transaction costs do exist in most processes of agreement and as a result, private individuals often fail to resolve problems.

Application of the Coase theorem

Suppose that the neighbours' combined medical and other costs, per unit of output, is $10. Also, the marginal private cost incurred by the factory is constant at $100 per unit. The marginal social cost is then the $100 private cost plus the $10 external cost, or $110 per unit of output.

Defining clean air as a property right and allowing for free negotiation enables the neighbours to quantify at $10 their willingness to pay for clean air or, conversely, their willingness to accept the dirty air. So, for each unit of output, neighbours will demand to be compensated exactly the amount of their true loss: $10. Since they have the right to clean air, the factory owners are obliged to pay them, and thus the new cost to the factory

owners takes into account the social cost or S-social. We know now that this will result in a socially efficient outcome.

Now suppose that the factory owners instead had the right to pollute the air as much as they like. Neighbours would be willing to pay the factory owners $10 a unit (the external cost of the pollution) to reduce emissions from the current level. So again the socially efficient level of output will result. The transfer of wealth is quite different here, so assigning property rights has big implications in terms of the relative welfare of the groups. But in terms of the socially efficient level of output, the assignment of property rights has no impact.

You may think that implementing the Coase theorem is an ideal policy solution for externalities, but a few words of caution are in order. The assumption of costless negotiation is quite improbable in practice. In order for it to be true in the example of the polluting factory, the neighbours all have to be able to identify themselves and band together, correctly assess the values of the damage done to them per unit of output, and be able to demand the money from the factory owners. Costless negotiation is unlikely to be the case in any similar real word situation.

Example: Coase Theorem

An interesting real-world application of the Coase theorem has happened in sparsely populated areas of eastern Oregon where residents have been paid $5000 by a wind-energy company to put up with the noise of wind turbines (residents must sign a waiver promising not to complain about the noise). Oregon law gives the right to peace and quiet to the residents, so for the turbines to exist, the residents must agree to live with the noise. In this case, because the area is sparsely populated and it is pretty easy to determine who is affected (just use a decibel meter), negotiation is relatively easy.

"WindShare Turbine" by GTD Aquitaine, Public Domain.

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5.4 Public Goods

Even though new technology creates positive externalities so that perhaps one-third or one-half of the social benefit of new inventions spills over to others, the inventor still receives some private return.

In Perspective

What about a situation where the positive externalities are so extensive that private firms could not expect to receive any of the social benefits?

We call this kind of good a ***public good***. Spending on national defence is a good example of a public good. Let's begin by defining the characteristics of public goods and discussing why these characteristics make it difficult for private firms to supply public goods. Then we will see how the government may step in to address the issue.

Public Good

Economists have a strict definition of a public good, and it does not necessarily include all goods financed through taxes. To understand the defining characteristics of a public good, first consider an ordinary private good, like a piece of pizza. We can buy and sell a piece of pizza fairly easily because it is a separate and identifiable item. However, public goods are not separate and identifiable in this way.

Instead, public goods have two defining characteristics: they are nonexcludable and non-rival.

"Slice of pizza" by OpenClipart, Public Domain.

- The first characteristic, that a public good is non-excludable, means that it is costly or impossible to exclude someone from using the good. If Larry buys a private good like a piece of pizza, then he can exclude others, like Lorna, from eating that pizza. However, if the national defence is provided, then it includes everyone. Even if you strongly disagree with Canada's defence policies or with the level of defence spending, the national defence still protects you. You cannot choose to be unprotected, and national defence cannot protect everyone else and exclude you.
- The second main characteristic of a public good, that it is non-rival, means that when one person uses the public good, another can also use it. With a private good like pizza, if Max is eating the pizza then Amy cannot also eat it; that is, the two people are rivals in consumption. With a public good like national defence, Max's consumption of national defence does not reduce the amount left for Michelle, so they are non-rival in this area.

A number of government services are examples of public goods. For instance, it would not be easy to provide

fire and police service so that some people in a neighbourhood would be protected from the burning and burglary of their property, while others would not be protected at all. Protecting some necessarily means protecting others, too. Private Goods are both rival and excludable while public goods are both non-excludable and non-rival.

The Free Rider Problem of Public Goods

Private companies find it difficult to produce public goods. When individuals make decisions about buying a public good, a free-rider problem can arise, in which people have an incentive to let others pay for the public good and then to “free ride” on the purchases of others.

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5.5 Key Terms

Key Terms

Externality

Marginal Social Cost Curve or S-Social

Marginal Social Benefit Curve or D-Social

Negative Externality

Pigouvian tax

Positive Externality

Private Markets

Public Good

Spillovers

The Coase Theorem

CHAPTER 6: ELASTICITY

Chapter Outline

6.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Discuss the Price Elasticity of Demand and Its Measurement
- Explain the Determinants of the Price Elasticity of Demand
- Analyze the Relationship between Price Elasticity of Demand and Total Revenue
- Elaborate other Demand Elasticities
- Describe elasticity of Supply

In Perspective – Elasticity

In early 2011, Netflix consumers paid about $10 a month for a package consisting of streaming video and DVD rentals. In July 2011, the company announced a packaging change. Customers wishing to retain both streaming video and DVD rental would be charged $15.98 per month – a price increase of about 60%. In 2014, Netflix also raised its streaming video subscription price from $7.99 to $8.99 per month for new U.S. customers. The company also changed its policy of 4K streaming content from $9.00 to $12.00 per month that year.

How did customers react? Did they abandon Netflix? How much will this price change affect the demand for Netflix's products? The answers to those questions will be explored in this chapter with concept economists call elasticity.

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6.1 Price Elasticity of Demand

Anyone who has studied economics knows the law of demand: a higher price will lead to a lower quantity demanded. What you may not know is how much lower the quantity demanded will be. This topic will explain how to answer these questions and why they are critically important in the real world.

Definition: Price Elasticity of Demand

Elasticity is an economics concept that measures the responsiveness of one variable to changes in another variable. The **price elasticity of demand** is the percentage change in the quantity demanded of a good or service divided by the percentage change in the price. This shows the responsiveness of the quantity demanded to a change in price. Because price and quantity demanded move in opposite directions, the price elasticity of demand is always a negative number. Therefore, price elasticity of demand is usually reported as an absolutevalue, withouta negative sign.

Price Elasticity of Demand = % change in Quantity demanded ÷ % change in Price

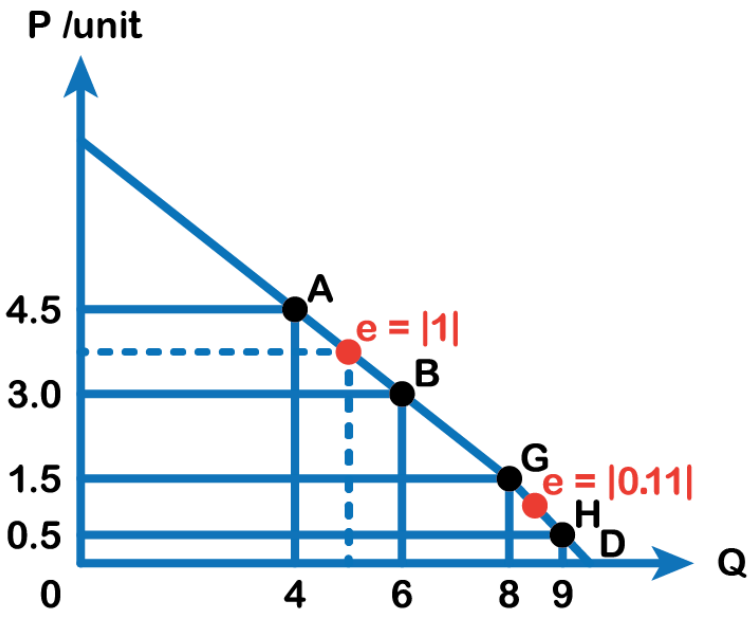

Fig 6.1 – Fanshawe College, CC-BY-NC-SA 4.0

Example

Look at the above figure. When the price of a cup of coffee is $4.5, the quantity demanded is 4 cups an hour and when the price falls to $3.00 a cup, the quantity demanded rises to 6 cups every hour.

Moving from Point A to B:

- **% Change in Price**: The coffee price falls from $4.50 to $3.00, meaning the percentage change is [(3.00 − 4.50) ÷ 4.50] × 100 = −33%. *Price has fallen by 33%*
- **% Change in Quantity Demanded**: The quantity of coffee sold increases from 4 to 6, meaning the percentage change is [(6 − 4) ÷ 4] × 100 = 50%. *The quantity has risen by 50%*

Therefore, **Elasticity:** %change in Quantity demanded ÷ %change in Price = −50% ÷ 33% = −1.5.

In *absolute* terms, elasticity = 1.5. This is the price elasticity of demand over the range of the demand curve between points A and B.

Midpoint Method

To calculate elasticity, instead of using simple percentage changes in quantity and price, economists use the average percent change. This is called the **mid-point method for elasticity**, and is represented in the following equations:

% change in quantity demanded = [(New Q − Old Q) ÷ ((New Q + Old Q) ÷ 2)] × 100%

- (New Q + Old Q) ÷ 2 shows the average of the two quantities

% change in price = [(New Price − Old Price) ÷ ((New P + Old P) ÷ 2)] × 100%

- (New P +Old P) ÷ 2 is the average of the two prices

The advantage of the **mid-point method** is that we find the elasticity right at a single point on the demand curve, which is more precise than finding the elasticity over the entire range between the two points A and B, in the above figure.

Using the mid-point method to calculate the elasticity between Point A and Point B:

$$= \frac{\left(\frac{(3.00 - 4.50)}{[(3 + 4.50) \div 2]}\right) \times 100}{\left(\frac{(6.00 - 4.00)}{[(6.00 + 4.00) \div 2]}\right) \times 100} = \frac{40}{40} = 1 \ (absolute \ value)$$

This method gives us a sort of average elasticity of demand at the centre point between the two points on our demand curve. The elasticity of demand is interpreted as when the price changes by 1 percent, the quantity demanded also changes by 1 percent.

Is Elasticity the Slope?

It is a common mistake to confuse the slope of the demand curve with its elasticity. The slope is the rate of change in units along the curve, or the rise/run (change in y over the change in x).

Example

In Fig 6.1, at each point between A and B, shown on the demand curve, price drops by $1.50 and the number of units demanded increases by 2. The slope is –1.5/2 = – 0.75 along the entire demand curve and does not change. The price elasticity, however, changes along the curve. The elasticity between points A and B was – 1 and changed to – 0.11 between points G and H. Elasticity is the percentage change, which is a different calculation from the slope and has a different meaning.

Different Kinds of Price Elasticities of Demand

We can usefully divide elasticities into three broad categories: elastic, inelastic, and unitary.

Elastic demand is one in which the elasticity is greater than one, indicating high responsiveness to changes in price (Fig 6.2 A). Elasticities that are less than one indicate low responsiveness to price changes and correspond to inelastic demand (Fig 6.2 B). An **elastic demand** curve is relatively **flatter** than an inelastic demand curve. Unitary elastic demand indicates quantity demanded changes by the same proportion with respect to the price, as Fig 6.3 below summarizes.

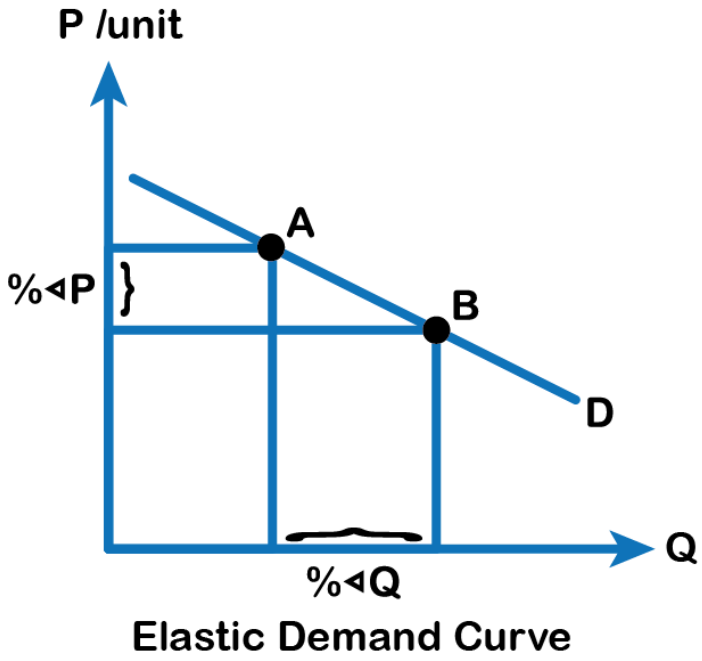

Fig 6.2 (A) – Fanshawe College, CC-BY-NC-SA 4.0

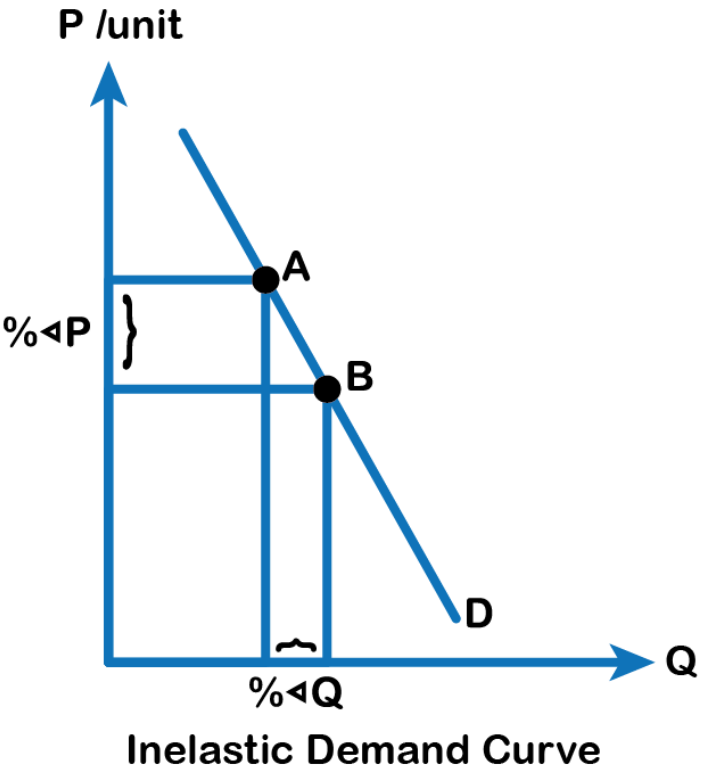

Fig 6.2 (B) – Fanshawe College, CC-BY-NC-SA 4.0

If...	Then...	And it is called...
% change in quantity > % change in price	% change in quantity ÷ % change in price > 1	Elastic
% change in quantity = % change in price	% change in quantity ÷ % change in price = 1	Unitary
% change in quantity < change in price	% change in quantity ÷ % change in price < 1	Inelastic

Fig 6.3

There are *two* extreme cases of elasticity: when elasticity equals zero and when it is infinite. We will describe each case. **Infinite elasticity or perfect elasticity** refers to the extreme case where the quantity demanded changes by an infinite amount in response to any change in price at all. In this case, the demand curve is horizontal as Fig 6.4 A shows. Perfectly elastic demand is an extreme example. Examples of such goods are Caribbean cruises and sports vehicles.

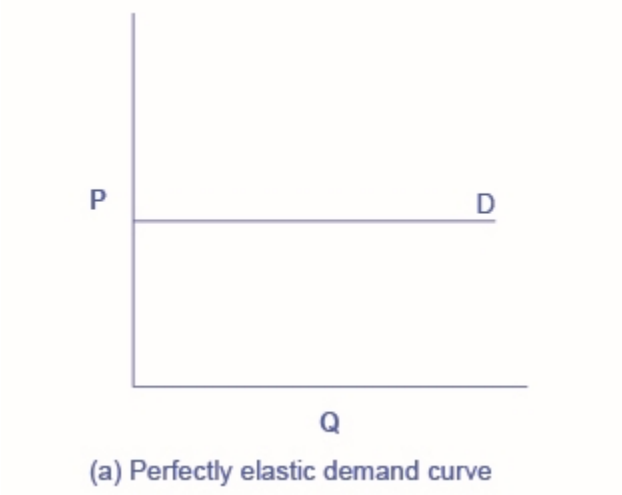

Fig 6.4 (A) Adapted from "Infinite Elasticity" by OpenStax, CC BY 4.0.

Zero elasticity or **perfect inelasticity**, as Fig 6.4 B depicts, refers to the extreme case in which a percentage change in price, no matter how large, results in zero change in quantity. Again, while perfectly inelastic demand is an extreme case, necessities are likely to have highly inelastic demand curves. This is the case with life-saving drugs and gasoline.

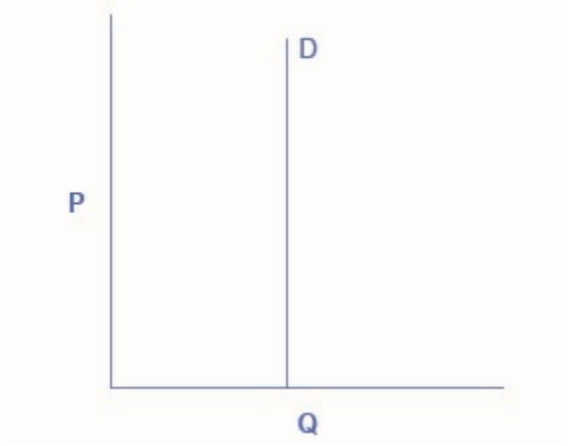

Fig 6.4 (B) Adapted from "Infinite Elasticity" by OpenStax, CC BY 4.0.

Constant unitary elasticity, in a demand curve, occurs when a price change of one percent results in a quantity change of one percent. Fig 6.4 C shows a demand curve with constant unit elasticity. Using the midpoint method, you can calculate that between points A and B on the demand curve, the price changes by 66.7%, and quantity demanded also changes by 66.7%. Hence, the elasticity equals 1. Between points B and C, price again changes by 66.7% as does quantity, while between points C and D the corresponding percentage changes are again 66.7% for both price and quantity. In each case, then, the percentage change in price equals the percentage change in quantity, and consequently, elasticity equals 1.

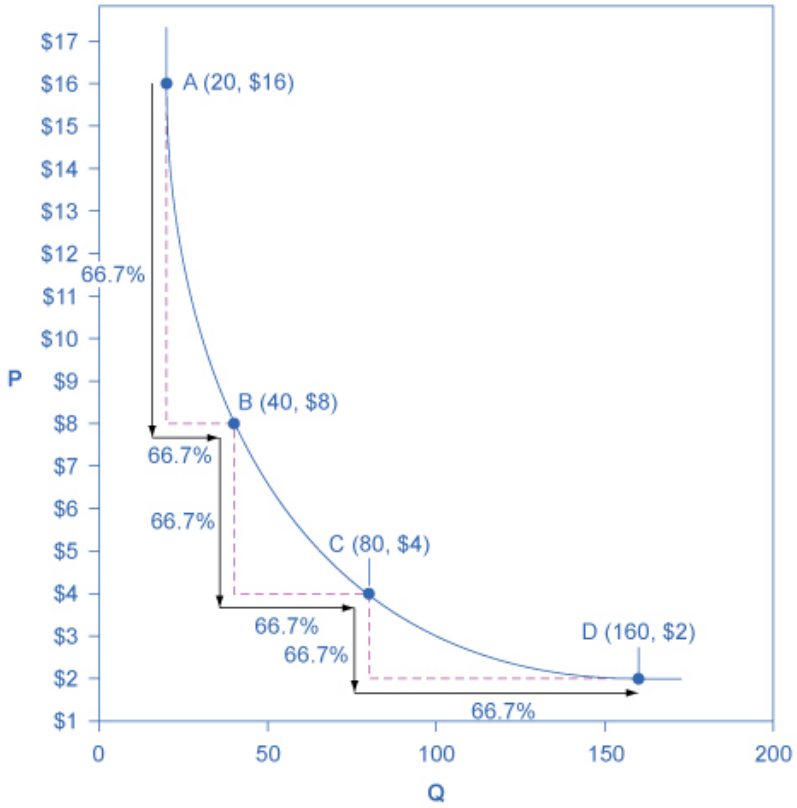

Fig 6.4 (C) "A Constant Unitary Elasticity Demand Curve" by OpenStax, CC BY 4.0.

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"5.1 Price Elasticity of Demand and Elasticity of Supply" and "5.2 Polar Cases of Elasticity and Constant Elasticity" in Principles of Economics 2e by OpenStax is licensed under Creative Commons Attribution 4.0 International License.

6.2 Determinants of Elasticity of Demand

Factors that determine the elasticity of demand would be the availability of substitutes, the share of the good's expense in individuals' income, and the passage of time.

More substitutes imply individuals have more choices and therefore consumers are more sensitive to price changes. The **availability of substitutes** makes the goods relatively more elastic. Conversely, less substitutes give consumers less choices and therefore goods with low substitutes are relatively less elastic or inelastic. Usually, necessities have less substitutes such as gasoline, medicines, and certain food items such as milk. Because consumers have less choices available, they are less sensitive to price changes, i.e. when the price rises, people cannot make significant changes to their consumption.

Also, another factor that determines elasticity is the **passage of time**. Take the example of gasoline. When gas prices rise, people cannot cut their consumption very much as it is a necessity and also people cannot change their driving habits quickly. However, as gas prices keep rising we will likely see the elasticity of demand for gasoline increase slightly (i.e. gasoline could become relatively less inelastic) as people start carpooling, taking public transportation, and/or switching to hybrid or electric vehicles.

Goods that take up a larger **share of individuals' expenses** are likely to be more elastic such as expensive items or luxury items. A rise in the price of these expensive items could make consumers more sensitive to the price change. Conversely, goods that are relatively cheap and take up a smaller share of individuals' expenses are likely to be less elastic or relatively inelastic. A rise in the price of these cheaper goods may not make consumers too sensitive to the price change because the share of these items in individuals' budget is much less, such as certain food items like salt and sugar.

Fig 6.5 below shows a selection of demand elasticities for different goods and services drawn from a variety of different studies by economists, listed in order of increasing elasticity.

Goods and Services	Elasticity of Price
Housing	0.12
Transatlantic air travel (economy class)	0.12
Rail transit (rush hour)	0.15
Electricity	0.20
Taxi cabs	0.22
Gasoline	0.35
Transatlantic air travel (first class)	0.40
Wine	0.55
Beef	0.59
Transatlantic air travel (business class)	0.62
Kitchen and household appliances	0.63
Cable TV (basic rural)	0.69
Chicken	0.64
Soft drinks	0.70
Beer	0.80
New vehicle	0.87
Rail transit (off-peak)	1.00
Computer	1.44
Cable TV (basic urban)	1.51
Cable TV (premium)	1.77
Restaurant meals	2.27

Fig 6.5

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6.3 Price Elasticity of Demand and Total Revenue

Example

Imagine that a band on tour is playing in an indoor arena with 15,000 seats. To keep this example simple, assume that the band keeps all the money from ticket sales. Assume further that the band pays the costs for its appearance, but that these costs, like travel, and setting up the stage, are the same regardless of how many people are in the audience. Finally, assume that all the tickets have the same price. The band knows that it faces a downward-sloping demand curve; that is, if the band raises the ticket price, it will sell fewer seats. How should the band set the ticket price to generate the most total revenue, which in this example, because costs are fixed, will also mean the highest profits for the band? Should the band sell more tickets at a lower price or fewer tickets at a higher price?

The key concept in thinking about collecting the most revenue is the price elasticity of demand. Total revenue is price times the quantity of tickets sold. Imagine that the band starts off thinking about a certain price, which will result in the sale of a certain quantity of tickets. The three possibilities are in Fig 6.7. If demand is elastic at that price level, then the band should cut the price, because the percentage drop in price will result in an even larger percentage increase in the quantity sold—thus raising total revenue. However, if demand is inelastic at that original quantity level, then the band should raise the ticket price because a certain percentage increase in price will result in a smaller percentage decrease in the quantity sold—and total revenue will rise. If demand has a unitary elasticity at that quantity, then an equal percentage change in quantity will offset a moderate percentage change in the price—so the band will earn the same revenue whether it (moderately) increases or decreases the ticket price.

If Demand Is . . .	Then . . .	Therefore . . .
Elastic	% change in Qd > change in P	A given % rise in P will be more than offset by a larger % fall in Q so that total revenue (P × Q) falls.
Unitary	% change in Qd = % change in P	A given % rise in P will be exactly offset by an equal % fall in Q so that total revenue (P × Q) is unchanged.
Inelastic	% change in Qd < change in P	A given % rise in P will cause a smaller % fall in Q so that total revenue (P × Q) rises.

Fig 6.6

What if the band keeps cutting price, because demand is elastic until it reaches a level where it sells all

15,000 seats in the available arena? If demand remains elastic at that quantity, the band might try to move to a bigger arena, so that it could slash ticket prices further and see a larger percentage increase in the quantity of tickets sold. However, if the 15,000-seat arena is all that is available or if a larger arena would add substantially to costs, then this option may not work.

Conversely, a few bands are so famous or have such fanatical followings, that demand for tickets may be inelastic right up to the point where the arena is full. These bands can, if they wish, keep raising the ticket price. Ironically, some of the most popular bands could make more revenue by setting prices so high that the arena is not full—but those who buy the tickets would have to pay very high prices.

The table below summarizes the relationship between price and total revenue

	Increase in Price	Decrease in Price
Price Elastic	Revenue/Expenditure Falls	Revenue/Expenditure Rises
Price Inelastic	Revenue/Expenditure Rises	Revenue/Expenditure Falls

Fig 6.7 "Summary Graphic" by Dr. Emma Hutchinson, University of Victoria CC BY 4.0.

What about Expenditure?

You will notice that expenditure is mentioned whenever revenue is. This is because a dollar earned by the band corresponds to a dollar spent by the consumer. Therefore, if the band's revenue is rising, then the consumer's expenditure is rising as well. You must understand how to answer questions from both sides.

Can Business Pass Costs on to Consumers?

Imagine that as a consumer of legal pharmaceutical products, you read a newspaper story that a technological breakthrough in the production of aspirin has occurred, so that every aspirin factory can now produce aspirin more cheaply. What does this discovery mean to you? Fig 6.8 A illustrates two possibilities. In Panel A, the demand curve is highly inelastic. In this case, a technological breakthrough that shifts supply to the right, from S0 to S1, so that the equilibrium shifts from E0 to E1, creates a substantially lower price for the product with relatively little impact on the quantity sold. In Panel B, the demand curve is highly elastic. In this case, the technological breakthrough leads to a much greater quantity sold in the market at very close to the original price. Consumers benefit more, in general, when the demand curve is more inelastic because the shift in the supply results in a much lower price for consumers.

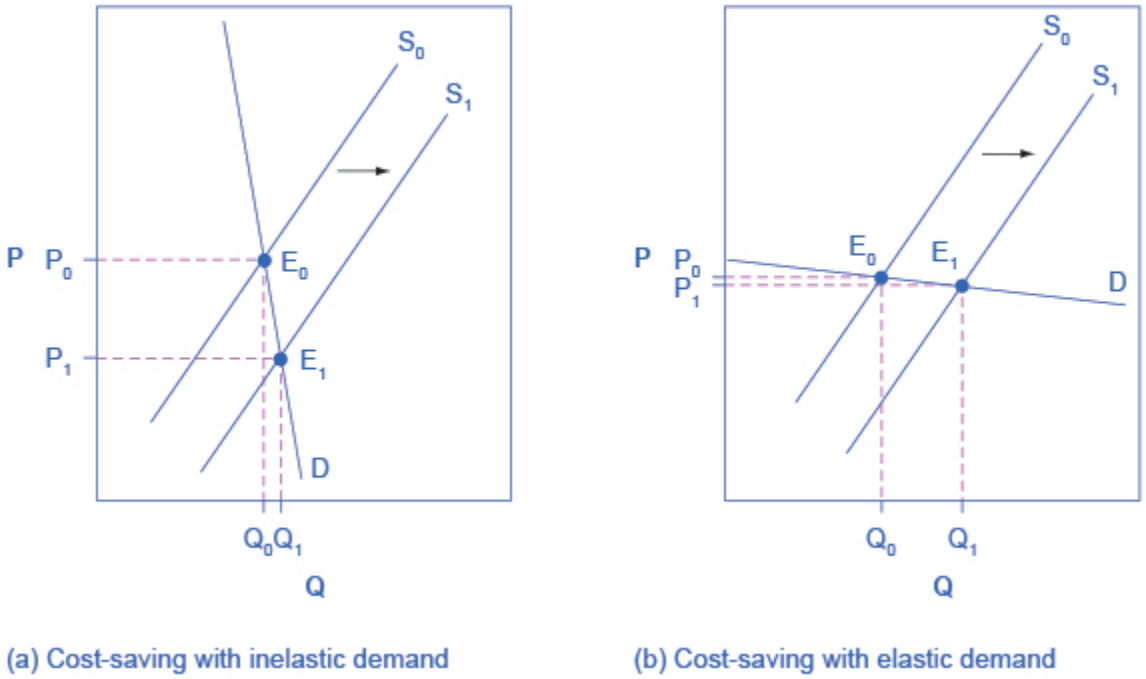

Fig 6.8 "Passing along Cost Savings to Consumers" by OpenStax, CC BY 4.0.

