International Business Economics

Lecture Notes
Set #1

Introduction & Basic Economic Concepts

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Chapter 1

Introduction & Overview

1.1 What is Economics?

- Economics is the study of how scarce resources are allocated amongst competing alternative uses.
- This allocation problem can be divided into two parts:
  - Production: what, how and how much to produce
  - Distribution: who gets what and how much
- The study of economics is sometimes split into two levels:
  - Micro: studies how individuals, households and firms make decisions to allocation limited resources
  - Macro: studies the aggregates (sum totals of economic activities) and focuses on issues such as growth, inflation and unemployment

1.2 Market Vs. Planned Economies

Market Economies

- In a market economy, all exchanges are **voluntary** and based on **mutual benefits**, coordinated by **prices** which are determined in the **market** by both the actions of the consumers (demand) and the actions of the producers (supply).
- Consumers communicate their willingness to buy by purchasing products at a given price, and producers set prices that indicate their willingness to sell.
- Prices, therefore, serve as a signaling device: what and how much should be produced, and what should not be produced, is determined by the market price.

Planned Economies

- "A planned economy (also known as command or centrally planned economy) is an economic system in which the state or government controls the factors of production and makes all decisions about their use and about the distribution of income." (Myers, Danny. *Construction Economics*, Spon Press, U.K., 2004. p. 288)
- Planned economies are inefficient because, without market signals, the collection of information necessary for effective planning is extremely complicated and costly.

1.3 Mixed Economies

- Most economies are "mixed" – a combination of planned and market economies.
- Government intervention is usually warranted (or justified) on the grounds of market failure and income redistribution (e.g. welfare payments).
- Market Failure: a situation in which market forces fail to allocate goods and services efficiently to serve the public interests.
- Sources of market failure:
  - Externality: when the participants do not bear all the costs or reap all the benefits of a transaction (e.g. pollution, congestion, tragedy of the common, pure public goods).
  - Asymmetric Information: when one party in a transaction is better informed than the other; can create incentives for opportunistic behavior.

1.4 Economic Models

- An economic model is a theoretical construct that attempts to simplify the complex reality and provide a framework to carry out meaningful analyses of the core issues and make useful predictions.
- Comparative Statics ("snap shots") vs. Dynamic models ("time path")

1.4.1 The Production Possibility Frontier (PPF)

The *PPF* is a simple yet powerful model that illustrates the trade-off all societies have to face – how to allocate finite resources among competing wants.

- You may have heard of the "guns and butter" parable in economics, where "butter" is a metaphor for private consumption goods and "guns" for public goods.
- Imagine an economy producing only two goods: guns and butter.
- The *PPF* represents all feasible combinations of guns and butter the economy can potentially produce if its limited resources are fully (i.e. efficiently) utilized.

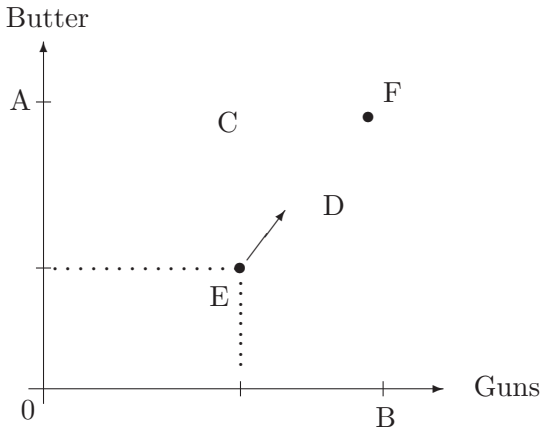
A: the maximum amount (say, kilograms) of butter that can be produced if all resources are allocated to produce butter only.

B: the maximum number of guns this economy can produce utilizing all its resources.

- All allocations ON the *PPF* are optimal – efficient use of resources.

  Is allocation C "better" than allocation D, or vice versa? No. They are both efficient combinations and cannot be compared.

  Suppose point C is 400 guns and 10,000 kilos of butter, and point D is 700 guns and 6,000 kilos of butter. Moving from point C to point D means 300 more guns can be produced but at the expense of 4,000 kilos less butter $\Rightarrow$ the opportunity cost of 300 more guns is 4,000 kilos of butter.



The Production Possibility Frontier

Note that the *PPF* is concave to the origin: as we move down the *PPF* in the southeast direction, the **opportunity cost** of producing more guns (in terms of butter forgone) gets larger and larger.

- Allocations INSIDE the *PPF* (e.g. E) are sub-optimal: some resources are not efficiently utilized ⇒ recession, unemployment (i.e. there are idle resources).

  The economy can be strictly better off by moving in the northeast direction: utilizing idle resources to produce more guns and more butter.

- Allocations OUTSIDE the *PPF* (e.g. F) are not attainable, but can be a macro policy goal of economic growth ⇒ shifts the *PPF* outward in the NE direction.

1.5 Economic Way of Thinking

1.5.1 Scarcity and Choice

- If resources were not scarce, allocation would not be too big an issue.
- Having more of one good usually means having less of another.
- There are implicit as well as explicit costs involved in making choices. Explicit costs are out-of-pocket expenses while implict costs are opportunity costs.
- "There is no such thing as a free lunch."

1.5.2 Rationality

- Individuals and organizations are said to be **rational** if they act in some sense optimally in pursuit of their goals. In other words, they make decisions and act in such a way that is consistent with their goals and objectives.
- People may not act rationally (make rational choices) all the time, but we by and large do.
- Herbert Simon proposes the notion of **bounded rationality** – "boundedly rational agents experience limits in formulating and solving complex problems and in processing (receiving, storing, retrieving, transmitting) information".

- Postulates of Behavior
  - People have preferences
  - More is preferred to less
  - People are willing to make substitutes

1.5.3 Opportunity Cost

- All decisions involve some kind of trade-off; there are advantages and disadvantages of each alternative.
- The true cost of something is what we have to give up to obtain it.
- When a choice (or decision) is made, we forgo all the other alternatives.
- Opportunity Cost is the highest-valued foregone alternative resulting from a decision or a choice of action.
- We will talk about opportunity costs in more detail in later chapters.

1.6 Economics of Strategy

"The objective of this book is to study and analyze strategy primarily (though not exclusively) from the perspective of economics." (*Economics of Strategy*, 4th ed. 2007. p.1)

- Business Economics is a branch of microeconomics that focuses on how managers determine how to effectively allocate the limited resources available to the firm - i.e. the study of business allocation strategies.
- What is Strategy? Consider a decision as "strategy" if it relates to one of the "big" issues faced by a firm:

  What are the boundaries of the firm? (Ch. 1-4)
  - We will study the horizontal, vertical, and corporate limits of the firm.
  - This will require a good understanding of the nature of the firm

  What is the intensity of the competition in the firm's market? (Ch. 6, 8, 9)
  - We will study the relationship between market concentration (different market structures) and the profitability of a typical firm in that market.

  How is the firm positioned and how will it evolve overtime? (Ch. 10-12)
  - Why is one firm more profitable than another in the same industry?
  - How can firms develop a competitive advantage and sustain it over time?

  How is the firm organized internally?
  - Examines how a firm structures its activities, what incentives it provides its workers and who are its managers responsible to etc.
  - This is NOT part of the syllabus and will not be covered in this class.

Chapter 2

Competitive Markets: Demand & Supply Analysis

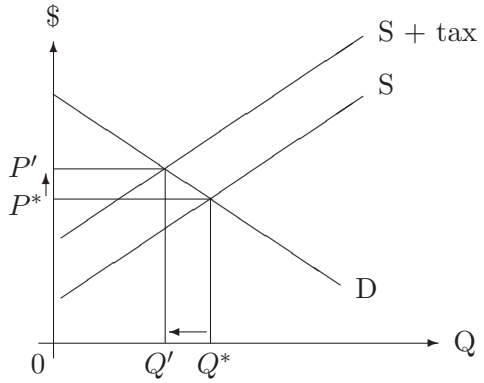
2.1 Demand & Supply Analysis

(Please see PowerPoint file Market_DD_SS.ppt for details)

2.2 Practice Questions

1. A politician was asked at a news conference whether or not her proposed tax hike on gasoline would raise the price of gasoline. Her response was that the tax would initially push the price up, but the higher price would discourage demand and bring the price back down. What is wrong with her statement?

   The politician confused *a change in quantity demanded* with *a change in demand*. A hike on gasoline tax will shift the supply curve inward (up and to the left) and result in higher gasoline prices. But the higher gasoline prices will reduce the **quantity** of gasoline demanded. It will not shift the demand curve.



New Equilibrium: (P', Q')

2. Consider four markets which are initially in equilibrium: wine, beer, cheese and pretzels. Suppose a $1 per gallon tax is imposed on the wine suppliers.

   a. What will be the effect of the tax on the price of wine and the quantity of wine consumed, ceteris paribus?

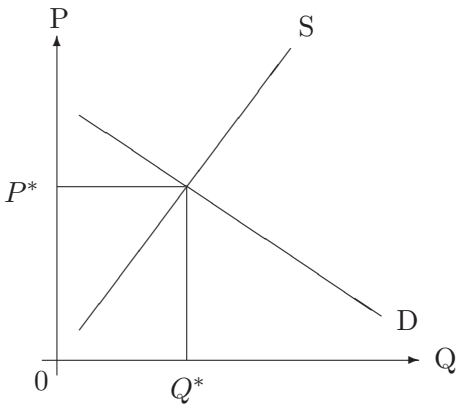
   b. What effect will there be on the price of beer and the quantity of beer consumed? What assumptions are you making about the relationship between beer and wine?

   c. What effect might the wine tax have on the markets for pretzels and cheese. What assumptions did you make to reach your conclusion?

