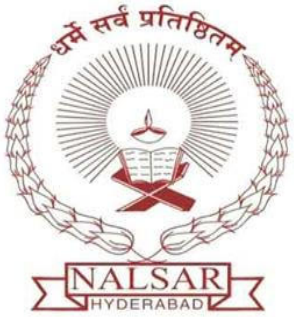

Centre for Aerospace & Defence Laws (CADL)
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Course Material

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TABLE OF CONTENTS

I. **MODULE I: FUNDAMENTALS OF ECONOMICS**

1.1. **Economics : Meaning and Nature**
- 1.1.1. Definition and Concept of Economics
- 1.1.2. Nature of Economics
- 1.1.3. Nature of Economic Law
- 1.1.4. Micro-Economic Analysis
- 1.1.5. Macro-Economic Analysis

1.2. **Economies and Law of Demand**
- 1.2.1. Demand Analysis
- 1.2.2. Law of Demand
- 1.2.3. Elasticity of Demand
- 1.2.4. Demand Forecasting

1.3. **Economies and Law of Supply**
- 1.3.1. Meaning of Supply
- 1.3.2. Law of Supply
- 1.3.3. Classification of Supply
- 1.3.4. Supply Function
- 1.3.5. Elasticity of Supply

1.4. **Market Equilibrium**

II. **MODULE II: FUNDAMENTALS OF AIR TRANSPORT ECONOMICS**

2.1. **Evolving Air Transport Industry**
- 2.1.1. Existing Financial Condition of Air Transport Industry
- 2.1.2. Airline Industry Consolidation
- 2.1.3. Factors affecting World Air Traffic Growth

2.2. **Economic Impact of Air Transport**
- 2.2.1. Direct and Indirect Impact
- 2.2.2. Induced and Total Impact
- 2.2.3. Economic and Social Benefit of Air Transport Operations

2.3. **International Economics and Aviation**
- 2.3.1. International Economics and Trade
- 2.3.2. Free Trade – Positive and Negative Aspects
- 2.3.3. The Logic of Production Possibility, Absolute Advantage, Comparative Advantage and Free Trade
- 2.3.4. Trade Protection and Trade Barriers
- 2.3.5. Foreign Currency and Exchange

III. **MODULE III: AIR TRANSPORT ECONOMICS: CORE PRINCIPLES**

3.1. **Market Demand and Supply for Airline Services**
- 3.1.1. Overview of Demand and Supply Concepts
- 3.1.2. Determinants of Demand for Air Transportation
- 3.1.3. Characteristics of Demand for Air Transportation

3.1.4. Supply of Airline Services
3.1.5. Characteristics Of Supply For Airline Services
3.1.6. Airline Supply And Demand Equilibrium

3.2. **Cost and Production Analysis in Air Transport Industry**
3.2.1. General Concepts of Cost and Production Analysis
3.2.2. Airline Industry and Cost Structure
3.2.3. Airline Economies of Scale, Scope and Density
3.2.4. Airline Break-even Analysis
3.2.5. Airline Operating Leverage

3.3. **Air Transport Market Structure and Monopolistic Markets**
3.3.1. Perfect Competition
3.3.2. Monopoly
3.3.3. Airport Market Structures
3.3.4. Market Structure in Aviation Industry

3.4. **Aviation Forecasting and Regression Analysis**
3.4.1. Aviation Forecasting Applications
3.4.2. Qualitative Forecasting Methods
3.4.3. Quantitative Forecasting Methods
3.4.4. Descriptive Statistics
3.4.5. Time-Series Analysis

IV. MODULE IV: AIRPORT AIRLINE ECONOMICS AND INFRASTRUCTURE

4.1. **Expenditure and Revenue Structure of Airports**
4.1.1. Airport Expense Profile
4.1.2. Airport Revenue Profile
4.1.3. Relationship between Revenue and Expense Profile
4.1.4. Reasons for Variance and Useful Parameters

4.2. **Financial Management of Airports**
4.2.1. Concept of Financial Management in Airports
4.2.2. Economic Performance Management

4.3. **Price Regulations and Airport Concessions**
4.3.1. Price Regulations
4.3.2. Airport Concessions and Airport Economics

4.4. **Air Transport Infrastructure: Supply and Demand**
4.4.1. The Nature of Air Transport Infrastructure
4.4.2. Supply of Airport and Air Navigation Services
4.4.3. Air Transport Demand

4.5. **Open Skies and Global Alliances**
4.5.1. Open Skies Agreement
4.5.2. Open Skies in Europe
4.5.3. Open Skies in Asia
4.5.4. Global Airline Alliances

4.6. **Economies of Aviation Safety and Security**

- 4.6.1. Incentives for Aviation Safety
- 4.6.2. Causes of Aviation Accidents
- 4.6.3. The Basic Economics of Safety
- 4.6.4. Safety Prevention

MODULE I

FUNDAMENTALS OF ECONOMICS

MEANING AND NATURE OF ECONOMICS

Economics was formerly called political economy. The term Political economy means the management of the wealth of the state. “Adam Smith, the father of modem Economics, in his book entitled 'An Enquiry into the Nature and Causes of the Wealth of Nations’ (Published in 1776) defined Economics as a study of wealth. Smith considered the acquisition of wealth as the main objective of human activity. According to him the subject matter of Economics is the study of how wealth is produced and consumed. Smith's definition is known as wealth definition.

This definition was too materialistic. It gave more importance to wealth than to man for whose use wealth is produced. The emphasis on wealth was severely criticized by many others. Cailyle, Ruskin and other philosophers called it the Gospel of Mammon. They even called it a dismal science as it was supposed to teach selfishness.

Later economists held that apart from man the said study of wealth has no meaning Economics is concerned not only with the production and use of wealth but also with man. It deals with wealth as serving the purpose of man. Wealth is only a means to the end of human welfare. We cannot consider the desire to acquire wealth as the inspiring factor behind every human endeavor. Nor can it be expected to be the sole cause of human happiness. The emphasis has now shifted from wealth to man. Man occupies the primary place and wealth only a secondary place.

Definitions of Economics

Economics is a study of the ways in which people use resources to satisfy their wants. The word wants requires little explanation. All of us want the food, clothing, and shelter that we need to stay alive. But most of us (even college teachers!) want much more. We want cars, television sets, vacation trips—in fact, our capacity to want is almost unlimited. In contrast, the things we want are always limited in quantity. Even in a wealthy country like the United States there is never enough of everything to satisfy all the wants of every person in the country. How to narrow this gap between what people want and what they are able to get is the basic problem studied in economics. We shall refer to this problem as the problem of scarcity.

Several definitions of Economics have been given. For the sake of convenience let us classify the various definitions into four groups:

- Science of wealth
- Science of material well-being
- Science of choice making and
- Science of dynamic growth and development

Science of wealth: Some earlier economists defined Economics as follows:

- "An inquiry into the nature and causes of the wealth of the nations'' by Adam Smith.
- "Science which deals with wealth" by J.B. Say.

In the above definition wealth becomes the main focus of the study of Economics. The definition of Economics, as science of wealth, had some merits. The important ones are:

- It highlighted an important problem faced by each and every nation of the world, namely creation of wealth.
- Since the problems of poverty, unemployment etc. can be solved to a greater extent when wealth is produced and is distributed equitably; it goes to the credit of Adam Smith and his followers to have addressed to the problems of economic growth and increase in the production of wealth.

The study of Economics as a 'Science of Wealth' has been criticized on several grounds. The main criticisms leveled against this definition are;

(i) Adam Smith and other classical economists concentrated only on material wealth. They totally ignored creation of immaterial wealth like services of doctors, chartered accountants etc.

(ii) The advocates of Economics as 'science of wealth' concentrated too much on the production of wealth and ignored social welfare. This makes their definition incomplete and inadequate.

Science of material well-being.

Under this group of definitions the emphasis is on welfare as compared with wealth in the earlier group. Two important definitions are as follows:

- "Economics is a study of mankind in the ordinary business of life. It examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of well-being. Thus, it is on the one side a study of wealth and on the other and more important side a part of the study of the man", Alfred Marshall
- "The range of our inquiry becomes restricted to that part of social welfare that can be brought directly or indirectly into relation with the measuring rod of money" by A.C. Pigou.

In the first definition Economics has been indicated to be a study of mankind in the ordinary business of life. By ordinary business we mean those activities which occupy considerable part of human effort. The fulfillment of economic needs is a very important business which every man ordinarily does. Professor Marshall has clearly pointed that

Economics is the study of wealth but more important is the study of man. Thus, man gets precedence over wealth. There is also emphasis on material requisites of well-being. Obviously, the material things like food, clothing and shelter, are very important economic objectives.

The second definition by Pigou emphasizes social welfare but only that part of it which can be related with the measuring rod of money. Money is general measure of purchasing power by the use of which the science of Economics can be rendered more precise.

Marshall's and Pigou's definitions of Economics are wider and more comprehensive as they take into account the aspect of social welfare. But their definitions have their share of criticism. Their definitions are criticised on the following grounds.

(i) Economics is concerned with not only material things but also with immaterial things like services of singers, teachers, actors etc. Marshall and Pigou chose to ignore them.

(ii) Robbins criticised the welfare definition on the ground that it is very difficult to state which things would lead to welfare and which will not. He is of the view that we would study in Economics all those goods and services which carry a price whether they promote welfare or not.

Science of choice making

Robbins gave a more scientific definition of Economics. His definition is as follows:

"Economics is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses".

The definition deals with the following four aspects:

(i) Economics is a science: Economics studies economic human behavior scientifically. It studies how humans try to optimize (maximize or minimize) certain objective under given constraints. For example, it studies how consumers, with given income and prices of the commodities, try to maximize their satisfaction.

(ii) Unlimited ends: Ends refer to wants. Human wants are unlimited. When one want is satisfied, other wants crop up. If man's wants were limited, then there would be no economic problem.

(iii) Scarce means: Means refer to resources. Since resources (natural productive resources, man- made capital goods, consumer goods, money and time etc.) are limited economic problem arises. If the resources were unlimited, people would be able to satisfy all their wants and there would be no problem.

(iv) Alternative uses: Not only resources are scarce, they have alternative uses. For example, coal can be used as a fuel for the production of industrial goods, it can

be used for running trains, it can also be used for domestic cooking purposes and for so many purposes. Similarly, financial resources can be used for many purposes. The man or society has, therefore, to choose the uses for which resources would be used. If there was only a single use of the resource then the economic problem would not arise.

It follows from the definition of Robbins that Economics is a science of choice. An important thing about Robbin's definition is that it does not distinguish between material and non- material, between welfare and non-welfare. Anything which satisfies the wants of the people would be studied in Economics. Even if a good is harmful to a person it would be studied in Economics if it satisfies his wants. No doubt, Robbins has made Economics a scientific study and his definition has become popular among some economists. But his definition has also been criticized on several grounds. Important ones are:

(i) Robbins has made Economics quite impersonal and colourless. By making it a complete positive science and excluding normative aspects he has narrowed down its scope.

(ii) Robbins' definition is totally silent about certain macro-economic aspects such as determination of national income and employment.

(iii) His definition does not cover the theory of economic growth and development. While Robbins takes resources as given and talks about their allocation, it is totally silent about the measures to be taken to raise these resources i.e. national income and wealth.

Science of dynamic growth and development

Although the fundamental economic problem of scarcity in relation to needs is undisputed it would not be proper to think that economic resources - physical, human, financial are fixed and cannot be increased by human ingenuity, exploration, exploitation and development. A modern and somewhat modified definition is as follows:

"Economics is the study of how men and society choose, with or without the use of money, to employ scarce productive resources which could have alternative uses, to produce various commodities over time and distribute them for consumption now and in the future amongst various people and groups of society". Paul A. Samuelson

The above definition is very comprehensive because it does not restrict to material well-being or money measure as a limiting factor. But it considers economic growth over time. The economist limits his studies to the attempts of people to get more of the things they want. But even in this limited area there are things which are outside his field of study. For reasons that will be made clear as we proceed, the economist confines his attention to those things which are exchanged.