Since demand for food is generally inelastic, farmers may often face the situation in Panel A. That is, a surge in production leads to a severe drop in price that can actually decrease the total revenue that farmers receive. Conversely, poor weather or other conditions that cause a terrible year for farm production can sharply raise prices so that the total revenue that the farmer receives, increases.

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6.4 Other Elasticities of Demand

Cross-price elasticity of demand

The Cross-price elasticity of demand shows us how quantity demand responds to changes in the price of related goods. Whereas before we could ignore positives and negatives with elasticities, with cross-price, this matters. Our equation is as follows:

Cross Price elasticity of demand = %change in quantity demanded of Good A ÷ % change in the price of Good B

Consider our discussion of complements and substitutes in Chapter 3. We defined complements as goods that individuals prefer to consume with another good, and substitutes as goods individuals prefer to consume instead of another good. If the price of a complement of a good rise, our demand for that good will fall, and if the price of a substitute of a good rise, our demand for the good will rise.

For Cross-price elasticity this means:

- A **complement** will have a **negative cross-price elasticity** since if the % change in price is positive, the % change in quantity will be negative and vice-versa.
- A **substitute** will have a **positive cross-price elasticity** since if the % change in price is positive, the % change in quantity will be positive and vice-versa.

This adds another dimension to our discussion of complements/substitutes. Now we can comment on the strength of the relationship between two goods.

Example

A cross-price elasticity of -4 suggests an individual strongly prefers to consume two goods together,

compared to a cross-price elasticity of -0.5. This could represent the cross-price elasticity of a consumer for a hot dog, with respect to ketchup and relish. The consumer might strongly prefer to consume hot dogs with ketchup and loosely prefers relish.

Income elasticity of demand

In Chapter 3, we also explained how goods can be normal or inferior depending on how a consumer responds to a change in income. This responsiveness can also be measured with elasticity by the income elasticity of demand. Our equation is as follows:

Income Elasticity of demand = % change in Quantity demanded ÷ %change in Income

For income elasticity this means:

- A **normal good** will have a **positive income elasticity**, since if income rises (or falls), the quantity demanded also increases (or decreases).
- An **inferior good** will have a **negative income elasticity**, since if income rises (or falls), the quantity demanded decreases (or increases).

The value of our elasticity will indicate how responsive a good is to a change in income. A good with an income elasticity of 0.05, while technically a normal good (since demand increases after an increase in income) is not nearly as responsive as one with an income elasticity of demand of 5.

Attributions

6.5 Elasticity of supply

The **price elasticity of supply** is the percentage change in quantity supplied divided by the percentage change in price.

Price Elasticity of supply = % change in Quantity supplied ÷ % change in Price

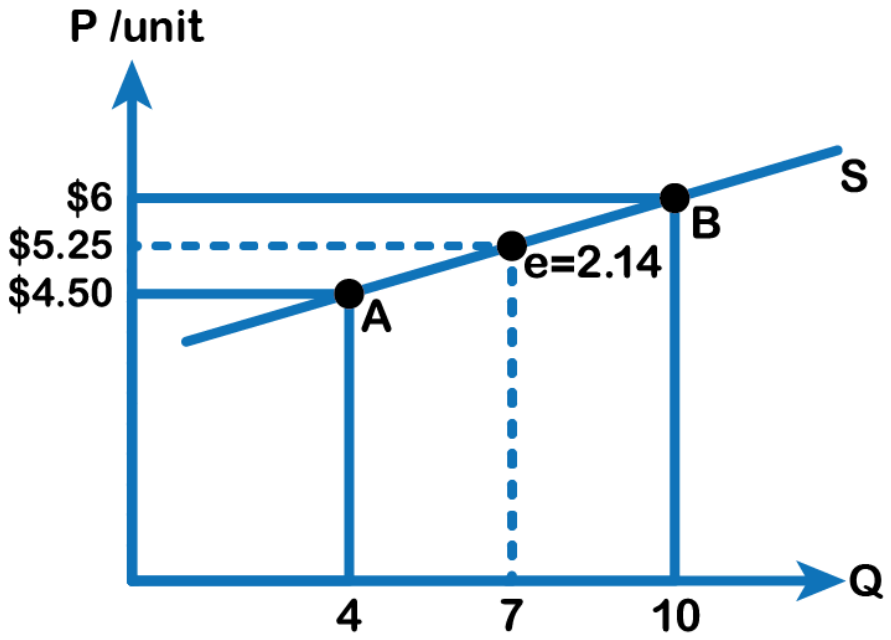

Fig 6.9 – Fanshawe College, CC-BY-NC-SA 4.0

In Fig 6.9, when the price of a cup of coffee is $4.5, the quantity supplied is 4 cups an hour as shown by point A and when the price rises to $6.00 a cup, the quantity supplied rises to 10 cups every hour as indicated by point B.

Price Elasticity of supply between points A and B (using the midpoint formula) = {(10 – 4) ÷ ((10 + 4) ÷ 2) × 100} ÷ {(6 – 4) ÷ ((6 + 4) ÷ 2) × 100} = 85.7 ÷ 40 = 2.14

Price elasticity of supply is always positive because price and quantity, both change in the same direction, following the law of supply.

Attribution

6.6 Determinants of Price Elasticity of Supply

Some factors that determine the elasticity of supply would be the availability of inputs. Easier access to inputs allows the producers to increase output relatively faster with respect to a rise in the price and therefore increases supply elasticity. Conversely, limited or scarce inputs lower the elasticity of supply. Just as on the demand side, the passage of time also influences the elasticity of supply. A good is likely to be relatively inelastic or less elastic in the short run time frame while elasticity increases as time go by.

Definition: Elastic supply

An elastic supply is one in which the elasticity is greater than one, indicating high responsiveness to changes in price. Elasticities that are less than one indicate low responsiveness to price changes and correspond to inelastic supply. Unit elastic supply indicates proportional responsiveness of quantity supplied with respect to price.

Perfectly elastic and perfectly inelastic supplies

In the case of **perfectly elastic supply**, the supply curve is horizontal as shown in Fig 6.10 A. While perfectly elastic supply curves are for the most part unrealistic, some examples of perfectly elastic supply include pizza, bread, books, and pencils. **Perfectly inelastic supply**, as Fig 6.10 B depicts, refers to the extreme case in which a percentage change in price, no matter how large, results in zero change in quantity. While a perfectly inelastic supply is an extreme example, goods with a limited supply of inputs are likely to feature highly inelastic supply curves. Examples include diamond rings or housing in prime locations such as apartments facing Central Park in New York City.

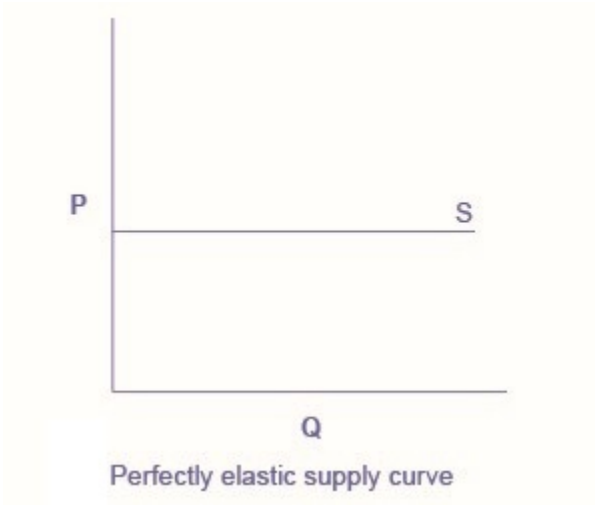

Fig 6.10 (A) Adapted from "Infinite Elasticity" by OpenStax, CC BY 4.0.

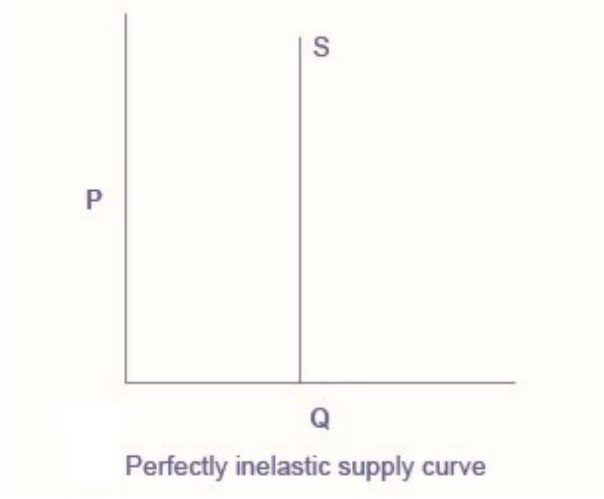

Fig 6.10 (B) Adapted from "Zero Elasticity" by OpenStax, CC BY 4.0.

Constant unitary elasticity, in a supply curve, occurs when a price change of one percent results in a quantity change of one percent. Consider the price changes moving up the supply curve in Fig 6.10 C. Along the constant unitary elasticity supply curve, the percentage quantity increases on the horizontal axis exactly match the percentage price increases on the vertical axis—so this supply curve has a constant unitary elasticity at all points.

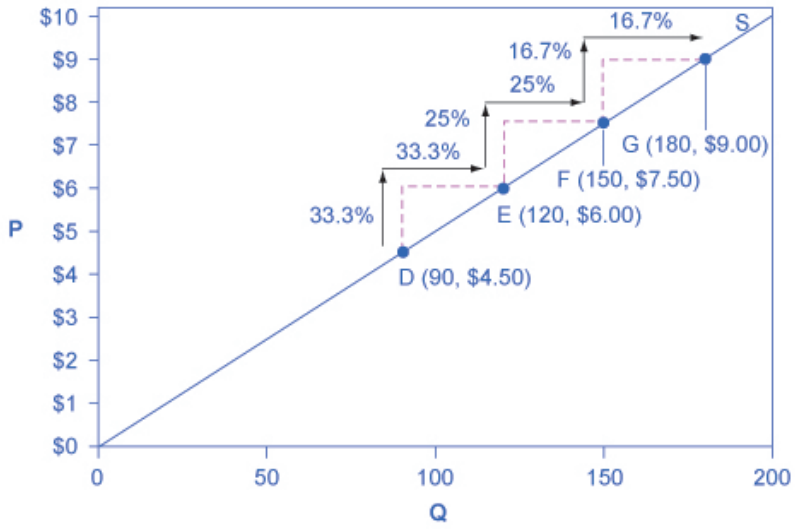

Fig 6.10 (C) "A Constant Unitary Elasticity Supply Curve" by OpenStax, CC BY 4.0.

The elasticities are summarized in the table below:

Fig 6.12

Elasticity of demand[1] > 1	Elastic
Elasticity of demand < 1	Inelastic
Elasticity of demand = 1	Unit elastic
Elasticity of demand = 0	Perfectly inelastic
Elasticity of demand = infinity	Perfectly elastic
Income elasticity of demand > 0	Normal good
Income elasticity of demand < 0	Inferior good
Cross price elasticity > 0	Two goods are substitutes
Cross price elasticity < 0	Two goods are complements

Attributions

"4.1 Calculating Elasticity" in Principles of Microeconomics by Dr. Emma Hutchinson, University of Victoria is licensed under a Creative Commons Attribution 4.0 International License, except where otherwise noted.

"5.1 Price Elasticity of Demand and Price Elasticity of Supply" and "5.2 Polar Cases of Elasticity and Constant Elasticity" in Principles of Economics 2e by OpenStax is licensed under Creative Commons Attribution 4.0 International License.

1. Price elasticities reported in absolute values

6.7 Key Terms

Key Terms

Constant Unitary Elasticity

Cross-Price Elasticity of Demand

Elasticity

Elastic Demand

Elastic Supply

Income Elasticity

Inelastic Demand

Inelastic Supply

Inferior Good

Mid-Point Method For Elasticity

Normal Good

Perfectly Elastic Demand

Perfectly Elastic Supply

Perfectly Inelastic Demand

Perfectly Inelastic Supply

Positive Cross-price elasticity

Price Elasticity of Demand

Price Elasticity of Supply

CHAPTER 7: PRODUCTION AND COST

Chapter Outline

7.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Describe technology and examples
- Explain short-run and long-run
- Describe marginal and average products of labour
- Elaborate marginal and average costs
- Recognize average costs and marginal costs graphs
- Identify firms long-run decisions

The Assembly Line- A Cost Revolution

In 1908, the automobile industry changed forever. The first automobiles date back to the 15th century when Leonardo da Vinci was creating designs and models for transport vehicles. Karl Benz, a German inventor, developed the first gas-powered automobile in 1885, and the first American car manufacturer opened in 1893. However, until 1908, the automobile was a luxury enjoyed only by the rich. It was not a technological innovation that changed the industry, but rather a revolution on costs.

"Assembly Line" by Kyle Harris CC-BY-2.0

Henry Ford, an American car manufacturer, developed a method that steadily reduced the cost of the automobile: the assembly line. Rather than having workers involved with each component of the manufacturing of a vehicle, workers specialized in certain areas. This example illustrates the **marginal product** of labour, a concept we will explore in this chapter. We will see that the MPL will rise as you add more workers, as each new worker helps make the assembly line more efficient than before.

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7.1 Explicit and Implicit Costs

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Each business's goal, regardless of size or complexity, is to earn a profit:

Profit = Total Revenue − Total Cost

Total **revenue** is the income the firm generates from selling its products. We calculate it by multiplying the price of the product times the quantity of output sold:

Total Revenue = Price × Quantity

Total cost is what the firm pays for producing and selling its products. Production involves the firm converting inputs to outputs. Each of those inputs has a cost to the firm. The sum of all those costs is the total cost. We will learn in this chapter that short-run costs are different from long-run costs.

We can distinguish between two types of cost: explicit and implicit.

Definition: Explicit and Implicit Costs

Explicit costs are out-of-pocket costs, that is, actual payments. The wage and rent that a firm pays for office space are explicit costs.

Implicit costs are more subtle but just as important. They represent the opportunity cost of using resources that the firm already owns. Often for small businesses, they are resources that the owners contribute.

For example, working in the business while not earning a formal salary, or using the ground floor of a home as a retail store are both implicit costs. Implicit costs also include the depreciation of goods, materials, and equipment that are necessary for a company to operate. Depreciation is the decline in the value of any capital due to its constant usage. Implicit costs imply expenses where payments are not made out to any individual or firm. These two definitions of cost are important for distinguishing between two conceptions of profit, accounting profit, and economic profit.

Definition: Accounting Profit and Economic Profit

Accounting profit is a cash concept. It means total revenue minus explicit costs—the difference between dollars brought in and dollars paid out.

Economic profit is total revenue minus total cost, including both explicit and implicit costs. The difference is important because even though a business pays income taxes based on its accounting profit, whether or not it is economically successful depends on its economic profit.

Calculating Implicit and Explicit Costs

Example

Fred currently works for a corporate law firm. He is considering opening his own legal practice, where he expects to earn $200,000 per year once he establishes himself. To run his own firm, he would need an office and a law clerk. He has found the perfect office, which rents for $50,000 per year. He could hire a law clerk for $35,000 per year. If these figures are accurate, would Fred's legal practice be profitable?

Step 1. First you have to calculate the costs. You can take what you know about explicit costs and total them:

Office rental + Law clerk's salary = Total explicit costs: $50,000 + $35,000 = $85,000

Total explicit costs: $85,000

Step 2. Subtracting the explicit costs from the revenue gives you the accounting profit.

Accounting profit: Revenue minus explicit costs = $200,000 – $85,000 = $115,000

However, these calculations consider only the explicit costs. To open his own practice, Fred would have to quit his current job, where he is earning an annual salary of $125,000. This would be an implicit cost of opening his own firm.

Step 3. You need to subtract both the explicit and implicit costs to determine the true economic profit:

Economic profit = total revenues – explicit costs – implicit costs = $200,000 – $85,000 – $125,000 = –$10,000 per year

Fred would be losing $10,000 per year. That does not mean he would not want to open his own business, but it does mean he would be earning $10,000 less than if he worked for the corporate firm.

Implicit costs can include other things as well. Maybe Fred values his leisure time, and starting his own firm would require him to put in more hours than at the corporate firm. In this case, the lost leisure would also be an implicit cost that would subtract from economic profits.

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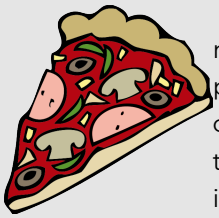
7.2 Theory of Production

"Industry", Piqsels License.

Production is the process (or processes) a firm uses to transform inputs (e.g. labour, capital, raw materials) into outputs, i.e. the goods or services the firm wishes to sell.

In perspective



"Slice of pizza" by OpenClipart, Public Domain.

Consider pizza making. The pizzaiolo (pizza maker) takes flour, water, and yeast to make dough. Similarly, the pizzaiolo may take tomatoes, spices, and water to make pizza sauce. The cook rolls out the dough, brushes on the pizza sauce, and adds cheese and other toppings. The pizzaiolo uses a peel—the shovel-like wooden tool—to put the pizza into the oven to cook. Once baked, the pizza goes into a box (if it's for takeout) and the customer pays for the goods.

We can summarize the ideas so far in terms of a **production function**, a mathematical expression or equation that explains the engineering relationship between inputs and outputs.

Assuming labor (L) and capital (K) are the two main inputs used in the production, we can write

the production function as:
Q= *f [L, K]*

The production function gives the answer to the question, how much output can the firm produce given different amounts of inputs. We can describe inputs as either **fixed** or **variable**.

Definition: Fixed Inputs and Variable Inputs

Fixed inputs are those that can't easily be increased or decreased in a short period of time. In the pizza example, the building is a fixed input. Once the entrepreneur signs the lease, he or she is stuck in the building until the lease expires. Fixed inputs define the firm's maximum output capacity.

Variable inputs are those that can easily be increased or decreased in a short period of time. The pizzaiolo can order more ingredients with a phone call, so ingredients would be variable inputs. The owner could hire a new person to work the counter pretty quickly as well. So labor is a variable input.

Economists also differentiate between short and long-run production.

The **short-run** is the period of time during which at least one or more factors of production are fixed. During the period of the restaurant lease, the pizza restaurant is operating in the short run, because it is limited to using the current building (an example of capital) —the owner can't choose a larger or smaller building. Plant size or capital is a fixed factor of production in the short run.

The **long run** is the period of time during which all factors are variable. Once the lease expires for the restaurant, the shop owner can move to a larger or smaller place.

Example

Let's explore production in the short run using a specific example: offering haircuts in a salon.

Since capital (the salon space) is fixed, the amount of output (e.g. haircuts per day) depends only on the amount of labour employed (e.g. number of barbers working). We can express this production function numerically as the table in Fig 7.1 below shows.

Number of barbers	Number of haircuts/day
1	15
2	22
3	25
4	23
5	19

Fig 7.1

Total Product, Marginal Product, and Average Product of Labour

Note that we have introduced some new languages in the above example. We also call Output (Q) as **Total Product (TP)**. TP is the amount of output produced with a given amount of labour and a fixed amount of capital. In this example, one barber can give 15 haircuts in a day. Two barbers can produce 22 haircuts in a day and so on.

We should also introduce a critical concept: **Marginal Product**. Marginal product is the additional output of one more worker. Mathematically, Marginal Product is the change in total product divided by the change in labour: MP = ΔTP ÷ ΔL. In the table below (Fig 7.2), since 0 workers produce 0 trees, the marginal product of the first worker is eight haircuts per day, but the marginal product of the second worker is nine haircuts per day.

Short Run production

Number of barbers	Number of haircuts per day (TP	Marginal Product of labor (MPL)	Average Product of Labor (APL)
0	0	-	0
1	8	8	8
2	17	9	8.5
3	23	6	7.6
4	26	3	6.5
5	27	1	5.4

Fig 7.2

Why might the MPL be rising? To understand the reason behind this pattern, consider that a one-man barbershop is a very busy operation. The single barber needs to do everything: say hello to people, answer the phone, cut hair, clean up, and run the cash register. A second barber reduces the level of disruption from jumping back and forth between these tasks and allows a greater *division of labour* and *specialization*. The result can be greater increasing marginal returns. Suppose we add a third barber to the story. What will that person's marginal product be? What will that person contribute to the salon? However, as other barbers are added, the advantage of each additional barber is less, since the specialization of labour can only go so far. The addition of a third or fourth or fifth barber will have less impact than the second one had. Given the fixed space inside the salon, as additional barbers are hired, they begin bumping elbows and getting in each other's way. In this case, the addition of still more barbers would cause the output by each worker to decrease and result in falling marginal returns This is called the **Law of Diminishing Marginal Product** and it's a characteristic of

production in the short run. Why does diminishing marginal productivity occur? It's because of fixed capital. If the salon manager is unable to lease a larger space but keeps hiring additional barbers, the rate at which TP rises starts to go down and MP decreases.

Below we see how the TP and the MP curves look graphically.

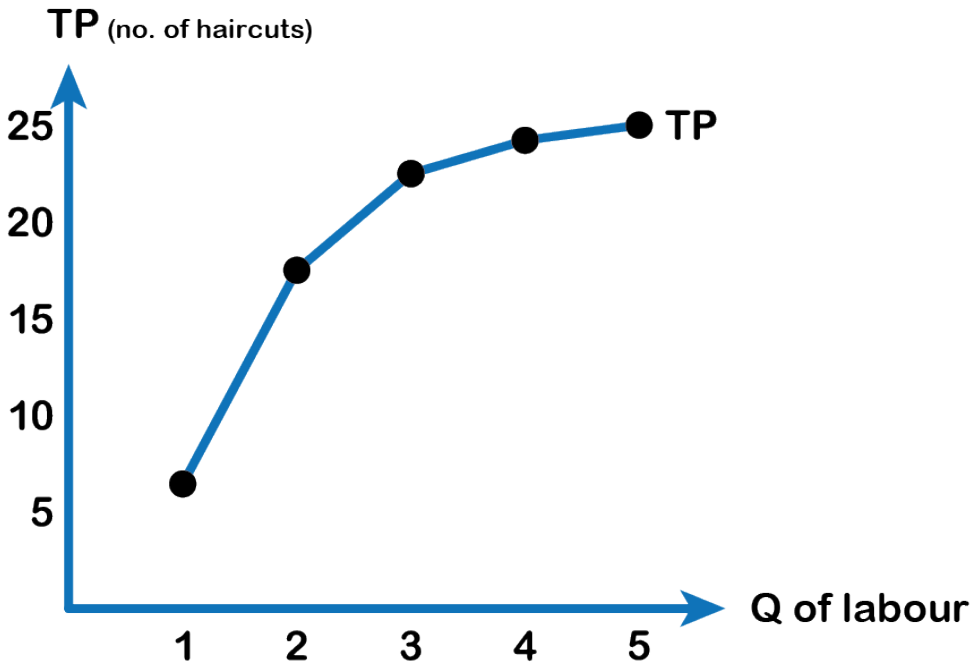


Fig 7.3 (A) "Short Run Total Product Curve" – Fanshawe College, CC-BY-NC-SA 4.0

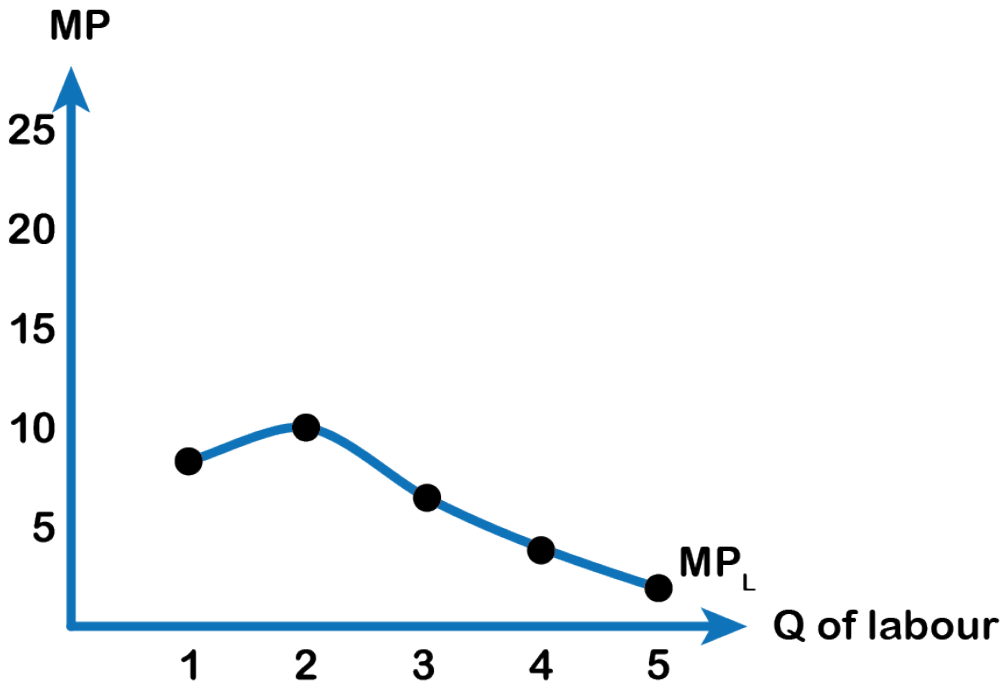


Fig 7.3 (B) "Marginal Product Curve" – Fanshawe College, CC-BY-NC-SA 4.0

The average product of labour is the total product divided by the quantity of labour. AP=TP/L. What we observe from the third and fourth columns of Fig 7.2 is that, as the marginal product rises, so does the average product, and as the marginal product starts to diminish, the average product starts falling too. As a general rule as long as,

MP > AP, AP rises

MP < AP, AP falls

MP = AP, AP is maximum (maximum productivity of the business)

This relationship between MP and AP is mathematically true. Suppose, 5 friends plan to go for dinner, each carrying $20. In that case, the average amount that each friend is carrying is ($20 × 5)÷ 5 = $20. Now suppose a sixth friend joins in for dinner who is carrying $25. Then the average rises to approximately $21. So the amount carried by the sixth friend is like the marginal product in our example, which is greater than the average product of $20, and that pulls up the average to about $21. Conversely, if the sixth friend carries $16, then the average changes to $19. Therefore, we find when the marginal ($16) falls below the average ($20), that pulls the average product down ($19). And when the sixth friend carries the same amount of $20 as the five others, the marginal and average both remain the same at $20.

The graph below shows the MP and the AP curves.

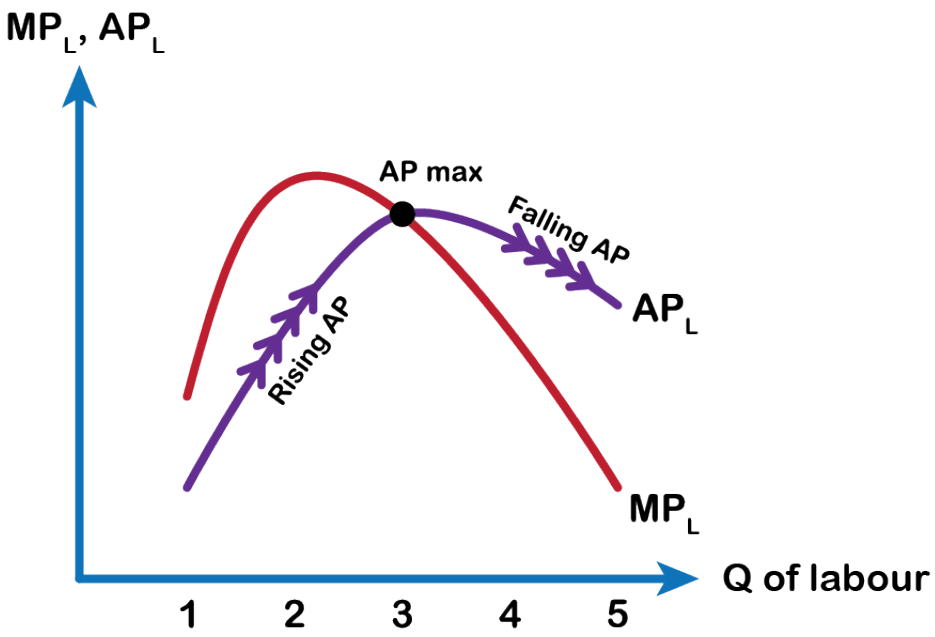


Fig 7.4 – Fanshawe College, CC-BY-NC-SA 4.0

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7.3 Costs of Production

Photo by Geralt, Pixabay License.

When a firm looks at its **Total Costs** (TC) of production in the short run, a useful starting point is to divide total costs into two categories: **Fixed Costs** and **Variable Costs**. Fixed cost of production is the cost that does *not* change as output changes and variable cost is the cost that changes as output changes.

Total Fixed Costs

The salon manager's **total fixed costs** are his expenditures that do not change regardless of the number of haircuts offered. Whether he gets a lot or a few customers, his fixed costs are the same. When the manager signs the lease to rent the salon space, the rent costs him $60 a day, regardless of the number of haircuts given. This lease has now become a **sunk cost** since there is nothing the manager can do to get his money back. Fixed costs can take many other forms: for example, the cost of equipment such as scissors, hairdryers, mirrors, chairs, and clippers to offer haircuts, and even an expense like advertising to popularize a brand name.