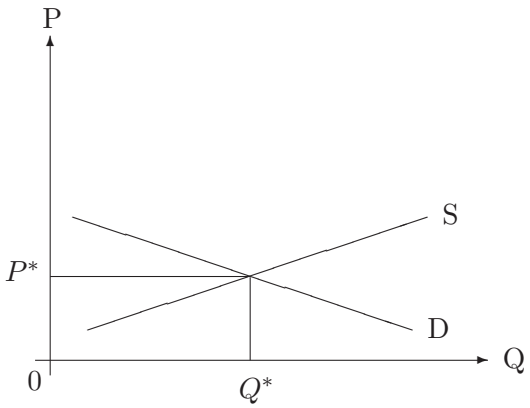
   Here we are considering the markets of four related goods.

   a. A tax on wine will increase the price of wine and decrease the quantity of wine consumed, ceteris paribus.

   b. Assuming that beer and wine are substitutes, the higher (after tax) price of wine will increase the demand for beer (i.e. shift the demand curve to the right). The new equilibrium price and quantity of beer will increase.

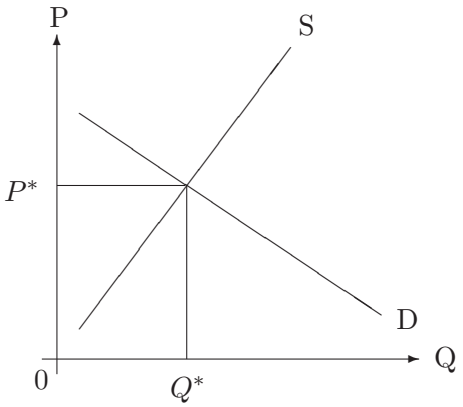


Market for Wine

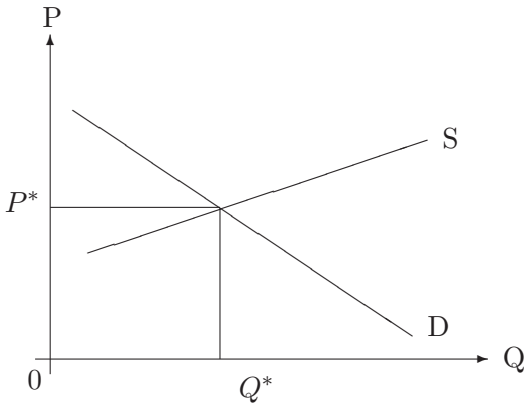


Market for Beer

   c. Assume that pretzels and beer are complementary goods, and that cheese and wine are complementary goods. The wine tax will result in a decrease in demand for cheese and an increase in demand for pretzels.



Market for Cheese



Market for Pretzels

Chapter 3

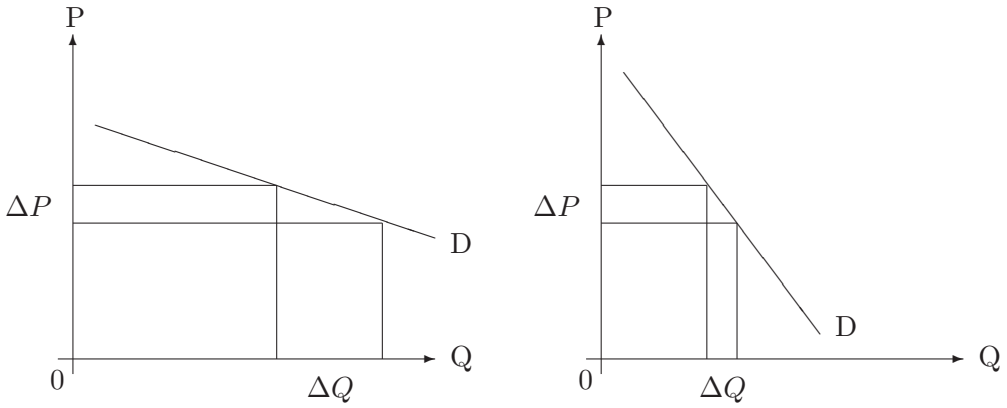
Elasticities of Demand

The concept of **elasticity** measures the responsiveness of one variable to another. We will introduce three demand elasticity measures:

- (Own) Price Elasticity of Demand
- Income Elasticity of Demand
- Cross-Price Elasticity of Demand

3.1 Price Elasticity Of Demand

- The price elasticity of demand measures the *degree of responsiveness* (or sensitivity) of quantity demanded to a change in price.



(a) An Elastic Demand (b) An Inelastic Demand

- The price elasticity of demand, commonly denoted as η (eta), is *the percentage change in quantity demanded in response to the percentage change in price.*

$$\eta = -\frac{\%\Delta Q^d}{\%\Delta P}$$

Note: To avoid any confusion we put a minus sign in front of $\frac{\%\Delta Q^d}{\%\Delta P}$ because we know from the law of demand that price and quantity demanded are invesely related.

- If $|\%\Delta Q^d| > |\%\Delta P|$, then $\eta > 1$: demand is price elastic or responsive to price change.

If $|\%\Delta Q^d| < |\%\Delta P|$, then $\eta < 1$: demand is price inelastic or not very responsive to price change.

If $|\%\Delta Q^d| = |\%\Delta P|$, then $\eta = 1$ and demand is unitary elastic.

- Examples of Price Elasticity of Demand Estimates

Type of Goods or Services	Price Elasticity
Eggs	0.1
Gasoline	0.2
Shoes	0.9
Foreign Travel	1.2
Alcoholic Beverages	1.5
Jewelry	2.6

"The price elasticity of demand for eggs is 0.1" means a 1% increase (decrease) in price will result in a 0.1% decrease (increase) in quantity of eggs demanded.

3.2 Determinants of Price Elasticity of Demand

- Availability of Substitutes

  The demand for a good tends to be *more* price elastic when close substitutes are readily available.

  Note: Whether close substitutes are available for a good depends on how broad or narrow we define the good. Generally, the narrower or more specific we define a good (e.g. Lay's potato chips vs. potato chips as a snack) the more close substitutes are available and the more price elastic its demand will be.

- Big-ticket vs. Small-ticket Items

  In general we tend to pay less attention to the change in price of an item that represents only a small fraction of our total budget, and therefore less sensitive to its price change.

- Necessities vs. Luxuries

  The demand for a necessity good is relatively *less* price elastic than that of a luxury good.

  Note: "Necessity" or "luxury" is not an intrinsic property of a good; it depends largely on the preferences of the user, among other things.

- Time Horizon

  Demand tends to be become more elastic in the long-run when the consumers have enough time to fully respond and make adjustments to a price change. For example: to find other substitutes.

  This is also known as the **Second Law of Demand**: demand is more responsive to price changes in the long-run than in the short-run. In other words, if a price change of a good is persistent, its demand curve will become flatter in the long-run.

- Other: If you are not the one paying for something, you tend to be not very sensitive to any price change. This may be "obvious" but sometimes overlooked.

3.3 Computing Own Price Elasticity Coefficient

Consider two points on a demand curve (P_1, Q_1) and (P_2, Q_2). Suppose price increased from P_1 to P_2 such that $\Delta P = P_2 - P_1$ and $\Delta Q^d = Q_2 - Q_1$.

1. Point Elasticity (point estimate):

$$\eta = -\frac{\frac{Q_2 - Q_1}{Q_1}}{\frac{P_2 - P_1}{P_1}}$$

   The example in the textbook (p.25) uses this formula. The drawback of this method is that you will get one value of η for the case $P_1 \to P_2$ and a different η for the case $P_2 \to P_1$.

2. Arc Elasticity (mid-point estimate):

$$\eta = -\frac{\frac{Q_2 - Q_1}{(Q_1+Q_2)/2}}{\frac{P_2 - P_1}{(P_1+P_2)/2}}$$

   Unless specified in the question otherwise, you should use this formula on the exam.

3. General Formula (Point Elasticity using calculus):

$$\begin{aligned} \eta &= -\frac{\%\Delta Q^d}{\%\Delta P} \\ &= -\frac{dQ/Q}{dP/P} = -\frac{dQ}{dP}\frac{P}{Q} \end{aligned}$$

   If the demand function is given and you happen to know calculus, use this formula.

3.3.1 Why is elasticity measured in percentage term?

- Why not just measure the change in quantity in response to a change in price directly? That is, why not just measure elasticity with the slope of the demand curve (or the first derivative of the demand function $\frac{dQ}{dP}$ in mathematical terms)?
- The reason is that the slope of a curve is sensitive to a change in units. If the quantity of chocolate is changed from pounds to kilograms, the slope of the demand curve will change even when the demand itself remains unchanged. And if the price is changed from one currency to another, the slope of the demand will change as well.

3.3.2 Example (May 2005, Q.1, part c.)

A retail store faces a demand equation for Roller Blades given by $Q = 180 - 1.5P$, where Q is the number of pairs sold per month and P is the price per pair. The store changes its price from $P = \$80$ [to] $P = \$100$. Compute the price elasticity associated with this change using the starting price as your basis. What do you conclude?

- Given $Q(P) = 180 - 1.5P \quad \to \quad P(Q) = 120 - \frac{2}{3}Q$.
- Let the starting price be $P_0 = \$80$, then $Q_0 = 180 - 1.5(80) = 60$.
  Let the new higher price be $P_1 = \$100$, then $Q_1 = 180 - 1.5(100) = 30$.

- Using the point elasticity measure,

$$\begin{aligned} \%\Delta Q^d &= \frac{30-60}{60} = -0.5 \\ \%\Delta P &= \frac{100-80}{80} = 0.25 \end{aligned}$$

- The price elasticity of demand coefficient is

$$\eta = -\frac{\%\Delta Q^d}{\%\Delta P} = -\frac{-0.5}{0.25} = 2 > 1$$

- Conclusion: The demand for Roller Blades is *elastic* because $\eta > 1$, i.e., consumers are sensitive (react strongly) to a price change.