Useful, scarce goods which can be exchanged are called economic goods. All other goods are called noneconomic goods.
Many of the things which satisfy human wants cannot be exchanged—the physical potential to play football, the liking of one's friends, the love of family members, etc. It may well be that these sources of satisfaction are more important than the ones which can be exchanged, the ones which the economist studies. However, most people seem to prefer some combination of economic goods and noneconomic goods.

Nature of Economics

Under this, we generally discuss whether Economics is science or art or both and if it is a science whether it is a positive science or a normative science or both.

Economics - As a science and as an art:
Often a question arises - whether Economics is a science or an art or both.

(a) Economics is a science: A subject is considered science if

- It is a systematized body of knowledge which studies the relationship between cause and effect.
- It is capable of measurement.
- It has its own methodological apparatus. It should have the ability to forecast.

If we analyze Economics, we find that it has all the features of science. Like science it studies cause and effect relationship between economic phenomena. To understand, let us take the law of demand. It explains the cause and effect relationship between price and demand for a commodity. It says, given other things constant, as price rises, the demand for a commodity falls and vice versa. Here the cause is price and the effect is fall in quantity demanded. Similarly like science it is capable of being measured, the measurement is in terms of money. It has its own methodology of study (induction and deduction) and it forecasts the future market condition with the help of various statistical and non-statistical tools. But it is to be noted that Economics is not a perfect science. This is because Economists do not have uniform opinion about a particular event. The subject matter of Economics is the economic behavior of man which is highly unpredictable. Money which is used to measure outcomes in Economics is itself a dependent variable. It is not possible to make correct predictions about the behavior of economic variables.

Economics is an art: Art is nothing but practice of knowledge. Whereas science teaches us to know art teaches us to do. Unlike science which is theoretical, art is practical. If we analyse Economics, we find that it has the features of an art also. Its various branches, consumption, production, public finance, etc. provide practical solutions to various

economic problems. It helps in solving various economic problems which we face in our day-to-day life.

Thus, Economics is both a science and an art. It is science in its methodology and art in its application. Study of unemployment problem is science but framing suitable policies for reducing the extent of unemployment is an art.

Economics as Positive Science and Economics as Normative Science

(i) Positive Science: As stated above, Economics is a science. But the question arises whether it is a positive science or a normative science. A positive or pure science analyses cause and effect relationship between variables but it does not pass value judgment. In other words, it states what is and not what ought to be. Professor Robbins emphasised the positive aspects of science but Marshall and Pigou have considered the ethical aspects of science which obviously are normative.

According to Robbins, Economics is concerned only with the study of the economic decisions of individuals and the society as positive facts but not with the ethics of these decisions. Economics should be neutral between ends. It is not for economists to pass value judgments and make pronouncements on the goodness or otherwise of human decisions. An individual with a limited amount of money may use it for buying liquor and not milk, but that is entirely his business. A community may use its limited resources for making guns rather than butter, but it is no concern of the economists to condemn or appreciate this policy. Economics only studies facts and makes generalizations from them. It is a pure and positive science, which excludes from its scope the normative aspect of human behaviour.

Complete neutrality between ends is, however, neither feasible nor desirable. It is because in many matters the economist has to suggest measures for achieving certain socially desirable ends. For example, when he suggests the adoption of certain policies for increasing employment and raising the rates of wages, he is making value judgments; or that the exploitation of labour and the state of unemployment are bad and steps should be taken to remove them. Similarly, when he states that the limited resources of the economy should not be used in the way they are being used and should be used in a different way; that the choice between ends is wrong and should be altered, etc. he is making value judgments.

(ii) Normative Science: As normative science, Economics involves value judgments. It is prescriptive in nature and described 'what should be the things'. For example, the questions like what should be the level of national income, what should be the wage rate, how the fruits of national product be distributed among people - all fall within the scope of normative science. Thus, normative economics is concerned with welfare propositions.

Some economists are of the view that value judgments by different individuals will be different and thus for deriving laws or theories, it should not be used.

Nature of Economic Laws

Every science, natural or social, has its laws. These laws are generalizations built upon the bases of facts, reasoning and scientific verification. In economic science also, there are many such laws. But, by their nature, economic laws are different from those of physical sciences like Physics and Chemistry.

First of all, economic laws are hypothetical; they are valid with the qualifying phrase "ceteris paribus' which means "other things being equal". This condition qualifies all economic laws. In actual life, other things seldom remain equal. But this does not deter the validity of economic laws. All social sciences are under the necessity to make certain assumptions. To quote Alfred Marshall, "Economic laws or statements of economic tendencies are those social laws which relate to branches of conduct in which the strength of the motives chiefly concerned can be measured by a money price". The implication of this definition is that given certain conditions, certain results are likely to occur. There is an element of uncertainty about them. For instance, the Law of Demand states that, if price rises, the demand for the commodity will contract. This is true and the law is quite valid, only when counteracting forces do not operate. Hence we say that economic laws are merely statements of tendencies. The hypothetical nature of economic laws in contrast to laws of natural sciences is due to the following reasons:

1. Economic laws are concerned with human behavior which is subject to emotions, impulses and feelings.
2. Time factor also makes for the hypothetical nature of economic laws.

With the passage of time, conditions change, and so also economic laws. However, economic laws are more exact than other social laws, because economic science makes use of the "measuring rod of money". To Marshall, the laws of economics are to be compared with the laws of tides rather than with the simple and exact law of gravitation. Economic laws, like tides, lack predictability and exactness.

Lionel Robbins, however, did not subscribe to this narrow view and broadened the scope of economic laws. Whether any objective or conduct of man is concerned with money or not is immaterial; still, it will fall within the ambit of economic laws, if it is involving the problem of choice, i.e., allocation of limited means among competing ends. In the view of Lionel Robbins, economic laws are statements of tendencies which govern human behavior relating to the use of scarce means for the achievement of unlimited wants.

Economic laws are not permanent, general and everlasting because they are framed in a particular social and institutional set- up. When the set- up itself changes, no longer the established law will remain relevant. Economic laws will undergo change with the evolution of economic life of man and transformation in the institutional set-up. Thus, economic laws applying to hunting and pastoral stages did not make sense in the agricultural and industrial stages. Economic laws framed in the context of capitalistic institutional set-up may not apply to the socialist countries. Laws of economics, valid for developed economies, may fail to apply to less developed countries because different conditions and factors obtain in these countries. Economic laws are not statutory commands or moral laws or even customary laws. They are merely in the indicative mood and not in the imperative mood.

Methods of Economic Analysis

As in the case of every other science, so in the field of economic analysis, there are two important methods useful for investigation and formulation of its principles, laws, generalizations or theorems. They are the deductive method the inductive method. The issue of whether deductive method is preferable to inductive method or vice versa was a raging controversy in the 19th century. The English classical economists like David Ricardo, T.R.Malthus, John Stuart Mill and Nassau Senior were solid advocates of deductive methodology.

Deduction

The deductive method is also called the abstract, analytical or a priori method. In this method, we start from a few indispensable facts and after making certain assumptions, through logical reasoning, certain conclusions are reached. It consists of three important stages, namely (i) observation, (ii) logical reasoning, and (iii) inference and testing by means of further observations. Deductive reasoning provides us with hypothesis which are tested and verified with relevance to facts and figures and then we draw valid economic laws.

In economics we start with simple premises and step by step work up to more complex and refined hypothesis. In this method, we descend from the general to the particular.

The following merits are found in the deductive method:

1. It is simple and logical.
2. It does away with the need for experimentation.
3. It leads to accuracy in generalisation due to logical reasoning.

However, there are certain defects:

1. If assumptions made are wrong, generalizations made on the basis of wrong assumptions will also be invalidated.
2. There is too much abstraction and economists through their intellectual exercise give rise to only "intellectual toys" without any reality.
3. Generalizations of deduction based on wrong premises may become dangerous and disastrous results will follow when governments frame policies on such premises.

Induction Method

The inductive method is also known as the empirical method. It derives economic generalizations based on experience and observations. In this, data are collected with reference to certain economic phenomena and finally generalizations are derived from the collected data and observations. Here we mount from the particular to the general. From observations we build up through reasoning founded on experience, to formulate generalizations based on observed data. The historical school of Germany represented by Carl Knies, Hildebrand, Prof. Roscher and Von Thunen were strong and staunch supporters of the inductive method. It should, however, be emphasized that the division of opinion between the two schools of thought was neither complete nor clear-cut.

In the inductive method, economic scientists proceed from a particular angle to scientific problems to bridge the gap between theory and practice. Induction is done by either experimentation or the statistical approach and these are the two forms of induction. Experimentation has larger scope in the physical sciences and the statistical approach in social sciences like economics. The famous Malthusian Theory of Population and Engel's Law of Consumption are based on the statistical approach.

The merits of the inductive method are as follows:

1. It leads to precise, measurable conclusions.
2. It is highly practical and realistic.
3. It is helpful in verifying the conclusions of the deductive method.
4. It emphasizes relativity of economic laws which are valid only under certain conditions and circumstances.

The following are the drawbacks of the inductive method:

1. There is an underlying risk of drawing false and hurried conclusions from inadequate data and facts.
2. The collection of data and facts in itself is no easy work.

Divorced from deduction which uses logical analysis, it would only produce a mass of unrelated and unconnected facts and figures. Induction alone would not deliver the goods unless it is supplemented by using deductive reasoning.

Micro-Economic Analysis

The subject matter of economics consists of two parts, namely Micro economics and Macro economics. Ragnar Frisch. Who is among the first Nobel laureates in Economics coined these term. Which are now universally used. "Micro" is derived from the Greek word “Mikros" meaning small and "Macro" from "Makros" meaning large.

In Micro–Economics we study the economic behaviour of an individual, firm or industry in the national economy. It is thus a study of a particular unit rather than all the units combined. We mainly study the following in Micro-Economics:

(i) Product pricing;
(ii) Consumer behaviour
iii) Factor pricing;
iv) Economic conditions of a section of the people;
(v) Study of firms; and
(vi) Location of a industry.

According to K.E. Boulding, "Micro economics is the study of particular firms, particular households, individual prices, wages, incomes, individual industries, particular commodities". Thus, it deals with the analysis of small individual units of the economy such as individual consumers, firms and small groups of individual units such as various industries and markets; it is a microscopic study of the economy. Herein it should be emphasized that it does not study the economy in its totality. It looks at the economy through a microscope, to analyse how the millions of units in the economy (analogous to cells in any organism) play their part in the functioning of the entire economic organisation. To quote Prof.Mc.Connel, "Micro Economics is concerned with specific economic units and a detailed consideration of the behavior of these individual units. In Micro Economics, we examine the trees, not the forest. Micro Economics is useful in achieving a worm's-eye view of some very specific component of our economic system’’

Macro-Economic Analysis

Macroeconomics is the study of aggregates; hence called Aggregative Economics. It is the analysis of the entire economic system, the overall conditions of an economy like total investment and total production. In the words of K. E. Boulding, "Macroeconomics deals not with individual quantities as such but with aggregates of these quantities; not with individual incomes, but with the national income; not with individual prices but with the price levels; not with individual outputs but with the national output." It analyses the entire economy and its large aggregates like total national income and output, aggregate consumption, saving and investment and total employment.

In Macro-Economics, we study the economic behavior of the large aggregates such as the overall conditions of the economy such as total production, total consumption, total saving

and total investment in it. It is the study of overall economic phenomena as a whole rather than its individual parts. It includes:

(i) National income and output;
(ii) General price level;
(iii) Balance of trade and payments;
(iv) External value of money;
(v) Saving and investment; and
(vi) Employment and economic growth.

Thus, when we study why we continue to have balance of payments deficits, or why the value of rupee vis-a-vis dollar is falling or why saving rates are high or low in a particular country we are studying Macro-Economics.