Total Variable Costs

The salon manager's **total variable costs** are incurred in the act of producing—the more he produces, the greater the variable cost.

After signing the lease for the salon and purchasing the required hair cutting equipment, the manager now has to find workers to offer haircuts. The more haircuts he wants to offer every hour, the more workers he

needs to hire. For this reason, his variable costs are increasing as his production (or service) increases. Assuming the wage cost for each labour is $80/day. The table below (Fig 7.5) shows us the fixed cost and the variable cost of production for haircuts, as the manager keeps hiring more barbers to offer more haircut services each day.

Short Run cost

No of barbers (L)	No of haircuts/day (TP)	Fixed cost (TFC)	Variable cost (TVC)	Total Cost (TC)
0	0	$60	0	$60
1	8	$60	$80	$140
2	17	$60	$160	$220
3	23	$60	$240	$300
4	26	$60	$320	$380
5	27	$60	$400	$460

Fig 7.5

Note when the total output is zero the firm still incurs a fixed cost of $60 as rental cost per day.

The fifth column shows the total cost of production which is the sum of TFC and TVC.

TC = TFC + TVC

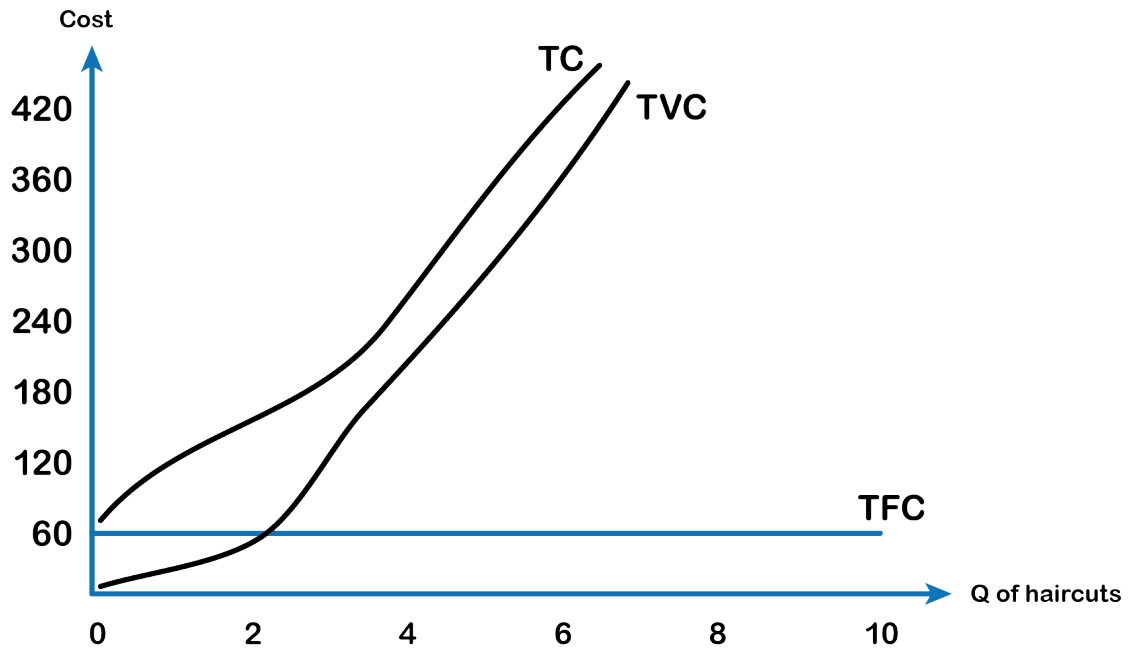

Fig 7.6 – Fanshawe College, CC-BY-NC-SA 4.0

Marginal Cost and Average Total Cost

Marginal Cost (MC) is the change in total cost divided by the change in total output or TP.

MC =ΔTC ÷ ΔTP

Average Total Cost (ATC) is the total cost divided by total output.

TC = TFC + TVC

TC ÷ TP = (TFC ÷ TP) + (TVC ÷ TP) (dividing all three expressions by TP)

ATC = AFC + AVC where, AFC = TFC ÷ TP and AVC = TVC ÷ TP

The table below illustrates the different short run cost concepts:

No of barbers (L)	No of haircuts/day (TP)	TFC	TVC	TC	MC	AFC	AVC	ATC
0	0	$60	0	$60	-	-	-	-
1	8	$60	$80	$140	80÷8 = $10	60÷8 = $7.5	80÷8 = $10	$17.5
2	17	$60	$160	$220	80÷9 = $8.9	60÷17 = $3.5	160÷17 = $9.4	$12.9
3	23	$60	$240	$300	80÷6 = $13.3	60÷23 =$2.6	240÷23 = $10.4	$13
4	26	$60	$320	$380	80÷3 = $26.7	60÷26 = $2.3	320÷26 = $12.3	$14.6
5	27	$60	$400	$460	80÷1 = $80	60÷27 = $2.2	400÷27 = $14.8	$17

Fig 7.7

As seen from the numbers in the above table Fig 7.7, marginal cost initially falls and then starts rising. The average fixed cost keeps decreasing as the quantity of output (the number of haircuts) increases. Both average variable cost and average total cost initially decrease and then start increasing. The graph in Fig 7.8 below shows the marginal and the average cost curves. The marginal cost and the average cost curves emphasize the division of labour, which we will discuss in the next section.

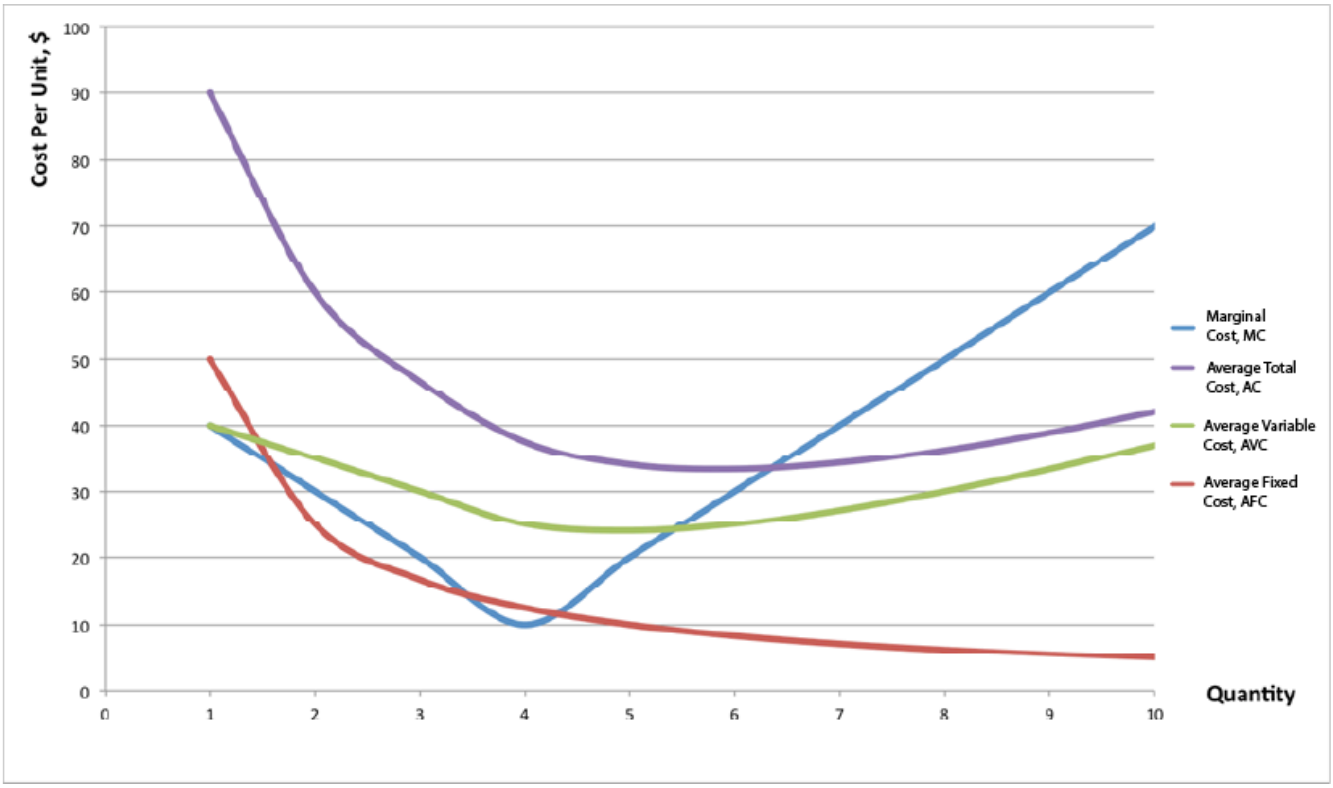

Fig 7.8 "Short-Run Marginal Cost, Average Fixed Cost, Average Variable Cost, and Average Total Cost Curves" by Patrick M. Emerson, CC BY-NC-SA 4.0.

Notice from Fig 7.8 that the marginal cost curve intersects the average cost curve exactly at the bottom of the average cost curve. This is where the average cost reaches its minimum. The reason why the intersection occurs at this point is built into the economic meaning of marginal and average costs. If the marginal cost of production is below the average cost of producing previous units, as it is for the points to the left of where MC crosses AVC, then producing one additional unit will reduce average costs overall—and the AVC curve will be downward-sloping in this zone. Conversely, if the marginal cost of production for producing an additional unit is above the average cost of producing units, as it is for points to the right of where MC crosses AVC, then producing a marginal unit will increase average costs overall—and the AVC curve must be upward-sloping in this zone. The point of transition, between where MC is pulling AVC down and where it is pulling it up, must occur at the *minimum point* of the AVC curve. As long as marginal cost is below average cost, it causes AVC to decrease. When MC intercepts AVC and begins to rise, it causes AVC to increase. As we will see, AVCmin is very important in the short run.

Marginal costs are typically rising. A firm can compare the marginal cost to the additional revenue it gains from selling another unit to find out whether its marginal unit is adding to its profit. Average total cost is calculated by taking total cost and dividing it by total output at each different level of output. Average costs are typically U-shaped on a graph. Average variable cost is calculated by taking variable cost and dividing it by the total output at each level of output. Average variable costs are also typically U-shaped.

Why are total cost and average cost not on the same graph?

Total cost, fixed cost, and variable cost each reflect different aspects of the cost of production over the entire quantity of output being produced. These costs are measured in dollars. In contrast, marginal cost, average cost, and average variable cost are costs per unit. In the previous example, they are measured as cost per haircut. Thus, it would not make sense to put all of these numbers on the same graph, since they are measured in different units ($ versus $ per unit of output).

Using the figures from the previous example (fig 7.7), the total cost of producing 17 haircuts per day is $160, but the average cost is $160 ÷ 17, or $12.9.

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7.4 Relationship between Production and Costs

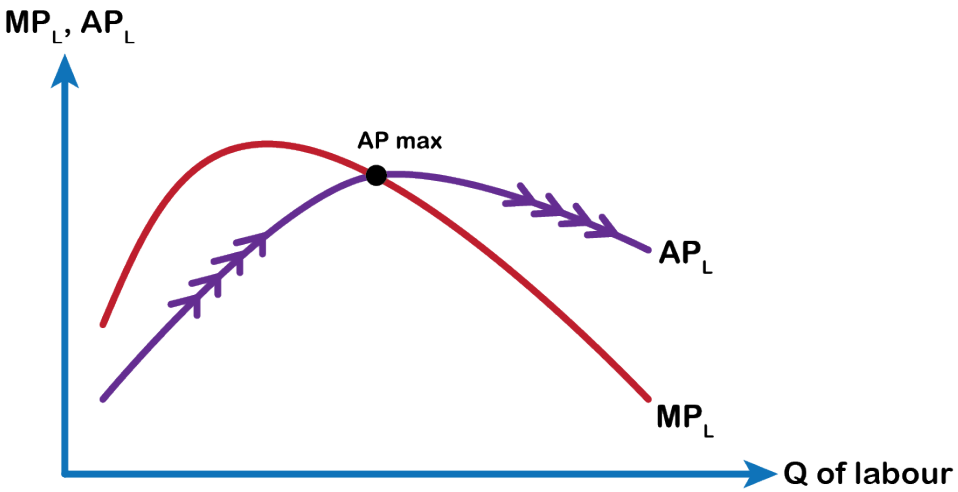

Fig 7.9 (A) – Fanshawe College, CC-BY-NC-SA 4.0

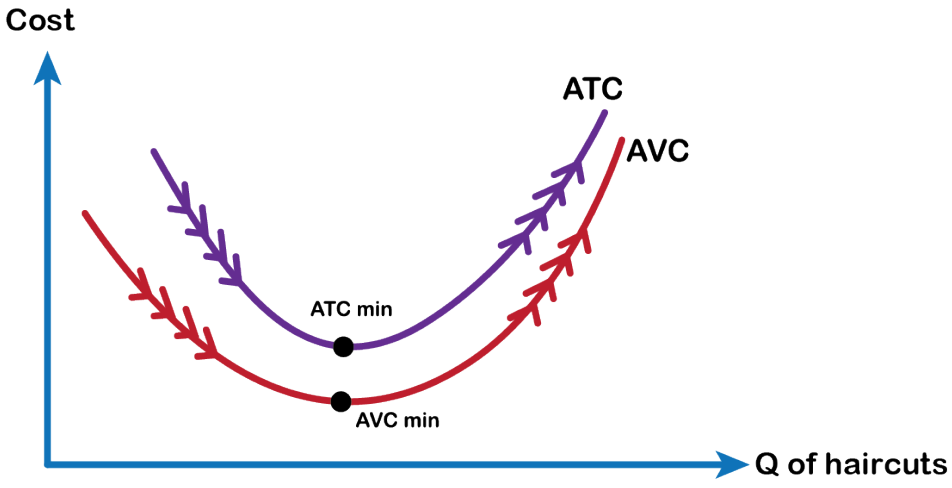

Fig 7.9 (B) – Fanshawe College, CC-BY-NC-SA 4.0

Panel A in Fig 7.9 shows the average and marginal product curves. Notice when marginal product lies above average product, average product rises and when marginal product lies below average product, the average

product falls. The point where the two are equal is the point of maximum average productivity. Now notice the bottom Panel which shows the marginal and average cost curves. Looking at both panels, we find that when the average product (AP) increases, the average cost (ATC and AVC) decreases. AP increases when each additional labour adds significantly to the business, such as in our example, the number of haircuts offered by the second barber is greater than that of the first due to division of labour and specialization. The second barber's greater productivity pulls up the salon's total product (TP) faster than the total cost (TC). When TP rises faster as each worker is more productive, then a relatively less amount of such labour results in TC rising less faster (relatively less labour, so less wage cost) than TP. Therefore, the average cost falls (*Recall*, ATC = TC ÷ TP; AP = TP ÷ Labour) as long as the average product increases.

Conversely, when AP starts falling, average costs start increasing. Due to the law of diminishing returns resulting from fixed capital in the short run, adding more labour lowers each worker's marginal returns. In our example, adding the third, fourth, or fifth barber lowers the marginal productivity of each worker due to the salon's manager's inability to offer his barbers more capital. Falling productivity lowers the rate of increase in TP and lowers the average productivity of the business. Therefore, TP rises less fast while relatively greater quantities of labour result in TC rising faster than TP. Therefore, the average cost starts increasing as the average product begins to decrease. When the average productivity of the firm reaches its maximum (AP_{max}), the average cost gets to a minimum (ATC_{min} or AVC_{min}).

7.5 Long Run Costs: The Advantage of Flexibility

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Short-run average costs are constrained by the presence of a fixed input. So in the long run we can always do at least as well as, and often better than, in the short run with respect to cost. We can see this is true by comparing the long-run and short-run average cost curves.

Shapes of Long-Run Average Cost Curves

While in the short run firms are limited to operating on a single average cost curve (corresponding to the level of fixed costs they have chosen), in the long run when all costs are variable, they can choose to operate on any average cost curve. Thus, the **long-run average cost (LRAC) curve** is actually based on a group of **short-run average cost (SRAC) curves**, each of which represents one specific level of fixed costs. More precisely, the long-run average cost curve will be the least expensive average cost for producing any level of output. Fig 7.9 shows how we build the long-run average cost curve from a group of short-run average cost curves. Five short-run-average cost curves appear on the diagram. Each SRAC curve represents a different level of fixed costs.

Example

Imagine SRAC1 as a small factory, SRAC2 as a medium factory, SRAC3 as a large factory, and SRAC4 and SRAC5 as very large and ultra-large. Although this diagram shows only five SRAC curves, presumably there are an infinite number of other SRAC curves between the ones that we show. Think of this family of short-run average cost curves as representing different choices for a firm that is planning its level of investment in fixed cost physical capital—knowing that different choices about capital investment in the present will cause it to end up with different short-run average cost curves in the future.

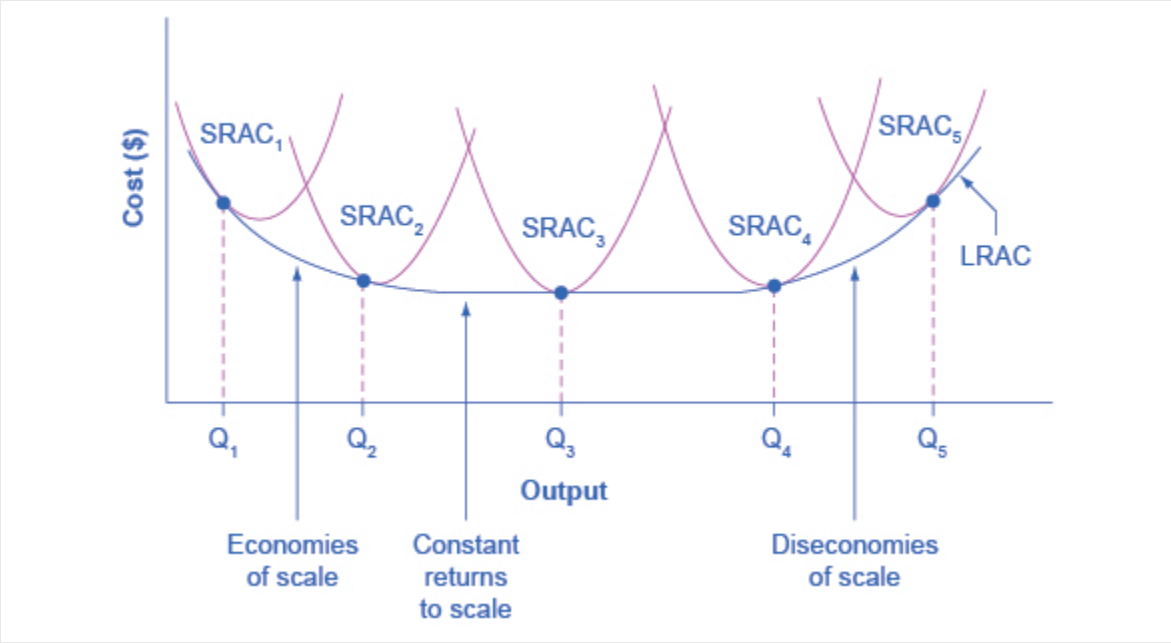

Fig 7.10 "From Short-Run Average Cost Curves to Long-Run Average Cost Curves" by OpenStax, CC BY 4.0.

The long-run average cost curve shows the cost of producing each quantity in the long run when the firm can choose its level of fixed costs and thus choose which short-run average costs it desires. If the firm plans to produce in the long run at an output of Q3, it should make the set of investments that will lead it to locate on SRAC3, which allows producing q3 at the lowest cost. A firm that intends to produce Q3 would be foolish to choose the level of fixed costs at SRAC2 or SRAC4. At SRAC2 the level of fixed costs is too low for producing Q3 at the lowest possible cost, and producing q3 would require adding a very high level of variable costs and make the average cost very high. At SRAC4, the level of fixed costs

is too high for producing q3 at the lowest possible cost, and again average costs would be very high as a result.

The shape of the long-run cost curve, in Fig 7.10, is fairly common for many industries. The left-hand portion of the long-run average cost curve, where it is downward-sloping from output levels Q1 to Q2 to Q3, illustrates the case of economies of scale. In this portion of the long-run average cost curve, a larger scale leads to lower average costs.

The right-hand portion of the long-run average cost curve, running from output level Q4 to Q5, shows a situation where, as the level of output and the scale rises, average costs rise as well. A firm or a factory can grow so large that it becomes very difficult to manage, resulting in unnecessarily high costs as many layers of management try to communicate with workers and with each other, and as failures to communicate lead to disruptions in the flow of work and materials.

In the middle portion of the long-run average cost curve, the flat portion of the curve around Q3, economies of scale have been exhausted. In this situation, allowing all inputs to expand does not much change the average cost of production.

In this LRAC curve range, the average cost of production does not change much as scale rises or falls.

Economies and Diseconomies of Scale

An important economic concept associated with the long-run average cost curve is economies of scale. **Economies of scale** occur when the average cost of production falls as output increases. Economies of scale refer to the situation where, as the quantity of output goes up, the cost per unit goes down. This is the idea behind "warehouse stores" like Costco or Walmart. In everyday language: a larger factory can produce at a lower average cost than a smaller factory. Similarly, **diseconomies of scale** occur when the average cost of production rises as output increases. **Constant returns to scale (Fig 7.11)** occur when the average cost of production does not change as output rises. In a typical long-run average cost curve, there are sections of both economies of scale and diseconomies of scale. There is also a point or region of **minimum efficient scale** where the average cost is at its minimum. This is the point where economies of scale are used up and no longer benefit the firm. Figure 7.12 illustrates these points.

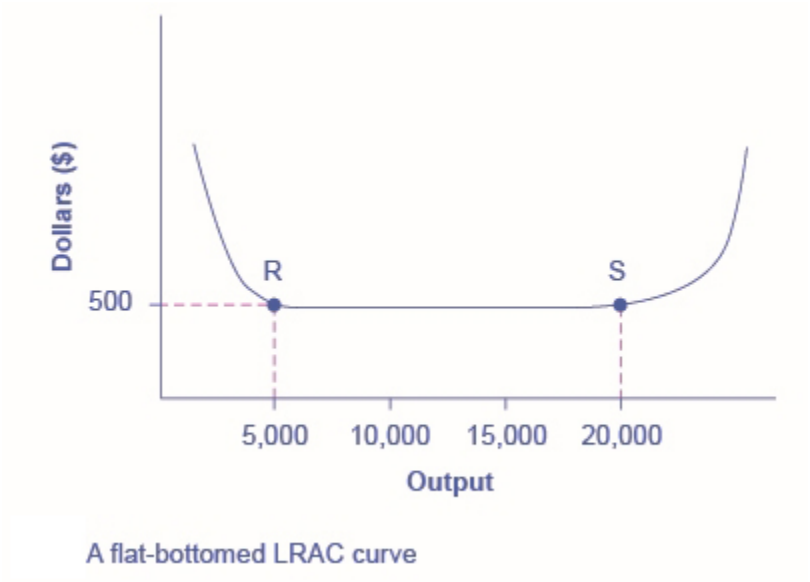

Fig 7.11 Adapted from "The LRAC Curve and the Size and Number of Firms" by OpenStax, CC BY 4.0.

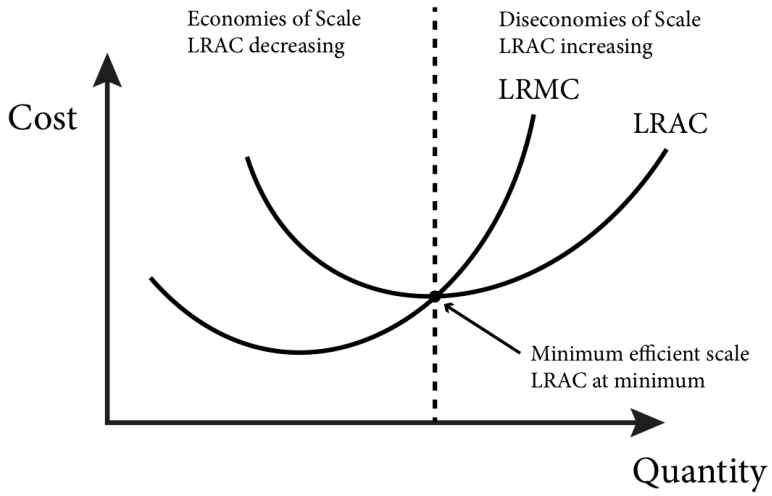

Fig 7.12 "Economies, Diseconomies and Minimum Efficient Scale" by OpenStax, CC BY-NC-SA 4.0.

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7.6 Key Terms

Key Terms

Accounting Profit

Average Product

Constant Returns to scale (Fig 7.10)

Diseconomies of Scale

Economic Profit

Economies of Scale

Explicit Costs

Fixed Inputs

Implicit Costs

Short Run

Long Run

Long-Run Average cost (LRAC)

Marginal Product

Minimum Efficient Scale

Production

Production Function

Short-Run

Total Costs (TC)

Total Fixed Costs

Total Product (TP)

Total Revenue

Total Variable Costs

Variable Inputs

CHAPTER 8: PERFECT COMPETITION

Chapter Outline

8.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Describe the characteristics of a market
- Explain profit or loss in graphs
- Discuss shut down decision
- Identify what is entry and exit
- Elaborate perfect competition and economic efficiency

In perfectly competitive markets firms and consumers are all **price takers**: their supply and purchasing decisions have no impact on the market price. This means that the market is so big that anyone individual seller or buyer is such a small part of the overall market that their individual decisions are inconsequential to the market as a whole. It is worth mentioning here at the start that this is a very strong assumption and thus this is considered an almost purely theoretical extreme along with monopoly at the other extreme. We can and will describe markets that come pretty close to the assumptions underlying perfect completion, but most markets will lie somewhere in between purely competitive and monopolistic. It is important to study these extremes to better understand the full range of markets and their outcomes.

Before we describe in detail perfectly competitive markets, let's consider how we categorize **market structure** and the competitive environments in which firms and consumers interact. There are three main metrics by which we measure a market's structure:

- *The number of firms.* More firms mean more competition and more places to which consumers can turn to purchase a good.
- *The similarity of goods*. The more similar the goods sold in the market the more easily consumers can switch firms and the more competitive the market is.
- *The barriers to entry.* The more difficult is it to enter a market for a new firm, the less competitive it is.

The first is relatively straightforward; more firms mean more competition in the sense that it is hard to charge more for a product that consumes can find easily from other sellers. The second is a little subtler because products can be differentiated by something as simple as a brand or more tangible aspects like colours, features and other characteristics. Finally the third can be barriers of law like patents, or technology even if not covered by legal patent protection, or more natural barriers like a very high cost of starting up a firm that is not justified by the expected revenue.

We will study four market types in more detail where these metrics will be discussed further, but for now, they are described along with the three metrics in Table 8.1.

Fig 8.1

	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of Firms	Many	Many	Few	One
Similarity of Goods	Identical	Differentiated	Identical or Differentiated	Unique
Barriers to Entry	None	None	Some	Many

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8.1 Characteristics of Perfect Competition

"Perfect Competition" – Fanshawe College, CC-BY-NC-SA 4.0

Many Firms

Many firms, means that from the perspective of one individual firm there is no way to raise or lower the market price for a good. This is because the individual firm's output is such a small part of the overall market that it does not make a difference in terms of price. Firms are, therefore, **price takers**, meaning that their decision is simply how much to sell at the market price. If they try and sell for a higher price, no one will buy from them, and they could sell for a lower price, but if they did so, they would only be hurting themselves because it would not affect their quantity sold. Thus from an individual firm's perspective, they face a *horizontal* demand curve.

Identical Goods

Identical goods mean there is nothing to distinguish one firm's goods from another. For example: corn – once all the corn is dumped into the grain elevator there is absolutely no way to tell from which farm a particular kernel of corn came. This means there is no way for one seller to differentiate their output to try and sell it at a different price on the premise that it is different.

Barriers to Entry

It is very easy for firms to start and stop selling in this market. For example, if a farmer decides to plant corn instead of soybeans, there is nothing preventing them from doing so. Likewise, a farmer who wishes to plant soybeans instead of corn faces no barriers. In general, free entry and exit mean that there are no legal barriers to entry, like needing a special permit only given to a limited number of firms, and no major cost obstacles, like needing to invest millions of dollars in a manufacturing plant as a new car manufacturer would.

There is an implicit assumption here and that is, buyers and sellers have full information meaning that they know the prices charged by every firm. This is important because without it a firm could possibly charge an uninformed consumer more and this violates the price taker condition.