- Note: The solution given uses the point estimate formula. As an exercise, use the mid-point formula and compute the own-price elastic coefficient again. You will get a slightly different number ($\eta = 3$), but the conculsion remains the same: the demand is price elastic.

3.4 Relationship Between Elasticity and Revenue

Why are firms interested in the price elasticity of demand? A change in price will affect the quantity demanded, hence the firm's revenue and profit.

3.4.1 An Example

Consider a simple linear demand curve: $Q(P) = 12 - P$. To find TR(Q) and MR(Q), we use the inverse demand function $P(Q) = 12 - Q$.

- Total Revenue

$$\begin{aligned} \text{TR}(Q) &= P(Q) \times Q \\ &= (12-Q)Q \\ &= 12Q - Q^2 \end{aligned}$$

- Marginal Revenue

$$\begin{aligned} \text{MR}(Q) &= \frac{d}{dQ}\text{TR}(Q) \\ &= 12 - 2Q \end{aligned}$$

- The demand elasticity coefficient (using calculus) is given by

$$\eta = -\frac{dQ}{dP}\frac{P}{Q} = -(-1)\frac{P}{Q} = \frac{P}{Q}$$

(Figure 3.1 here)

P	Q	TR $= P \times Q$	MR $= \Delta$TR$/\Delta Q$	η
11	1	11		
			9	7
10	2	20		
			7	3.8
9	3	27		
			5	2.429
8	4	32		
			3	1.667
7	5	35		
			1	1.182
6	6	36		
			-1	0.846
5	7	35		
			-3	0.6
4	8	32		
			-5	0.412
3	9	27		
			-7	0.263
2	10	20		
			-9	0.143
1	11	11		

3.4.2 Elasticity of Demand and Total Revenue

Demand is	η	MR	Effect of ΔP on TR
Elastic	> 1	> 0	$P \uparrow$ TR $\downarrow$
Unitary Elastic	$= 1$	$= 0$	$P \uparrow$ TR unchanged
Inelastic	< 1	< 0	$P \uparrow$ TR $\uparrow$

3.4.3 Elasticity of Demand and Marginal Revenue

Here we will derive a useful relationship between P and MR in terms of η.

$$\begin{aligned} \text{TR}(Q) &= P(Q) \times Q \\ \text{MR}(Q) &= \frac{d\text{TR}(Q)}{dQ} = P + Q\frac{dP}{dQ} \\ &= P + P\frac{dP}{dQ}\frac{Q}{P} \\ &= P - P\frac{1}{\eta} \\ \text{MR} &= P(1 - \frac{1}{\eta}). \end{aligned}$$

- If $\eta > 1$ (demand is elastic), then $1 - \frac{1}{\eta} > 0 \Rightarrow \text{MR} > 0$
  If $\eta < 1$ (demand is inelastic), then $1 - \frac{1}{\eta} < 0 \Rightarrow \text{MR} < 0$
  If $\eta = 1$ (demand is unitary elastic), then $1 - \frac{1}{\eta} = 0 \Rightarrow \text{MR} = 0$

3.5 Other Demand Elasticity Measures

There are two other elasticity measures we are interested in. Consider a demand function for good X given by $Q_x(p_x, p_y, I)$, where p_x is the price of x, p_y is the price of a related good y, and I is average household income.

3.5.1 Cross-price Elasticity of Demand

- Cross-price Elasticity of Demand measures how much the quantity demanded of one good responds to a change in the price of another good.

$$\eta_{xy} = \frac{\%\Delta Q_x}{\%\Delta P_y} \quad (= \frac{\partial Q_x}{\partial p_y}\frac{p_y}{Q_x}).$$

- If $\eta_{xy} > 0$, then x and y are *substitutes* (e.g. coffee and tea).
  If $\eta_{xy} < 0$, then x and y are *complements* (e.g. DVD and DVD player).

3.5.2 Income Elasticity of Demand

- Income Elasticity of Demand measures how much the quantity demanded of a good responds to a change in income.

$$\eta_I = \frac{\%\Delta Q}{\%\Delta I} \quad (= \frac{\partial Q_x}{\partial I}\frac{I}{Q}).$$

- If $\eta_I > 0$, then x is called a *normal good*. (Demand $\uparrow$ when $I \uparrow$)
  If $\eta_I > 1$, then x is classified as a *luxury good*.
  If $\eta_I < 0$, then x is called an *inferior good*. (Demand $\downarrow$ when $I \uparrow$)

3.6 Examples (May 2009, Q.2, part d.)

The demand for personal computers can be characterised by the following elasticities: price elasticity = -5; cross price elasticity with software = -4; and income elasticity =2.5. Indicate whether each of the following statements is "True" or "False" and explain your answer.

i). A price reduction for personal computers will increase both the number of units demanded and the total revenue of sellers.

The price elasticity of demand for personal computers is given by

$$\frac{\%\Delta Q^d}{\%\Delta P} = -5$$

That means the demand for personal computers is *price elastic* because a 1% decrease in price will lead to a 5% increase in quantity demanded. This implies that the revenue loss from selling each unit at a lower price is more than offset by the revenue gain from selling more units. So the statement is TRUE.

ii). The cross-price elasticity indicates that a 5% reduction in the price of software programs will cause a 20% increase in PCs.

The cross-price elasticity between personal computers and computer software is given as

$$\frac{\%\Delta Q_{\text{PC}}}{\%\Delta P_{\text{Software}}} = -4$$

That means a 1% decrease in software prices will led to a 4% increase in demand for personal computers. So if software prices decrease by 5%, the quantity demanded of PC will increase by four times that amount i.e. 20%. The two goods are obviously complements because the cross-price elasticity coefficient is negative. So the statement is TRUE.

iii). Demand for personal computers is price elastic and computers are normal goods.

We have already established that demand for PC is price elastic. The income elasticity of demand for PC is given by

$$\eta_I = \frac{\%\Delta Q}{\%\Delta I} = 2.5$$

That means if income increases by 1%, the demand for will increase by 2.5%. Since $\eta_I > 0$ PC is a normal good. Furthermore, since $\eta_I > 1$ we can also conclude that PC are a luxury good. So the statement is TRUE.

iv). Falling software prices will increase revenues received by sellers of both computers and software.

It is TRUE that falling software prices will increase revenues received by computer sellers because it will increase the demand for PCs.
Without more information, we cannot tell whether falling software prices will increase revenues of software sellers; it will be determined by the price elasticity of demand for software.

v). A 2% price reduction would be necessary to overcome the effects of a 1% decline in income.

Since the income elasticity of demand for PC is 2.5, a 1% decline in income will decrease demand by 2.5%. A 2% decrease in the price of PC, on the other hand, will increase demand by 10% since the price elasticity of demand is 5. That means only a 0.5% reduction in price would be sufficient to offset a 1% decline in income. So the statement is FALSE.

3.7 Exam Questions

3.7.1 May 2005, Q.1

a. Define and discuss three types of elasticities. Use examples to show your understanding.

b. During a five-year period, the ticket sales of a city's professional basketball team have increased 30 percent at the same time that average ticket prices have risen by 50 percent. Do these changes imply an upward-sloping demand curve? Explain.

The fact that increased sales coincided with higher prices does not disprove the law of downward-sloping demand. Clearly, other factors – an increase in population and/or income improved playoff the home team, or increased promotion – could have caused the increased ticket sales, despite higher prices.

c. A retail store faces a demand equation for Roller Blades given by $Q = 180 - 1.5P$, where Q is the number of pairs sold per month and P is the price per pair. The store changes its price from $P = \$80$ then at $P = \$100$. Compute the price elasticity associated with this change using the starting price as your basis. What do you conclude?

(see §3.3.2 above)

3.7.2 October 2005, Q.1

a. Explain the notion of elasticity – include a formula and explain how it is used.

Elasticity is essentially a formula that normalises the changes in two related variables. Economists use it frequently to determine the sensitivity of consumer demand to prices, prices of other goods, income, advertising expenditures and many other economic factors. For instance, the basic formula for the own-price elasticity of a firm's demand curve is the derivative of quantity demanded with respect to x times the ratio of x over quantity demanded in the market. (x can be any relevant economic factor). Elasticities along the comparisons of consumer sensibilities in different markets, countries, currencies etc. and are thus an important analytical tool.

Use this definition, along with demand and supply curves concepts to discuss the following examples:

b. Why might a bumper crop (e.g. a 10% increase in a crop's output) be detrimental for overall farm revenue?

Since Total Revenue $= P \times Q$ where quantity is determined by the firm's demand curve, TR is closely related to E_{xx}. If $E_{xx} < 1$, the demand is inelastic and raising prices will increase TR (and vice versa), if $E_{xx} > 1$, demand is elastic and raising prices will decrease TR (and vice versa). In order to sell its extra production, prices will have to decrease. If the demand is inelastic, then decreasing prices will not raise total revenues.

c. Court and legal reforms (to speed the process of litigation and lower its cost) will encourage more disputants to use the court system. Under what circumstances could this cause an increase in total litigation spending?

Using the court system is tied to a number of other legal service expenditures. In other words they are a number of complement goods to the use of court systems. Hiring lawyers, days taken off, legal administration fees etc. are all expenses that will need to be made if a lawsuit takes place. A decrease in the cost of using the court system may well increase the total litigation bill.

d. Despite technological advances in fishing methods and more numerous fishing boats, total catches of many fish species have declined over time. Explain.

The improvement in production technologies and increase in firms (fishing boats) should have increased the total output of fishes in the long term (and ceteris paribus). However, fish will only replenish if they a certain amount of fish of any given specie are allowed to survive. Fishing is a tragedy of the commons in that more boats with more efficient technologies are chasing dwindling supply of fishes. Less intensive fishing will actually increase the overall supply and catch of fish. Individual boats do not take into account the impact their fishing has on the overall fish population.

e. Predict the impact on smoking behaviour (and the incidence of lung disease) after shifts to low-tar and low-nicotine cigarettes.