In the view of Prof. Mc. Connel, "The level of Macroeconomics is concerned either with the economy as a whole or with the basic sub-divisions or aggregates such as governments, households and businesses which make up the economy In short, macroeconomics examines the forest, not the trees. It gives us a bird's-eye view of the economy". It deals with the great averages and aggregates of the system rather than with particular units composing it.

ECONOMICS AND LAWS OF DEMAND

Demand Analysis

In economic science, the term "demand" refers to the desire, backed by the necessary ability to pay. The demand for a good at a given price is the quantity of it that can be bought per unit of time at the price. There are three important things about the demand:

- It is the quantity desired at a given price.
- It is the demand at a price during a given time.
- It is the quantity demanded per unit of time.

The factors that determine the size and amount of demand are manifold. The term "function" is employed to show such "determined" and "determinant" relationship. For instance, we say that the quantity of a good demanded is a function of its price i.e. -

$$\text{i.e., } Q = f(p)$$

➔ Q represents quantity demanded

➔ f means function, and

➔ p represents price of the good.

There are many important determinants of the demand for a commodity:

- Price of the goods : The first and foremost determinant of the demand for good is price. Usually, higher the price of goods, lesser will be the quantity demanded of them.
- Income of the buyer: The size of income of the buyers also influences the demand for a commodity. Mostly it is true that "larger the income, more will be the quantity demanded".
- Prices of Related Goods: The prices of related goods also affect the demand for a good. In some cases, the demand for a good will go up as the price of related good rises. The goods so inter-related arc known as substitutes, e.g. radio and gramophone. In some other cases, demand for a good will comes down as the price of related good rises. The goods so inter-related are complements, e.g. car and petrol, pen and ink, cart and horse, etc.
- Tastes of the buyer: This is a subjective factor. A commodity may not be purchased by the consumer even though it is very cheap and useful, if the commodity is not up to his taste or liking. Contrarily, a good may be purchased by the buyer, even though it is very costly, if it is very much liked by him.
- Seasons prevailing at the time of purchase; In winter, the demand for woollen clothes will rise; in summer, the demand for cool drinks rises substantially; in the rainy season, the demand for umbrellas goes up.
- Fashion: When a new film becomes a success, the type of garments worn by the hero or the heroine or both becomes an article of fashion and the demand goes up for such garments.
- Advertisement and Sales promotion: Advertisement in newspapers and magazines, on outdoor hoardings on buses and trains and in radio and television broadcasts, etc. have a substantial effect on the demand for the good and thereby improves sales.

The need to have clarity in demand analysis makes us adopt a 'ceteris paribus' assumption, i.e. all other things remain the same except one. This enables us to consider the relation between demand and each of the variable factors considered in isolation.

Law of Demand

For a long period of time economists are much interested to study the relationship of price and sales. An indepth knowledge of such relationship is necessary for the management

Law of Demand

Among the many causal factors affecting demand, price is the most significant and the price- quantity relationship called as the Law of Demand is stated as follows: "The greater the amount to be sold, the smaller must be the price at which it is offered in order that it may find purchasers, or in other words, the amount demanded increases with a fall in price and diminishes with a rise in price" (Alfred Marshall). In simple words other things being equal, quantity demanded will be more at a lower price than at higher price. The law assumes that income, taste, fashion, prices of related goods, etc. remain the same in a given period. The law indicates the inverse relation between the price of a commodity and its quantity demanded in the market. However, it should be remembered that the law is only an indicative and not a quantitative statement. This means that it is not necessary that such variation in demand be proportionate to the change in price.

Demand Schedule

It is a list of alternative hypothetical prices and the quantities demanded of a good corresponding to these prices. It refers to the series of quantities an individual is ready to buy at different prices. An imaginary demand schedule of an individual for apples is given below:

Price of an Apple per Unit (in Rupees)	Quantity Demanded of Apples (in dozens)
5	1
4	2
3	3
2	4

Table 1: Demand of a Consumer for Apples

Assuming the individual to be rational in his purchasing behaviour, the above schedule illustrates the law of demand. At Rs.5/- per apple, the consumer demands 1 dozen of apples; at Rs.4/- per unit 2 dozens, at Rs.3/- per unit 3 dozens and at Rs.2/~ per unit 4 dozens. Thus the inverse relationship between price and demand is shown in the demand schedule.

Demand Curve

When the data presented in the demand schedule can be plotted on a graph with quantities demanded on the horizontal or X- axis and hypothetical prices on the vertical or Y- axis, and a smooth curve is hypothetical prices on the vertical or Y- axis, and a smooth curve is drawn Joining all the points so plotted, it gives a demand curve. Thus, the demand schedule is translated into a diagram known as the demand curve.

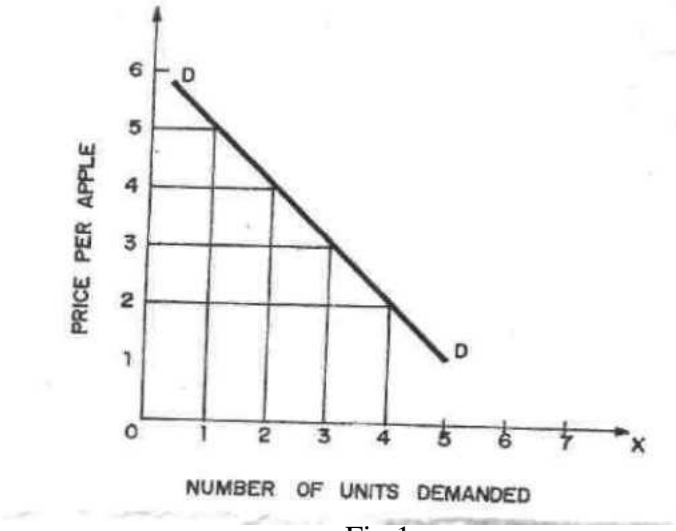


Fig.1

The demand curve slopes downwards from left to right, showing the inverse relationship between price and quantity as in Figure 1.

The market demand reflects the total quantity purchased by all consumers at alternative hypothetical prices. It is the sum- total of all individual demands. It is derived by adding the quantities demanded by each consumer for the product in the market at a particular price. The table presenting the series of quantities demanded of all consumers for a product in the market at alternative hypothetical prices is known as the Market Demand Schedule. If the data are represented on a two dimensional graph, the resulting curve will be the Market Demand Curve. From the point of view of the seller of the product, the market demand curve shows the various quantities that he can sell at different prices. Since the demand curve of an individual is downward sloping, the lateral addition of such curves to get market demand curve will also result in downward sloping curve.

Shifts in Demand Curve

The price-quantity relationship represented by the law of demand is important but it is more important for the manager of the firm to know about the shifts in the demand function (or curve). For many products, change in price has little effect in the quantity demanded in relevant price ranges. Many other determinants like incomes, tastes, fashion, and business activity have larger effect on demand for such product. Thus, changes or shifts in demand curve rather than movement along the demand curve is of greater significance to the decision-maker in the firm.

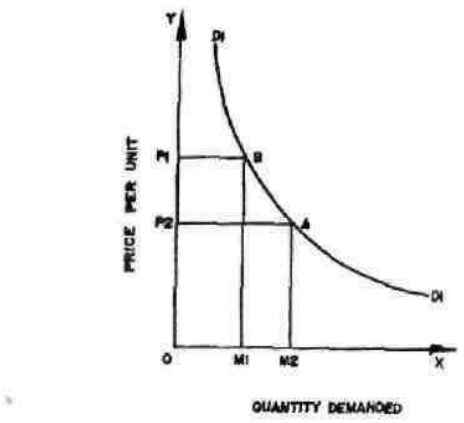


Figure 2.

Let us clearly know the difference between movement along one and the same demand curve and shift in demand curve due to changes in demand. When price of a good alone varies, ceteris paribus, the quantity demanded of the good changes. These changes due to price variations alone are called as extension or contraction of demand represented by movement along the same demand curve. Such movement along the same demand curve is shown in Figure 2(a). Price declines from OP1 to OP2 and demand goes up from OM1 to OM2. Here the demand for the good is said to have extended or expanded. This is represented by movement from point A to point B along the demand curve. On the contrary, if price rises from OP2 to OP1 demand falls from OM2 to OM1. Here the demand for the good is said to have contracted. This is represented by movement from point B to point A along the demand curve D1D1.

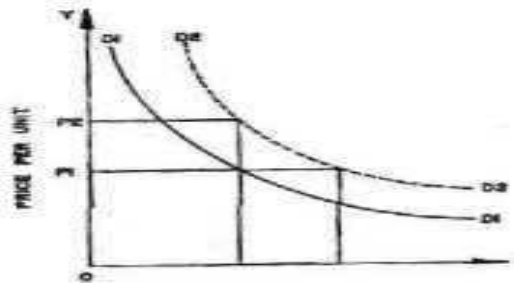


Figure 2(b)

Shifts in demand curve take place on account of determinants other than price such as changes in income, fashion, tastes, etc. The ceteris paribus assumption is relaxed; other factors than price influence demand and the impact of these factors on demand is described as changes in demand or shifts in demand, showing increase or decrease in demand. This kind of change is shown in Figure 2(b). The quantity demanded at OP1 is OM1. If, as a result of increase in income, more of the product is demanded, say OM2 at the same price OP1. Note that OM2 is due to the new demand curve D2D2. This is a case

of shift in demand. Due to fall in income, less of the good may be demanded at the same price and this will be a case of decrease in demand. Thus increase or decrease in demand with shifts in demand curves upward or downward are different from extension or contraction of demand.

Causes of changes in demand may be due to:

- Changes in the consumer's income.
- Changes in the tastes of the consumer.
- Changes in the prices of related goods (substitutes and complements).
- Changes in exogenous factors like fashion, social structure, etc.

Why The Demand Curve Slopes Downward Or Reasons For The Law Of Demand

Truly, the demand curve slopes left downward to right, throughout its length although the slope may be much steeper in some parts. It means, demand increases with the fall in price and contracts with an increase in price. There are several reasons responsible for the inverse price demand relationship which has been explained as under:

- Law of Diminishing Marginal Utility. The law of demand is based on the law of diminishing marginal utility which states that as the consumer purchases more and more units of a commodity, the utility derived from each successive unit goes on decreasing. It means as the price of the commodity falls, consumer purchases more of the commodity so that his marginal utility from the commodity falls to be equal to the reduced price and vice-versa.
- Substitution Effect. Substitution effect also leads the demand curve to slope from left downward to right. As the price of a commodity falls, prices of its substitute goods remain the same, the consumer will buy more of that commodity. For instance, tea and coffee are the substitute goods. If the price of tea goes down, the consumers may substitute tea for coffee, although price of coffee remains the same. Therefore, with a fall in price, the demand will increase due to favorable substitution effect. On the other hand with the rise in price, the demand falls due to unfavorable substitution effect. This is nothing but the application of Law of Demand.
- Income Effect. Another reason for the downward slope of demand curve is the income effect. As the price of the commodity falls, the real income of the consumer goes up. Real income is that income which is measured in terms of goods and services. For example, a consumer has Rs.20, he wants to buy oranges whose price is Rs.20 per dozen. It means the consumer can buy one dozen of oranges with his fixed income. Now, suppose, the price of the oranges falls to Rs.15 per dozen which leads to an increase in his real income by Rs.5. In this case, either the consumer will buy more quantity of oranges than before or he will buy some other commodity with his increased income.

- New Consumers. When the price of commodity falls, many other consumers who were not consuming that commodity previously will start consuming the commodity. As a result, total market demand goes up. For example, if the price of radio set falls, even the poor man can buy the radio set. Consequently, the total demand for radios goes up.
- Several Uses. Some commodities can be put to several uses which lead to downward slope of the demand curve. When the price of such commodities goes up they will be used for important purposes, so their demand will be limited. On the other hand, when the price falls, the commodity in question will extend its demand. For instance, when the price of coal increases, it will be used for important purposes but as the price falls its demand will increase and it will be used for many other uses.
- Psychological Effects. When the price of a commodity falls, people favour to buy more which is natural and psychological. Therefore, the demand increases with the fall in prices. For example, when the price of silk falls, it is purchased for all the members of the family.