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8.2 Price and Quantity in Perfect Competition

A perfectly competitive firm has only one major decision to make — namely, what quantity to produce. To understand this, consider a different way of writing out the basic definition of profit:

$$\textit{Profit} = \textit{Total Revenue} - \textit{Total Cost}$$
$$= \textit{Price} \times \textit{Quantity} - \textit{Average Total Cost} \times \textit{Quantity}$$

Since a perfectly competitive firm must accept the price for its output as determined by the product's market demand and supply, it cannot choose the price it charges. This is already determined in the profit equation, and so the perfectly competitive firm can sell any number of units at exactly the same price. It implies that the firm faces a *perfectly elastic demand curve* for its product: buyers are willing to buy any number of units of output from the firm at the market price. When the perfectly competitive firm chooses what quantity to produce, then this quantity — along with the prices prevailing in the market for output and inputs — will determine the firm's total revenue, total costs, and ultimately, level of profits.

Determining the Highest Profit by Comparing Total Revenue and Total Cost

A perfectly competitive firm can sell as large a quantity as it wishes, as long as it accepts the prevailing market price. The formula above shows that total revenue depends on the quantity sold and the price charged. If the firm sells a higher quantity of output, then total revenue will increase. If the market price of the product increases, then total revenue also increases whatever the quantity of output sold.

The table in 8.3 is represented graphically in Fig 8.2 which shows the total revenue and total costs for the raspberry farm. The horizontal axis shows the quantity of frozen raspberries produced in packs. The vertical axis shows both total revenue and total costs, measured in dollars. The total cost curve intersects with the vertical axis at a value that shows the level of fixed costs and then slopes upward. All these cost curves follow the same characteristics as the curves that we covered in the chapter on Production and Cost.

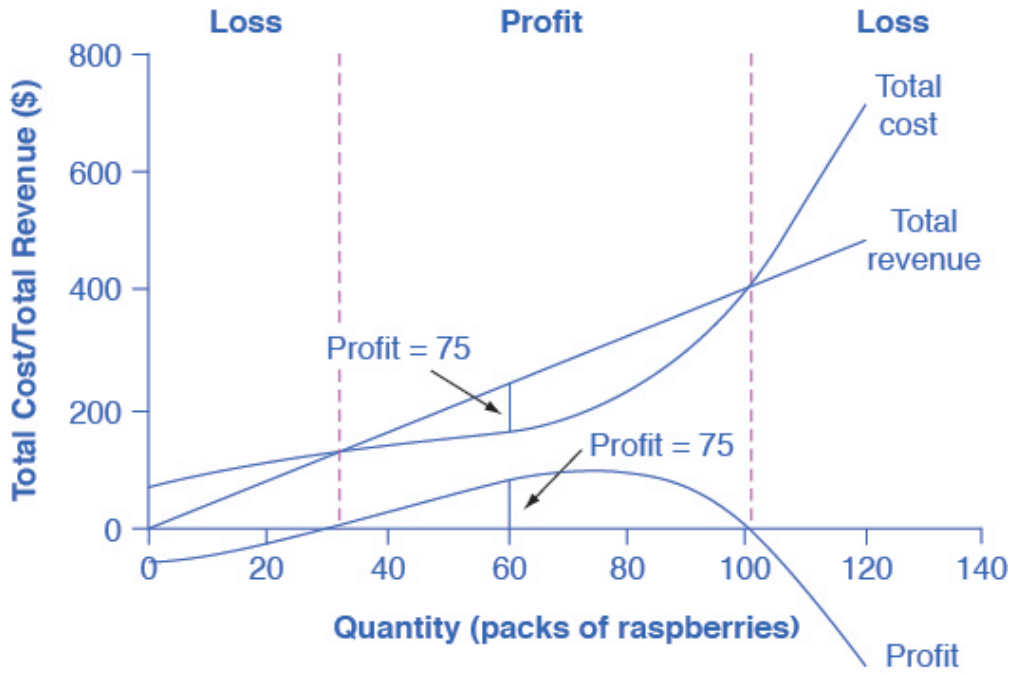

Fig 8.2 "Total Cost and Total Revenue at the Raspberry Farm" by OpenStax, CC BY 4.0.

Price	Quantity	Total Revenue	Marginal Revenue
$4	1	$4	-
$4	2	$8	$4
$4	3	$12	$4
$4	4	$16	$4

Fig 8.3

From Fig 8.2, the vertical gap between total revenue and the total cost is profit, for example, at Q = 60, TR = 240 and TC = 165. The difference is 75, which is the height of the profit curve at that output level. The firm doesn't make a profit at every level of output. In this example, total costs will exceed total revenues at output levels from 0 to approximately 30, and so over this range of output, the firm will be making losses. At output levels from 40 to 100, total revenues exceed total costs, so the firm is earning profits. However, at any output greater than 100, total costs again exceed total revenues and the firm is making increasing losses.

From the table in Fig 8.3, we can calculate the economic profit by subtracting total costs from total revenue. Total profits appear in the final column of Fig 8.3. Maximum profit occurs at an output between 70 and 80 when profit equals $90.

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8.3 Comparing Marginal Revenue and Marginal Costs

The approach that we described in the previous section, using total revenue and total cost, is not the only approach to determining the profit-maximizing level of output. In this section, we provide an alternative approach that uses marginal revenue and marginal cost.

Firms often do not have the necessary data they need to draw a complete total cost curve for all levels of production. They cannot be sure of what total costs would look like if they, say, doubled production or cut production in half because they have not tried it. Instead, firms experiment. They produce a slightly greater or lower quantity and observe how it affects profits. In economic terms, this practical approach to maximizing profits means examining how changes in production affect marginal revenue and marginal cost.

Fig 8.5 presents the marginal revenue and marginal cost curves based on the total revenue and total cost in Fig 8.2. The **marginal revenue** curve shows the additional revenue gained from selling one more unit. As mentioned before, a firm in perfect competition faces a perfectly elastic demand curve for its product—that is, the firm's demand curve is a horizontal line drawn at the market price level. This also means that the firm's marginal revenue curve is the same as the firm's demand curve: Every time a consumer demands one more unit, the firm sells one more unit and revenue increases by exactly the same amount equal to the market price. In this example, every time the firm sells a pack of frozen raspberries, the firm's revenue increases by $4. Fig 8.4 shows an example of this. This condition only holds for price-taking firms in a perfect competition where:

Marginal Revenue = Price

The formula for marginal revenue is:

Marginal Revenue = change in total revenue ÷ change in quantity

Price	Quantity	Total Revenue	Marginal Revenue
$4	1	$4	-
$4	2	$8	$4
$4	3	$12	$4
$4	4	$16	$4

Fig 8.4

Notice that marginal revenue does not change as the firm produces more output. That is because, under perfect competition, the price is determined through the interaction of supply and demand in the market as shown in Fig 8.5, and does not change as the farmer produces more.

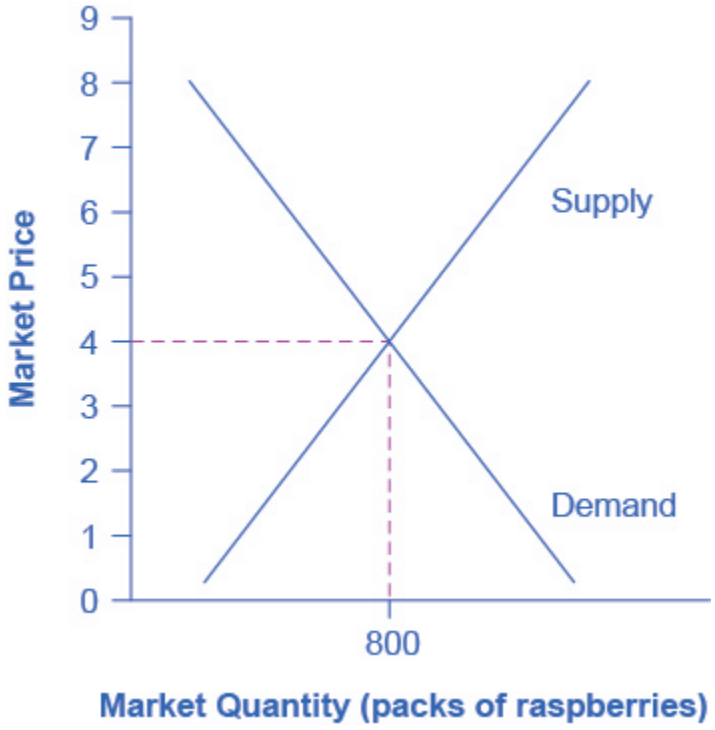

Fig 8.5 "Marginal Revenues and Marginal Costs at the Raspberry Farm: Raspberry Market" by OpenStax, CC BY 4.0.

Since a perfectly competitive firm is a price taker, it can sell whatever quantity it wishes at the market-determined price. We calculate marginal cost, the cost per additional unit sold, by dividing the change in total cost by the change in quantity.

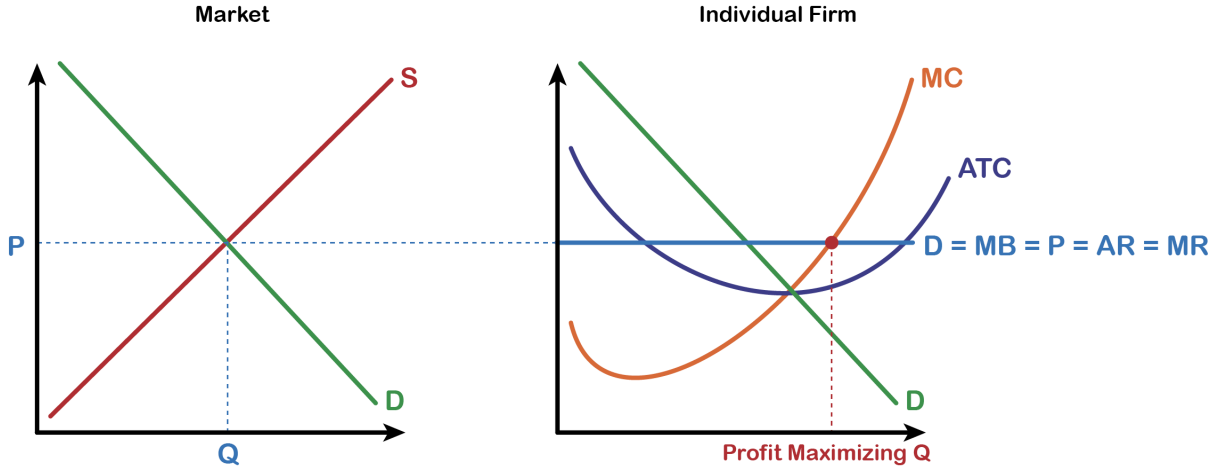

Fig. 8.6

The figure above shows the market graph on the left panel (just as the example in Fig 8.5). Markets determine the price, and this is the price the perfectly competitive producer is charging. The right panel shows the price

line which is also the perfectly elastic demand faced by a representative producer. The price and the demand is the marginal revenue earned by the producer for every additional unit of the good sold. The profit maximizing output produced is determined where the marginal revenue line intersects the marginal cost curve.

The formula for marginal cost is:

Marginal cost = change in total cost/change in quantity

Example

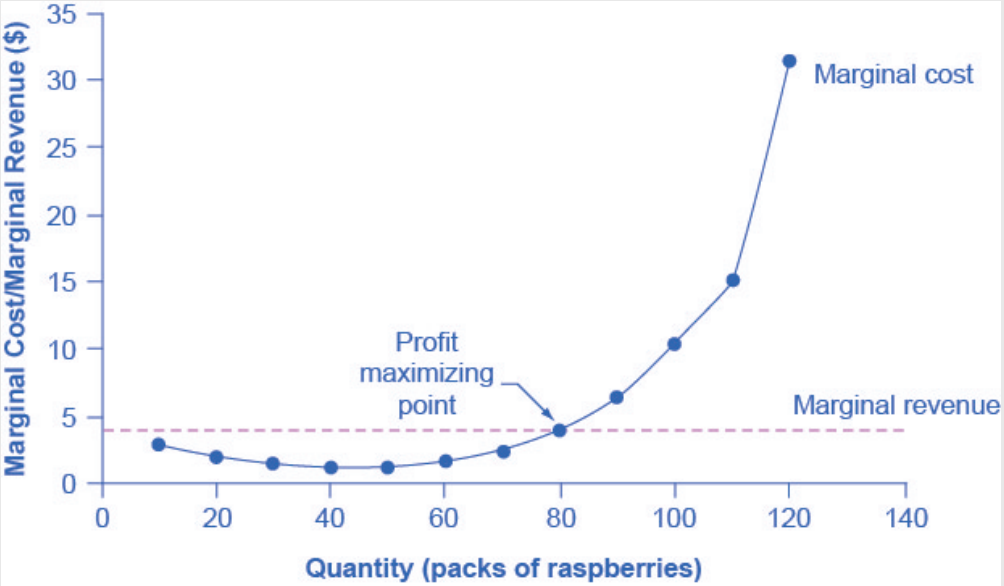

Fig 8.7 "Marginal Revenues and Marginal Costs at the Raspberry Farm: Individual Farmer" by OpenStax, CC BY 4.0.

From Fig 8.6, if the firm is producing at a quantity where MR > MC, like 60 packs of raspberries, then it can increase profit by increasing output because the marginal revenue is exceeding the marginal cost. The revenue from the 60th pack more than compensates for the cost of producing the 60th pack of raspberry. If the firm is producing at a quantity where MC > MR, like 100 packs, then it can increase profit by reducing output because the cost of producing the 100th pack exceeds the revenue obtained from selling the 100th pack. The firm's *profit-maximizing choice of output* will occur where *MR = MC* (i.e. at a quantity of 80 packs). The revenue obtained from selling the 80th pack of raspberry just compensates for the cost of producing the 80th pack.

The profit-maximizing choice for a perfectly competitive firm will occur at the level of output where marginal revenue is equal to marginal cost—that is, where MR = MC. This occurs at Q = 80 in Fig 8.7 below.

Quantity	Total Cost	Marginal Cost	Total Revenue	Marginal Revenue	Profit
0	$62	-	$0	$4	-$62
10	$90	$2.80	$40	$4	-$50
20	$110	$2.00	$80	$4	-$30
30	$126	$1.60	$120	$4	-$6
40	$138	$1.20	$160	$4	$22
50	$150	$1.20	$200	$4	$50
60	$165	$1.50	$240	$4	$75
70	$190	$2.50	$280	$4	$90
80	$230	$4.00	$320	$4	$90
90	$296	$6.60	$360	$4	$64
100	$400	$10.40	$400	$4	$0
110	$550	$15.00	$440	$4	-$110
120	$715	$16.50	$480	$4	-$235

Fig 8.7

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8.4 Profits and Losses in Perfect Competition

Does maximizing profit (producing where MR = MC) imply an actual economic profit?

The answer depends on the relationship between price and average total cost, which is the average profit or profit margin.

If the market price is higher than the firm's average cost of production for that quantity produced, then the profit margin is positive and the firm will earn profits. Conversely, if the market price is lower than the average cost of production, the profit margin is negative and the firm will suffer losses. You might think that, in this situation, the firm may want to shut down immediately. Remember, however, that the firm has already paid for fixed costs, such as equipment, so it may continue to produce for a while and incur a loss.

In perspective

Fig 8.8 illustrates the three possible scenarios:

(A) where price intersects marginal cost at a level above the average cost curve,

(B) where price intersects marginal cost at a level equal to the average cost curve, and,

(C) where price intersects marginal cost at a level below the average cost curve.

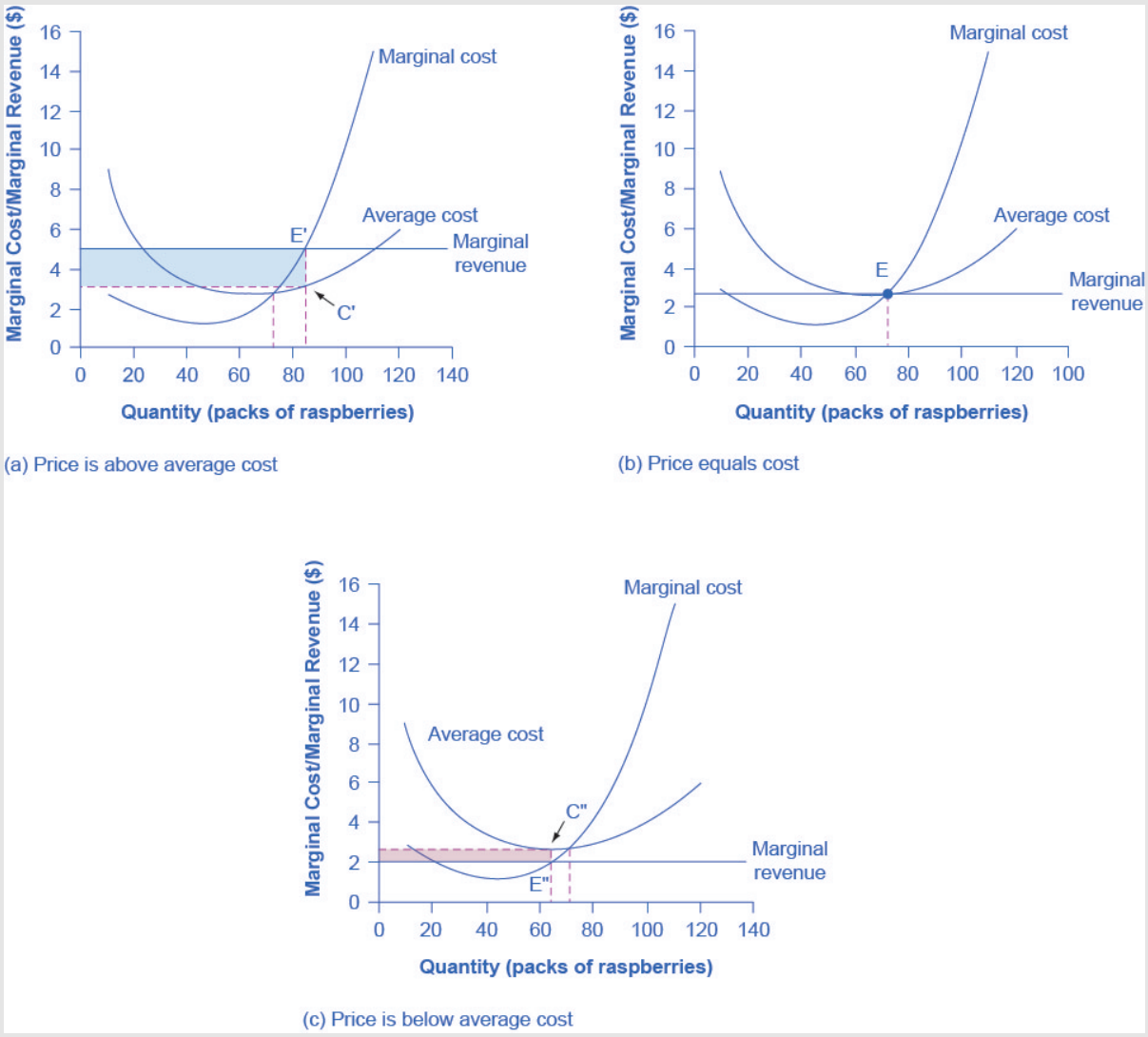

Fig 8.8 "Price and Average Cost at the Raspberry Farm" by OpenStax, CC BY 4.0.

In Fig 8.8 A,

Economic Profit = Total Revenue – Total Cost = (5 × 85) − (3.50 × 85) = $127.50

(POSITIVE ECONOMIC PROFIT)

In Fig 8.8 B,

Economic Profit = Total Revenue – Total Cost = (2.75 × 75) − (2.75 × 75) = $0

(ZERO ECONOMIC PROFIT)

In Fig 8.8 C,

Economic Profit = Total Revenue – Total Cost = (2 × 65) − (2.73 × 65) = − $47.45

(NEGATIVE ECONOMIC PROFIT OR ECONOMIC LOSS)

If....	Then...
Price > ATC	Firm earns an economic profit
Price = ATC	Firm earns zero economic profit
Price < ATC	Firm earns a loss

Fig 8.9

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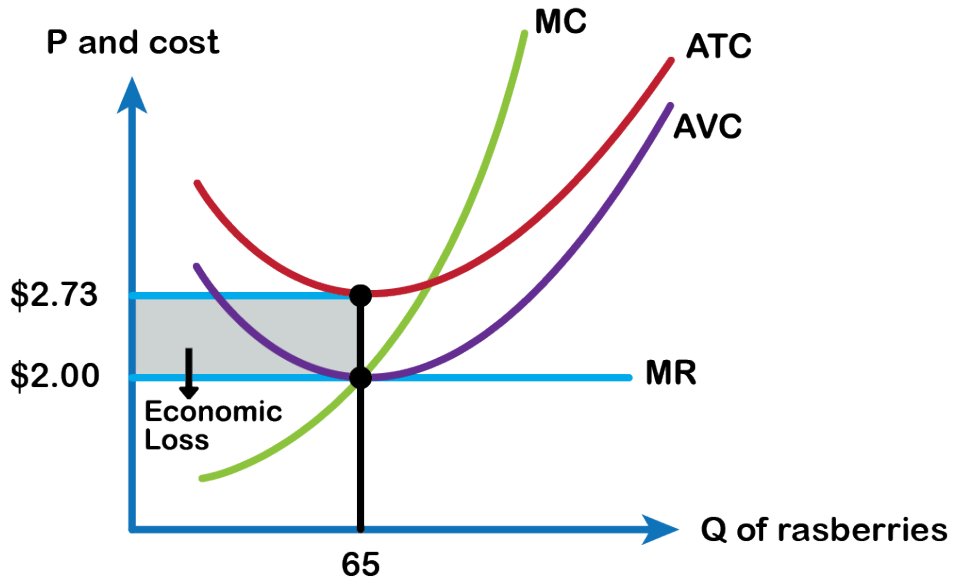
8.5 Economic Loss and Shut Down in the Short Run

The possibility that a firm may earn losses raises a question: Why can the firm not avoid losses by shutting down and not producing at all? The answer is that shutting down can reduce variable costs to zero, but in the short run, the firm has already paid for fixed costs. As a result, if the firm produces a quantity of zero, it would still make losses because it would still need to pay for its fixed costs. Therefore when a firm is experiencing losses, it must face a question: should it continue producing or should it shut down?

In either case, the firm pays for its fixed cost which is the economic loss incurred. However, to understand whether the firm can continue producing, we need to identify the average variable cost of production.



Ecnomic Loss = TC - TR
= $2.73 x 65 - $2 x 65
= $47.45

Fig 8.10 – Fanshawe College, CC-BY-NC-SA 4.0

The Fig 8.10 above shows the loss minimizing output of 65. The marginal revenue or price received from selling each pack is $2 and the average variable cost of producing 65 packs is also $2. The price just covers the average variable cost of production, which implies the farmer will still be able to manage and continue production because labour cost and raw material cost for producing each pack are paid for by the price received. However, if the firm decides to shut down temporarily and stop production, it still has to incur an economic loss of $47.45 (fixed cost paid out of its own pocket).

Therefore, P = AVC is called the **shutdown point**, at which level the firm is indifferent between producing the loss minimizing output or shutting down. Shut down is a temporary phenomenon where the firm stays in the

business but could stop production for a while until market conditions improve. If P > AVC but P < ATC, then the firm continues to produce in the short-run, making economic losses.

However, If P < AVC, then the firm stops producing as the price is not sufficient enough to cover the variable cost and the firm incurs its fixed costs.

Marginal Cost and the Firm's Supply Curve

For a perfectly competitive firm, the marginal cost curve is identical to the firm's supply curve starting from the minimum point on the average variable cost curve. To understand why this perhaps surprising insight holds true, first think about what the supply curve means. A firm checks the market price and then looks at its supply curve to decide what quantity to produce. Now, think about what it means to say that a firm will maximize its profits by producing at the quantity where P = MC. This rule means that the firm checks the market price, and then looks at its marginal cost to determine the quantity to produce—and makes sure that the price is at least equal to the minimum average variable cost. In other words, the marginal cost curve above the minimum point on the average variable cost curve becomes the firm's supply curve. The rising portion of the MC curve from the shutdown point becomes the firm's supply curve in the short run, as shown in fig 8.11 below.

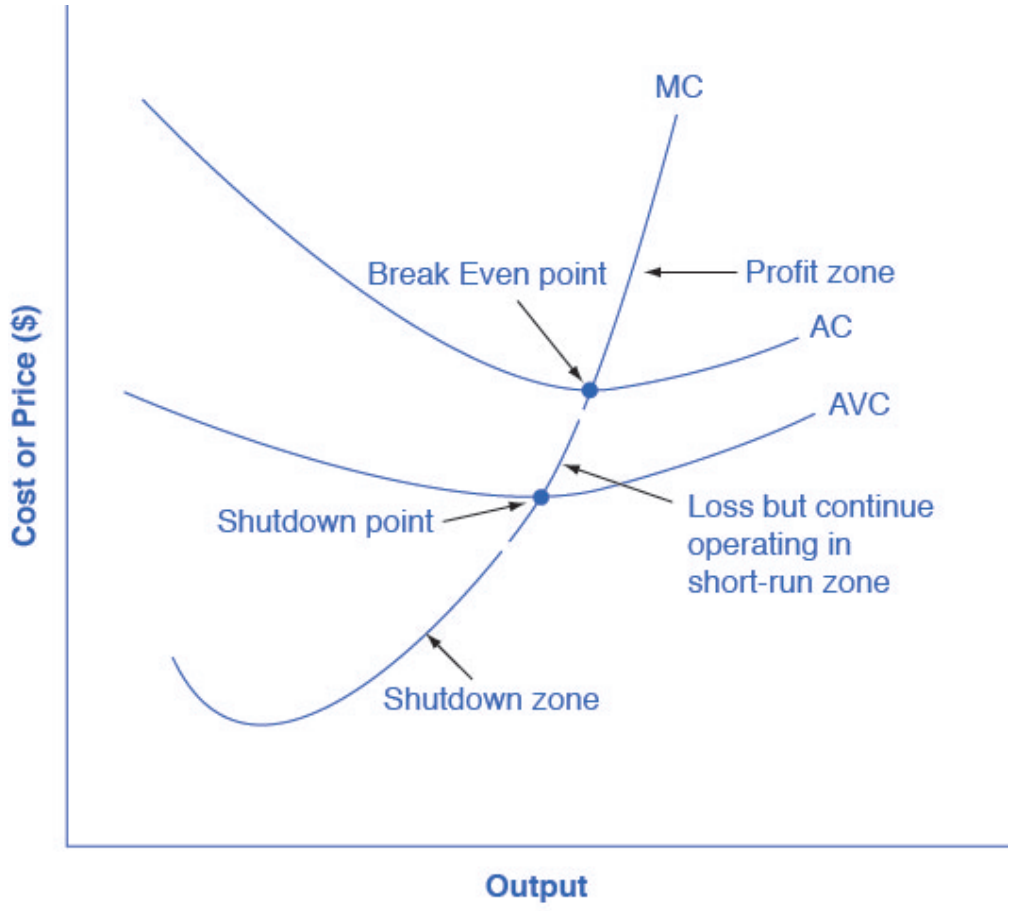


Fig 8.11 "Profit, Loss, Shutdown" by OpenStax, CC BY 4.0.

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8.6 How Entry and Exit Lead to Zero Profits in the Long Run

No perfectly competitive firm acting alone can affect the market price. However, the combination of many firms entering or exiting the market will affect the overall supply in the market. In turn, a shift in supply for the market as a whole will affect the market price. Entry and exit to and from the market are the driving forces behind a process that, in the long run, pushes the price down to minimum average total costs so that all firms are earning zero profit.

Entry of New Firms

Let's say that the product's demand increases, and with that, the market price goes up. The existing firms in the industry are now facing a higher price than before, so they will increase production to the new output level where P = MR = MC. Now the existing firms make a positive economic profit at output Q1 (Fig 8.12 A). This induces new firms to enter the market. As new firms enter, market supply increases and shifts the supply curve to the right to S* (Fig 8.12 B). As the supply curve shifts to the right, the market price starts falling, and with that, economic profits fall for new and existing firms. As long as there are still profits in the market, entry will continue to shift supply to the right. This will stop whenever the market price is driven down to the zero-profit level at output Q2, where no firm is earning positive economic profits. This is the **long-run equilibrium** where the firms continue to produce as long as price *equals* average total cost and end up earning *zero* economic profits. Each firm's share falls but the market output increases.