The introduction of low-tar and low-nicotine will perhaps give a false sense of security to smokers. They will switch consumption on the belief that these cigarettes are less dangerous than original ones. This may also encourage new smokers to take up smoking on this basis.

3.7.3 May 2006, Q.2

Water is increasingly scarce and many regions of the world have introduced metering which allows local water companies to charge households for their respective water consumption. In one study it was found that the price elasticity of demand for water on the Isle of Wight was in the region of 0.40.

a. What does a price elasticity of 0.40 mean?

This means that the demand for water is relatively inelastic, i.e. when the price of water goes up by 1%, the consumption of water goes down by 0.40%. Consumers are relatively price insensitive to water.

b. In regions where outdoor use of water makes up a relatively large portion of total use, the price elasticity is high. Why?

Outdoor water are normally for more deluxe pursuits such as swimming pools, watering the garden, fountains, washing cars etc. whereas indoor water usage is for toilets, cooking, showers and other more essential purposes. This means that consumers can cut down on the more superfluous activities when prices go up which explains this observation.

c. The price elasticity of water for office building is much lower than for households. Why may this be?

One plausible explanation for this is that office workers do not directly pay the bill for the water they use while at work. They don't have the same incentives as they would at home for keeping tabs on their consumption and rationing their use of water. There is a mismatch between the user of the water and the person paying the bill. Admittedly few working hours activities require water!

3.7.4 October 2006, Q.4

a. Define and discuss three types of elasticities.

b. State whether these statement are true or false. Explain your answers.

i). *If the price elasticity of demand is 2 then a 1 percent decrease in price will double the quantity demanded.*

False. $\eta = 2$ means a 1% decrease (increase) in price will result in a 2% increase (decrease) in quantity demanded, i.e. the quantity will increase by 2%.

ii). *A good will have a more price inelastic demand if it is a luxury good.*

Not necessarily true. A luxury goods means that when income increases, the amount spent on the good increases by more than the percentage increase in income.

iii). *If the demand for cranberries is price elastic, then the quantity sold will decrease after a severe frost.*

A severe frost will decrease the supply of cranberries (supply curve shifts to the left). The equilibrium price will increase and the equilibrium quantity (bought and sold) will decrease. This has nothing to do with whether the demand is elastic or inelastic!

iv). *If an increase in price causes a decrease in total revenue then price elasticity of demand must be greater than one.*

This is true since the quantity demanded will decrease by more than the increase in price, reducing total revenue.

v). *If a 10 percent increase in income causes a 5 percent increase in quantity demanded, the income elasticity must be* -2.0.

False. First of all, the elasticity coefficient should be positive, not negative. And the income elasticity coefficient is $\eta_I = \frac{\%\Delta Q}{\%\Delta I} = \frac{5\%}{10\%} = 0.5$, not -2.0.

c. For each of the following pairs of goods or services, identify the one for which the price elasticity of demand is greater and explain why:

i). Coffee / Starbucks Coffee

The first is more price elastic than the second as there are less immediate substitutes [for Starbucks coffee].

You could argue it differently if you interpret "coffee" as a beverage. There are more immediate substitutes for a specific brand of coffee (Starbucks) than for coffee as a beverage. In this case one would expect the demand for Starbucks coffee to be more price elastic.

ii). Movies in the afternoon / movies in the evening

The 9-5:00 working population can only go to the movies in the evening and cinemas will charge higher prices knowing that they are more captive, often with less time on their hands but more income. Daytime viewers (old age pensioners, mothers with young children, unemployed etc.), on the other hand, have more substitute activities and tend to be more price sensitive.

iii). Prescription medicine / over-the-counter medicine (i.e. those you can obtain without a prescription)

Prescription medicines will tend to be less elastic than over-the-counter drugs since these will typically be associated with a more 'serious' medical condition where the patient had to take an appointment to see a doctor.

iv). Eggs / tic tac breath mints

Eggs are likely to be less price elastic than mints. They are an essential ingredient to many types of foods and few substitutes exists for them. Tic tac mints on the other hand have a lot of available substitutes and consumers will have a more elastic demand for these.

v). UK return flight to New York / UK return flight to Tenerife Spain

One could argue that the typical flight to Tenerife is taken mostly by someone going on holiday. There are many holiday destinations to choose from and consumers will tend to be very price sensitive, particularly in terms of their flights. Of course some customers will also choose to go to New York for their holiday but this is less popular and reserved to couples or single passengers without children with higher income (and hence less price sensitive). The NY flights are also common for business travellers. If an important meeting is taking place in New York then there are no substitutes to the flight (the next best thing is probably video conferencing). For these reasons, NY flights are associated with a less elastic demand than flight to Tenerife.

3.7.5 May 2007, Q.1

a). The price elasticity of demand for cigarettes is 1.20 for consumers aged 16-25 yrs old and 0.40 for consumers aged 25 yrs and over. Interpret these findings – what factors explain the difference in price elasticities? (25 marks)

The price of elasticity is defined by the following equation:

$$\begin{aligned} \eta &= -\frac{\partial Q(P)}{\partial P}\frac{P}{Q(P)} \\ &= -\frac{\Delta Q^d/Q}{\Delta P/P} \end{aligned}$$

This formula measures the price sensitivity of consumers to changes in price. Since young consumers have a price elasticity of 1.20 this means that if prices increases by 100%, quantity sold will decrease by 120% – they have an elastic demand for cigarettes. On the other hand, the price elasticity for older consumers is 0.40 suggesting that when prices increase by 100%, quantity sold decreases by only 40% – they have an inelastic demand curve. There are a number of reasons why older consumers may exhibit a more inelastic demand curve including the following:

i). Older consumers may be more addicted to nicotine and find it difficult to give up.

ii). Older consumers are likely to have higher, more stable income than younger consumers. Cigarettes may be a smaller part of their total expenses and are consequently less responsive to price changes.

iii). Older consumers tend to plan their purchase of cigarettes and will buy in bulk, perhaps during their weekly shop. Younger consumers are often impulse buyers who will tend to smoke due to peer pressure. They will pay more per cigarette than older consumers and the lack of planning means that they experience the full price rise.

iv). Others?

b). If the price of a cigarette pack is £5.00 per pack, 10 millions packs are sold. How many packs will be sold at £5.50 given a price elasticity of 1.20? (25 marks)

Let $P_1 = £5.0, P_2 = £5.5$ and $Q_1 = 10$. Use the mid-point formula to find Q_2.

$$\begin{aligned}
\eta &= -\frac{\frac{Q_2-Q_1}{(Q_1+Q_2)/2}}{\frac{P_2-P_1}{(P_1+P_2)/2}} \\
1.2 &= -\frac{\frac{Q_2-10}{(Q_2+10)/2}}{\frac{5.5-5.0}{10.5/2}} \\
1.2 &= -\frac{\frac{Q_2-10}{(Q_2+10)/2}}{\frac{0.5}{5.25}} \\
-\frac{0.3}{5.25} &= \frac{Q_2-10}{Q_2+10} \\
Q_2 &= 8.9189 \approx 8.9 \text{ mil. packs}
\end{aligned}$$

c). The government is considering a number of initiatives geared towards encouraging people to stop smoking, including education, taxes and medical insurance (restricted coverage). In your view, which of these would work better with each group of consumers and why? (25 marks)

All of these may be effective on both groups but other things equal one may argue that taxes, due to price sensitivity, will work better with young consumers. In other words a rise in cigarette price through taxes will discourage relatively more young consumers from smoking than older ones. Education is also more likely to impact on young people who will have a longer expected number of years left to live. Many older consumers feel that they have done quite a lot of damage already and the benefits of stopping are not worth the displeasures associated with stopping altogether. Medical insurance is likely to affect older consumers which will tend to have more dependents and be more concerned that the dependents will be harmed by the consequences of their smoking. Other answers will be considered here.

d). Some economists argue that cigarettes are an inferior good for older consumers (25 yrs +). What does this mean? (25 marks)

An inferior good is one where we observe a decrease in quantity sold when income rises. In class we gave the example of baked beans – when individuals become richer they buy less of this sort of food. Studies show that it is the low income household that do the bulk of the smoking – higher income individuals either never take up smoking or have given up with past education programmes. There are a number of reasons that are put forward to explain this result including the following:

i). Lower income households have a lower expected length of life due to a number of reasons – this reduces the gains from quitting.

ii). Lower income households have less substitute 'entertainment' available to them and will use smoking as a stress release factor instead of another activity or consumption (e.g. playing a sport).

iii). Lower income groups are often burden by social problems and health is not a central concern.

iv). Other answers will be considered.

3.7.6 October 2007, Q.3

Suppose you are an economic consultant hired by the Mayor of London to improve the state of the capital's public transport. You commission a survey of transport habits and preferences and find that for the representative consumer, a decrease in the price of a return train ticket from £10.00 to £8.00 increases the number of ticket sold by 10%.

a). Using the information contained in this paragraph, compute and interpret the price elasticity of demand for rail tickets in and around London. (25 marks)

$$\begin{aligned} \eta &= -\frac{\frac{Q_2-Q_1}{(Q_1+Q_2)/2}}{\frac{P_2-P_1}{(P_1+P_2)/2}} \\ &= -\frac{0.1}{\frac{8.0-10.0}{18/2}} \\ &= 0.45 \end{aligned}$$

So the price elasticity of train transport in London is 0.45 – i.e. inelastic. Consumers are relatively price insensitive as far as train tickets sales are concerned. Some students my have used a different starting base P_0 or P_1 ... that's fine too.

b). If the Mayor is interested in maximising the revenues from the transport infrastructure, would you recommend that he increase, decrease or keep the price of train tickets unchanged? Explain your answer. (25 marks)

The price elasticity computed above suggests that if the Mayor's mission was to increase revenues then he should increase the price of train tickets. The organisation will lose some consumers but this will be more than compensated by the increase in revenues from higher prices. More specifically a 10% increase in prices will be associated with a 4% decrease in sales.

c). The price elasticity for tube travel is higher than it is for train travel although tube and train travel are obviously used jointly for many commuters of the capital. (The London Underground, or subway, is commonly known as "The Tube".) Would you advise the Mayor to: (25 marks)

i). raise the price of train and tube tickets jointly. Why?

ii). raise the price of train travel leaving tube prices unchanged. Why?

iii). raise the price of tube travel leaving train prices unchanged. Why?