Exceptions to the Law Of Demand

The Law of Demand will not hold good in certain peculiar cases in which more will be demanded at a higher price and less at a lower price. In these cases the demand curves will be exceptionally different, differing from the usual downward sloping shape of the demand curve. The exceptions are as follows:

(i) Conspicuous goods: Some consumers measure the utility of a commodity by its price i.e., if the commodity is expensive they think that it has got more utility. As such, they buy less of this commodity at low price and more of it at high price. Diamonds are often given as example of this case. Higher the price of diamonds, higher is the prestige value attached to them and hence higher is the demand for them.

ii) Giffen goods: Sir Robert Giffen, an economist, was surprised to find out that as the price of bread increased, the British workers purchased more bread and not less of it. This was something against the law of demand. Why did this happen? The reason given for this is that when the price of bread went up, it caused such a large decline in the purchasing power of the poor people that they were forced to cut down the consumption of meat and other more expensive foods. Since bread even when its price was higher than before was still the cheapest food article, people consumed more of it and not less when its price went up.

Such goods which exhibit direct price-demand relationship are called 'Giffen goods'. Generally those goods which are considered inferior by the consumers and which occupy a substantial place in consumer's budget are called 'Giffen goods'. Examples of such goods are coarse grains like bajra, low quality of rice and wheat etc.

(iii) Future expectations about prices: It has been observed that when the prices are rising, households expecting that the prices in the future will be still higher tend to buy larger quantities of the commodities. For example, when there is wide-spread drought, people expect that prices of food grains would rise in future. They demand greater quantities of food grains as their price rise. But it is to be noted that here it is not the law of demand which is invalidated but there is a change in one of the factors which was held constant while deriving the law of demand, namely change in the price expectations of the people.

(iv) The law has been derived assuming consumers to be rational and knowledgeable about market-conditions. However, at times consumers tend to be irrational and make impulsive purchases without any cool calculations about price and usefulness of the product and in such contexts the law of demand fails.

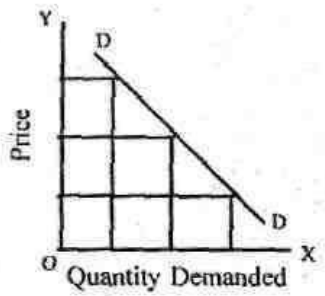
(v) Similarly, in practice, a household may demand larger quantity of a commodity even at a higher price because it may be ignorant of the ruling price of the commodity. Under such circumstances, the law will not remain valid.

The law of demand will also fail if there is any significant change in other factors on which demand of a commodity depends. If there is a change in income of the household, or in prices of the related commodities or in tastes and fashion etc. the inverse demand and price relation may not hold good.

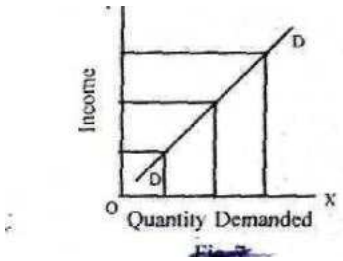
Types Of Demand

There are three types of demand. They are

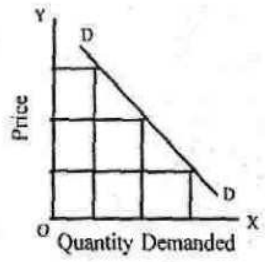
- Price Demand: It refers to the various quantities of the good which consumers will purchase at a given time and at certain hypothetical prices assuming that other conditions remain the same. We are generally concerned with price demand only. In the explanation of the law of demand given above, we dealt in detail with price demand only.



- Income Demand: Income demand refers to the various quantities of a commodity that a consumer would buy at a given time at various levels of income. Generally, when the income increases, demand increases and vice versa.



- Cross Demand: When the demand of one commodity is related with the price of other commodity is called cross demand. The commodity may be substitute or complementary.



Substitute goods are those goods which can be used in case of each other. For example, tea and coffee, Coca-cola and Pepsi. In such case demand and price are positively related. This means if the price of one increased then the demand for other also increases and vise versa. Complementary goods are those goods which are jointly used to satisfy a want. In other words, complementary goods are those which are incomplete without each other. These are things that go together, often used simultaneously. For example, pen and ink.

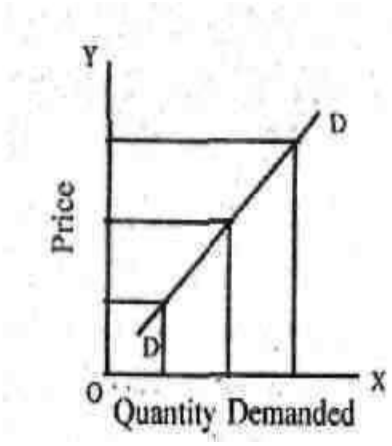


Fig. 5 (a)

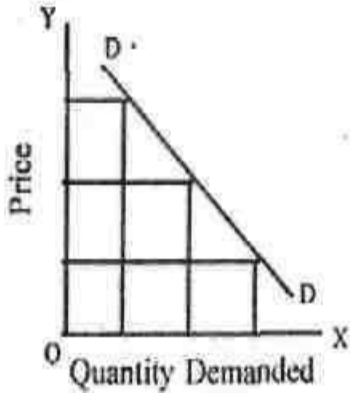


Fig. 5 (b)

Tennis rackets and tennis balls, cameras and film, etc. In such goods the price and demand are negatively related. This means when the price of one commodity increases the demand for the other falls.

Extension and Contraction of Demand

The change in demand due to change in price only (when other factors remain constant) is called extension and contraction of demand. Increase in demand due to fall in price is called extension of demand. Decrease in demand due to rise in price is called contraction of demand. Extension and Contraction of demand results in movement on the same demand curve. It is shown in the following diagram.

When price is OP, the quantityFig-6 demanded is OQ. Suppose the price falls from OP2 to 0P2 demand will be increased to OQ2. This is a downward movement along the demand curve DD from a to c. This indicates extension of demand. When the price rises to OP1, the demand will be decreased to OQ2 this is an upward movement along the demand curve from a to b. This indicates contraction of demand.

Shift in Demand

We have seen that the demand depends not only on price but also on other factors like income, population, taste and preference of consumers etc. The change in demand due to change in any of the factors other than the price is'called shift in demand. Change in any one of the factors shifts the entire demand curve. A change in demand will shift the demand curve either upwards or downwards. An upward shift in demand curve is called increase in demand. Downward shift in demand curve is called decrease in demand. Shift in demand is shown in the following diagram.

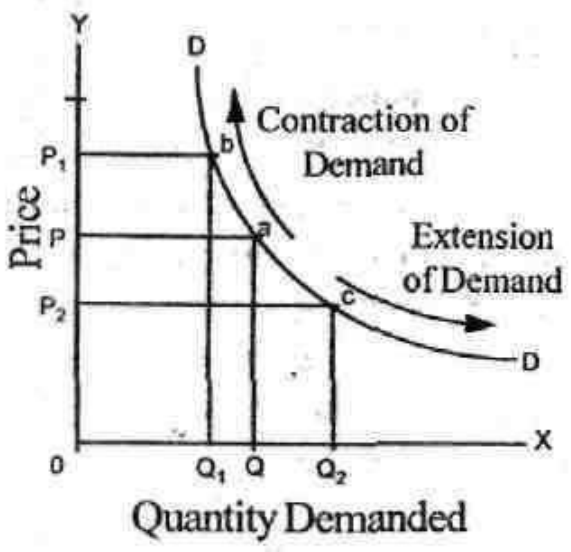


Fig - 7

In the given figure DD is the original demand curve. When the demand increases, (e.g., due to increase in income) the curve will shift upwards to D2D2 without any increase in price. It is constant at OP. Similarly when the demand decreases, (e.g., due to decrease in income) the curve will shift downwards to D1D1. The price remains constant.

Thus extension of demand is different from increase in demand. Likewise, contraction of demand doesn't mean decrease in demand. It should be noted that exclusion and contraction of demand is called "change in quantity demanded" and shift in demand is called "change in demand".

Other Types of Demand

Joint demand: When several commodities are demanded for a joint purpose or to satisfy a particular want. It is a case of a joint demand. Milk , sugar and tea dust are jointly demanded to make tea. Similarly, we may demand paper, pen and ink for writing. Demand for such commodities in bunch is known as joint demand. Demand for land, labour, capital and organisation for producing commodity is also a case of joint demand.

Composite demand: The demand for a commodity which can be put to several uses is a composite demand. In this case a single product is wanted for a number of uses. For example, electricity is used for lighting, heating, for running the engine, for the fans etc. Similarly coal is used in industries, for cooking etc.

Direct and Derived demand: The demand for a commodity which is for direct consumption, i.e.. Demand for ultimate object, is called direct demand, e.g food, cloth, etc. Direct demand is called autonomous demand. Here the demand is not linked with the purchase of some main products. When the commodity is demanded as a result of the demand for another commodity or service, it is known as the derived demand or induced demand. For example, demand for cement is derived from the demand for building construction; demand for tires is derived from the demand for cars or scooters, etc.

Importance of the Law of Demand

The law of demand plays a crucial role in decision-making and forward planning of a business unit. The production planning in a firm mainly rests on accurate demand analysis. The law of demand has theoretical as well as practical advantages. These are as follows:

1. Price determination: With the help of law of demand a monopolist fixes the price of his product. He is able to decide the most profitable quantity of output for him.

2. Useful to government: The finance minister takes the help of this law to know the effects of his tax reforms and policies. Only those commodities which have relatively inelastic demand should be taxed.

3. Useful to farmers: From the law of demand, the farmer knows how far a good or bad crop will affect the economic condition of the fanner. If there is a good crop and demand for it remains the same, price will definitely go down. The farmer will not have much benefit from a good crop, but the rest of the society will be benefited.

4. In the field of planning: The demand schedule has great importance in planning for individual commodities and industries. In such cases it is necessary to know whether a given change in the price of the commodity will have the desired effect on the demand for commodity within the country or abroad. This is known from a study of the nature of demand schedule for the commodity.

Indifference Curve Analysis

In the last section we discussed marginal utility analysis of demand. A very popular alternative and more realistic method of explaining consumer's demand is the Indifference Curve Analysis. This approach to consumer behaviour is based on consumer preferences. It believes that human satisfaction being a psychological phenomenon cannot be measured quantitatively in monetary terms as was attempted in Marshall's utility analysis. In this approach it is felt that it is much easier and scientifically more sound to order preferences than to measure them in terms of money.

The consumer preference approach, is, therefore an ordinal concept based on ordering of preferences compared with Marshall's approach of cardinality.

Assumptions Underlying Indifference Curve Approach

- The consumer is rational and possesses full information about all the relevant aspects of economic environment in which he lives.
- The consumer is capable of ranking all conceivable combinations of goods according to the satisfaction they yield. Thus if he is given various combinations say A, B, C, D, E he can rank them as first preference, second preference and so on.
- If a consumer happens to prefer A to B, he can not tell quantitatively how much he prefers A to B.
- If the consumer prefers combination A to B, and B to C, then he must prefer combination A to C. In other words, he has consistent consumption pattern behavior.
- If combination A has more commodities than combination B, then A must be preferred to B.

What are Indifference Curves? Ordinal analysis of demand (here we will discuss the one given by Hicks and Allen) is based on indifference curves. An indifference curve is a curve which represents all those combinations of goods which give same satisfaction to the consumer. Since all the combinations on an indifference curve give equal satisfaction to the consumer, the consumer is indifferent among them. In other words, since all the combinations provide same level of satisfaction the consumer prefers them equally and does not mind which combination he gets.