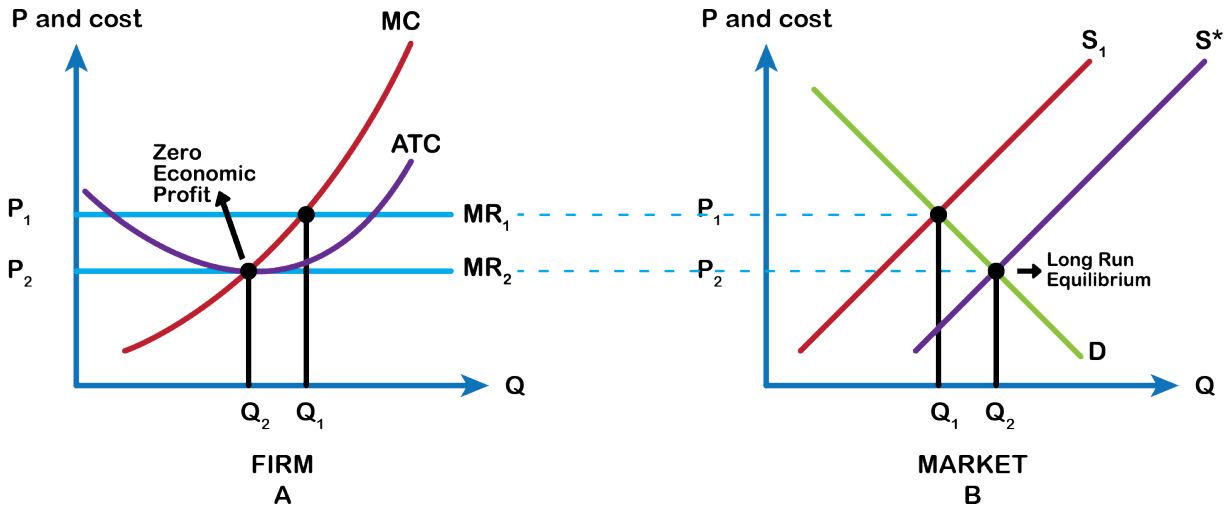

Fig 8.12 – Fanshawe College, CC-BY-NC-SA 4.0

Exit of Firms

Short-run losses will fade away by reversing this process. Say that this time, instead, demand decreases, and

with that, the market price starts falling. The existing firms in the industry are now facing a lower price than before, and as it will be below the average cost curve, they will now be making economic losses at output Q1 (Fig 8.13 A). Some firms will continue producing where the new P = MR = MC, as long as they are able to cover their average variable costs. Some firms will have to shut down immediately as they will not be able to cover their average variable costs, and will then only incur their fixed costs, minimizing their losses. The exit of many firms causes the market supply curve to shift to the left to S* (Fig 8.13 B). As the supply curve shifts to the left, the market price starts rising, and economic losses start to be lower. This process ends whenever the market price rises to the zero-profit level at output Q2, where the existing firms are no longer losing money and are at *zero* profits again. Each firm's share rises but the market output decreases.

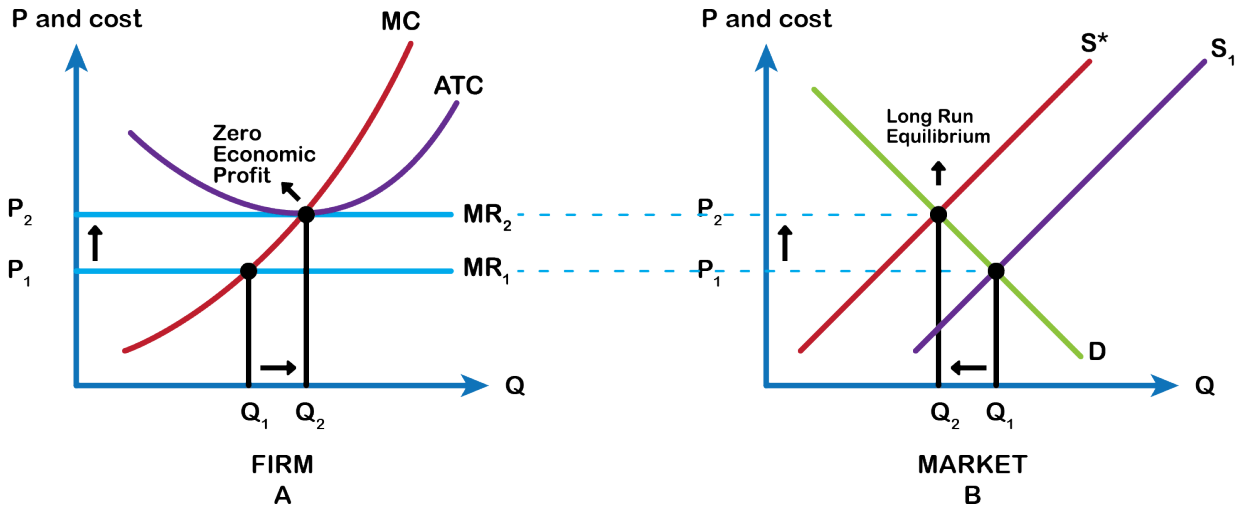

Fig 8.13 – Fanshawe College, CC-BY-NC-SA 4.0

Thus, while a perfectly competitive firm can earn profits in the short run, in the long run, the process of entry will push down prices until they reach the zero-profit level. Conversely, while a perfectly competitive firm may earn losses in the short run, firms will not continually lose money. In the long run, firms making losses are able to escape from their fixed costs, and their exit from the market will push the price back up to the zero-profit level. In the long run, this process of entry and exit will drive the price in perfectly competitive markets to the zero-profit point at the bottom of the ATC curve, where the marginal cost curve crosses the average total cost at its minimum point.

Attribution

8.7 Perfect Competition and Efficiency

Profit-maximizing firms in perfectly competitive demonstrate both productive and allocative efficiency. In the long run in a perfectly competitive market, because of the process of entry and exit, the price in the market is equal to the minimum of the long-run average cost curve. In other words, firms produce and sell goods at the lowest possible average cost, as shown in Fig 8.14 below.

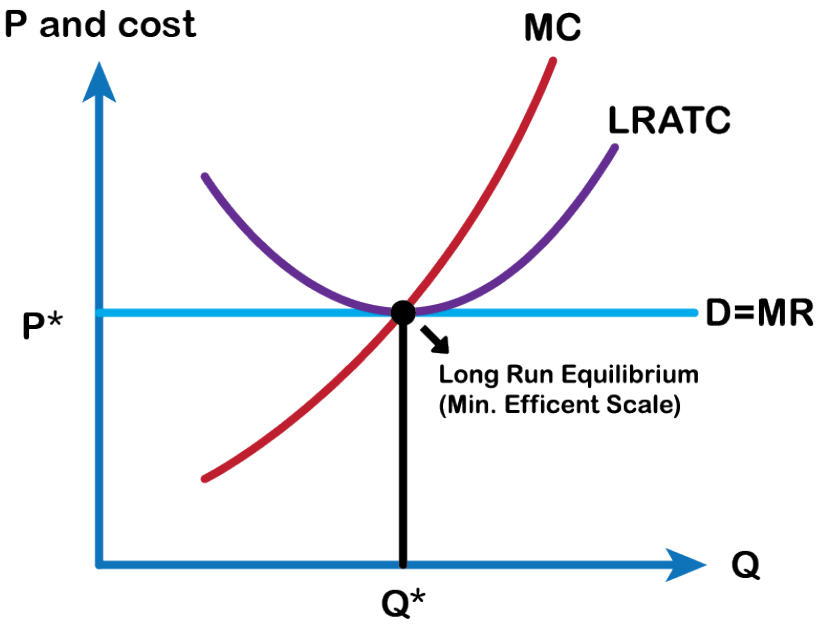

Fig 8.14 – Fanshawe College, CC-BY-NC-SA 4.0

In a perfectly competitive market, the price will be equal to the marginal cost of production. Think about the price that one pays for a good as a measure of the social benefits one receives for that good; after all, willingness to pay conveys what the good is worth to a buyer. Then think about the marginal cost of producing the good as representing not just the cost for the firm, but more broadly the social cost of producing that good. When perfectly competitive firms follow the rule that profits are maximized by producing at the quantity where price (willingness of consumers to pay) is equal to marginal cost, they are thus ensuring that the social benefits they receive from producing a good are in line with the social costs of production. So perfectly competitive markets maximize consumer and producer surpluses resulting in no deadweight or efficiency loss, shown in Fig 8.15 below.

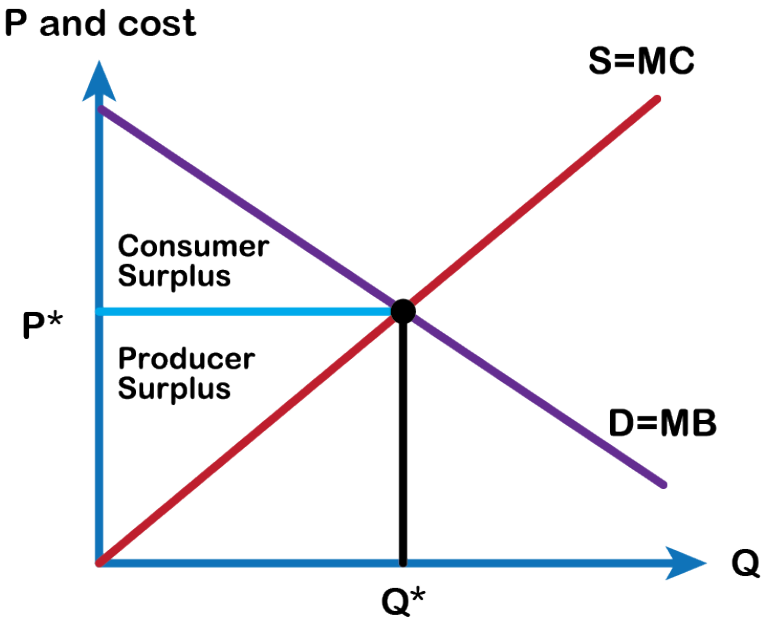

Fig 8.15 – Fanshawe College, CC-BY-NC-SA 4.0

Suppose, P > MC. In that situation, the benefit to society as a whole of producing additional goods, as measured by the willingness to pay for marginal units of a good, would be higher than the cost of the inputs of labor and physical capital needed to produce the marginal good. In other words, the gains to society as a whole from producing additional marginal units will be greater than the costs.

Perfect competition, in the long run, is a hypothetical benchmark. For market structures such as monopoly, monopolistic competition, and oligopoly, which are more frequently observed in the real world than perfect competition, firms will not always produce at the minimum of average cost, nor will they always set price equal to marginal cost. Thus, these other competitive situations will not produce productive and allocative efficiency.

Attribution

8.8 Key Terms

Key Terms

Barriers to Entry

Identical Goods

Long Run Equilibrium

Many Firms

Marginal Revenue Curve

Market Structure and The Competitive Environments

Price Takers

Shutdown Point

CHAPTER 9: MONOPOLY

Chapter Outline

9.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Explain sources of monopoly
- Describe monopoly price and output
- Recognize how monopoly reduces efficiency
- Discuss government policy toward efficiency

Many believe that top executives at firms are the strongest supporters of market competition, but this belief is far from the truth.

In perspective

Think about it this way: If you very much wanted to win an Olympic gold medal, would you rather be far better than everyone else, or locked in competition with many athletes just as good as you? Similarly, if you would like to attain a very high level of profits, would you rather manage a business with little or no competition, or struggle against many tough competitors who are trying to sell to your customers? By now, you might have read the chapter on Perfect Competition. In this chapter, we explore the opposite extreme: **Monopoly**.

If perfect competition is a market where firms have no market power and they simply respond to the market price, monopoly is a market with no competition at all, and firms have a great deal of market power. In the case of a monopoly, one firm produces all of the output in a market. Since a monopoly faces no significant competition, it can charge any price it wishes, subject to the demand curve. While a monopoly, by definition, refers to a single firm, in practice people often use the term to describe a market in which one firm merely has a very high market share.

Attribution

9.1 Monopoly and Barriers to Entry

Because of the lack of competition, monopolies tend to earn significant economic profits. These profits should attract vigorous competition as we described in Perfect Competition, and yet, because of one particular characteristic of monopoly, they do not.

Definition: Barriers to Entry

Barriers to entry are the legal, technological, or market forces that discourage or prevent potential competitors from entering a market.

"Monopoly" by Nick Youngson, CC BY-SA 3.0.

Barriers to entry can range from the simple and easily surmountable, such as the cost of renting retail space, to the extremely restrictive. For example, there are a finite number of radio frequencies available for broadcasting. Once an entrepreneur or firm has purchased the rights to all of them, no new competitors can enter the market. In some cases, barriers to entry may lead to monopoly. In other cases, they may limit competition to a few firms. Barriers may block entry even if the firm or firms currently in the market are earning profits. Thus, in markets with significant barriers to entry, it is *not* necessarily true that abnormally high profits will attract new firms, and that this entry of new firms will eventually cause the price to decline so that surviving firms earn only a normal level of profit in the long run.

There are two types of monopoly, based on the types of barriers to entry they exploit. One is a **natural monopoly**, where the barriers to entry are something other than legal prohibition. The other is a **legal monopoly**, where laws prohibit (or severely limit) competition.

Natural Monopoly

Economies of scale can combine with the size of the market to limit competition. (We introduced this theme in Chapter 7: Production and Cost).

Example

Fig 9.1 presents a long-run average cost curve for the airplane manufacturing industry. It shows economies of scale up to an output of 8,000 planes per year and a price of P0, then constant returns to scale from 8,000 to 20,000 planes per year, and diseconomies of scale at a quantity of production greater than 20,000 planes per year.

Now consider the market demand curve in the diagram, which intersects the long-run average cost (LRAC) curve at an output level of 5,000 planes per year and at a price P1, which is higher than P0. In this situation, the market has room for only one producer. If a second firm attempts to enter the market at a smaller size, say by producing a quantity of 4,000 planes, then its average costs will be higher than those of the existing firm, and it will be unable to compete. If the second firm attempts to enter the market at a larger size, like 8,000 planes per year, then it could produce at a lower average cost—but it could not sell all 8,000 planes that it produced because of insufficient demand in the market.

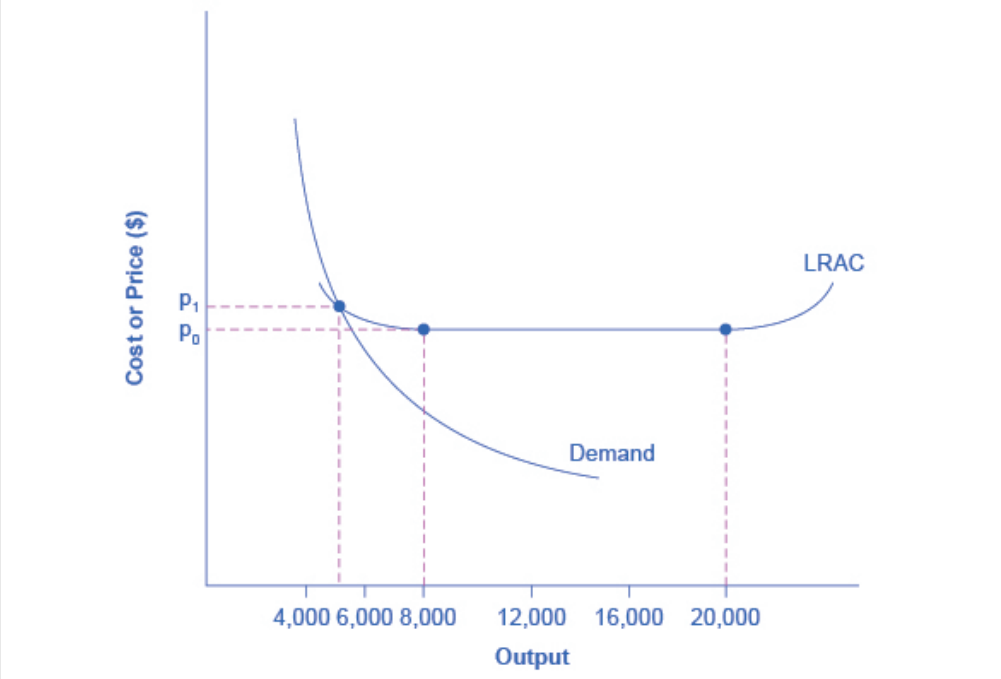

Fig 9.1 "Economies of Scale and Natural Monopoly" by OpenStax, CC BY 4.0.

Economists call this situation, when economies of scale are large relative to the quantity demanded in the market, a natural monopoly. Natural monopolies often arise in industries where the marginal cost of adding an additional customer is very low, once the fixed costs of the overall system are in place. This results in situations where there are substantial economies of scale. For example, once a water company lays the main water pipes

through a neighbourhood, the marginal cost of providing water service to another home is fairly low. Such industries offer an example where, because of economies of scale, one producer can serve the entire market more efficiently than a number of smaller producers that would need to make similar physical capital investments.

Ownership barrier arising out of control of a physical resource

Another type of monopoly occurs when a company has control of a scarce physical resource.

Key Takeaways

In the Canadian economy, one historical example of this pattern occurred when the International Nickel Company of Canada (INCO)—controlled most of the supply of nickel, a key mineral used leading manufacturer of specialized forged components made from alloy materials.

As another example, the majority of global diamond production is controlled by DeBeers, a multi-national company that has mining and production operations in South Africa, Botswana, Namibia, and Canada. It also has exploration activities on four continents, while directing a worldwide distribution network of rough cut diamonds. Although in recent years they have experienced growing competition, their impact on the rough diamond market is still considerable.

"The Big Nickel and the Inco Superstack" by Sean Marshall CC-BY-NC

Legal Monopoly

For some products, the government erects barriers to entry by prohibiting or limiting competition. Under Canadian law, no organization but Canada Post is legally allowed to deliver residential mail. Many states or cities have laws or regulations that allow households a choice of only one electric company, one water company, and one company to pick up the garbage. Most legal monopolies are utilities—products necessary for everyday life—that are socially beneficial. As a consequence, the government allows producers to become regulated monopolies, to insure that customers have access to an appropriate amount of these products or services. Additionally, legal monopolies are often subject to economies of scale, so it makes sense to allow only one provider.

Definition: Patent, Trademark, Copyright & Intellectual Property

Suppose a company invests in research and development and finds the cure for the common cold.

A **patent** gives the inventor the exclusive legal right to make, use, or sell the invention for a limited time. In Canada, exclusive patent rights last for 20 years. The idea is to provide limited monopoly power so that innovative firms can recoup their investment in R&D, but then to allow other firms to produce the product more cheaply once the patent expires.

A **trademark** is an identifying symbol or name for a particular good, like Chiquita bananas, Chevrolet cars, Rogers Cable.

A **copyright**, according to the Canadian Law, "is a form of protection for 'original works of authorship' including literary, dramatic, musical, architectural, cartographic, choreographic, pantomimic, pictorial, graphic, sculptural, and audiovisual creations."

Taken together, we call this combination of patents, trademarks, copyrights as **intellectual property**, because it implies ownership over an idea, concept, or image, not a physical piece of property like a house or a car. Countries around the world have enacted laws to protect intellectual property, although the time periods and exact provisions of such laws vary across countries.

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9.2 Single Price Monopoly Demand and Marginal Revenue

So we know a competitive market faces an elastic demand, what about a **single-priced monopoly?** This is distinct from other monopolies in that the firm must charge the same price to all consumers. In this case, the aggregate demand is the firm's demand!

Example: The Sunglass Market

To explore monopoly, consider the sunglasses market. What do Oakley, Ray-Ban and Persol have in common? They are all owned by the same brand. That's right, *Luxottica*, an Italian-based eyewear company, produces about 70% of all name-brand eyewear. This is fairly close to a monopoly, as with that high of a market share, Luxottica dominates the market price. Notice that Luxottica is not a single price monopoly, as it practices a form of price discrimination by having multiple brands aimed at different consumers.

Let's consider what would happen if Luxottica only sold one kind of sunglasses at the same price to all consumers, and if they owned 100% of the market. Whereas the competitive firm was a small player in the aggregate market, the monopolist dictates both the final price and the quantity. If Luxottica decides to lower the price, it must do so for ALL buyers. Consider what implications this has on revenue.

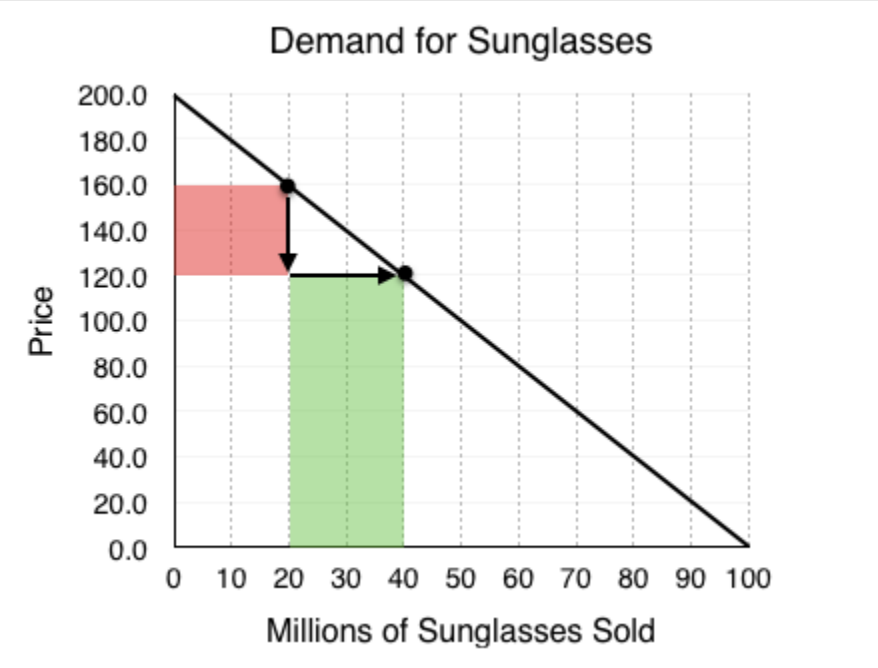

Fig 9.2 Graphic by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

According to the law of demand, as price falls, the quantity demanded increases. This means that Luxottica can increase revenue by lowering prices, as they sell more sunglasses. This is not what happens from a price decrease however, as the firm decreases its price it loses some of the revenue on the goods it was previously selling.

As shown in Fig 9.2, Luxottica is selling 20 million sunglasses at $160 per pair. When it reduces the price to $120, two things happen:

1. Luxottica loses $40 on each of the 20 million sunglasses it was selling before. 20 million consumers were willing to pay the full $160 for a pair, and now only have to pay $120. This results in a **loss of $800 million** for Luxottica. (shown as the red shaded region in Fig 9.2).
2. Luxottica gains $120 on each of the 20 million new sunglasses it now sells. 20 million consumers were not willing to pay $160 for a pair, but are willing to pay $120. This results in a **gain of $2.4 billion** for Luxottica (shown as the green shaded region in Fig 9.2).

These changes collectively represent a **net gain of $1.6 billion** for Luxottica. This net gain is the marginal revenue earned by Luxottica (Total revenue of $120b × 40 – $160b × 20 = $1.6 billion).

For a single-price monopolist, marginal revenue is less than the price at each quantity of output (P > MR). Therefore, the marginal revenue curve lies below the demand curve for a monopolist.

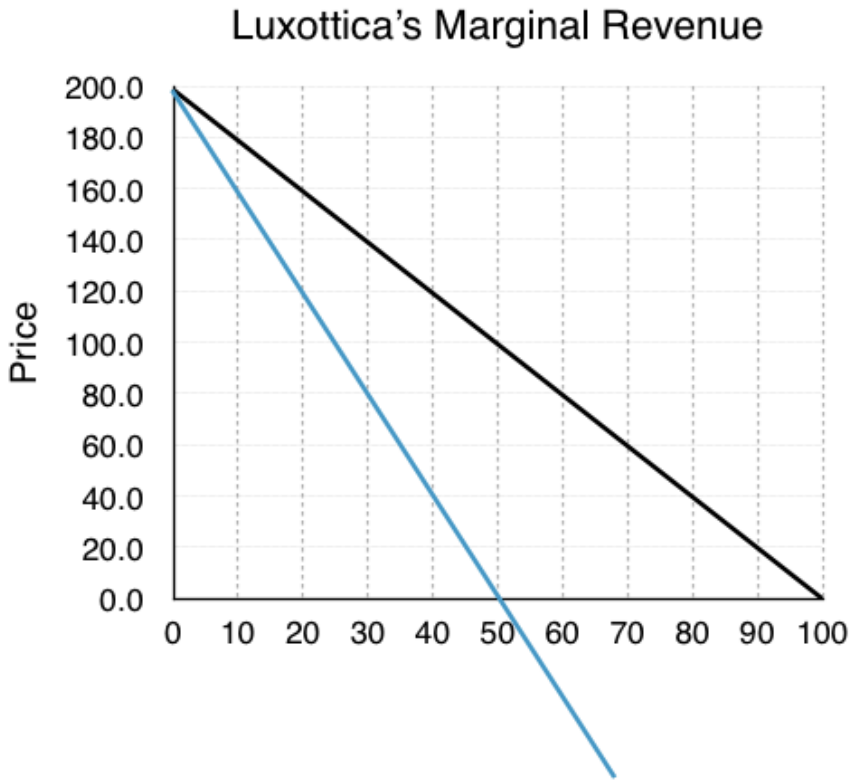

Fig 9.3 Graphic by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Remember, the equation to calculate the elasticity of demand ED is (% change in quantity ÷ % change in price). Looking at the change in revenue from the examples above, we can see that the *decrease* in revenue came from the *price change*, and the *increase* came from the *quantity change*. This means that when % change in quantity > % change in price, our revenue increases from a price drop! Put simply, when our ED>1, we should continue to decrease price, maximizing our revenue. Therefore, the monopolist should operate on the elastic portion of the demand curve.

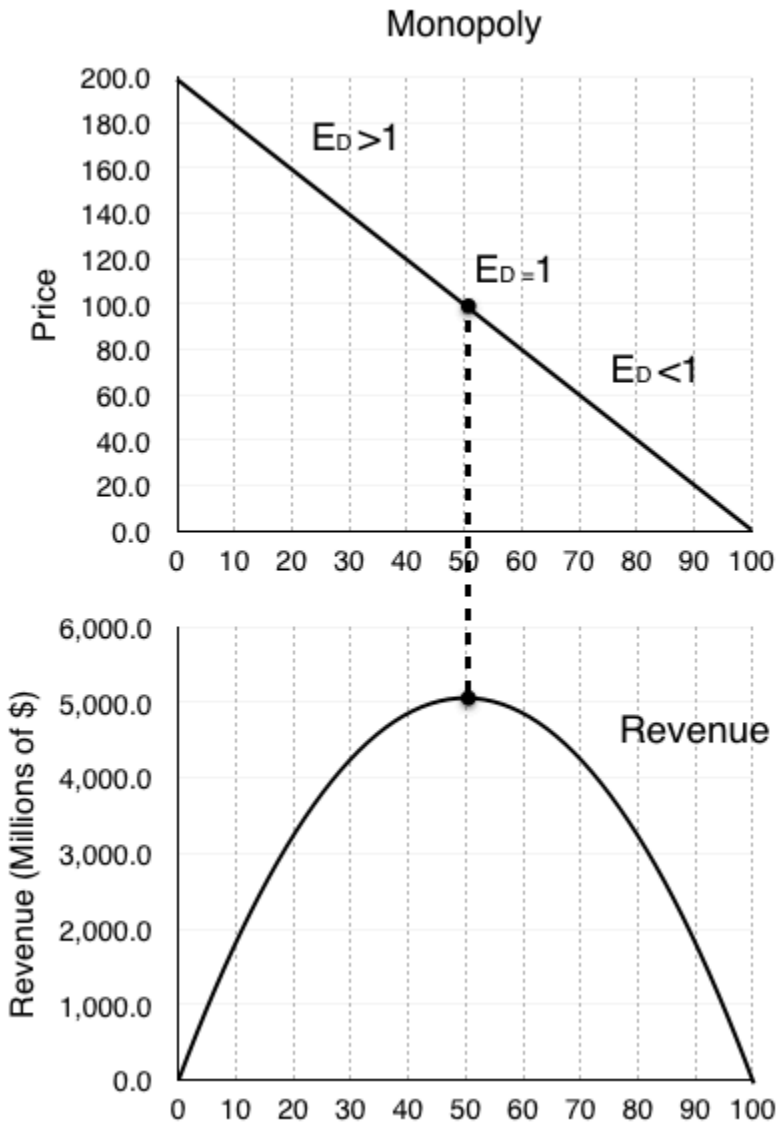

Fig 9.4 Graphic by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Competition vs Monopoly

A perfectly competitive firm acts as a price taker and faces a perfectly elastic or horizontal demand curve as shown in Fig 9.5 A. The monopolist is a price maker and faces a downward-sloping demand curve as shown in Fig 9.5 B. As the price is lowered, the quantity demanded increases.

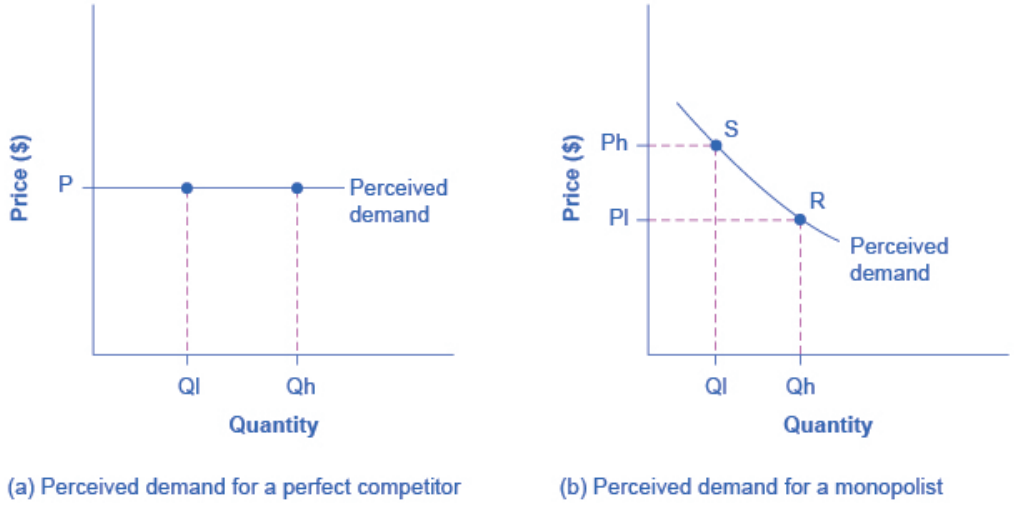

Fig 9.5 a, b "The Perceived Demand Curve for a Perfect Competitor and a Monopolist" by OpenStax, CC BY 4.0.