Train and tube tickets are complementary goods for many commuters. This implies that too high prices on one mode of transport can decrease demand on the other. Since train travel is relatively inelastic, raising train ticket prices is unlikely to affect the number of total commute (train + tube) into London. However, higher tube prices are likely to encourage commuters out of the transport system. Of course this is a simplistic interpretation that assumes that quality is held constant. The raise in transport prices can actually improve the service for those that are willing to pay the higher prices by reducing congestion. Setting the 'right' fares is a complex exercise!

d). Train and tube ticket prices are higher during peak commuting times (7:00−9:30 am). Using demand elasticities, explain why it may be efficient for London Transport to price discriminate in this way. (25 marks)

Commuters during peak hours (7−9:30 am) are likely to be working in London. Few 'leisure' travellers will need to travel around these times. The term leisure is used loosely here to indicate anyone that has a more flexible schedule. By charging higher prices during peak hours, the train company can

i). maximise its revenues by charging higher prices to its loyal consumers

ii). improve the quality of the service by reducing congestion caused by those who do not need to travel at these times, and

iii). improve sales on non-popular time slots by charging lower prices off-peak.

Most public transport companies price discriminate in this way to maximise revenues and manage congestion!

3.7.7 May 2009, Q.1, various parts

a. v). (True / False) If a good has an income elasticity of 0.25, then ceteris paribus, a decrease in income tax should generate more sales revenues.

True. An income elasticity of 0.25 means that the quantity demanded of a good increases by less than the percentage increase in income but quantity demanded and hence sold increases. Assuming prices stay the same then sales revenues should increase as well.

d. Is the price elasticity of demand typically greater if computed for an industry or for a single firm in the industry? Explain why?

The price elasticity for an industry will typically be smaller for an industry than for a particular firm in that industry. In the case of a monopoly, industry and firm demand curves are the same. But in other market structures (except for a cartel), the firm's demand curve will be more horizontal (i.e. its price elasticity will be higher) than the industry demand curve. This is explained by consumer's ability to find substitutes which makes them more price sensitive. The more competing firms there are, the greater the price sensitivity (ceteris paribus, of course).

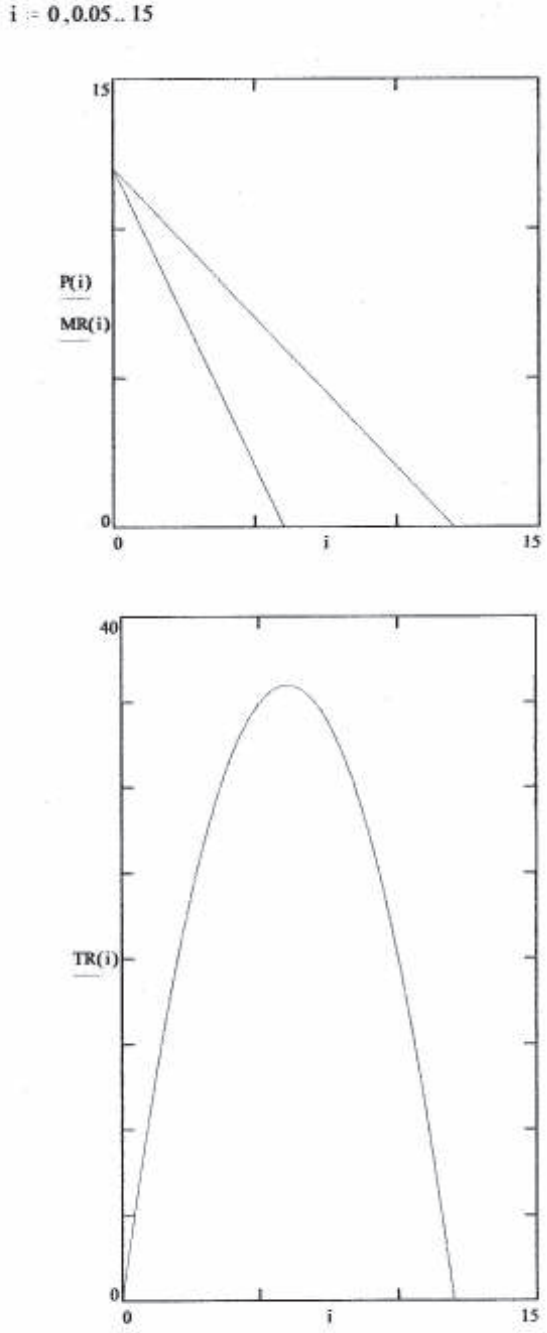


Figure 3.1: Elasticity, TR and MR

Chapter 4

Cost Of Production

For every production technology there is a corresponding cost function $C(Q)$. Costs, after all, are nothing more than monetary measures of the underlying production process. You are NOT expected to know the technical derivations of the concepts introduced in this section. Instead, you should focus on gaining an intuitive understanding of them. During this lecture, you need to think in slightly more abstract terms and at the same time make the necessary connections to see how these concepts apply to your firm / industry.

4.1 Production Technology

- How input factors can be combined to produce goods and services is determined by the production technology available.
- The input-output relationship of a production technology can be captured using a production function.
- Consider a production process that uses two input factors: labor (L) and capital (K).

$$K, L \longrightarrow \boxed{f(K,L)} \longrightarrow Q$$

- A production function can be written in the form

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

  where Q is the number of units of output produced from the most efficient use of the two factors K and L.
  i.e. Q is the maximum units of output that can be produced using K and L.
- Different production technologies can be described using appropriate functional forms. Some examples:

$$\begin{aligned} f(K.L) &= \frac{1}{4}L\sqrt{K} \\ f(K,L) &= 2KL - L^2 \end{aligned}$$

- Actual production functions can be estimated using econometric techniques.

Linear approximation: $Q = \beta_0 + \beta_1 L + \beta_2 K$.

Quadratic form: $Q = \beta_0 + \beta_1 L + \beta_2 L^2 + \beta_3 K + \beta_4 K^2$.

- Instead of treating K and L as literally two factors, we will let

  K represents all **fixed factors**, factors that cannot be varied in the short-run (e.g. building, capital equipment)

  L represents all **variable factors**, factors that can be varied in the short-run (e.g. material, labor)

- In the **short-run** some factors (K) are "fixed", so output can only be varied by changing the variable factors (L).

- In the **long-run** all factors can vary, so all feasible factor combinations can be used. Which (K, L) combination is "least costly" depends on the production technology and factor prices.

4.2 Cost of Production

Understanding how costs behave – i.e. how they vary at different levels of activities – is important for decision making. We will skip the technical derivation of a cost function and assume that all the cost data can be obtained from a firm's financial statements.

Example of hypothetical cost data (Table P.2 in BDSS, p.11)

Cost of Materials		\$8,900
Direct Labor		\$2,300
Manufacturing Overhead		
Indirect Labor	\$700	
Heat, Light, and Power	\$400	
Repairs and Maintenance	\$200	
Depreciation	\$1,100	
Insurance	\$50	
Property Taxes	\$80	
Misc. Factory Expenses	\$140	
Total Manufacturing Overhead		\$2,670
Total Cost of Manufacturing		\$13,870

4.2.1 Fixed Vs. Variable Costs

Total costs fall into two main categories: fixed and variable costs.

- **Fixed Costs** are costs that do not vary with the firm's output.

  Examples: depreciation, debt service, insurance, and many general and administrative costs. In practice, there is a handy way to check which costs are fixed – costs the firm has to incur even when the output or sales level were zero are fixed costs.

- **Variable Costs** are costs that do vary as the firm's output changes.

  Examples: cost of goods sold, sales commissions, shipping / delivery charges, costs of direct materials or supplies, and direct labor.

Some Remarks:

- The dividing line between fixed and variable costs is not always clear; it depends on the time period (short- vs. long-run) to some extend.
- Labor costs are generally considered variable. But in Japan where life-time employment still exists in some firms, labor costs for those firms should be considered fixed.
- What about advertising expenses? It depends – if the firm has a long-term contract with an agency, it should be considered fixed.
- Some costs are semi-fixed: fixed over certain range but variable over other ranges of output. In other words, semi-fixed costs are costs that tend to go and down in steps. The example in your textbook is the cost of [renting or leasing] delivery trucks.
- Why do we care about the distinction between fixed and variable costs?
  "Whether the firm [or its management] has the freedom to alter its physical capital or other elements of its operations has important implications for its cost structure and the nature of its decision making." (BDSS, p.13)

4.2.2 A Typical Total Cost Curve

Characteristics of a Total Cost curve *TC(Q)*:

- *TC* is increasing throughout
- *TC* is increasing at a *decreasing* rate initially.
- *TC* is increasing at an *increasing* rate after some point.
- There are some costs involved even when output is zero.

(Figure 4.1-a)

4.2.3 Average and Marginal Costs

Associated with total costs, there are two related cost concepts:

- **Average Cost**

$$AC(Q) = \frac{TC(Q)}{Q}$$

  i.e. cost per unit of output.