To understand indifference curves let us consider the example of a consumer who has one unit of food and 12 units of clothing. Now we ask the consumer how many units of

clothing he is prepared to give up to get an additional unit of food, so that his level of satisfaction does not change. Suppose the consumer says that he is ready to give up 6 units of clothing to get an additional unit of food. We will have then two combinations of food and clothing giving equal satisfaction to consumer: Combination A has 1 unit of food and 12 units of clothing, combination B has 2 units of food and 6 units of clothing. Similarly, by asking the consumer further how much of clothing he will be prepared to forgo for successive increments in his stock of food so that his level of satisfaction remains unaltered, we get various combinations as given below:

Table of Indifference

Table 2

Combination	Food	Clothing	MRS
A	1	12	
B	2	6	6
C	3	4	2
D	4	3	1

Now if we draw the above schedule we will get the following figure.

In Figure 8, an indifference curve IC is drawn by plotting the various combinations of the indifference schedule. The quantity of food is measured on the X axis and the quantity of clothing on the Y axis. As in indifference schedule, combinations lying on an indifference curve will give the consumer same level of satisfaction.

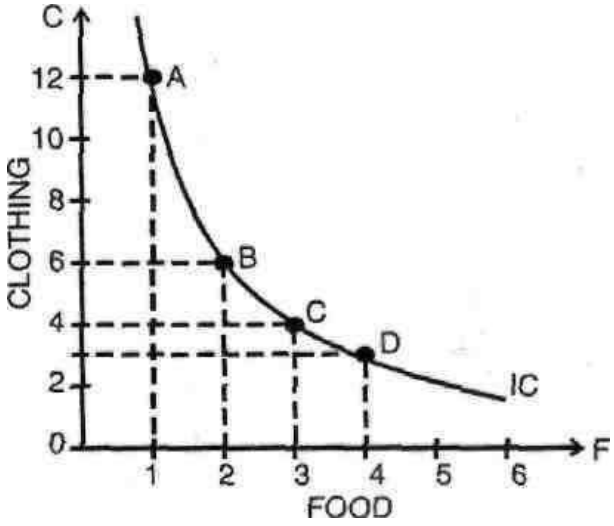


Fig. 8 : A Consumer's Indifference Curve

Indifference Map: A set of indifference curves is called indifference map.

An indifference map depicts complete picture of consumer's tastes and preferences. In Figure 9, an indifference map of a consumer is shown which consists of three indifference curves. We have taken good X on X-axis and good Y on Y-axis. It should be noted that while the consumer is indifferent among the combinations lying on the same indifference curve, he certainly prefers the combinations on the higher indifference curve to the combinations lying on a lower indifference curve because a higher indifference curve signifies a higher level of .satisfaction. Thus while all combinations of IC, give same satisfaction, all combinations lying on IC2 give greater satisfaction than those lying on IC1

Marginal Rate of Substitution: Marginal Rate of Substitution (MRS) is the rate at which the consumer is prepared to exchange goods X and Y Consider Table-2. In the beginning the consumer is consuming 1 unit of food and 12 units of clothing. Subsequently, he gives up 6 units of clothing to get an extra unit of food, his level of satisfaction remaining the same. The MRS here is 6. Like wise which he moves from B to C and from C to D in his indifference schedule, the MRS are 2 and 1 respectively. Thus, we can define MRS of X for Y as the amount of Y whose loss can just be compensated by a unit gain of X in such a manner that the level of satisfaction remains the same. We notice that MRS is falling i.e., as the consumer has more and more units of food, he is prepared to give up less and less units of cloths. There are two reasons for this.

- The want for a particular good is satiable so that when a consumer has its more quantity, his intensity of want for it decreases. Thus, when consumer in our example, has more units of food, his intensity of desire for additional units of food decreases.
- Most of the goods are imperfect substitutes of one another. If, they could substitute one another perfectly. MRS would remain constant.

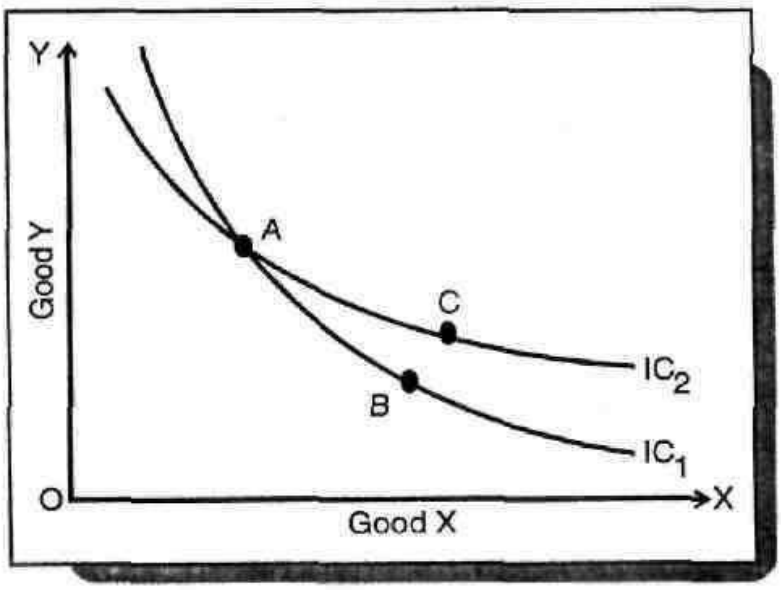
Properties of Indifference Curves: The following are the main characteristics or properties of indifference curves :

(i) Indifference curves slope downward to the right: This property implies that when the amount of one good in combination is increased, the amount of the other good is reduced. This is essential if the level of satisfaction is to remain the same on an indifference curve.

(ii) Indifference curves are always convex to the origin: It has been observed that as more and more of one commodity (X) is substituted for another (Y), the consumer is willing to part with less and less of the commodity being substituted (i.e. Y). This is called diminishing marginal rate of substitution. Thus in our example of food and clothing, as a consumer has more and more units of food, he is prepared to forego less and less units of clothing. This happens mainly because want for a particular good is satiable and as a

person has more and more of a good, his intensity of want for that good goes on diminishing. This diminishing marginal rate of substitution gives convex shape to the indifference curves. However, there are two extreme situations. When two goods are perfect substitutes of each other, the indifference curve is a straight line on which MRS is constant. And when two goods are perfect complementary goods (e.g. gasoline and water in a car), the indifference curve will consist of two straight line with a right angle bent which is convex to the origin or in other words, it will be L shaped.

(iii) Indifference curves can never intersect each other: No two indifference curves will intersect each other although it is not necessary that they are parallel to each other. In case of intersection the relationship becomes logically absurd because it would show that higher and lower levels are equal which is not possible. This property will be clear from the following Figure 10.

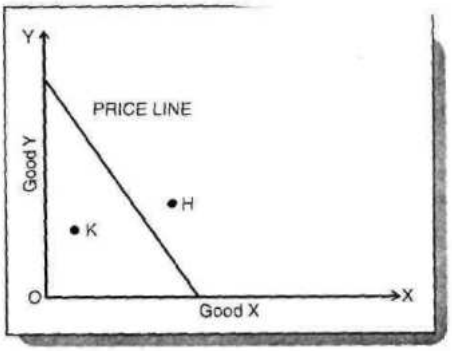


Intersecting Indifference Curves

In figure 10 IC1, and IC2 intersect at A. Since A and B lie on IC1, they give same satisfaction to the consumer. Similarly since A and C lie on IC2, they give same satisfaction to the consumer. This implies that combination B and C are equal in terms of satisfaction. But a glance will show that this is an absurd conclusion because certainly combination C is better than combination B because it contains more units of commodities X and Y. Thus we see that no two indifference curves can touch or cut each other.

A higher indifference curve represents a higher level of satisfaction than the lower indifference curve: This is because combinations lying on a higher indifference curve contain mere of either one or both goods and more goods are preferred to less of them.

Budget line : A higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer in his attempt to maximise satisfaction will try to reach the highest possible indifference curve. But in his pursuit of buying more and more goods and thus obtaining more and more satisfaction he has to work under two constraints : firstly, he has to pay the prices for the goods and, secondly, he has a limited money income with which to purchase the goods. These constraints are explained by budget line or price line. In simple words a budget line shows all those combinations of two goods which the consumer can buy spending his given money income on the two goods at their given prices. All those combinations which are within the reach of the consumer (assuming that he spends all his money income) will lie on the budget line.



: Price Line

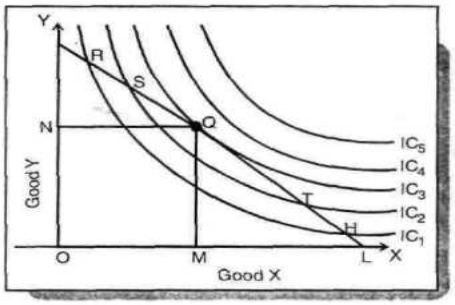
Fig. 11

It should be noted that any point outside the given price line, like H, will be beyond the reach of the consumer and any combination lying within the line, like K, shows under spending by the consumer.

Consumer's Equilibrium: Having explained indifference curves and budget line, we are in a position to explain how a consumer reaches equilibrium position. A consumer is in equilibrium when he is deriving maximum possible satisfaction from the goods and is in no position to rearrange his purchases of goods. We assume that :

- the consumer has a given indifference map which shows his scale of preferences for various combinations of two goods X and Y.
- he has a fixed money income which he has to spend wholly on goods X and Y. (iii)prices of goods X and Y are given and are fixed for him.

To show which combination of two goods X and Y the consumer will buy to be in equilibrium we bring his indifference map and budget line together.



Consumer's Equilibrium

Fig. 12

We know by now, that the indifference map depicts the consumer's preference scale between various combinations of two goods and the budget line shows various combinations which he can afford to buy with his given money income and prices of the two goods. Consider Figure 12, in which IC1, IC2, IC3, IC4 and IC5 are shown together with budget line PL for good X and good Y. Every combination on budget line PL costs the same. Thus combinations R, S, Q, T and H cost the same to the consumer. The consumer's aim is to _aximize his satisfaction and for this he will try to reach highest indifference curve.

But since there is a budget constraint he will be forced to remain on the given budget line, that is he will have to choose any combinations from among only those which lie on the given price line.

Which combination will he choose? Suppose he chooses R, but we see that R lies on a lower indifference curve IC1, when he can very well afford S, Q or T lying on higher indifference curve. Similar is the case for other combinations on IC1, like H. Again, suppose he chooses combination S (or T) lying on IC2. But here again we see that the consumer can still reach a higher level of satisfaction remaining within his budget constraints i.e., he can afford to have combination Q lying on IC3 because it lies on his budget line. Now what if he chooses combination Q? We find that this is the best choice because this combination lies not only on his budget line but also puts him on highest possible indifference curve i.e., IC3 The consumer can very well wish to reach IC4 or IC5, but these indifference curves are beyond his reach given his money income. Thus the consumer will be at equilibrium at point Q on IC3. What do we notice at point Q? We notice that at this point, his budget line PL is tangent to the indifference curve IC3. In this equilibrium position (at Q), the consumer will buy OM of X and ON of Y.

Elasticity of Demand

The concept of price-elasticity of demand was first of all introduced in economics by Dr. Marshall. In simple words, price elasticity of demand is the ratio of percentage change in quantity demanded to the percentage change in price. In other words, price elasticity of demand is a measure of the relative change in quantity purchased of a good in response to a relative change in its price. It is, thus a rate at which the demand changes to the given change in prices. So, it means the rate or the degree of response in demand to the change in price. Thus, the co-efficient of price-elasticity of demand can be expressed as under:

$$E_d = \frac{\text{Proportionate Change in Quantity Demanded}}{\text{Proportionate Change in Prices}}$$

Definitions of Price Elasticity of Demand

The concept of price elasticity of demand has been defined by different economists as under :

- According to Alfred Marshall: "*Elasticity of demand may be defined as the percentage change in quantity demanded to the percentage change in price*."
- According to A.K. Cairncross: "*The elasticity of demand for a commodity is the rate at which quantity bought changes as the price changes*."
- According to J.M. Keynes: "*The elasticity of demand is a measure of the relative change in quantity to a relative change in price*."
- According to Kenneth Boulding: "*Elasticity of demand measures the responsiveness of demand to changes in price.*"

Different commodities have different price elasticities. Some commodities have more elastic demand while others have relative elastic demand. Basically, the price elasticity of demand ranges from zero to infinity. It can be equal to zero, less than one, greater than one and equal to unity.