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"8.1 Monopoly" in Principles of Microeconomics by Dr. Emma Hutchinson, University of Victoria is licensed under a Creative Commons Attribution 4.0 International License, except where otherwise noted.

"9.2 How a Profit-Maximizing Monopoly Chooses Output and Price" in Principles of Economics 2e by OpenStax is licensed under Creative Commons Attribution 4.0 International License.

9.3 Single Monopoly Price and Output

Since a monopolist faces a downward-sloping demand curve, the only way it can sell more output is by reducing its price. Selling more output raises revenue, but lowering prices reduces it.

Let's explore this using the data in the table in Fig 9.6, which shows quantities along the demand curve and the price at each quantity demanded and then calculates total revenue by multiplying price times quantity at each level of output. (In this example, we give the output as 1, 2, 3, 4, and so on, for the sake of simplicity. As the figure illustrates, total revenue for a monopolist has the shape of a hill, first rising, next flattening out, and then falling. In this example, total revenue is highest at a quantity of 6 or 7.

Quantity Q	Price P	Total Revenue TR	Total Cost TC
1	1,200	1,200	500
2	1,100	2,200	750
3	1,000	3,000	1,000
4	900	3,600	1,250
5	800	4,000	1,650
6	700	4,200	2,500
7	600	4,200	4,000
8	500	4,000	6,400

Fig 9.6

However, the monopolist is not seeking to maximize revenue, but instead to earn the highest possible profit. In the Health Pill example, the highest profit will occur at the quantity where total revenue is the farthest above total cost.

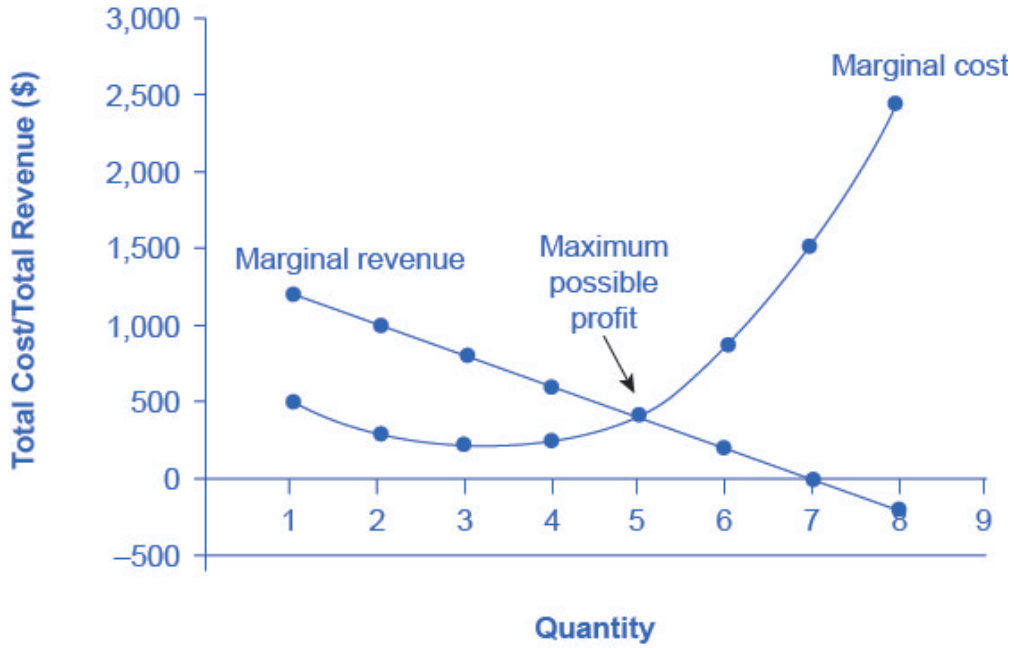

Fig 9.7 "Marginal Revenue and Marginal Cost for the HealthPill Monopoly" by OpenStax, CC BY 4.0.

A monopolist can determine its profit-maximizing price and quantity by analyzing the marginal revenue and marginal costs of producing an extra unit. If the marginal revenue exceeds the marginal cost, then the firm should produce the extra unit.

For example, at an output of 4 in Fig 9.7, marginal revenue is 600 and marginal cost is 250, so producing this unit will clearly add to overall profits. At an output of 5, marginal revenue is 400 and marginal cost is 400, so producing this unit still means overall profits are unchanged. However, expanding output from 5 to 6 would involve a marginal revenue of 200 and a marginal cost of 850, so the sixth unit would actually reduce profits. Thus, the monopoly can tell from the marginal revenue and marginal cost that of the choices in the table, the profit-maximizing level of output is 5.

Quantity Q	Total Revenue TR	Marginal Revenue MR	Total Cost TC	Marginal Cost MC
1	1,200	1,200	500	500
2	2,200	1,000	775	275
3	3,000	800	1,000	225
4	3,600	600	1,250	250
5	4,000	400	1,650	400
6	4,200	200	2,500	850
7	4,200	0	4,000	1,500
8	4,000	-200	6,400	2,400

Fig 9.8

Thus, a profit-maximizing monopoly should follow the rule of producing up to the quantity where marginal revenue is equal to marginal cost—that is, MR = MC. This quantity is easy to identify graphically, where MR and MC intersect, as shown in Fig 9.9.

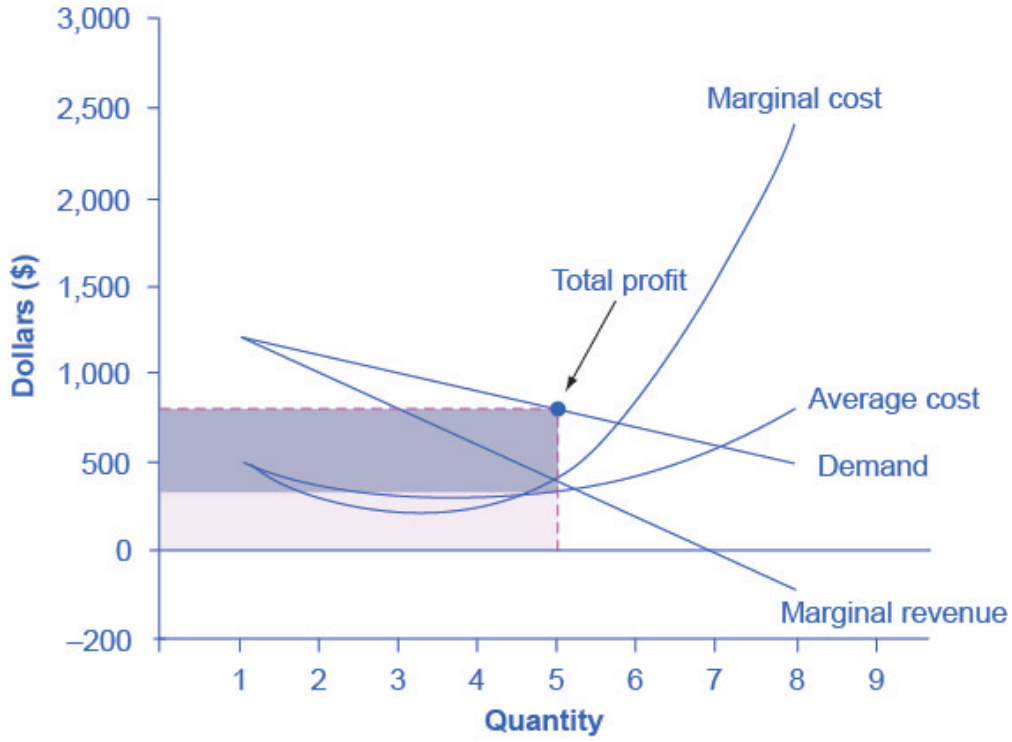

Fig 9.9 "Illustrating Profits at the HealthPill Monopoly" by OpenStax, CC BY 4.0.

Fig 9.9 illustrates the three-step process where a monopolist: selects the profit-maximizing quantity to produce; decides what price to charge; determines total revenue, total cost, and profit.

The Monopolist determines its Profit-Maximizing level of output

The firm can use the points on the demand curve D to calculate total revenue, and then, based on total revenue, calculate its marginal revenue curve. The profit-maximizing quantity will occur where MR = MC — or at the last possible point before marginal costs start exceeding marginal revenue. In Fig 9.9, MR = MC occurs at an output of 5.

The Monopolist decides what price to charge

The monopolist will charge what the market is willing to pay. A dotted line drawn straight up from the profit-maximizing quantity to the demand curve shows the profit-maximizing price which, in Fig 9.9, price is $800. This price is above the average cost curve, which shows that the firm is earning profits.

Calculate Total Revenue, Total Cost, and Profit

Total revenue is the overall shaded box, where the width of the box is the quantity sold and the height is the price. In Fig 9.9, this is 5 × $800 = $4000. In Fig 9.9, the bottom part of the shaded box, which is shaded more lightly, shows total costs; that is, quantity on the horizontal axis multiplied by average cost on the vertical axis or 5 × $330 = $1650. The larger box of total revenues minus the smaller box of total costs will equal profits, which the darkly shaded box shows. Using the numbers, the profit earned is $4000 – $1650 = $2350.

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9.4 Inefficiency of Monopoly

"Economic" by Geralt, Pixabay License.

Most people criticize monopolies because they charge too high a price, but what economists object to is that monopolies do not supply enough output to be allocatively efficient. To understand why a monopoly is inefficient, it is useful to compare it with the benchmark model of perfect competition.

Definition: Allocative efficiency

Allocative efficiency is an economic concept regarding efficiency at the social or societal level. It

refers to producing the optimal quantity of some output, the quantity where the marginal benefit to society of one more unit just equals the marginal cost.

The rule of profit maximization in a world of perfect competition was for each firm to produce the quantity of output where $P = MC$, where the price (P) is a measure of how much buyers value the good and the marginal cost (MC) is a measure of what marginal units cost society to produce. Following this rule assures allocative efficiency.

If $P > MC$, then the marginal benefit to society (as measured by P) is greater than the marginal cost to society of producing additional units, and a greater quantity should be produced. However, in the case of monopoly, price is always greater than marginal cost at the profit-maximizing level of output. Thus, consumers will suffer from a monopoly because it will sell a lower quantity in the market, at a higher price, than would have been the case in a perfectly competitive market. As the price exceeds marginal cost, the monopolist charges a *markup*.

Attribution

9.5 Monopoly and Antitrust Laws

The goals of competition policy are relatively uniform across developed economies: The promotion of domestic competition; the development of new ideas, new products and new enterprises; the promotion of efficiency in the resource-allocation sense; the development of manufacturing and service industries that can compete internationally. In addition to these economic objectives, governments and citizens frown upon monopolies or monopoly practices if they lead to an undue *concentration of political power*. Such power can lead to a concentration of wealth and influence in the hands of an elite.

Canada's regulatory body is the *Competition Bureau*, whose activity is governed primarily by the *Competition Act* of 1986. This act replaced the *Combines Investigation Act*. The *Competition Tribunal* acts as an adjudication body, and is composed of judges and non- judicial members. This tribunal can issue orders on the maintenance of competition in the marketplace. Canada has had anti-combines legislation since 1889, and the act of 1986 is the most recent form of such legislation and policy. The Competition Act does not forbid monopolies, but it does rule as unlawful the *abuse* of monopoly power. Canada's competition legislation is aimed at anti-competitive practices. Let us examine some of these proscribed policies.

Anti-Competitive Practices

Anti-competitive practices may either limit entry into a sector of the economy or force existing competitors out. In either case they lead to a reduction in competition.

- *Mergers* may turn competitive firms into a single organization with excessive market power. The customary justification for mergers is that they permit the merged firms to achieve scale economies that would otherwise be impossible. Such scale economies may in turn result in lower prices in the domestic or international market to the benefit of the consumer, but may alternatively reduce competition and result in higher prices. Equally important in this era of global competition is the impact of a merger on a firm's ability to compete internationally. In a market with few suppliers mergers have the potential to reduce domestic competition.
- *Cartels* aim to restrict output and thereby increase profits. These formations are almost universally illegal in individual national economies.
- *Price discrimination* is another means of increasing prices. For example, if a concrete manufacturer makes their product available to large builders at a lower price than to small-scale builders – perhaps because the large builder has more bargaining power – then the small builder is at a competitive disadvantage in the construction business. If the small firm is forced out of the construction business as a consequence, then competition in this sector is reduced.

Definitions

Predatory pricing is a practice that is aimed at driving out competition by artificially reducing the price of one product sold by a supplier.

Bid rigging is an illegal practice in which bidders (buyers) conspire to set prices in their own interest.

Enforcement

The Competition Act is enforced through the Competition Bureau in a variety of ways. Decisions on acceptable business practices are frequently reached through study and letters of agreement between the Bureau and businesses. In some cases, where laws appear to have been violated, criminal proceedings may follow.

Regulation, deregulation and privatization

The last three decades have witnessed a significant degree of privatization and deregulation in Canada, most notably in the transportation, communication and energy sectors. Modern deregulation in the US began with the passage of the *Airline Deregulation Act* of 1978, and was pursued with great energy under the Reagan administration in the eighties. The Economic Council of Canada produced an influential report in 1981, titled "Reforming Regulation," on the impact of regulation and possible deregulation of specific sectors. The Economic Council proposed that regulation in some sectors was inhibiting competition, entry and innovation. As a consequence, the interests of the consumer were in danger of becoming secondary to the interests of the suppliers.

Telecommunications provision, in the era when the telephone was the main form of such communication, was traditionally viewed as a natural monopoly. The Canadian Radio and Telecommunications Commission (CRTC) regulated its rates. The industry has developed dramatically in the last two decades with the introduction of satellite-facilitated communication, the internet, multi-purpose cable networks, cell phones and service integration.

Trucking, historically, has been regulated by individual provinces. Entry was heavily controlled prior to the federal *National Transportation Act* of 1987, and subsequent legislation introduced by a number of provinces, have made for easier entry and a more competitive rate structure.

Deregulation of the airline industry in the US in the late seventies had a considerable influence on thinking and practice in Canada. The Economic Council report of 1981 recommended in favour of easier entry and greater fare competition. These policies were reflected in the 1987 National Transportation Act. Most economists are favourable to deregulation and freedom to enter, and the US experience indicated that cost reductions and increased efficiency could follow. In 1995 an agreement was reached between the US and Canada that provided full freedom for Canadian carriers to move passengers to any US city, and freedom for US carriers to do likewise, subject to a phase-in provision.

The National Energy Board regulates the development and transmission of oil and natural gas. But earlier powers of the Board, involving the regulation of product prices, were eliminated in 1986, and controls on oil exports were also eliminated.

Agriculture remains a highly controlled area of the economy. Supply 'management', which is really supply restriction, and therefore 'price maintenance', characterizes grain, dairy, poultry and other products. Management is primarily through provincial marketing boards.

Attribution

9.6 Key Terms

Key Terms

Allocative Efficiency

Barriers to Entry

Bid Rigging

Copyright

Intellectual-Property

Legal Monopoly

Monopoly

Natural Monopoly

Patent

Predatory Pricing

Single-Priced Monopoly

Trademark

CHAPTER 10: MONOPOLISTIC COMPETITION

Chapter Outline

10.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Define demand and marginal revenue
- Describe profit maximization in the short run long run profits
- Compare perfect and monopolistic competition
- Discuss marketing differentiated products

We have now explored the two sides of the spectrum. In perfect competition, we assume identical products, and in a monopoly, we assume only one product is available.

Monopolistic Competition

Monopolistic competition lies in-between the spectrum. It involves many firms competing against each other, but selling products that are distinctive in some way.

Examples of monopolistic competition include stores that sell different styles of clothing, restaurants or grocery stores that sell different kinds of food and even products like golf balls or beer that may be at least somewhat similar but differ in public perception because of advertising and brand names. Firms producing such products must also compete with other styles, flavours and brand names. The term “monopolistic competition” captures this mixture of mini-monopoly and tough competition.

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10.1 Differentiated Products

A firm can try to make its products different from those of its competitors in several ways: *physical aspects of the product, selling location, intangible aspects of the product, and perceptions of the product*. Products that are distinctive in one of these four ways are called **differentiated products**.

- *Physical aspects of a product* include all the phrases you hear in advertisements: such as an unbreakable bottle, non-stick surface, freezer-to-microwave, non-shrink, extra spicy, newly redesigned for your comfort.
- The *location of a firm* can also create a difference between producers. For example, a gas station located at a busy intersection can probably sell more gas than one located on a small side-road. A supplier to an automobile manufacturer may find that it is advantageous to locate near the car factory.
- *Intangible aspects* can differentiate a product, too. Some intangible aspects may be promises like a guarantee of satisfaction or money back, a reputation for high-quality services like free delivery, or a loan to purchase the product.
- *Product perception* may occur in the minds of the buyers. For example, many people could not tell the difference in taste between common varieties of beer or cigarettes if they were blindfolded, but because of past habits and advertising, they have strong preferences for certain brands. Advertising can play a role in shaping these intangible preferences.

The concept of differentiated products is closely related to the degree of variety that is available. If everyone in the economy wore only blue jeans, ate only white bread, and drank only tap water, then the markets for clothing, food, and drink would be much closer to perfectly competitive. The variety of styles, flavors, locations, and characteristics creates product differentiation and monopolistic competition.

Attribution

10.2 Perceived Demand for Monopolistic Competitor

A monopolistically competitive firm faces a demand for its goods that is between monopoly and perfect competition. Fig 10.1 offers a reminder that the **demand curve** as faced by a perfectly competitive firm is **perfectly elastic** or flat, because the perfectly competitive firm can sell any quantity it wishes at the prevailing **market price**. In contrast, the demand curve, as faced by a monopolist, is the market demand curve, since a monopolist is the only firm in the market, and hence is downward sloping.

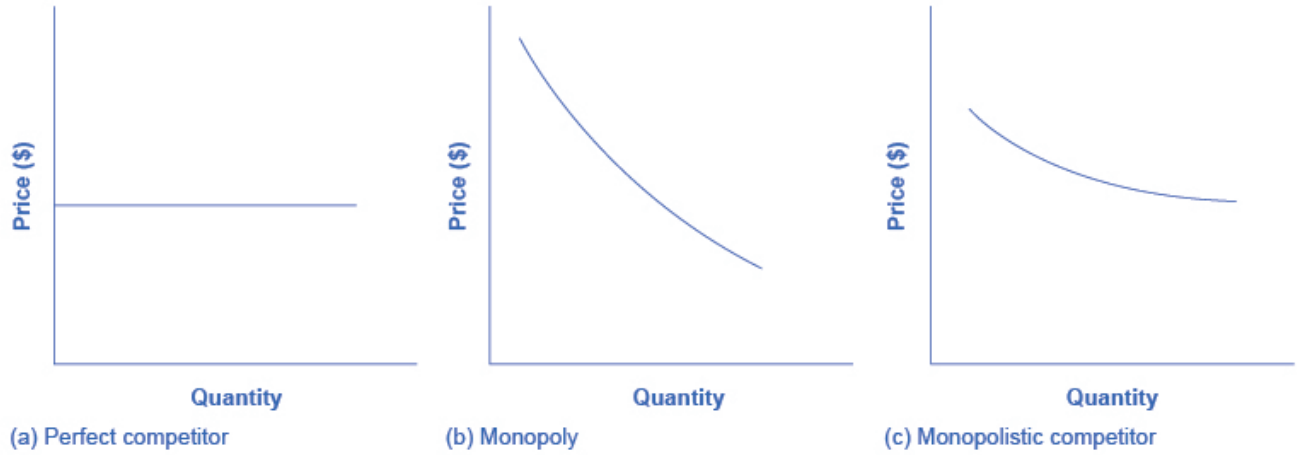

Fig 10.1 "How a Monopolistic Competitor Chooses Price and Quantity" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

The demand curve as faced by a monopolistic competitor is not flat, but rather downward-sloping, meaning that the monopolistic competitor, like the monopoly, can raise its price without losing all of its customers or lower its price and gain more customers. Since there are substitutes, the demand curve for a monopolistically competitive firm is relatively more elastic than that of a monopoly, where there are no close substitutes. If a monopolist raises its price, some consumers will choose not to purchase its product—but they will then need to buy a completely different product. However, when a monopolistic competitor raises its price, consumers can choose to buy a similar product from another firm. If a monopolistic competitor raises its price, it will not lose as many customers as would a perfectly competitive firm, but it will lose more customers than a monopoly would.

At a glance, the demand curves faced by a monopoly and monopolistic competitor look similar—that is, they both slope down. Still, the underlying economic meaning of these demand curves is different because a monopolist faces the market demand curve and a monopolistic competitor does not.

Attribution

10.3 How a Monopolistic Competitor Chooses Price and Quantity

Monopolistic Competition

To explore monopolistic competition, let's consider Rogers, one of the Cellular companies in the market. Rogers faces a downward sloping demand curve and has ATC and MC curves similar to the ones we have seen before.

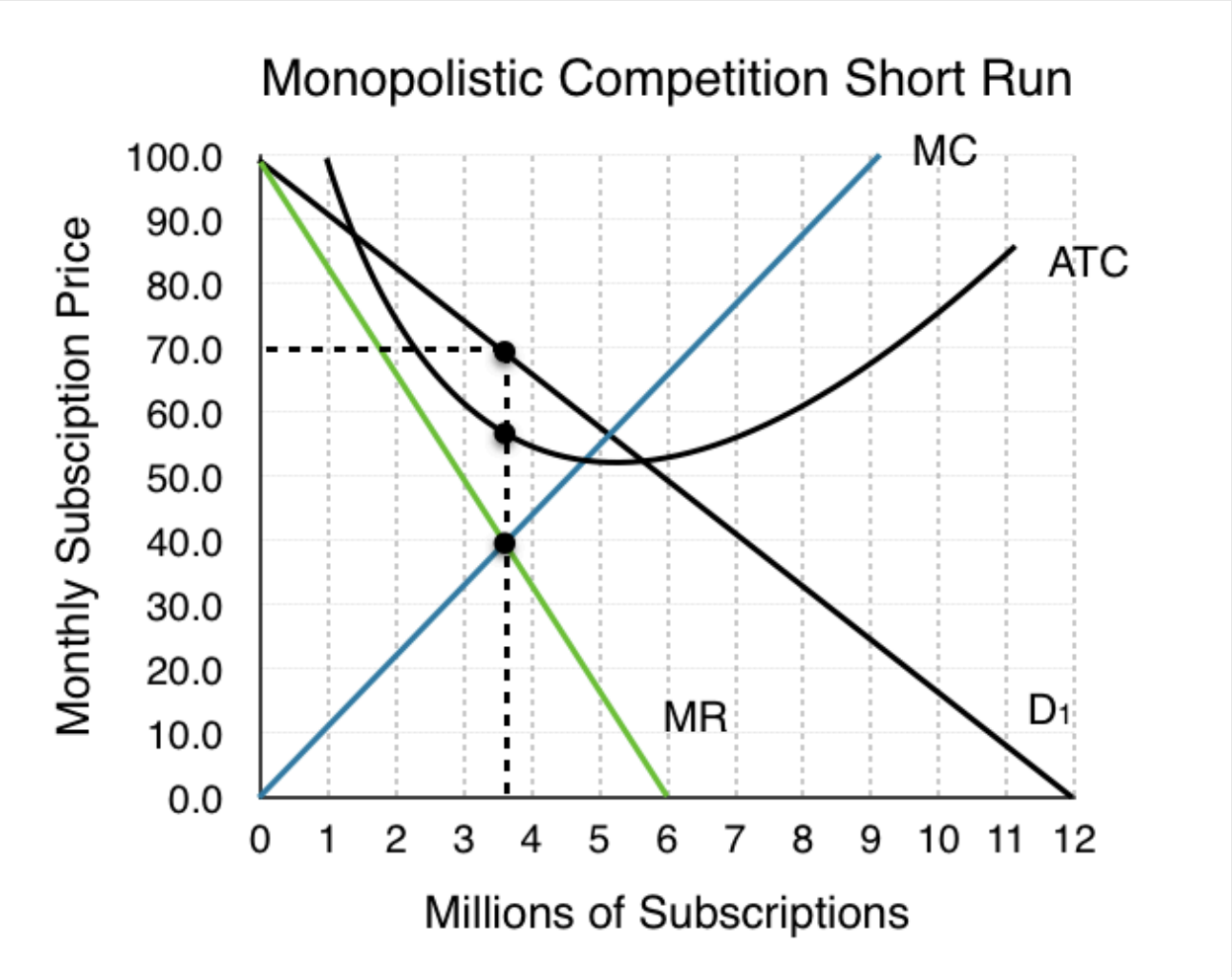

Fig 10.2 "Perceived Demand for Firms in Different Competitive Settings" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

The monopolistically competitive firm decides on its profit-maximizing quantity and price similar to the way that a monopolist does. Since they face a downward sloping demand curve, the same considerations about how elasticity affects revenue are relevant, and the firm will maximize profits where MR = MC when P > MR. Rogers determines its profit-maximizing level of output. This will occur where MR = MC. MR and MC intersect when Rogers has 3.6 million subscribers.

Rogers decides what price to charge. When the firm has determined its profit-maximizing quantity of output, it will behave like a monopoly and charge the maximum it can at the quantity. On the graph, this process can be shown as a vertical line reaching up through the profit-maximizing quantity until it hits the firm's perceived demand curve. For Rogers, this occurs at a price of $70/month.

Although the process by which a monopolistic competitor makes decisions about quantity and price is similar to the way in which a monopolist makes such decisions, two differences are worth remembering.

1. First, although both a monopolist and a monopolistic competitor face downward-sloping demand curves, the monopolist's demand curve is the market demand curve, while the perceived **demand curve** for a monopolistic competitor is based on the extent of its product differentiation and how many competitors it faces.
2. Second, a monopolist is surrounded by barriers to entry, but a monopolistic competitor who earns profits must expect the entry of firms with similar, but differentiated, products.

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10.4 Mark-up and Excess Capacity

Look at Fig 10.3 below. The profit maximizing price is $70 and the profit maximizing quantity is 3.6 million subscribers. Notice the marginal cost of offering the 3.6 millionth subscription is $40 for Rogers. This difference between the price and the marginal cost at the profit maximizing quantity is called mark up. The mark up in the graph is $70 – $40 = $30.

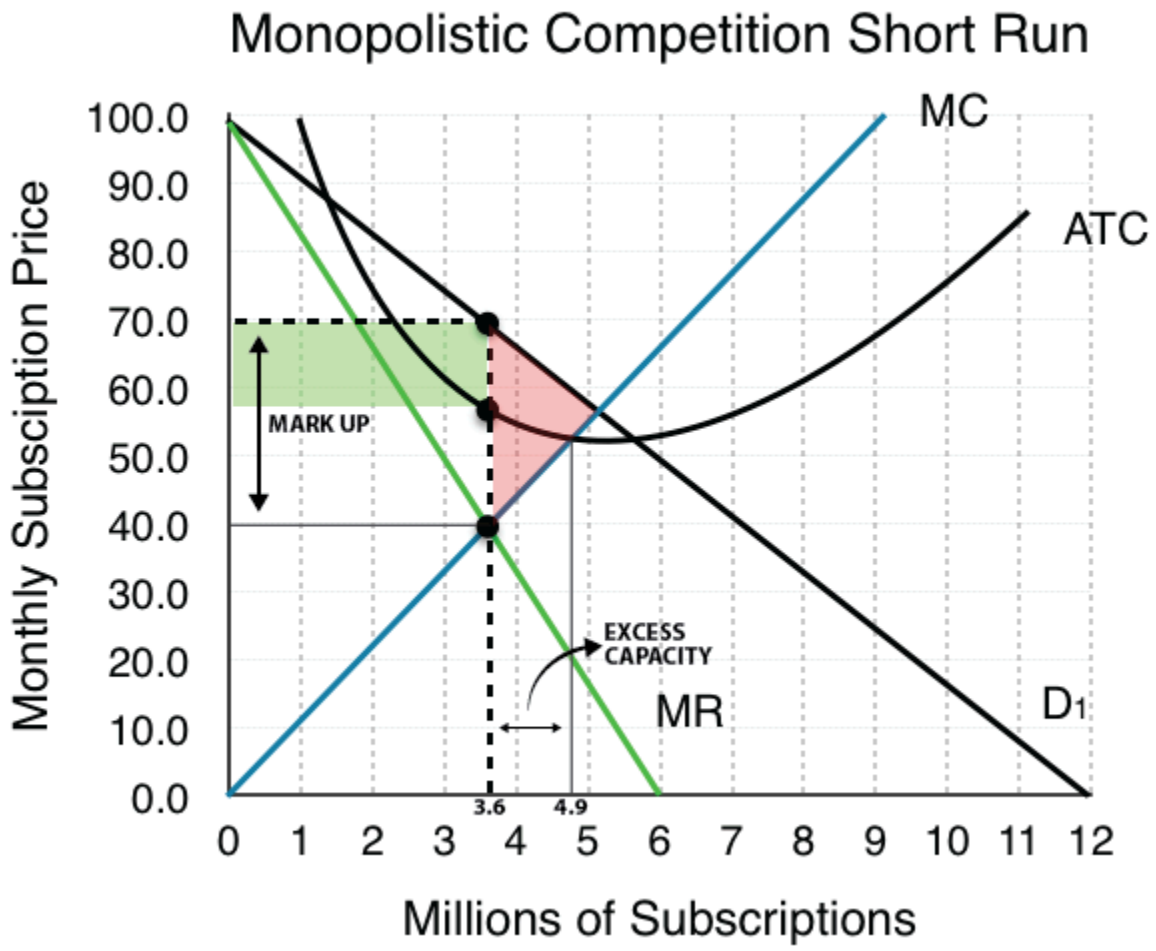

Fig 10.3 "Monopolistic Competition Short Run – Mark-up & Excess Capacity" by Fanshawe College CC BY 4.0 adapted from "Monopolistic Competition Short Run" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Refer to the above graph. What is the minimum efficient scale output? About 4.8 million subscriptions. If Rogers has provided subscriptions to 4.9 m customers, it would be operating efficiently because at that quantity the ATC reaches a minimum. However, we see Rogers' profit maximizing quantity of subscriptions is 3.6 m customers. This difference between profit maximizing quantity of output and the minimum efficient scale is the excess capacity. In the above figure, that is about 4.9 – 3.6 = 1.3 million subscriptions.