- **Marginal Cost**

$$MC(Q) = \frac{\Delta TC}{\Delta Q}$$

  i.e. incremental cost or the cost of producing one more unit.

Note: The concept of "margin" is one of the most important concepts in economics. All optimality conditions have something to do with how things behave "at the margin".

(Figure 4.1-b)

4.2.4 Relationship Between Average and Marginal Costs

- When $MC < AC$, AC is decreasing
- When $MC = AC$, AC is at its minimum
- When $MC > AC$, AC is increasing

4.2.5 A Numerical Example

The cost curves in Figure 2.1 are generated using the cost function

$$C(q) = 2q^3 - 18q^2 + 60q + 150$$

- Fixed Cost: $C(0) = 150$
- Variable Cost: $VC(q) = 2q^3 - 18q^2 + 60q$
- Average Total Cost: $AC(q) = \frac{C(q)}{q} = 2q^2 - 18q + 60 + \frac{150}{q}$
- Average Variable Cost: $AVC(q) = \frac{VC(q)}{q} = 2q^2 - 18q + 60$
- Marginal Cost: $MC(q) = \frac{d}{dq}C(q) = 6q^2 - 36q + 60$

4.3 Economies and Diseconomies of Scale

As we can see, AC curves are typically U-shape – as output increases, the per unit cost decreases initially, reaches a minimum, and starts rising after that point.

- **Economies of Scale** exits when AC decreases as output (or the "scale" of the operation) increases. i.e. there are cost advantages in producing large quantities.
- **Diseconomies of Scale** exits when AC increases as output increases. In this case, we say the economies of scale has been exhausted.
- The *optimal* scale of a firm (or plant), naturally, is the level of output at which its AC is minimum.

4.3.1 Example (May 2005, Q.5)

In the past few years, several American and European firms opened "hypermarkets", enormous stores that sold groceries, household goods, hardware, and other products under one roof.

a. What are the possible economies of scale that might be enjoyed by hypermarts?

   Hypermarts could conceivably achieve several economics of scale by offering a wide array of consumer products in one store. **First** if the firm has already purchased expensive real estate and could build a slightly larger building, it can enjoy economies of scale by effectively spreading these high fixed costs across a wider array of products. **Second**, a firm that already has a strong reputation with consumers could enjoy marketing economies of scale using their existing branding umbrella. **Third**, the firm could achieve greater economies of scale by using its current distribution systems to deliver more products to fewer large stores. **Finally** a hypermart may realize purchasing economies because it turns over products quickly, buys in bulk, and becomes a desirable channel in the eyes of product manufacturers.

b. What are the potential diseconomies of scale?

Despite these potential benefits, there are some limits to economies of scale. For instance, a hypermart could spread a specialized labour such as talented store managers too thinly that they have a difficult time managing and monitoring the entire store. Because the store has lost its niche focus, both the store's old and new services may be adversely impacted. Additionally, the firm may damage its reputation with core consumers by expanding its products well beyond the range for which it is known.

4.4 Long-Run Vs. Short-Run

- The focus of our analyzes so far has been on short-run scenarios in which some factors are fixed and the firm can only increase output by hiring more variable factors.
- Recall that in the long run all factors can be varied – the firm can adjust the size and other dimensions of its production facilities.
- Consider a set of short-run cost curves with some fixed factor K. What will happen to the firm's AC and MC if it keeps increasing the amount of K? Conceptually, think of the situation in which a firm can choose any plant size it wants.
- For simplicity, suppose the firm is choosing between three different plant sizes: small, medium and large.
- The LRAC is the lower envelop of the SRAC curves.

(Figure 4.2)

4.4.1 Returns to Scale

Although Returns to Scale (RTS) is sometimes used interchangably with Economies of Scale, it is actually a slightly different concept. RTS is concerned with this type of question: "If we change ALL input factors by some propotion $\lambda > 0$, what will happen to output and cost?" Suppose we double all input factors (i.e. $\lambda = 2$).

- If output more than doubles, we have **Increasing Returns to Scale (IRS)** $\Rightarrow$ cost will less than double because we can double output without doubling input.
- If output exactly doubles, we have **Constant Returns to Scale (CRS)** $\Rightarrow$ cost will exactly double because we can double output by doubling input.
- If output less than doubles, we have **Decreasing Returns to Scale (DRS)** $\Rightarrow$ cost will more than double because we have to more than double input to double output.

4.4.2 Minimum Efficient Scale

- Minimum efficient scale (MES): the output level of a firm at which its **economies of scale** in production has been fully exploited in the long-run.

  i.e. the level of output at which the *long-run average cost* is at its minimum.
- The steeper the fall in the LRAC up to the MES, the greater the cost advantage in exploiting economies of scale.

- The *MES* of a firm has important implications about
  - the optimal size of the firm.
  - the market structure of the industry.
- What kind of industries have "large" MES? Typically those with high fixed costs and low marginal costs. Why? Because the higher the level of output, the more the high fixed costs can be spread over those units. The optimal size of the firm tends to be large and the number of firms in the industry tends to be small. Classic examples: steel, auto, and telcom industries.
- If the MES of a typical firm is small relative to the size of the market, there will be a large number of firms and the market tends to be more competitive.

4.5 Opportunity Cost

- Opportunity Cost is the *highest valued* foregone alternative resulting from a decision or an action.
- The "true" cost of something is what one has to give up to obtain it – that includes not only out-of-pocket costs but opportunity costs as well.
- Is a leisure walk after dinner "free"? It depends on what you could be doing with your time – the value of that alternative is your opportunity cost.
- "If someone invites you to lunch and offers to pay for it, is it free for you?" (Q.1, May 2006)
- What is your true cost of taking this course? In addition to all the out-of-pocket expenses, you have to spend three Sunday afternoons with me instead of doing something else, such as spending time with your family and friends.

4.6 Sunk Cost

- Sunk costs are costs already incurred and cannot be recovered (i.e. irreversible) regardless of any decision made from that point on.
- Fixed costs $\neq$ sunk costs. They are different concepts: **not all fixed costs are sunk**.
- Whether a cost is considered "sunk" or not depends on your options at hand.
- Time spent doing something (waiting in line, studying for a test), whether it turns out to be worthwhile or not, is definitely sunk – you cannot turn back the clock.
- Suppose you studied to become a CPA and later realized that you don't like being an accountant anymore. Should you stay in the profession simply because you have invested so much time and money into it already?
- The concept of sunk costs cannot help you answer that question. What it can tell you is that you are asking the wrong question. The investment you have made (time and money) is sunk and therefore irrelevant to your decision-making.

- Highly specific R&D expenditures are a good example of sunk costs. The sunk cost fallacy is also known as the "Concord Effect" because the British and French governments continued to fund the project even after it became apparent that it was not an economically viable one.
- Advertising expenses to create and promote a brand are likely to be "totally sunk" because advertisements usually have little or no salvage value.
- MORAL: Ignore sunk costs in your decision-making. Don't throw good money after bad money; cut your loses if you have to.
- Sunk costs, however, can have strategic value in some situations, like entry deterrence. It's a signal of commitment. (We will talk about this later.)

4.7 Accounting Profit Vs. Economic Profit

- Accounting costs that appear in financial statements (e.g. Table P.2 in BDSS) are out-of-pocket or "explicit costs" only. Sound business decisions require that opportunity costs be taken into account (pun intended).
- In economics, the term "costs" also refer to **economic costs**.

$$\text{Economic costs} = \text{Accounting Costs} + \text{Opportunity Cost}$$

- Once you have a clear understanding of opportunity cost, the distinction between Accounting Profit and Economic Profit is quite straight forward:

$$\begin{aligned} \text{Accounting Profit} &= \text{Total Revenue} - \text{Accounting Costs} \\ \text{Economic Profit} &= \text{Total Revenue} - \text{Economic Costs} \end{aligned}$$

4.7.1 An Example

- John is a computer programmer who has been earning $480,000 / year. A year ago he took over his father's small business. The following is the year-end accounting data of the firm (in thousands per year):

Total Revenue		$1,200
Rent	$300	
Cost of Sales	$240	
Other Expenses	$120	$660
Profit		$540

Summary of revenue, costs and profit:

Total Revenue	Explicit Costs	Accounting Profit	Implicit Costs	Economic Profit
$1,200	$660	$540	$480	$60

The difference between John's current earning (accounting profit) and his next best alternative (as a programmer) is his economic profit or rent.

- Suppose sales revenues drop to $1,000,000/year. Should John stay in business?

  Summary of revenue, costs and profit:

Total Revenue	Explicit Costs	Accounting Profit	Implicit Costs	Economic Profit
$1,000	$660	$340	$480	−$140

  Though the accounting profit is still positive, the economic profit is now negative!

- Suppose the owner of the retail space is John's uncle who just passed away and left John the space in his will.

  Though John now owns the space, it's not really rent-free because of opportunity cost. Assume that John has been paying the market rent, his explicit costs will decrease by $300, but implicit costs will increase by the same amount (forgone rental income).

  Summary of revenue, costs and profit:

Total Revenue	Explicit Costs	Accounting Profit	Implicit Costs	Economic Profit
$1,000	$360	$640	$780	−$140

  Note: The higher the market rent for the retail space, the higher his implicit costs and the lower his economic profit will be.

4.8 Example

4.8.1 October 2005, Q.6

a. How would you estimate the full cost to an airline if one of its planes is held over for 24 hours in a western airport for repair?

   The full cost to the airline of a grounded plane includes explicit costs – repair costs, overnight hangar costs, and the like. It also includes an opportunity cost: the lost profit on any cancelled flights. A good answer would highlight the difference between accounting costs and economic costs.

b. A firm spent £10 millions to develop a product. In the product's first two years, its profit was £6 millions. Recently there has been an influx of comparable products offered by competitors (imitators in the firm's view). Now the firm is reassessing the product. If it drops the product, it can recover £2 millions of its original investment by selling its production facility. If it continues to produce the product, its estimated revenues for successive two-year periods will be £5 millions and £3 millions and its costs will be £4 millions and £2.5 millions. (After four years, the profit potential of the product will be exhausted and the plant will have zero resale value.) What is the firm's best course of action?