According to Dr. Marshall : "The elasticity or reponsiveness of demand in a market is great or small according as the amount demanded increases much or little for a given fall in price and diminishes much or little for a given rise in price."

However, some particular values of elasticity of demand have been explained as under:

Perfectly Elastic Demand:

Perfectly elastic demand is said to h appen when a little change in price leads to an infinite change in quantity demanded. A small rise in price on the part of the seller reduces the demand to zero. In such a case the shape of the demand curve will be horizontal straight line as shown in figure 13

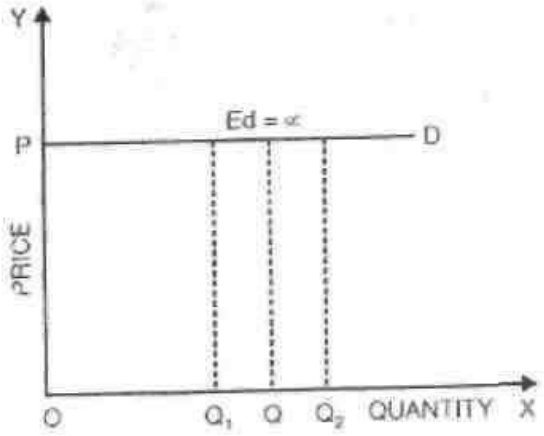


Figure 13

The figure 13 shows that at the ruling price OP, the demand is infinite. A slight rise in price will contract the demand to zero. A slight fall in price will attract more consumers but the elasticiy of demand will remain infinite. But in real world, the cases of perfectly elastic demand are exceedingly rare and are not of any practical interest.

Perfectly inelastic Demand

Perfectly inelastic demand is opposite to perfectly elastic demand. Under the perfectly inelastic demand, irrespective of any rise or fall in price of a commodity, the quantity demanded remains the same. The elasticity of demand in this case will be equal to zero. In diagram 14, DD shows the perfectly inelastic demand. At price OP, the quantity demanded is OQ. Now, the price falls to OP, from OP1, demand remains the same. Similarly, if the price rises to OP2 the demand still remains the same. But just as we do not see the example of perfectly elastic demand in the real world, in the same fashion it is difficult to come across the cases of perfectly inelastic demand because even the demand for bare essentials of life does show some degree of responsiveness to change in price.

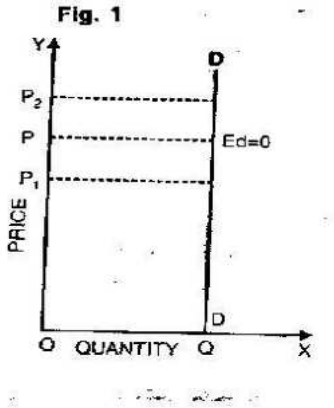


Fig. 14

Unitary Elastic Demand:

The demand is said to be unitary elastic when a given proportionate change in the price level brings about an equal proportionate change in quantity demanded, The numerical value of unitary elastic demand is exactly one i.e., ed = 1. Marshall calls it unit elastic.

In figure 15, DD demand curve represents unitary elastic demand. This demand curve is called rectangular hyperbola. When price is OP, the quantity demanded is OQ1. Now price falls to OP1, the quantity demanded increases to OQ1. The shaded area in the fig. equal in terms of price and quantity demanded denotes that in all cases price elasticity of demand is equal to one.

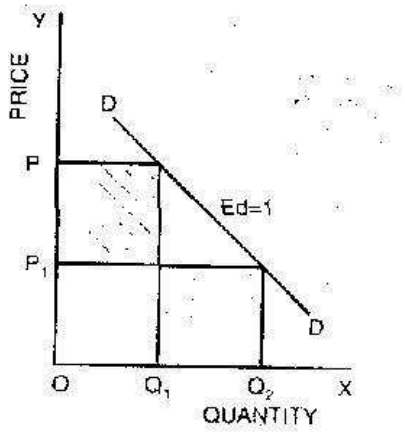


Fig. 15

Relatively Elastic Demand

Relatively elastic demand refers to a situation in which a small change in price leads to a big change in quantity demanded. In such a case elasticity of demand is said to be more than one. This has been shown in figure 16.

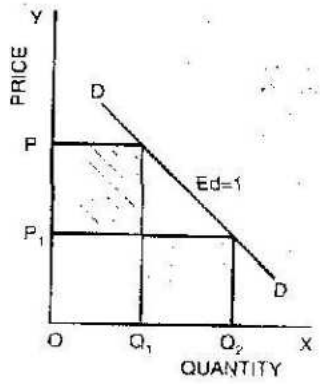
Relatively Inelastic Demand

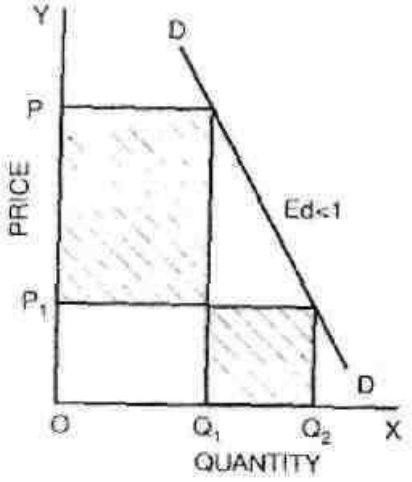
Under the relatively inelastic demand a given percentage change in price produces a relatively less percentage change in quantity demanded. In such a case elasticity of demand is said to be less than one as shown in figure 17.

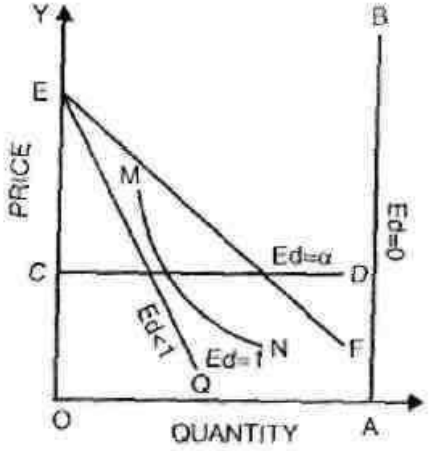
All the five degrees of elasticity of demand have been shown in figure 18. On OX axis, quantity demanded and on OY axis price is given. It shows:

- AB — Perfectly Inelastic Demand
- CD — Perfectly Elastic Demand
- EQ — Less Than Unitary Elastic Demand

- EF — Greater Than Unitary Elastic Demand
- MN — Unitary Elastic Demand







Factors Determining Price Elasticity of Demand

The factors that determine elasticity of demand are numberless. But the most important among them are the nature, uses and prices of related goods and the level of income. They are stated below:

I. Nature of the commodity: Generally, all commodities can be dividend into three categories i.e.

(i) Necessaries of Life. For necessaries of life the demand is inelastic because people buy the required amount of goods whatever their price. For example, necessaries such as rice, salt, cloth are purchased whether they are dear or cheap.

(ii) Conventional Necessaries. The demand for conventional necessaries is less elastic or inelastic. People are accustomed to the use of goods like intoxicants which they purchase at any price. For example, drunkards consider opium and wine almost as a necessity as food and water. Therefore, they buy the same amount even when their prices are higher and highest.

(iii) Luxury Commodities. The demand for luxury is usually elastic as people buy more of them at a lower price and less at a higher price. For example, the demand of luxuries like silk, perfumes and ornaments increases at a lower price and diminishes at a higher price. Here, we must keep in mind that luxury is a relative term, which varies from person to person, place to place and from time to time. For example, what is a luxury to a poor man is a necessity to the rich. The luxury of the past may become a necessity of today. Similarly a commodity which is a necessity to one class may be a luxury to another. Hence, the elasticity of demand in such cases should have to be carefully expressed.

2. Substitutes. Demand is elastic for those goods which have substitutes and inelastic for those goods which have no substitutes. The availability of substitutes, thus, determines the elasticity of demand. For instance, tea and coffee are substitutes. The change in the price of tea affects the demand for coffee. Hence, the demand for coffee and tea is elastic.

3. Number of Uses. Elasticity of demand for any commodity depends on its number of uses. Demand is elastic; if a commodity has more uses and inelastic if it has only one use. As coal has multiple uses, if its price falls it will be demanded more for cooking, heating, industrial purposes etc. But if its price rises, minimum will be demanded for every purpose.

4. Postponement. Demand is more elastic for goods the use of which can be postponed. For example, if the price of silk rises, its consumption can be postponed. The demand for silk is, therefore, elastic. Demand is inelastic for those goods the use of which is urgent and, therefore, cannot be postponed. The use of medicines cannot be put off. Hence, the demand for medicines is inelastic.

5. Raw Materials and Finished Goods. The demand for raw materials is inelastic but the demand for finished goods is elastic. For instance, raw cotton has inelastic demand but cloth has elastic demand. In the same way, petrol has inelastic demand but car itself has only elastic demand.

6. Price Level. The demand is elastic for moderate prices but inelastic for lower and higher prices. The rich and the poor do not bother about the prices of the goods that

they buy. For example, rich buy Benaras silk and diamonds etc. at any price. But the poor buy coarse rice, cloth etc. whatever their prices are.

7. Income Level. The demand is inelastic for higher and lower income groups and elastic for middle income groups. The rich people with their higher income do not bother about the price. They may continue to buy the same amount whatever the price. The poor people with lower incomes buy always only the minimum requirements and, therefore, they are induced neither to buy more at a lower price nor less at a higher price. The middle income group is sensitive to the change in price. Thus, they buy more at a lower price and less at higher price.

8. Habits. If consumers are habituated of some commodities, the demand for such commodities will be usually inelastic. It is because that the consumer will use them even their prices go up. For example, a smoker does not smoke less when the price of cigarette goes up.

9. Nature of Expenditure. The elasticity of demand for a commodity also depends as to how much part of the income is spent on that particular commodity. The demand for such commodities where a small part of income is spent is generally highly inelastic i.e. newspaper, boot-polish etc. On the other hand, the demand of such commodities where a significant part of income is spent, elasticity of demand is very elastic.

10. Distribution of Income. If the income is uniformly distributed in the society, a small change in price will affect the demand of the whole society and the demand will be elastic. In case of unequal distribution of income and wealth, a change in price will hardly influence the poor section of the society and the demand will be relatively inelastic.

11. Influence of Diminishing Marginal Utility. We know that utility falls when we consume more and more units but not in a uniform way. In case utility falls rapidly, it means that the consumer has no other near substitutes. As a result, demand is inelastic. Conversely, if the utility falls slowly, demand for such commodity would be elastic and raises much for a fall in price.

Measurement of Price Elasticity Of Demand

There are five methods to measure the price elasticity of demand.

- Total Expenditure Method.
- Proportionate Method.
- Point Elasticity of Demand.
- Arc Elasticity of Demand.
- Revenue Method.

Total Expenditure Method

Dr. Marshall has evolved the total expenditure method to measure the price elasticity of demand. According to this method, elasticity of demand can be measured by considering the change in price and the subsequent change in the total quantity of goods purchased and the total amount of money spend on it.

Total Outlay = Price x Quantity Demanded.

There are three possibilities:

(i) If with a fall in price (demand increases) the total expenditure increases or with a rise in price (demand falls) the total expenditure falls, in that case the elasticity of demand is greater than one i.e. (Ed >1.)

(ii) If with a rise or fall in the price (demand falls or rises respectively), the total expenditure remains the same, the demand will be unitary elastic i.e. (Ed = 1).

(iii) with a fall in price (Demand rises), the total expenditure also falls, and with a rise in price (Demand falls) the total expenditure also rises, the demand is said to be less elastic or elasticity of demand is less than one i.e. (Ed <1).

Table Representation: The method of total expenditure has been explained with the help of Table 3.