10.5 Monopolistic Competitors and Entry

Consider the profits of Rogers at equilibrium quantity of 3.6 million subscribers.

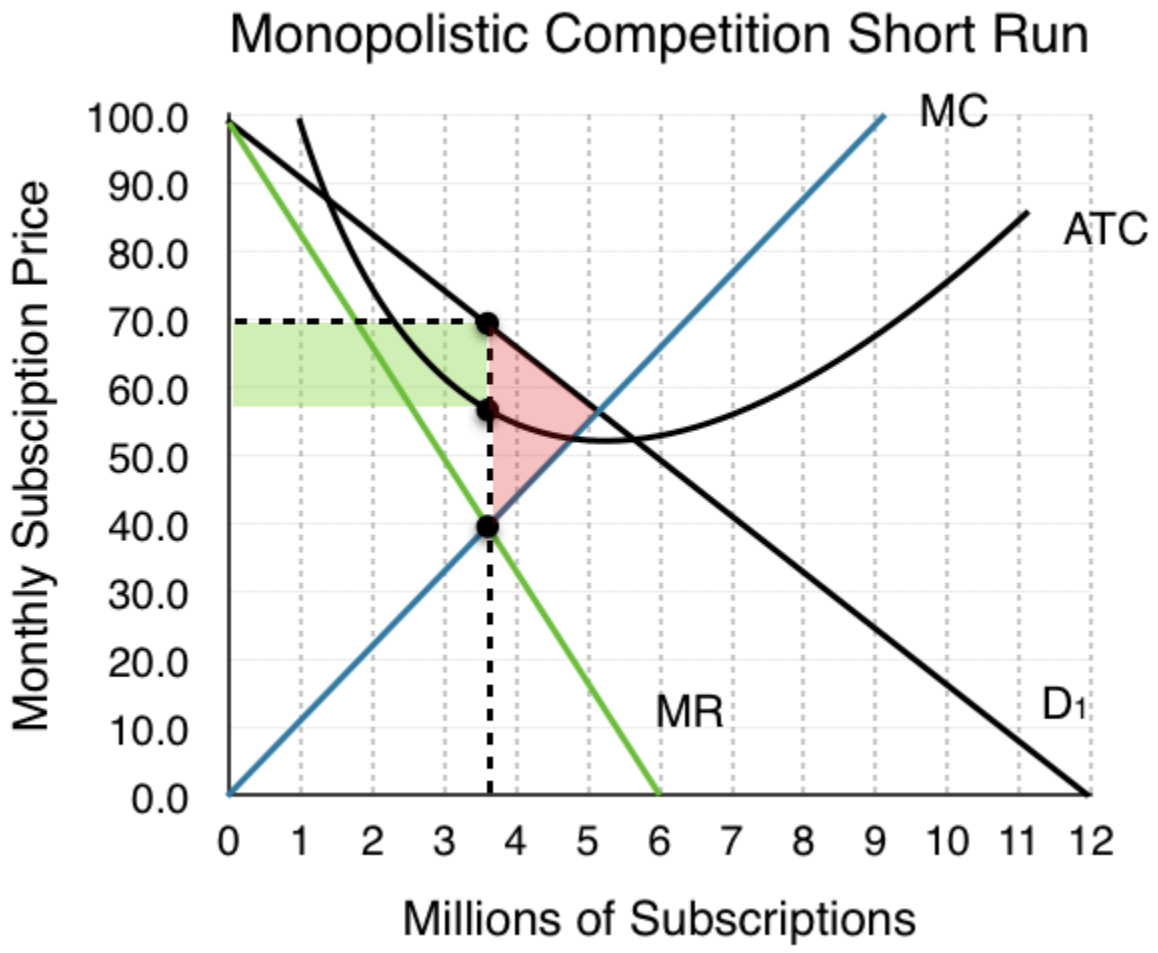

Fig 10.4 "Monopolistic Competition Short Run" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

At a price of $70/month, ATC is only $60 and Rogers' profit is $36 million. ($10 profit/subscriber) Notice that this market creates a deadweight loss equal to the red area since the equilibrium quantity is less than what would occur in competitive equilibrium (5 million subscriptions).

Remember that in monopolistic competition, there are few barriers to entry. Since Rogers is earning positive economic profits, other firms will be tempted to enter the market.

The entry of other firms into the same general market shifts the demand curve faced by a monopolistically competitive firm. As more firms enter the market, the quantity demanded at a given price for any particular firm will decline, and the firm's perceived demand curve will shift to the left. As a firm's perceived demand curve shifts to the left, its marginal revenue curve will also shift to the left. The shift in marginal revenue will change the profit-maximizing quantity that the firm chooses to produce since marginal revenue will then equal marginal cost at a lower quantity.

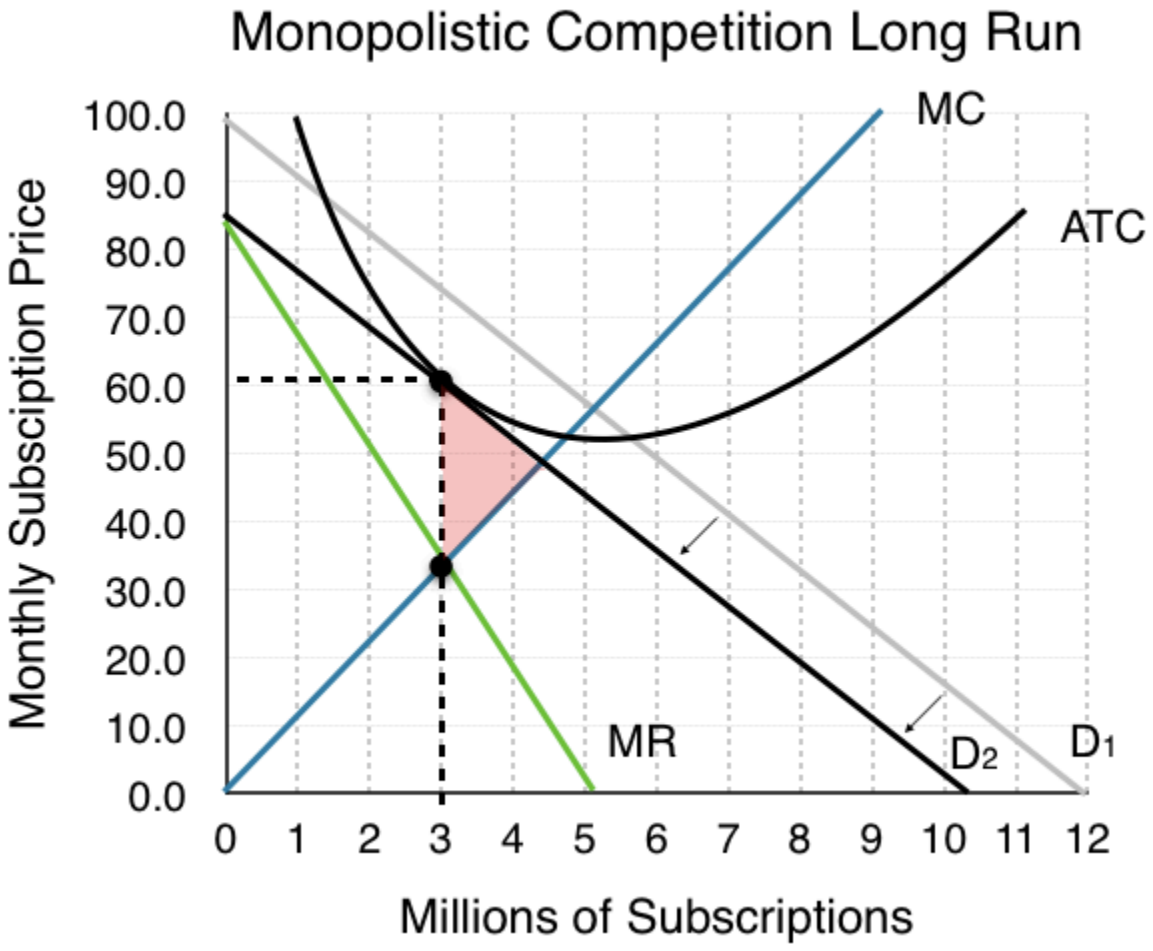

Fig 10.5 "Monopolistic Competition Long Run" by Dr. Emma Hutchinson, University of Victoria, CC BY 4.0.

Long Run Equilibrium in Monopolistic Competition

When will this shifting stop? When profits are 0. As long as P > ATC firms will continue to enter the market, and demand will continue to shift inward. As shown in Fig 10.5, this occurs when P = ATC and MR = MC. This specific point happens when Demand is tangent to ATC, because only when this is true can P = ATC, given that ATC is downward sloping (recall that the MC curve passes through ATC at the minimum point of ATC, and note that the minimum point of ATC is at a quantity higher than that produced by the monopolistically competitive firm). In the long run, the firms end up making zero economic profits. This is called the *long run equilibrium*.

What about the social surplus? Although profits are now 0, a deadweight loss persists. This is because, unlike perfect competition, P > MR, which also means that P > MC. Since consumers' willingness to pay is greater that the marginal cost of the firm, market failure continues. Remember that a key reason for this is the firms' inability to charge more that one price. Notice also that ATC is not at a minimum. This is the price the market pays for variety since the aggregate market does not ensure the most efficient production when there is slight differentiation in products. The existence of mark up and excess capacity ensures monopolistic competition is inefficient.

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10.6 The Benefits of Variety and Product Differentiation

Even though monopolistic competition does not provide efficiency, it does have benefits of its own. Product differentiation is based on variety and innovation. Many people would prefer to live in an economy with many kinds of clothes, foods, and car styles; not in a world of perfect competition where everyone will always wear blue jeans and white shirts, eat only spaghetti with plain red sauce, and drive an identical model of car. Many people would prefer to live in an economy where firms are struggling to figure out ways of attracting customers by methods like friendlier service, free delivery, guarantees of quality, variations on existing products, and a better shopping experience.

Economists have struggled, with only partial success, to address the question of whether a market-oriented economy produces the optimal amount of variety. Critics of market-oriented economies argue that society does not really need dozens of different athletic shoes or breakfast cereals or automobiles. They argue that much of the cost of creating such a high degree of product differentiation, and then of advertising and marketing this differentiation, is socially wasteful—that is, most people would be just as happy with a smaller range of **differentiated products** produced and sold at a lower price.

Defenders of a market-oriented economy respond that if people do not want to buy differentiated products or highly advertised brand names, no one is forcing them to do so. Moreover, they argue that consumers benefit substantially when firms seek short-term profits by providing differentiated products. This controversy may never be fully resolved, in part because deciding on the optimal amount of variety is very difficult, and in part because the two sides often place different values on what variety means for consumers.

The following table summarizes the three types of market structure we have examined.

Market Type	Description	MR vs P	P vs MC	LR Profit	LR ATC	DWL
Perfect Competition	Many sellers, identical goods, free entry in LR	MR=P	P=MC	Profits are zero	$ATC_{LR}=ATC_{MIN}$	No
Monopoly	Single seller, barriers to entry	MR<P	P>MC	Positive profits	$ATC_{LR}>ATC_{MIN}$	Yes
Monopolistic Competition	Many sellers, differentiated products, free entry in LR	MR<P	P>MC	Profits are zero	$ATC_{LR}>ATC_{MIN}$	Yes

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10.7 Key Terms

Key Terms

Demand curve

Differentiated Products

Market price

Monopolistic Competition

Perfectly elastic

Product differentiation

CHAPTER 11: OLIGOPOLY

Chapter Outline

11.0 Introduction

Learning Objectives

At the end of this chapter, learners will be able to:

- Explain why oligopolies exist
- Contrast collusion and competition
- Interpret and analyze the prisoner's dilemma problem
- Explain the role of game theory in understanding the behaviour of oligopolies

Many purchases that individuals make at the retail level are produced in markets that are neither perfectly competitive, monopolies, nor monopolistically competitive. Rather, they are oligopolies.

Oligopy

Oligopoly arises when a small number of large firms have all or most of the sales in an industry.

Examples of oligopoly abound and include the auto industry, cable television, and commercial air travel. If oligopolists collude with each other, they may effectively act like a **monopoly** and succeed in pushing up prices and earning consistently high levels of profit. We typically characterize oligopolies by mutual interdependence where various decisions such as output, price, and advertising depend on other firm(s)' decisions.

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11.1 Why do Oligopolies Exist: Barriers to Entry?

A combination of the barriers to entry that create monopolies and the product differentiation that characterizes monopolistic competition can create the setting for an oligopoly. For example, when a government grants a patent for an invention to one firm, it may create a monopoly. When the government grants patents to, for example, three different pharmaceutical companies that each have its own drug for reducing high blood pressure, those three firms may become an oligopoly.

Similarly, a natural oligopoly will arise when the quantity demanded in a market is only large enough for very few firms to operate at the minimum of the long-run average cost curve. In such a setting, the market has room for only two or three firms, because no smaller firm can operate at a low enough average cost to compete, and no single large firm could sell what it produced given the quantity demanded in the market.

Quantity demanded in the market may also be two or three times the quantity needed to produce at the minimum of the average cost curve—which means that the market would have room for only two or three oligopoly firms. Again, smaller firms would have higher average costs and be unable to compete, while additional large firms would produce such a high quantity that they would not be able to sell it at a profitable price. This combination of economies of scale and market demand creates the barrier to entry, which led to the Boeing-Airbus oligopoly (also called a duopoly) for large passenger aircraft.

The product differentiation at the heart of monopolistic competition can also play a role in creating an oligopoly. For example, firms may need to reach a certain minimum size before they are able to spend enough on advertising and marketing to create a recognizable brand name. The problem in competing with, say, Coca-Cola or Pepsi is not that producing fizzy drinks is technologically difficult, but rather that creating a brand name and marketing effort to equal Coke or Pepsi is an enormous task.

This brings us to understanding the **Characteristics of an Oligopoly Market**:

Therefore, Oligopoly is a market structure where a few **interdependent firms** compete, each firm pays close attention to what the other firm does and this is possible because a relatively small number of firms compete in the market. **Barriers to entry** result in less competition by preventing the entry of new firms in the market.

Because oligopoly models are complex due to this interdependence among firms, we do not use the traditional economic models to study Oligopoly, rather we use a different kind of model to understand firms' behaviour in Oligopolistic set up. Such models are called Game Theory Models. We will discuss these in the consequent sections.

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11.2 Collusion or Competition?

When oligopoly firms in a certain market decide what quantity to produce and what price to charge, they face a temptation to act as if they were a monopoly. By acting together, oligopolistic firms can hold down industry output, charge a higher price, and divide the profit among themselves. When firms act together in this way to reduce output and keep prices high, it is called **collusion**. A group of firms that have a formal agreement to collude to produce the monopoly output and sell at the monopoly price is called a **cartel.**

Even when oligopolists recognize that they would benefit as a group by acting like a monopoly, each individual oligopoly faces a private temptation to produce just a slightly higher quantity and earn a slightly higher profit—while still counting on the other oligopolists to hold down their production and keep prices high. If at least some oligopolists give in to this temptation and start producing more, then the market price will fall. A small handful of oligopoly firms may end up competing so fiercely that they all find themselves earning zero economic profits—as if they were perfect competitors.

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11.3 The Prisoner's Dilemma

Because of the complexity of oligopoly, which is the result of mutual interdependence among firms, there is no single, generally-accepted theory of how oligopolies behave, in the same way that we have theories for all the other market structures. Instead, economists use **game theory**, a branch of mathematics that analyzes situations in which players must make decisions and then receive payoffs based on what other players decide to do. Game theory has found widespread applications in the social sciences, as well as in business, law, and military strategy.

All games have three basic elements: players, strategies and payoffs.

- The **players** of the game are the agents actively participating in the game and who will experience outcomes based on the play of all players.
- The **strategies** are all of the possible strategic choices available to each player, they can be the same for all players or different for each player.
- The **payoffs** are the outcomes associated with every possible strategic combination, for each player.

There are different types of games: Games can also be single-shot or repeated.

- **Single-shot games** are played once and then the game is over.
- **Repeated games** are simultaneous move games played repeatedly by the same players. Below we see examples of single-shot games. We will discuss sequential games in section 11.7.

The **prisoner's dilemma** is a scenario in which the gains from cooperation are larger than the rewards from pursuing self-interest. It applies well to oligopoly. The story behind the prisoner's dilemma goes like this: There are two prisoners (players of the game), who have two strategies: confess and deny the crime, and serve a jail sentence (payoffs)

The Prisoner's Dilemma

Two co-conspiratorial criminals are arrested. When they are taken to the police station, they refuse to say anything and are put in separate interrogation rooms. Eventually, a police officer enters the room where Prisoner A is being held and says: "You know what? Your partner in the other room is confessing. Your partner is going to get a light prison sentence of just one year, and because you're remaining silent, the judge is going to stick you with eight years in prison. Why don't you get smart? If you confess, too, we'll cut your jail time down to five years, and your partner will get five years, also." Over in the next room, another police officer is giving exactly the same speech to Prisoner B. What the police officers do not say is that if both prisoners remain silent, the evidence against them is not especially strong, and the prisoners will end up with only two years in jail each.

"Prisoner's Dilemma" by Giulia Forsythe CCO 1.0

The game theory situation facing the two prisoners is in Fig 11.1 below.

		Prisoner B	
		Remain Silent (cooperate with other prisoner)	Confess (do not cooperate with other prisoner)
Prisoner A	Remain Silent (cooperate with other prisoner)	A gets 2 years, B gets 2 years	A gets 8 years, B gets 1 year
	Confess (do not cooperate with other prisoner	A gets 1 year, B gets 8 years	A gets 5 years, B gets 5 years

Understanding the situation from the figure: Dominant Strategy and Nash Equilibrium

First consider the choices from Prisoner A's point of view. If A believes that B will confess, then A should confess, too, so as to not get stuck with the eight years in prison. However, if A believes that B will not confess, then A will be tempted to act selfishly and confess, so as to serve only one year. The key point is that A has an incentive to confess regardless of what choice B makes! B faces the same set of choices, and thus will have an incentive to confess regardless of what choice A makes. To confess is called the **dominant strategy**. It is the strategy an individual (or firm) will pursue regardless of the other individual's (or firm's) decision. The result is

that if prisoners pursue their own self-interest, both are likely to confess, and end up doing a total of 10 years of jail time between them.

The game is called a dilemma because if the two prisoners had cooperated by both remaining silent, they would only have had to serve a total of four years of jail time between them. If the two prisoners can work out some way of cooperating so that neither one will confess, they will both be better off than if they each follow their own individual self-interest, which in this case leads straight into longer jail terms.

The solution concept most commonly used in game theory is the Nash Equilibrium concept. A **Nash Equilibrium** is an outcome where, given the strategy choices of the other players, no individual player can obtain a higher payoff by altering their strategy choice. An equivalent way to think about Nash Equilibrium is that it is an outcome of a game where all players are simultaneously playing a best response to the others' strategy choices. The *Nash Equilibrium* of the game is that both players *confess* and serve a five-year sentence.

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11.4 The Oligopoly Version of the Prisoner's Dilemma

The members of an oligopoly can face a prisoner's dilemma, also. If each of the oligopolists cooperates in holding down output, then high monopoly profits are possible. Each oligopolist, however, must worry that while it is holding down output, other firms are taking advantage of the high price by raising output and earning higher profits.

Fig 11.2 shows the prisoner's dilemma for a two-firm oligopoly—known as a **duopoly**. If Firms A and B both agree to hold down output, they are acting together as a monopoly and will each earn $1,000 in profits. However, both firms' dominant strategy is to increase output. The***Nash Equilibrium*** is shown by the bottom right-hand corner payoffs, where each firms earn $400 in profits.

		Firm B	
		Hold Down Output (cooperate with other firm)	Increase Output (do not cooperate with other firm)
Firm A	Hold Down Output (cooperate with other firm)	A gets $1,000, B gets $1,000	A gets $200, B gets $1,500
	Increase Output (do not cooperate with other firm)	A gets $1,500, B gets $200	A gets $400, B gets $400

Fig 11.2

Why don't the firms trust each other and why won't they co-operate? Consider the situation of Firm A:

- If A thinks that B will cheat on their agreement and increase output, then A will increase output, too, because for A the profit of $400 when both firms increase output (the bottom right-hand choice in Fig 11.2) is better than a profit of only $200 if A keeps output low and B raises output (the upper right-hand choice in the table).
- If A thinks that B will cooperate by holding down output, then A may seize the opportunity to earn higher profits by raising output. After all, if B is going to hold down output, then A can earn $1,500 in profits by expanding output (the bottom left-hand choice in the table) compared with only $1,000 by holding down output as well (the upper left-hand choice in the table).

Thus, firm A will reason that it makes sense to expand output if B holds down output and that it also makes sense to expand output if B raises output. Again, B faces a parallel set of decisions that will lead B also to expand output.

The result of this prisoner's dilemma is often that even though A and B could make the highest combined profits by cooperating in producing a lower level of output and acting like a monopolist, the two firms may well end up in a situation where each increase output and earn only $400 each in profits.

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11.5: A Duopoly Game

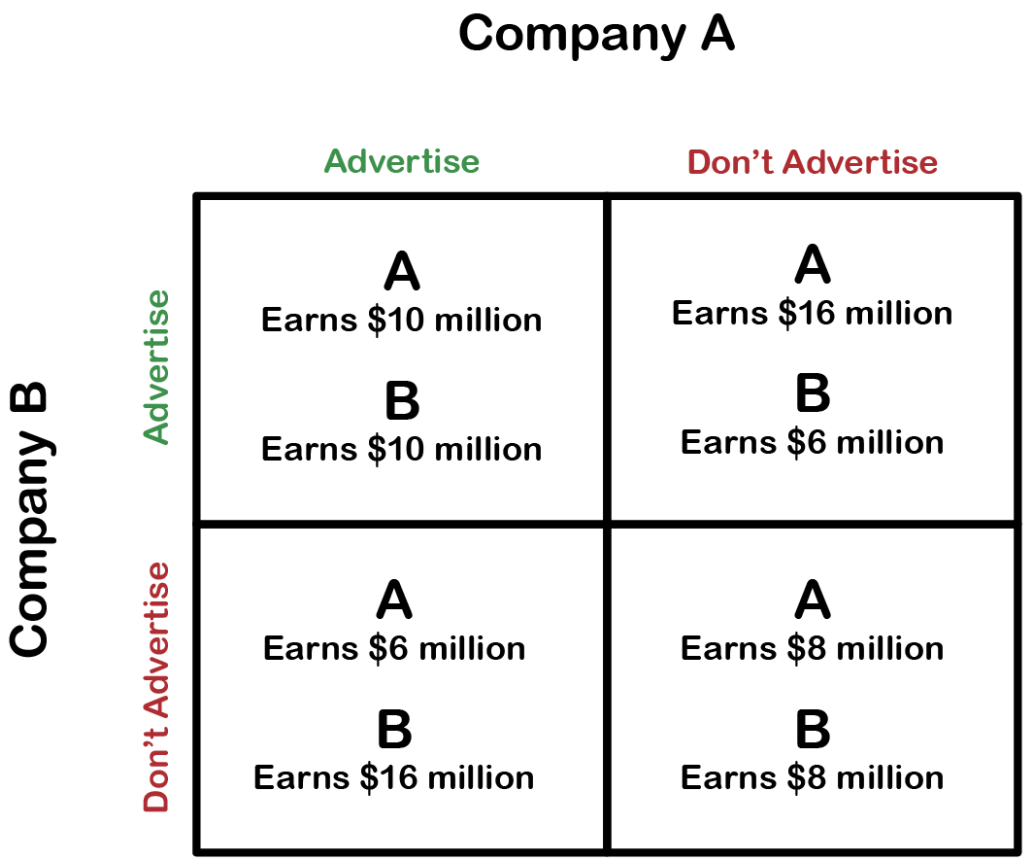

Fig 11.3. A duopoly is a game between 2 or more players where each player acts simultaneously.

Here we have another example of a prisoner's dilemma game. The table in Fig 11.3 above shows the payoff matrix of a duopoly game with two players A and B thinking of a strategy whether to advertise or not advertise. If company A decides to advertise, and company B also advertises, company B earns $16 million profit. If company A doesn't advertise and company B also doesn't, then company B earns $8 million profit. Therefore, the **dominant strategy** for company B, regardless of what A does, is to NOT advertise, because by not advertising company B earns higher profits, as shown by the payoffs.

Similarly, company A's **dominant strategy**, regardless of what company B does, is to *NOT* advertise. The **Nash equilibrium** is shown on the bottom right box where both firms don't advertise and earn $8 million profit each.

The result of this prisoner's dilemma is often that even though A and B could make the highest combined profits by cooperating in advertising, the two firms may well end up in a situation where they neither advertise and earn only $8 million each in profits.

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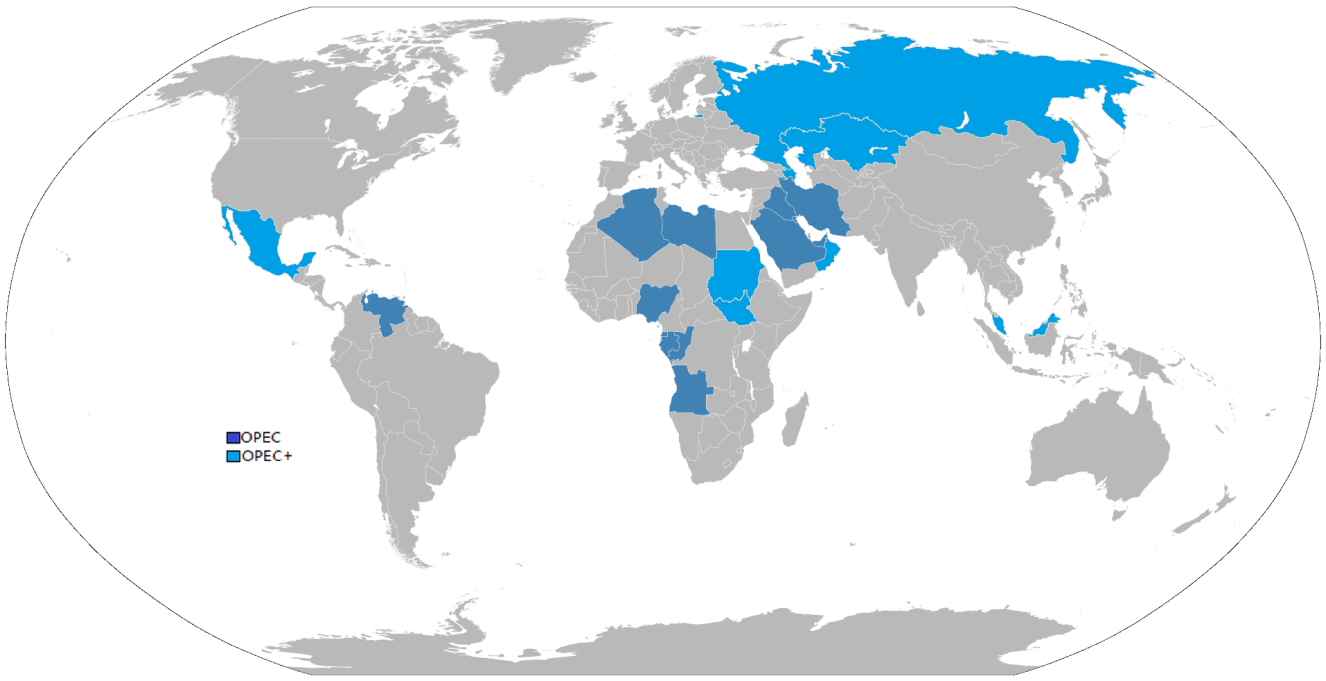
11.6 Cartels

A **cartel** is an agreement among competing firms to collude in order to attain higher profits. Cartels usually occur in an oligopolistic industry, where the number of sellers is small and the products being traded are homogeneous. Cartel members may agree on such matters are price fixing, total industry output, market share, allocation of customers, allocation of territories, bid rigging, establishment of common sales agencies, and the division of profits.