   The past profits and development costs are irrelevant. If the firm drops the product, it recovers £2 million. If the firm continues the product, its additional profit is $5 + 3 - 4 - 2.5 =$ £1.5 millions. Thus the firm should drop the product. The student should include a discussion of fixed versus sunk costs and how the latter are irrelevant for current decision-making.

4.8.2 May 2009, Q.2, Part a.

In many instances, the consequences of making a given decision are clear only when viewed in the light of what is done and not done. What economic concept do you think 'captures' this insight. Explain your answer. (3 marks)

This comment refers to the concept of opportunity cost of resources which is at the heart of economic decision making. Economic cost, unlike accounting costs takes into account the profits the firm would have made had it invested its funds in the next best alternative. These [foregone] profits are effectively a 'cost' in the sense that the firm will miss out on this opportunity by going ahead with the given proposed investment. If revenues still outweigh the economic costs of resources (including their opportunity costs) then the firm is making an economic profit.

$C(Q) := 2 \cdot Q^3 - 18 \cdot Q^2 + 60 \cdot Q + 150$

Figure 4.1-a

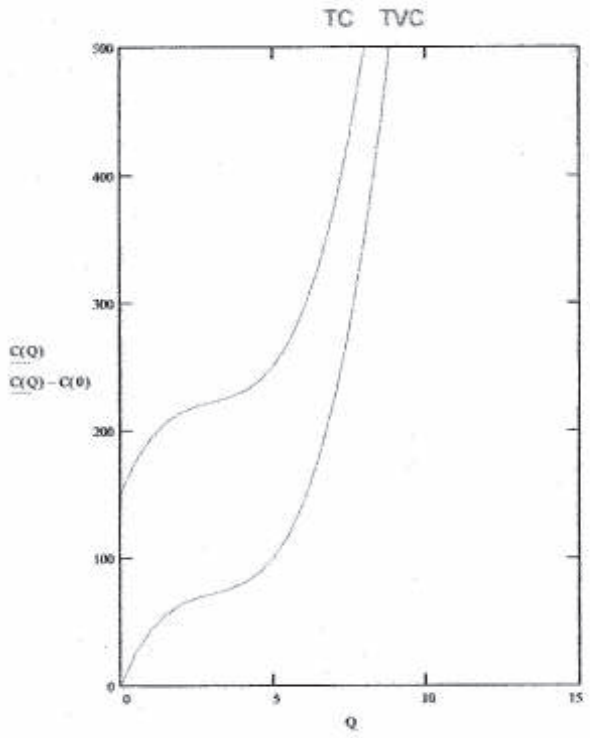


Figure 4.1-b

$Q := 0.01 .. 15$

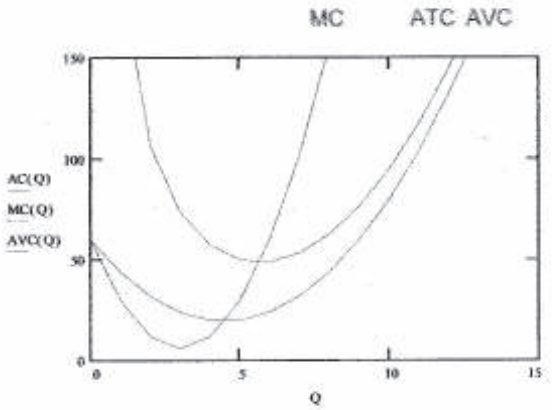


Figure 4.1: Total, Average, and Marginal Cost Curves

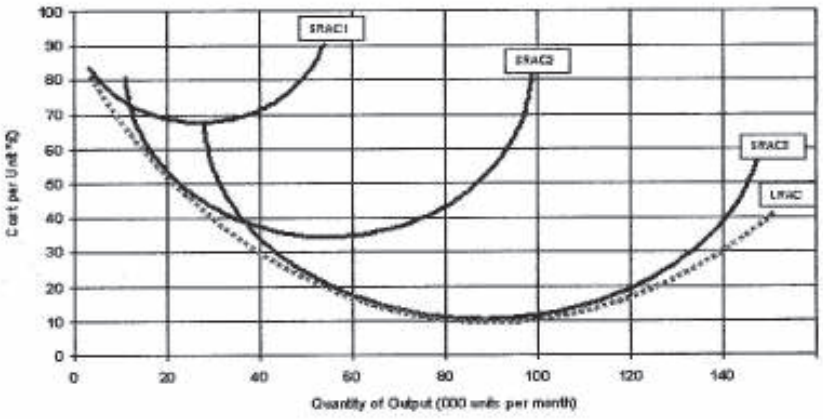


Figure 4.2: Long-run Average Cost and MES

Chapter 5

Output and Pricing

- We will introduce the Theory of The Firm by first examining how firms choose their output and price.
- We will assume that the primary objective of a firm is to maximize profit – the evolutionary argument of "survival of the fittest" supports this hypothesis.
- Do firms really strive to maximize profit on a daily or deal-by-deal basis? Probably not, because that will be short-sighted. Firms should strive to maximize long-term profit instead, which will require some strategic thinking.
- Two major decisions of a firm (or its manager) are output (how many units to produce) and pricing (what price to charge).

  Output can mean how many units "to order" as well as "to produce".

  Pricing: How much market (or pricing) power does a firm have depends on the market structure (i.e. how competitive is the market).

5.1 Optimal Output Rule: MC = MR

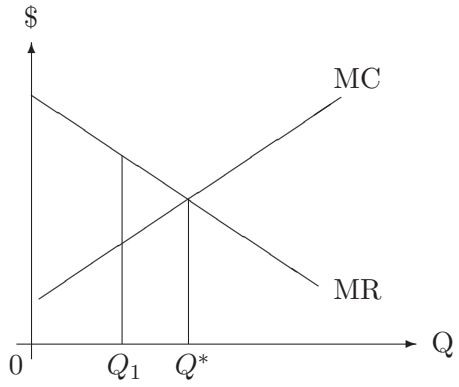
The Rule:

- The profit-maximizing (loss-minimizing) level of output Q^* is the one at which MC = MR.

The Logic:

- Suppose at the current level of output Q_1, MR > MC.
- That means the revenue $(Q_1)^{th}$ unit brings in is more than the cost of producing it, so it is profitable to produce Q_1. The profit of that unit is $\text{MR}(Q_1) - \text{MC}(Q_1)$.
- How about the $(Q_1 + 1)^{th}$ unit? If MR > MC, produce that unit and sell it.
- In other words, there is more profit to be made as long as MR > MC. So the firm should keep producing more units *as long as each additional unit brings in more revenue than the cost of producing it.*
- To maximize profit, the firm should produce up to the unit at which MC = MR.

NOTE: This rule holds regardless of the market structure, i.e. whether it is a monopolistic firm at one extreme or a perfectly competitive firm at the other.



Optimal Output: Q^*

5.1.1 Mathematically (optional)

By definition, profit (π) is total revenue minus total costs:

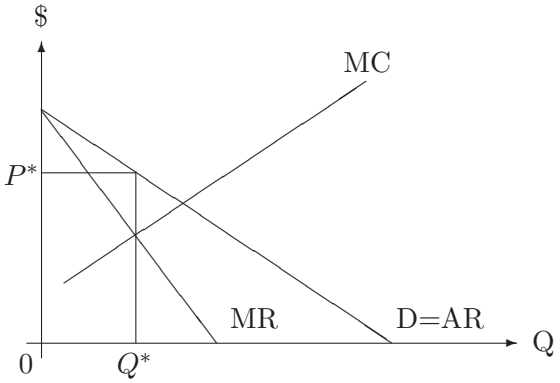
$$\pi(Q) = \text{TR}(Q) - C(Q).$$

The necessary condition for a maximum π is when the slope of $\pi(Q)$ is zero. So we take the first derivative of $\pi(Q)$ and set it equal to zero.

$$\begin{aligned} \frac{d\pi}{dQ} = \frac{d\text{TR}}{dQ} - \frac{dC}{dQ} &= 0 \\ \Rightarrow \quad \frac{d\text{TR}}{dQ} &= \frac{dC}{dQ} \\ MR &= MC \end{aligned}$$

5.2 A Monopolistic Firm

- A monopoly, by definition, is the sole producer / provider of a good or service. So the demand curve it is facing IS the market demand which is downward sloping.
- We already know that to maximize profit, a firm should produce the the level of output at which MC = MR. What price should a monopolistic firm charge? The maximum price the market is willing to pay.