Table 3

Price	ntity Demanded	Total Outlay	ticity of Demand
10	1	10	
9	2	18	
8	3	24	ED > 1
7	4	28	
6	5	30	ED = 1
5	6	30	
4	7	28	
3	8	24	
2	9	18	
1	10	10	ED < 1

In the above Table 3, we find three possibilities:

More Elastic Demand: When price is Rs. 10 the quantity demanded is 1 unit and total expenditure is 10. Now price falls from Rs. 10 to Rs. 6, the quantity demanded increases from 1 to 5 units and correspondingly the total expenditure increases from Rs. 10 to Rs.

30. Thus it is clear that with the fall in price, the total expenditure increases and vice-versa. So elasticity of demand is greater than one or Ed > 1.

Unitary Elastic Demand: If price is Rs. 6, demand is 5 units so the total outlay is Rs. 30. Now price falls to Rs. 5, the demand increases to 6 units but the total expenditure remains the same i.e., Rs. 30. Thus it is clear that with the rise or fall in price, the total expenditure remains the same. The elasticity of demand in this case is equal to one or Ed = 1.

Less Elastic Demand: If price is Rs. 5, demand is 6 and total outlay is Rs. 30. Now price falls from Rs. 5 to Re. 1. The demand increases from 6 units to 10 units and hence the total expenditure falls from Rs. 30 to Rs. 10. Thus it is clear that with the fall in price, the total expenditure also falls and vice-versa. In this case, the elasticity of demand is less

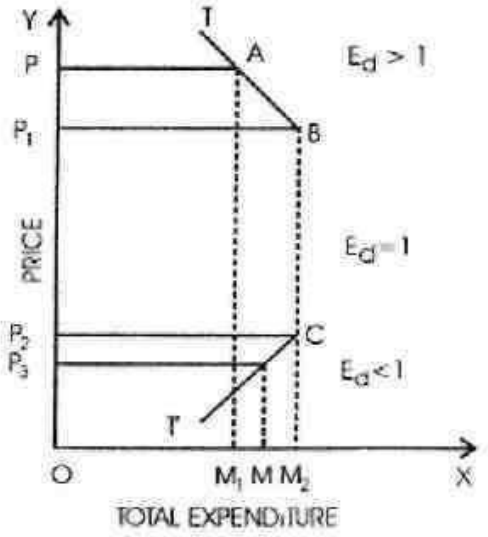


Fig. 19

Diagrammatic Representation:

Measurement of price elasticity through total expenditure method can be shown with the help of fig. 19

In the figure 19 total expenditure has been shown on X-axis and price on Y-axis. Line TT' is the total expenditure line. When price of the commodity falls from OP to OP1 total expenditure increases from OM1 to OM2. The elasticity of demand is greater than one as is shown in TB portion of the figure. Now, suppose that the price of the commodity decreases from OP1 to OP3 the total expenditure falls from OM2 to OM. This is shown in T'C part of the figure which represents the less than unity elasticity of demand. In the same way, BC part of the figure represents the unit elasticity of demand.

Thus it is clear that the changes in total expenditure due to changes in price also affect the elasticity of demand.

Proportionate Method:

This method is also associated with the name of Dr. Marshall. According to this method, "price elasticity of demand is the ratio of percentage change in the amount demanded to the percentage change in price of the commodity." It is also known as the Percentage Method, Flux Method, Ratio Method, and Arithmetic Method.

E_d = Proportionate Change in Quantity Demanded
Proportionate Change in Prices

Arc Elasticity of Demand

According to **Prof. Baumol:** "Arc elasticity is a measure of the average responsiveness to price change exhibited by a demand curve over some finite stretch of the curve".

According to **Watson:** "Arc elasticity is the elasticity at the mid-point of an are of a demand curve."

According to **Leftwitch :** "When elasticity is computed between two separate points on a demand curve, the concept is called Are elasticity."

This method of measuring elasticity of demand is also known as 'Average Elasticity'.
In this method we use :

$$\frac{P+P}{2}$$

However rather than P, we apply:

$$\frac{Q1+Q2}{2}$$

Thus the formula for Arc Elasticity of Demand (EA) is as follows:

Change in demand

Original demand + New demand =

Change in price

Original Price + New Price

Are elasticity of demand in notational farm can be express where

Q1 = Original quantity demanded

Q2 = New quantity demanded

P1 = Original price

P2 = New price

This can be shown with the help of a diagram 20. In figure 20 quantity is measured on X-axis while price on Y- axis. DD is the demand curve. Now if we want to measure the arc elasticity between A and B on the demand curve DD, we will have to take the average of prices OPl and OP2 as well as of quantities; Q1 and Q2.

$$= \frac{\vdash (P + \Delta P)]}{+ (Q + \Delta Q)]} \times$$

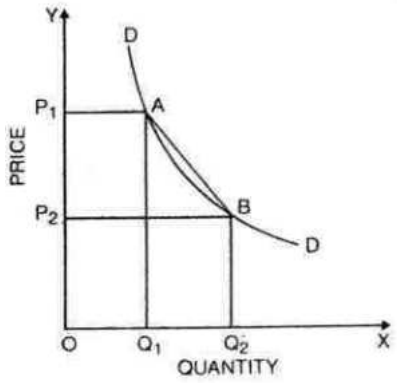
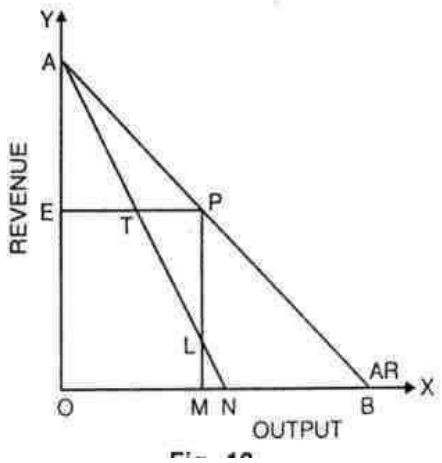


Fig. 20

Revenue Method

Mrs. Joan Robinson has given this method. She says that elasticity of demand can be measured with the help of average revenue and marginal revenue. Therefore, a sale proceeds that a firm obtains by selling its products is called its revenue. However, when total revenue is divided by the number of units sold, we get average revenue. On the contrary, when addition is made to the total revenue by the sale of one more unit of the commodity is called marginal revenue. Therefore, the formula to measure elasticity of demand can be written as,

$$E_d = \frac{A}{A\text{-}M}$$



where Ed represents elasticity of demand, A = average revenue and M = marginal revenue. This method can be explained with the help of diagram 21.

In this diagram 21 revenue has been shown on OY-axis while quantity of goods on OX-axis. AB is the average revenue or demand curve and AN is the marginal revenue curve. At point P on demand curve, elasticity of demand is calculated with the formula,

$$E_p = \frac{LowerPortion}{UpperPortion} \text{ or } \frac{PB}{PA}$$

We can see in the figure that ΔAEP and ΔPMB are similar, thus ratio of their sides is also equal.

$$E_p = \frac{PB}{PA} = \frac{PM}{AE}$$

and; ΔAET and ΔTPL are congruent triangles, therefore PL = AE. Putting PL in place of AE in the above equation, we shall get

$$E_p = \frac{PM}{PL}$$ (Because PL = PM—LM)

Income Elasticity of Demand

According to Stonier and Hague: "Income elasticity of demand shows the way in which a consumer's purchase of any good changes as a result of change in his income."

It shows the responsiveness of a consumer's purchase of a particular commodity to a change in his income. Income elasticity of demand means the ratio of percentage change in the quantity demanded to the percentage change in income. In brief income elasticity –

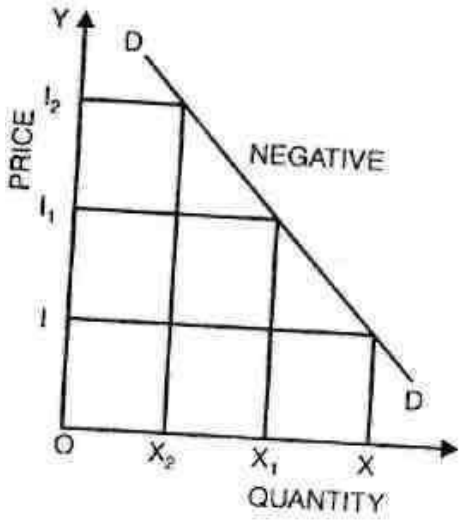
$$I_e = \frac{\text{Proportionate Change in Quantity Purchased}}{\text{Proportionate Change in Income}}$$

$$I_e = \frac{\text{Percentage Change in Demand}}{\text{Percentage Change in Income}}$$

Degrees of Income Elasticity of Demand

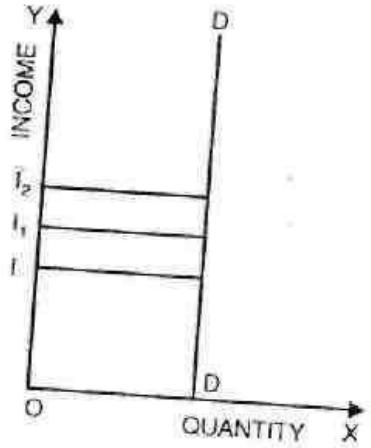
Positive income elasticity of Demand: Positive income elasticity of demand is said to occur when with the increase in the income of the consumer, his demand for goods and services also increases and vice-versa. Income elasticity of demand is positive in case of normal goods.

Negative Income Elasticity of Demand: Negative income elasticity of demand is said to occur when increase in the income of the consumers is accompanied by fall in demand of goods and services and vice-versa. It is the case of giffen goods.
In fig. 23 when income of the consumer is 01, demand for goods and services is OX. Now as the income I1 increases to I1 quantity demanded falls o to OX1. Again as the income increases to I2, quantity demanded falls to OX2. DD is the negative income elasticity of demand curve



(iii) Zero Income Elasticity of Demand: Zero income elasticity of demand is said to exist when increase or decrease in income has no impact on the demand of goods and services.

In fig. 24 initially when income is OI, quantity demanded is OD. Now, income increases to OI2 demand Remains constant i.e. OD. Even when income reduces to 01 , quantity demanded remains OD



Generally, as income increases demand for goods increases. But in some cases, demand may not change to change in income or demand may diminish for an increase in income. The former case represents zero income elasticity. Income elasticity is zero if a change in income fails to produce any change in demand. Income elasticity is negative, if an increase in income leads to a reduction of demand. This happens only in the case of inferior goods. But in all other cases it is positive.

In short income elasticity is greater than one for luxuries but less than one for necessaries.

Cross Elasticity Of Demand

It is the ratio of proportionate change in the quantity demanded of Y to a given proportionate change in the price of the related commodity X. It is a measure of relative change in the quantity demanded of a commodity due to a change in the price of its substitute complement.

It can be expressed as

Cross elasticity may be infinite or zero. It is infinite if the slightest change in the

price of X causes a substantial change in the quantity demanded of Y. It is always the case with goods which have perfect substitutes for one another.

Cross elasticity is zero, if a change in the price of one commodity will not affect the quantity demanded of the other. In the case of goods which are not related to each other, cross elasticity of demand is zero.

C_e = proportionate change in the quantity demanded of Y
proportionate change in the price of X

Cross elasticity may be infinite or zero. It is infinite if the slightest change in the Fig – 24 price of X causes a substantial change in the quantity demanded of Y. It is always the case with goods which have perfect substitutes for one another.

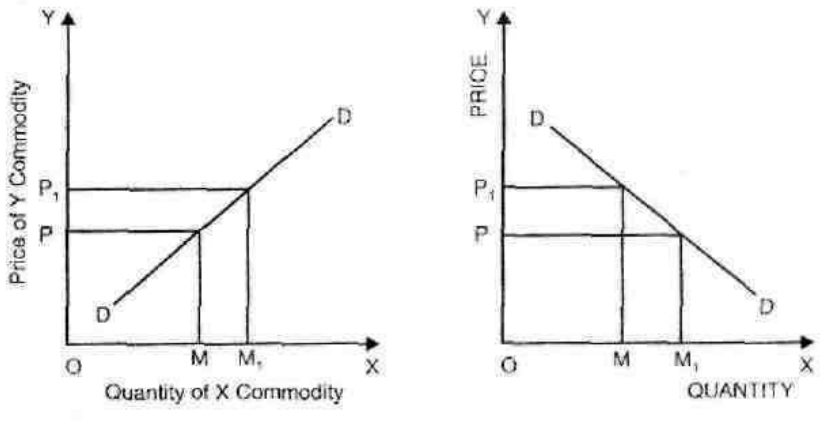
Cross elasticity is zero, if a change in the price of one commodity will not affect the quantity demanded of the other. In the case of goods which are not related to each other, cross elasticity of demand is zero.