Game theory suggests that cartels are inherently unstable, because the behaviour of cartel members represents a prisoner's dilemma. Each member of a cartel would be able to make a higher profit, at least in the short-run, by breaking the agreement (producing a greater quantity or selling at a lower price) than it would make by abiding by it. However, if the cartel collapses because of defections, the firms would revert to competing, profits would drop, and all would be worse off.

Whether members of a cartel choose to cheat on the agreement depends on whether the short-term returns to cheating outweigh the long-term losses from the possible breakdown of the cartel. It also partly depends on how difficult it is for firms to monitor whether the agreement is being adhered to by other firms. If monitoring is difficult, a member is likely to get away with cheating for longer; members would then be more likely to cheat, and the cartel will be more unstable.

Perhaps the most globally recognizable and effective cartel is OPEC, the Organization of Petroleum Exporting Countries. In 1973 members of OPEC reduced their production of oil. Because crude oil from the Middle East was known to have few substitutes, OPEC member's profits skyrocketed. From 1973 to 1979, the price of oil increased by $70 per barrel, an unprecedented number at the time. In the mid 1980s, however, OPEC started to weaken. Discovery of new oil fields in Alaska and Canada introduced new alternatives to Middle Eastern oil, causing OPEC's prices and profits to fall. Around the same time OPEC members also started cheating to try to increase individual profits.



"OPEC Map" by Caspian Delta, CC BY-SA 4.0.

Because oligopolists cannot sign a legally enforceable contract to act like a monopoly, the firms may instead keep close tabs on what other firms are producing and charging. Alternatively, oligopolists may choose to act in a way that generates pressure on each firm to stick to its agreed quantity of output.

Example

One example of the pressure these firms can exert on one another is the **kinked demand curve**, in which competing oligopoly firms commit to match price cuts, but not price increases. This situation is shown in Figure 11.3. Say that an oligopoly airline has agreed with the rest of a cartel to provide a quantity of 10,000 seats on the New York to Los Angeles route, at a price of $500. This choice defines the kink in the firm's perceived demand curve. The reason that the firm faces a kink in its demand curve is because of how the other oligopolists react to changes in the firm's price. If the oligopoly decides to produce more and cut its price, the other members of the cartel will immediately match any price cuts—and therefore, a lower price brings very little increase in quantity sold.

If one *firm* cuts its price to $300, it will be able to sell only 11,000 seats. However, if the airline seeks to raise prices, the other oligopolists will not raise their prices, and so the firm that raised prices will lose a considerable share of sales. For example, if the firm raises its price to $550, its sales drop to 5,000 seats sold. Thus, if oligopolists always match price cuts by other firms in the cartel, but do not match price increases, then none of the oligopolists will have a strong incentive to change prices, since the potential gains are minimal. This strategy can work like a silent form of cooperation, in which the cartel successfully manages to hold down output, increase *price*, and share a monopoly level of profits even without any legally enforceable agreement

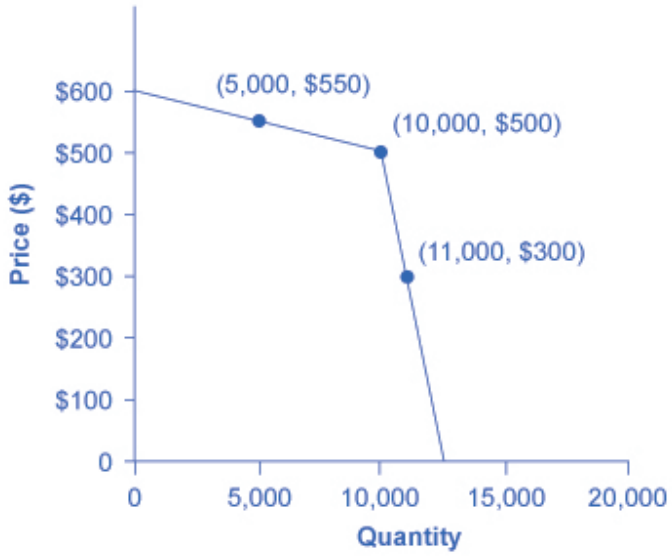


Fig 11.3 "A Kinked Demand Curve" by OpenStax, CC BY 4.0.

Many real-world oligopolies, prodded by economic changes, legal and political pressures, and the egos of their top executives, go through episodes of cooperation and competition. If oligopolies could sustain cooperation with each other on output and pricing, they could earn profits as if they were a single monopoly. However, each firm in an oligopoly has an incentive to produce more and grab a bigger share of the overall market; when firms start behaving in this way, the market outcome in terms of prices and quantity can be similar to that of a highly competitive market.

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11.7 Sequential Game

A “Sequential Game” between 2 or more players one where players take turns.

To solve a Sequential Game, we need to use a Decision Tree, as shown in Fig 11.4, not a payoff matrix.

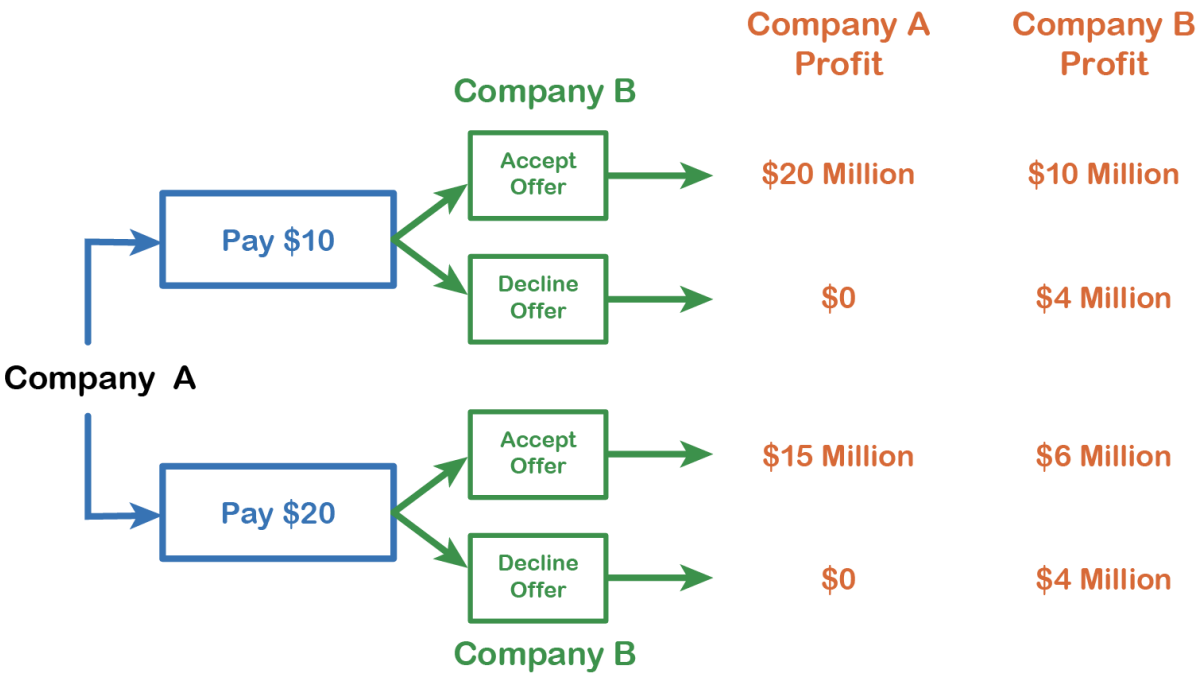

Fig 11.4 A “Sequential Game” between 2 or more players one where players take turns.

To solve a sequential game, we use backwards induction. Since the second player will make the final decision we need to determine which choice they will make. To do this, we consider both choices for player A and choose the optimal choice for player B (i.e.: for Pay $10, Player B can Accept and make 10 mill or Decline and make 4 mill; in this case 10 mill is optimal so they would always choose to accept the offer if $10 was the choice by player A).

We complete this for all options of player A (i.e.: for Pay $20, Player B will also accept and make 10 mill instead of declining and only making 4 mill). Once we have determined what Player B will do, Player A can then pick from those remaining options and choose what is best for them (i.e.: Player A can choose Pay $10 and make 20 million or Pay $20 and make 15 million; they would choose the 20 mill). Therefore, the **equilibrium** would be Player A chooses to Pay $10 and Player B will Accept Offer.

Attribution

11.8 Key Terms

Key Terms

Cartel

Collusion

Dominant strategy

Duopoly

Game theory

Kinked demand

Monopoly

Nash equilibrium

Oligopoly

Payoffs

Players of the game

Prisoner’s dilemma

Repeated games

Single-shot games

pb_glossary id=”1462"]Sequential games[/pb_glossary]

Strategies

Ancillary Resources

Instructor Slide Decks

- Chapter 1 – Microeconomics
- Chapter 2 – Microeconomics
- Chapter 3 – Microeconomics
- Chapter 4 – Microeconomics
- Chapter 5 – Microeconomics
- Chapter 6 Microeconomics
- Chapter 7 – Microeconomics
- Chapter 8 – Microeconomics
- Chapter 9 – Microeconomics
- Chapter 10 – Microeconomics
- Chapter 11 – Microeconomics

Glossary

Monopoly

when a government grants a patent for an invention to one firm. 11.1

Natural Monopoly

Where the barriers to entry are something other than legal prohibition 9.1

Single-Priced Monopoly

This is distinct from other monopolies in that the firm must charge the same price to all consumers. In this case, the aggregate demand is the firm's demand! 9.2

Accounting Profit

This is a cash concept. It means total revenue minus explicit costs—the difference between dollars brought in and dollars paid out. 7.1

Allocative Efficiency

Is an economic concept regarding efficiency at the social or societal level. It refers to producing the optimal quantity of some output, the quantity where the marginal benefit to society of one more unit just equals the marginal cost. 9.4

Average Product

of labour is the total product divided by the quantity of labour. AP=TP/L. 7.2

Barriers to Entry

It is very easy for firms to start and stop selling in this market. For example, if a farmer decides to plant corn instead of soybeans, there is nothing preventing them from doing so. 8.1

Cartel

means a group of firms that have a formal agreement to collude to produce the monopoly output and sell at the monopoly price. 11.2

Circular Flow Diagram

It pictures the economy as consisting of two groups—households and firms—that interact in two markets. (2.2)

Collusion

defines when firms act together in this way to reduce output and keep prices high. 11.2

Comparative Advantage

When one is able to produce a good at a lower opportunity cost than another, the person is said to be efficient or have a comparative advantage in producing that good. (2.5)

Copyright

According to the Canadian Law, “is a form of protection for original works of authorship including literary, dramatic, musical, architectural, cartographic, choreographic, pantomimic, pictorial, graphic, sculptural, and audiovisual creations.” 9.1

Cross-cultural marketing

is defined as the process of marketing among consumers whose culture differs from that of the marketer's own culture; such as language, religion, social norms and values, education and living style.

Cross-Price Elasticity of Demand

This shows us how quantity demanded is a response to changes in the price of related goods.

Demand curve

a graphical representation of the relationship between the price of a good or service and the quantity demanded for a given period of time.10.2 & 10.3

Demand

Refers to the amount (price) consumers are willing and able to purchase goods or services at (4.1)

Differentiated Products

Physical aspects of the product, selling location, intangible aspects of the product, and perceptions of the product. Products that are distinctive in one of these four ways are called differentiated products.10.2 & 10.5

Diseconomies of Scale

occur when the average cost of production rises as output increases. 7.5

Dominant strategy

is the strategy an individual (or firm) will pursue regardless of the other individual’s (or firm’s) decision. 11.3

Duopoly

each oligopolist must worry that while it is holding down output, other firms are taking advantage of the high price by raising output and earning higher profits. 11.4

Economic Efficiency

The market equilibrium where the marginal benefit from a good just equals the marginal cost of producing it. At the efficient level of output which is also called the competitive equilibrium, it is impossible to produce greater consumer surplus without reducing producer surplus, and it is impossible to produce greater producer surplus without reducing consumer surplus. (4.2)

Economic Growth

Allows countries, individuals, or firms to reach points outside their PPF. Factors that allow shifts in countries’ PPF resulting in a change in attainable output include: (2.4)

Economic Model

This is a simplified framework that is designed to illustrate complex processes. (2.1)

Economic Profit

Is total revenue minus total cost, including both explicit and implicit costs. The difference is important because even though a business pays income taxes based on its accounting profit, whether or not it is economically successful depends on its economic profit. 7.1

Economies of Scale

occur when the average cost of production falls as output increases. Economies of scale refer to the situation where, as the quantity of output goes up, the cost per unit goes down. 7.5

Elastic Demand

Is one in which the elasticity (in absolute value) is greater than one, indicating high responsiveness to changes in price (Fig 6.2 A). (6.1)

Explicit Costs

These are out-of-pocket costs, that is, actual payments. The wage and rent that a firm pays for office space are explicit costs. 7.1

Externality

The effect of market exchange on a third party who is outside or "external" to the exchange (5.1)

Fixed Inputs

These are those that can't easily be increased or decreased in a short period of time. In the pizza example, the building is a fixed input. Once the entrepreneur signs the lease, he or she is stuck in the building until the lease expires. Fixed inputs define the firm's maximum output capacity. 7.2

Game theory

is a branch of mathematics that analyzes situations in which players must make decisions and then receive payoffs based on what other players decide to do. 11.3

Identical Goods

Identical goods mean there is nothing to distinguish one firm's goods from another. For example corn – once all the corn is dumped into the grain elevator there is absolutely no way to tell from which farm a particular kernel of corn came. 8.1

Implicit Costs

These are more subtle but just as important. They represent the opportunity cost of using resources that the firm already owns. Often for small businesses, they are resources that the owners contribute.7.1

Income Elasticity

Shows how the quantity demanded of a good response to a change in income

Inelastic Demand

Is one in which the elasticity (in absolute value) is less than one, indicating low responsiveness to changes in price (Fig 6.2 A). (6.1)

Inferior Good

Will have a negative income elasticity, since if income rises (or falls), the quantity demanded decreases (or increases). (6.4)

Kinked demand

curve in which competing oligopoly firms commit to match price cuts, but not price increases. 11.5

Legal Monopoly

Where laws prohibit (or severely limit) competition.9.1

Long Run

This is the period of time during which all factors are variable. Once the lease expires for the pizza restaurant, the shop owner can move to a larger or smaller place. 7.2

Long-Run Average cost (LRAC)

curve is actually based on a group of short-run average cost (SRAC) curves, each of which represents one specific level of fixed costs. More precisely, the long-run average cost curve will be the least expensive average cost curve for any level of output. 7.5

Many Firms

Many firms, mean that from the perspective of one individual firm there is no way to raise or lower the market price for a good. This is because the individual firm's output is such a small part of the overall market that it does not make a difference in terms of price. 8.1

Marginal Product

Marginal product is the additional output of one more worker. Mathematically, Marginal Product is the change in total product divided by the change in labour: $MP=\Delta TP/\Delta L$.

Marginal Revenue Curve

This shows the additional revenue gained from selling one more unit. As mentioned before, a firm in perfect competition faces a perfectly elastic demand curve for its product—that is, the firm's demand curve is a horizontal line drawn at the market price level.8.2

Marginal Social Benefit Curve or D-Social

When we add external benefits to private benefits. In the presence of a positive externality (with a constant marginal external benefit), this curve lies above the demand curve at all quantities. (5.1)

Marginal Social Cost Curve or S-Social

When we add external costs to private costs. In the presence of a negative externality (with a constant marginal external cost), this curve lies above the supply curve at all quantities. (5.1)

Market price

is the current price at which a good or service can be purchased or sold. 10.2

Market Structure and The Competitive Environments

In which firms and consumers interact. There are three main metrics by which we measure a market's structure: (8.0)

The number of firms. More firms mean more competition and more places to which consumers can turn to purchase a good.

The similarity of goods: The more similar the goods sold in the market the more easily consumers can switch firms and the more competitive the market is.

The barriers to entry: The more difficult is it to enter a market for a new firm, the less competitive it is.

Mid-Point Method For Elasticity

To calculate elasticity, instead of using simple percentage changes in quantity and price, economists use the average percent change. (6.1)

% Change in Quantity Demanded: [New Q – Old Q /(New Q +Old Q)/2]×100% /(New Q +Old Q)/2 shows the average of the two quantities

% Change in Price: [New Price – Old Price / (New P +Old P)/2]×100% (New P +Old P)/2 is the average of the two prices

Minimum Efficient Scale

Where the average cost is at its minimum. This is the point where economies of scale are used up and no longer benefit the firm. Figure 9.11 illustrates these points. 7.5

Monopolistic Competition

lies in between monopoly and perfect competition. It involves many firms competing against each other, but selling products that are distinctive in some way. 10.1

Monopoly

One firm produces all of the output in a market. Since a monopoly faces no significant competition, it can charge any price it wishes, subject to the demand curve. 9.0

Nash equilibrium

is an outcome where, given the strategy choices of the other players, no individual player can obtain a higher payoff by altering their strategy choice. 11.3

Negative Externality

Externalities can be negative or positive. If you hate country music, then having it waft into your house every night. (5.1)

Normal Good

Will have a positive income elasticity, since if income rises (or falls), the quantity demanded also increases (or decreases). (6.4)

Oligopoly

arises when a small number of large firms have all or most of the sales in an industry. 11.1

Patent

Gives the inventor the exclusive legal right to make, use, or sell the invention for a limited time.9.1

Payoffs

are the outcomes associated with every possible strategic combination, for each player. 11.3

Perfectly elastic

means the response to price is complete and infinite: a change in price results in the quantity falling to zero. 10.2

Perfectly Inelastic Demand

is one in which elasticity is zero, the demand curve is vertical

Players of the game

are the agents actively participating in the game and who will experience outcomes based on the play of all players. 11.3

Positive Externality

Occurs when the market interaction of others presents a benefit to non-market participants. If you love country music, then what amounts to a series of free concerts
(5.1)

Price Ceiling

It is a type of price control where the government sets the maximum price to be charged to sell a good or service

Price Floor

It is a type of price control where the government sets the minimum price to be charged or paid to sell a good or service

Price Takers

Meaning that their decision is simply how much to sell at the market price. If they try and sell for a higher price, no one will buy from them, and they could sell for a lower price, but if they did so, they would only be hurting themselves because it would not affect the quantity sold. 8.1

Prisoner's dilemma

is a scenario in which the gains from cooperation are larger than the rewards from pursuing self-interest. 11.3

Private Markets

Private markets only consider consumers, producers, and the government – the impacts on external parties are irrelevant. (5.1)

Product differentiation

is based on variety and innovation. 10.5

Production Function

A mathematical expression or equation that explains the engineering relationship between inputs and outputs. 7.2

Production

The process (or processes) a firm uses to transform inputs (e.g. labour, capital, raw materials) into outputs, i.e. the goods or services the firm wishes to sell. 7.2

Public Good

Public goods have two defining characteristics: they are nonexcludable and non-rival. (5.4)

Repeated games

are simultaneous move games played repeatedly by the same players. 11.3

Short Run

This is the period of time during which at least one or more factors remain fixed. Within a short period of time, the shop owner may not be able to obtain more physical capital or move to a larger space.

Short-Run

This is the period of time during which at least one or more factors of production are fixed. During the period of the pizza restaurant lease, the pizza restaurant is operating in the short run, because it is limited to using the current building (an example of capital) —the owner can't choose a larger or smaller building. Plant size or capital is a fixed factor of production in the short run. 7.2

Single-shot games

are played once and then the game is over. 11.3

Specialization

In production results in gains from trade, as each person or country, can focus on what it can produce at the lowest cost and trade it with its partner.(2.5)

Strategies

are all of the possible strategic choices available to each player, they can be the same for all players or different for each player. 11.3

Supply

The amount of some good or service a producer is willing to supply at each price. The supply curve shows the quantity that firms are willing to supply at each price. (4.2)

Tax Wedge

This method recognizes that who pays the tax is ultimately irrelevant. Instead, the wedge method illustrates that a tax drives a wedge between the price consumers pay and the revenue producers receive, equal to the size of the tax levied. (4.4)

The Coase Theorem

States that if property rights are well-defined, and negotiations among the actors are costless, the result will be a socially efficient level of the economic activity in question. It is one of the most important and influential theorems in economics. (5.2)

Total Costs (TC)

Of production in the short run, a useful starting point is to divide total costs into two categories: Fixed Costs and Variable Costs. Fixed cost of production is the cost that does not change as output changes and variable cost is the cost that changes as output changes. 7.3

Total Fixed Costs

Are his expenditures that do not change regardless of the number of haircuts offered. 7.3

Total Product (TP)

TP is the amount of output produced with a given amount of labour and a fixed amount of capital. In this example, one barber can give 8 haircuts in a day. Two barbers can produce 22 haircuts in a day and so on. 7.2

Total Revenue

The income the firm generates from selling its products. We calculate it by multiplying the price of the product times the quantity of output sold 7.1

Trademark

An identifying symbol or name for a particular good or service, like Chiquita bananas, Chevrolet cars, Rogers Cable.9.1

Variable Inputs

These are those that can easily be increased or decreased in a short period of time. The pizzaiolo can order more ingredients with a phone call, so ingredients would be variable inputs. The owner could hire a new person to work the counter pretty quickly as well. So labour is a variable input. 7.2

Willingness to Pay (WTP)

Serves as a starting point for the demand curve. A consumer's maximum Willingness to Pay is equal to that consumer's Marginal Benefit (MB). This is useful information if we want to use Marginal Analysis. (4.1)

Absolute Advantage

In the production of crabs as he can produce a maximum of 20 crabs while you can produce a maximum of 15 crabs, and you have an absolute advantage in producing pineapples as you can grow a maximum of 30 pineapples while Jamie can produce a maximum of 15 only. The graph below (Fig 2.6) shows Jamie's production possibilities. (2.5)

Barriers to Entry

These are the legal, technological, or market forces that discourage or prevent potential competitors from entering a market. Barriers to entry can range from the simple and easily surmountable, such as the cost of renting retail space, to the extremely restrictive. For example, there are a finite number of radio frequencies available for broadcasting. 9.1

Bid Rigging

An illegal practice in which bidders (buyers) conspire to set prices in their own interest. 9.5

Capital

A factor of production that has been produced for use in the production of other goods and services. Office buildings, machinery, and tools are examples of capital. (1.3)

Change in Demand

The demand curve shifts from its current position. (3.2)

Change in Quantity Demanded

A movement along a demand curve that results from a change in price. (3.1)

Change in Quantity Supplied

A movement along a supply curve that results from a change in price

Change in Supply

The supply curve shifts from its current position

Choices

Mean that one alternative is selected over another. Selecting among alternatives involves three ideas central to economics: scarcity, choice, and opportunity cost. (1.1)

Command Economy

The government decides what goods and services will be produced and what prices it will charge for them. The government decides what methods of production to use and sets wages for workers. The government provides many necessities like healthcare and education for free. (1.2)

Complements

Both goods A and B are consumed together

Constant Returns to scale (Fig 7.10)

occur when the average cost of production does not change as output rises. In a typical long-run average cost curve, there are sections of both economies of scale and diseconomies of scale. 7.5

Constant Unitary Elasticity

A demand curve, occurs when a price change of one percent results in a quantity change of one percent. Fig 6.4 (6.1)

Consumer Surplus

The amount that individuals would have been willing to pay, minus the amount that they actually paid.

Economic Surplus or Total Surplus

The sum of consumer surplus and producer surplus

Economics

This is a social science that examines how people choose among the alternatives available to them. It is social because it involves people and their behaviour. It is a science because it uses, as much as possible, a scientific approach in its investigation of choices. (1.1)

Elastic Supply

Is one in which the elasticity is greater than one, indicating high responsiveness to changes in price.

Elasticity

Measures the responsiveness of one variable to changes in another variable.

Hypothesis

is an assertion of a relationship between two or more variables that could be proven to be false.

Inelastic Supply

Is one in which the elasticity is less than one, indicating low responsiveness to changes in price

Inferior Goods

Consumption of the goods decreases (increases) when income increases (decreases)

Intellectual-Property

We call this combination of patents, trademarks, and copyrights intellectual property because it implies ownership over an idea, concept, or image, not a physical piece of property like a house or a car. 9.1

Labour

This is the human effort that can be applied to the production of goods and services. People who are employed—or are available to be—are considered part of the labour available to the economy. (1.3)

Long Run Equilibrium

Where firms continue to produce as long as the price equals the average total cost, ending in zero economic profits

Macroeconomics

Looks at the economy as a whole. Microeconomics and macroeconomics are not separate subjects, but rather complementary perspectives on the overall subject of the economy. (1.2)

Marginal Analysis

This is the process of breaking down a decision into a series of 'yes or no' decisions. More formally, it is an examination of the additional benefits of an activity compared to the additional costs incurred by that same activity. If benefits > costs, this is the right choice for a rational thinker. (1.4)

Market Economy

A market is an institution that brings together buyers and sellers of goods or services, who may be either individuals or businesses. The New York Stock Exchange is a prime example of a market that brings buyers and sellers together. (1.2)

Microeconomics

Focuses on the actions of individual agents within the economy, like households, workers, and businesses. (1.2)

Mixed Economy

Most economies in the real world are mixed. They combine elements of command and market systems. The Canadian economy is positioned toward the market-oriented end of the spectrum. (1.2)

Movement Along The Supply Curve

Such a movement is called a change in quantity supplied. (3.3)

Normal Goods

Consumption of the goods increases (decreases) when income increases (decreases)

Normative Statemen

This is one that makes a value judgment. Such a judgment is the opinion of the speaker; no one can "prove" that the statement is or is not correct. (1.5)

Perfectly Elastic Demand

is one in which elasticity is infinity, the demand curve is horizontal

Perfectly Elastic Supply

is one in which elasticity is infinity, the supply curve is horizontal

Perfectly Inelastic Supply

is one in which elasticity is infinity, the supply curve is vertical

Pigouvian tax

A tax that addresses a negative externality by taxing the good instead of the actual external cost.

Positive Cross-price elasticity

shows two goods are substitutes and negative cross-price elasticity shows two goods are complements.

Positive Statement

A statement of fact or a hypothesis. (1.5)

Predatory Pricing

A practice that is aimed at driving out competition by artificially reducing the price of one product sold by a supplier. 9.5

Price Elasticity of Demand

shows how the quantity demanded of a good response to changes in its price.

Price Elasticity of Supply

shows how the quantity supplied of a good response to changes in its price.

Producer Surplus

The amount that a seller is paid for a good minus the seller's actual cost.

Production Possibility Frontier (PPF)

This is the graphical representation of Figure 2.2. It represents the maximum combination of goods that can be produced given available resources and technology. Each point represents one of the combinations from Figure 2.2. (2.3)

Scarcity

This means that human wants for goods, services and resources exceed what is available. Because of scarcity, we need to make choices. (1.1)

Shortage

This is the amount by which the quantity demanded exceeds the quantity supplied at the current price.A shortage occurs only if the current price is lower than the equilibrium price(3.5)

Shutdown Point

The point at which level the firm is indifferent between producing the loss minimizing output or shutting down.

Spillovers

Externalities that occur in market transactions that affect other parties beyond those involved.

Substitutes

One can consume either good A or good B

Surplus

Is the amount by which the quantity supplied exceeds the quantity demanded at the current price. A surplus occurs only if the current price exceeds the equilibrium price. (3.5)

Technology and Entrepreneurship

Goods and services are produced using the factors of production available to the economy. (1.3)

The law of increasing opportunity cost

Which holds that as the production of a good or service increases, the marginal opportunity cost of producing it increases as well.

Theory

is a simplified representation of how two or more variables interact with each other.

Total Variable Costs

Are incurred in the act of producing—the more he produces, the greater the variable cost. 7.3

Versioning History

This page provides a record of edits and changes made to this book since its initial publication. Whenever edits or updates are made in the text, we provide a record and description of those changes here. If the change is minor, the version number increases by 0.1. If the edits involve a number of changes, the version number increases to the next full number.

The files posted alongside this book always reflect the most recent version.

Version	Date	Change	Affected Web Page
1.0	August 2022	First Publication	N/A
1.1	August 2023	Modified • 11.5 Cartels to 11.6 Cartels • 11.6 Key Terms to 11.8 Key Terms Added • 11.5 A Duopoly Game • 11.7 Sequential Game	• 11.5 A Duopoly Game • 11.6 Cartels • 11.7 Sequential Game • 11.8 Key Terms