Equilibrium of a monopoly: (P^*, Q^*)

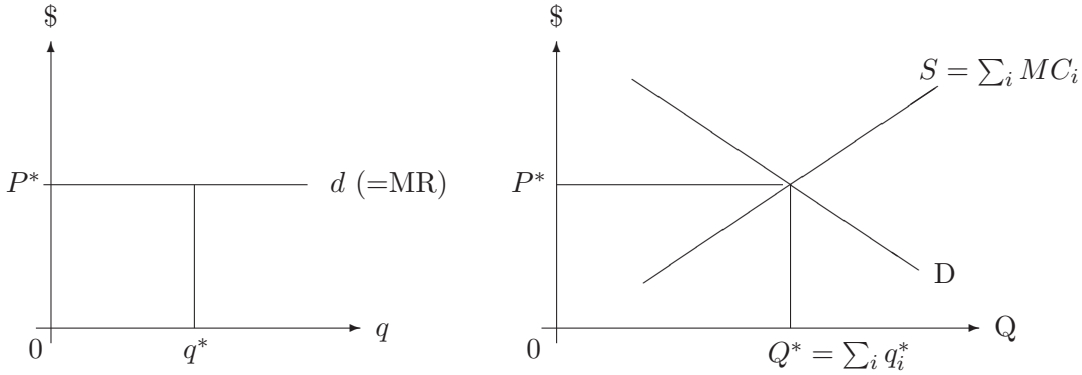
5.3 A Perfectly Competitive Firm

- In a perfectly competitive industry, a single firm is only one of many in the market and therefore its output is too small to have any effect on the market price.
- Market price is determined by the market demand and supply.
- Individual firms take the market price as given (they are price-takers), so the demand curve facing **a single firm** is effectively horizontal.
- Since price does not change with a single firm's quantity supplied, $P = AR = MR$.

$$\begin{aligned} \text{TR} &= P \times q \\ \text{AR} &= \frac{P \times q}{q} = P \\ \text{MR} &= \frac{\Delta \text{TR}}{\Delta q} = P \end{aligned}$$

  Here, we use the lower case q to denote the output of an individual firm.

- Optimal Output: choose the q at which (MR =) $P = MC$.



A Competitive Firm　　Market Equilibrium

5.3.1 Short-run Equilibrium

- If $P > \min ATC$, the firm is making positive economic profits.
  If $P = \min ATC$, the firm is making normal profits (or zero economic profit).
  If $P < \min ATC$, the firm is making negative economic profits (i.e. a loss).

** If $\min \text{AVC} < P < \min \text{ATC}$, the firm should continue to operate in the short-run because there is enough revenue to cover part of the fixed costs.

- Shut-down Rule: The firm should shut down if price falls below its min AVC.
  (If price falls below min AVC, it won't be making any operating profit.)

(Figure 5.1 here)

- **Firm Supply**: The short-run supply curve of a perfectly competitive firm is the portion of MC above AVC (i.e. $S_i = MC_i$).
- **Market Supply**: The market supply curve is simply the horizontal sum of the MC curves of individual firms in the market.

5.4 Exam Questions

5.4.1 October 2006, Q.1

a. Describe profit maximization in terms of marginal revenue and marginal cost. Your explanation must include a diagram that clearly shows where the firm will produce, at what price, and at what average cost? In your diagram, is the firm making profits? If so, you should also show what these are on the diagram.

A good answer would include the (properly labelled) profit maximising diagram discussed in class (one can be found in the Primer section of the Besanko et al textbook.) Profits are maximised at the level of output (Q^*) corresponding to MR=MC and the relevant price is determined by using the demand curve to determine what price will clear this level of output $P(Q^*)$. Once P^* and Q^* is determined, you are expected to show what profits will the firm be making (if any). These must be clearly indicated on the diagram. This should be followed by a brief discussion of how the [market] demand curve becomes much more elastic (horizontal) as competition sets into an industry. In perfect competition, the demand curve is perfectly horizontal and P=MR=MC and profits = 0 in the long term.

b. Explain why marginal revenue is either less than or equal to price. How does the difference between price and marginal revenue depend on the price elasticity of demand?

Here you can use the same diagram as above or reproduce a simplified one. $P > MR$ whenever a (non-discriminant) firm has market power. In other words, as long as a firm's action impacts upon the market you can assume that it has sufficient market power to be considered a price-setter. In this case, if it wants to produce and sell an additional unit of good because this will increase her profits, it has to consider what is the MR of doing so: the revenue it can obtain from selling that additional unit (at a lower price) MINUS the revenue loss from all previous units that it has to uniformly lower its price. This is why $MR < P$. In a perfectly competitive setting, $P = MR$ since the firm does not have any impact on price.

c. Suppose that the minimum level of short-run average cost was the same for every possible plant size. What would that tell you about the shapes of the long-run average and long-run marginal cost curves?

If $SRAC$ is the same for every plant size then the long-run average cost curve is flat (horizontal) as is the long-run marginal cost curve indicating a production process with constant economies of scales.

5.4.2 October 2006, Q.2

a. Discuss the following statement: *A firm that makes negative economic profits should stop producing.* Your answer should include diagrams as well as a justification for your answer.

Not necessarily. The firm should continue to produce in the short-run as long as $P > AVC \rightarrow TR > TVC$. That means the firm generates enough revenue to cover its variable costs and part of its fixed costs. If it stops producing, its loss will be its fixed costs. The firm should stop operating only if $P < AVC$. This statement obviously depends on the presence of fixed costs and is therefore a short-term phenomenon. Diagram absolutely necessary here and must be correctly labelled.

b. *Ben and Jerry's Ice Cream scorns profits. This company cares more about the environment and the health and safety of its employees than it does about profit.* Do you agree or disagree with this sentence? Your argument should be formulated using the theoretical concepts reviewed in this module.

This question highlights the fact that economists refer to profits as long-run economic profits. Activities and decisions that don't make much sense from an accounting perspective are sometimes more easily understood by using an economic perspective. An efficient and careful management of stakeholders demands will in the long term be profit maximising for firms. Organisations that fail to listen to their increasingly powerful stakeholder groups will lose out to rivals who do this better than them and will ultimately lose the ability to survive. Caring about the environment, health and safety of its employees goes hand in hand with LONG TERM profit maximising. Overly prioritising these issues at the expense of profits will endanger the survival of the firm. Efficient management of stakeholder demands will however allow it to balance the competing stakeholder demands and ensure its long run viability. Other answers are obviously welcome here as long as they are well argued!

5.4.3 October 2006, Q.3

Use the information below to calculate total revenue, marginal revenue, average cost, marginal cost, and profits for each level of output. (See the table)

Output	Price	TC	MC	AC	TR	MR	Profits
1	£5.00	£10	–	10.00	5	–	−5.00
2	£5.00	£12	2.00	6.00	10	5.00	−2.00
3	£5.00	£15	3.00	5.00	15	5.00	0.00
4	£5.00	£19	4.00	4.75	20	5.00	1.00
5	£5.00	£24	5.00	4.80	25	5.00	1.00
6	£5.00	£30	6.00	5.00	30	5.00	0.00
7	£5.00	£45	15.00	6.43	35	5.00	−10.00

a. Indicate the profit-maximizing level of output.

$MR = MC \quad \text{at} \quad Q = 5$

b. What are the firm's profits at that level?

Profits = £1.00

c. How would you answer to a. and b. change if the firm had additional fixed costs (e.g. increase in council tax) of £1.00?

TC would now be £25 and Profits would be £0. This would not affect the profit maximizing level of output ($Q^* = 5$) because MC is not affected by fixed costs.

d. What can you infer about the market structure from this information?

The market structure must be a fairly (perfectly) competitive one since prices do not change when output produced changes (and MR=P). This is backed up by the very low profit margins.

e. Produce a diagram that illustrates your answers, including the increase in fixed costs (£1.00).

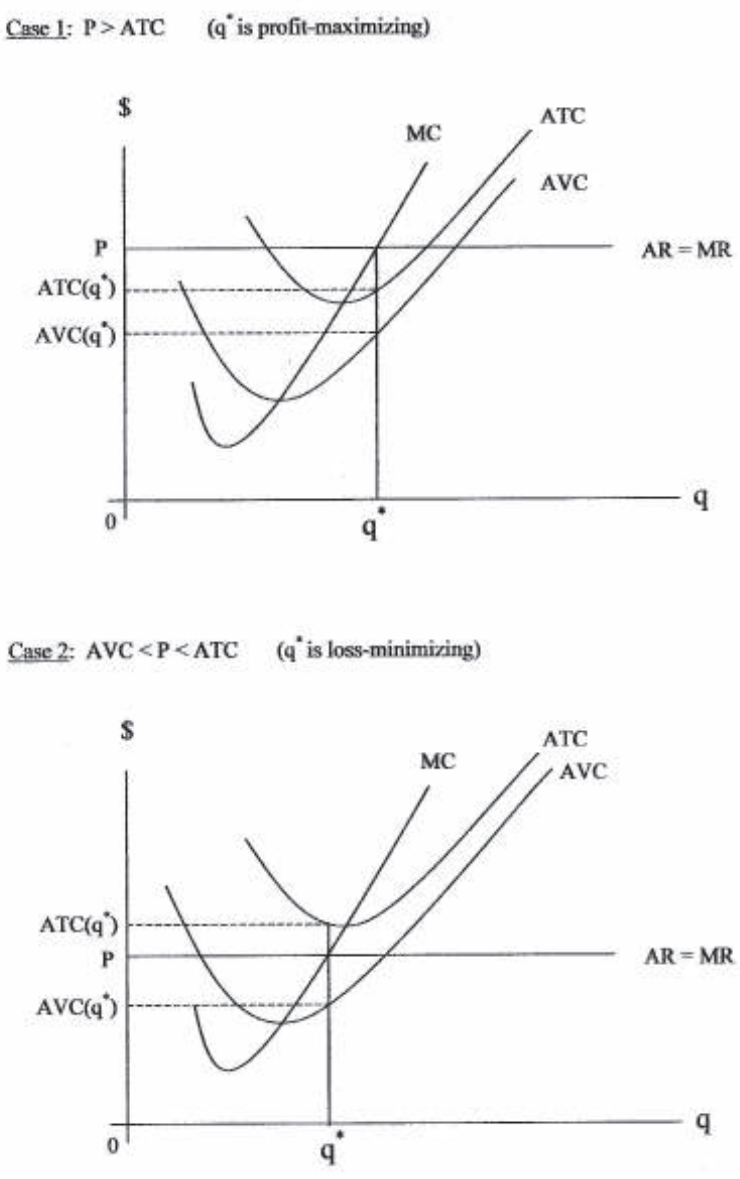


Figure 5.1: Competitive Firm: SR Equilibrium