Types of Cross Elasticity of Demand

1.Positive : When goods are substitute of each other than cross elasticity of demanded is positive. In other words, when an increase in the price of Y leads to an increase in the demand of X. For instance with the increase in price of a tea, demand of coffee will increase. In fig 25 Quantity has been measured on OX axis and price on OY axis. At price OP of Y commodity, demand of X – commodity is OM. Now as price Of Y commodity increase to OP1 demand of X-commodity increases to OM1. Thus, cross, elasticity of demand is positive.

2. Negative: In case of complementary goods, cross elasticity of demand is negative. A proportionate increase in price of one commodity leads to a proportionate fall in the demand, of .another commodity because both are demanded jointly

In fig. 26 quantity has been measured on OX-axis while price has been measured on OY-axis. When the price of commodity increases from OP to OP_1 quantity demanded falls from OM to OM_1 Thus, cross elasticity of demand is negative



3. Zero: Cross elasticity of demand is zero when two goods are related to each other. For instance, increase in price of car does not affect the demand of cloth. Thus, cross elasticity of demand is zero. It has been shown in fig. 27

Therefore, it can be concluded that cross elasticity depends upon Substitutability is perfect, cross elasticity is infinite; if on the other hand, substitutability does not exist, cross elasticity is zero. In the case of complementary goods like jointly demanded goods cross elasticity is negative. A rise in the price of one commodity X will mean not only decrease in the quantity of X but also decrease in the quantity demanded of Y because both are demanded together.

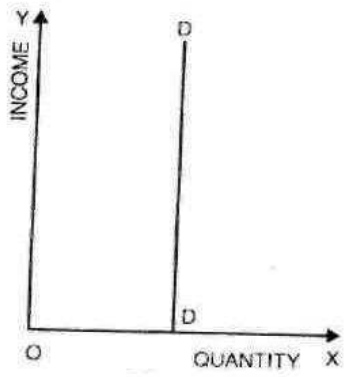


Fig. 27

Limitations of Cross Elasticity of Demand

The cross elasticity of demand is a useful measure of price-demand relationships between commodities. But this concept has following two limitations.

- Negative Cross Elasticity does not always mean complementarily.
- Cross Elasticity of Demand is only a one-way Relationship

Importance Of Elasticity Of Demand

The concept of elasticity of demand is of great importance in practical life. Its main points are given as under:

1. Useful for Business: It enables the business in general and the monopolists in particular to fix the price. Studying the nature of demand the monopolist fixes higher prices for those goods which have inelastic demand and lower prices for goods which have elastic demand. In this way, this helps him to maximise his profit.

2. Fixation of Prices: It is very useful to fix the price of jointly supplied goods. In the case of joint products like paddy and straw, the cost of production of each is not known. The price of each is then fixed by its elastic and inelastic demand.

3. Helpful to Finance Minister: It helps the Finance Minister to levy tax on goods. After levying taxes more and more on goods which have inelastic demand, the Government collects more revenue from the people without causing them inconvenience. Moreover, it is also useful for the planning.

4. Fixation of Wages: It guides the producers to fix wages for labourers. They fix high or low wages according to the elastic or inelastic demand for the labour.

5. In the Sphere of International Trade: It is of greater significance in the sphere of international trade. It helps to calculate the terms of trade and the consequent gain from foreign trade. If the demand for home product is inelastic, the terms of trade will be profitable to the home country.

6. Paradox of Poverty. It explains the paradox of poverty in the midst of plenty. A bumper crop instead of bringing prosperity may result in disaster, if the demand for it is inelastic. This is specially so, if the products are perishable and not storable.

7. Significant for Government Economic Policies. The knowledge of elasticity of demand is very important for the government in such matters as controlling of business cycles, removing inflationary and deflationary gaps in the economy. Similarly, for price stabilization and the purchase and sale of stocks, information about elasticity of demand is most useful.

8. Determination of Price of Public Utilities. This concept is significant in the determination of the prices of public utility services. Economic welfare of the society largely depends upon the cheap availability.

Demand Forecasting

Meaning of Demand Forecasting

Future is uncertain. There is great deal of uncertainty with regard to demand. Since the demand is uncertain, production, cost, revenue, profit etc. are also uncertain. Through forecasting it is possible to minimise the uncertainties. Forecasting simply refers to estimating or anticipating future events. It is an attempt to foresee the future by examining the past. Thus demand forecasting means estimating or anticipating future demand on the basis of past data.

Objectives of Demand Forecasting

A. Short Term Objectives

- To help in preparing suitable sales and production policies.
- To help in ensuring a regular supply of raw materials.
- To reduce the cost of purchase and avoid unnecessary purchase.
- To ensure best utilization of machines.
- To make arrangements for skilled and unskilled workers so that suitable labour force may be maintained.
- To help in the determination of a suitable price policy.
- To determine financial requirements.
- To determine separate sales targets for all the sales territories.
- To eliminate the problem of under or over production.

B. Long term Objectives

- To plan long term production.
- To plan plant capacity.
- To estimate the requirements of workers for long period and make arrangements.
- To determine an appropriate dividend policy.
- To help the proper capital budgeting.
- To plan long term financial requirements.
- To forecast the future problems of material supplies and energy crisis.

Factors Affecting Demand Forecasting

For making a good forecast, it is essential to consider the various factors governing demand forecasting. These factors are summarized as follows.

1. Prevailing business conditions: While preparing demand forecast it becomes necessary to study the general economic conditions very carefully. These include the price level changes, change in national income, percapita income, consumption pattern, savings and investment habits, employment etc.

2. Conditions within the industry: Every business enterprise is only a unit of a particular industry. Sales of that business enterprise are only a part of the total sales of that industry. Therefore, while preparing demand forecasts for a particular business enterprise, it becomes necessary to study the changes in the demand of the whole industry, number of units within the industry, design and quality of product, price policy, competition within the industry etc.

3. Conditions within the firm: Internal factors of the firm also affect the demand forecast. These factors include plant capacity of the firm, quality of the product, price of the product, advertising and distribution policies, production policies, financial policies etc.

4. Factors affecting export trade: If a firm is engaged in export trade also it should consider the factors affecting the export trade. These factors include import and export control, terms and conditions of export, exim policy, export conditions, export finance etc.

5. Market behaviour : While preparing demand forecast, it is required to consider the market behavior which brings about changes in demand.

6. Sociological conditions: Sociological factors have their own impact on demand forecast of the company. These conditions relate to size of population, density, change in age groups, size of family, family life cycle, level of education, family income, social awareness etc.

7. Psychological conditions: While estimating the demand for the product, it becomes necessary to take into consideration such factors as changes in consumer tastes, habits, fashions, likes and dislikes, attitudes, perception, life styles, cultural and religious bents etc.

8. Competitive conditions: The competitive conditions within the industry may change. Competitors may enter into market or go out of market. A demand forecast prepared without considering the activities of competitors may not be correct.

Process of Demand Forecasting/ Steps in Demand Forecasting

Demand forecasting involves the following steps:

- Determine the purpose for which forecasts are used.
- Subdivide the demand forecasting programme into small I parts on the basis of product or sales territories or markets.
- Determine the factors affecting the sale of each product and their relative importance.
- Select the forecasting methods.
- Study the activities of competitors.
- Prepare preliminary sales estimates after, collecting necessary data.
- Analyse advertisement policies, sales promotion plans, personal sales arrangements etc. and ascertain how far these programmes have been successful in promoting the sales.
- Evaluate the demand forecasts monthly, quarterly, half yearly or yearly and necessary adjustments should be done.
- Prepare the final demand forecast on the basis of preliminary forecasts and the results of evaluation.

Methods of Demand Forecasting for Established Products

There are several methods to predict the future demand. All methods can be broadly classified into two. (A) Survey methods, (B) Statistical methods

(A) Survey methods

Under this method surveys are conducted to collect information about the future purchase plans of potential consumers. Survey methods help in obtaining information about the desires, likes and dislikes of consumers through collecting the opinion of experts or by interviewing the consumers. Survey methods are used for short term forecasting. Important survey methods are (a) consumers interview method, (b) collective opinion or sales force opinion methodic) experts opinion method, (d) consumers clinic and (f) end use method.

(a) Consumers' interview method (Consumers survey): Under this method, consumers are interviewed directly and asked the quantity they would like to buy. After collecting the data, the total demand for the product is calculated. This is done by adding up all individual demands. Under the consumer interview method, either all consumers or selected few are interviewed. When all the consumers are interviewed, the method is known as complete enumeration method. When only a selected group of consumers are interviewed, it is known as sample survey method

Advantages

- It is a simple method because it is not based on past record.
- It suitable for industrial products.
- The results are likely to be more accurate.
- This method can be used for forecasting the demand of a new product.

Disadvantages

- It is expensive and time consuming.
- Consumers may not give their secrets or buying plans.
- This method is not suitable for long term forecasting.
- It is not suitable when the number of consumer is large.

(b)Collective opinion method: Under this method the salesmen estimate the expected sales in their respective territories on the basis of previous experience. Then demand is estimated after combining the individual forecasts (sales estimates) of the salesmen.

This method is also known as sales force opinion method.

Advantages

- This method is simple.
- It is based on the first hand knowledge of Salesmen.

- This method is particularly useful for estimating demand of new products.
- It utilises the specialised knowledge of salesmen who are in close touch with the prevailing market conditions.

Disadvantages

- The forecasts may not be reliable if the salespeople are not trained.
- It is not suitable for long period estimation.
- It is not flexible.
- Salesmen may give lower estimates that make possible easy achievement of sales quotas fixed for each salesman.

(c)Experts' opinion method: This method was originally developed at Rand Corporation in 1950 by Olaf Helmer, Dalkey and Gordon. Under this method, demand is estimated on the basis of opinions of experts and distributors other than salesmen and ordinary consumers. This method is also known as Delphi method. Delphi is the ancient Greek temple where people come and prey for information about their future.

Advantages

- Forecast can be made quickly and economically
- This is a reliable method because estimates are made on the basis of knowledge and experience of sales experts.
- The firm need not spare its time on preparing estimates of demand.
- This method is suitable for new products.

Disadvantages

- This method is expensive.
- This method sometimes lacks reliability

(d)Consumer clinics: In this method some selected buyers are given certain amounts of money and asked to buy the products. Then the prices are changed and the consumers are asked to make fresh purchases with the given money. In this way the consumers" responses to price changes are observed. Thus the behaviour of the consumers is studied. On this basis demand is estimated. This method is an improvement over consumer's interview method.

Merits

- It provides an opportunity to study the behaviour of consumers directly.
- It provides reliable and realistic picture about future demand.
- It gives useful information to aid in the decision making process.

Demerits

- It is a time consuming method.
- Selecting the participants is very difficult.
- It is expensive.
- Consumers may take it as a game. They may not reveal their preferences.

(e) End use method: This method is based on the fact that a product generally has different uses. In the end use method, first a list of end users (final consumers, individual industries, exporters etc.) is prepared. Then the future demand for the product is found either directly from the end users or indirectly by estimating their future growth. Then the demand of all end users of the product is added to get the total demand for the product.

Statistical Methods

Statistical methods use the past data as a guide for knowing the level of future demand. Statistical methods are generally used for long run forecasting. These methods are used for established products. Statistical methods include: (i) Trend projection method, (ii) Regression and Correlation, (iii) Extrapolation method, (iv) Simultaneous equation method, and (v) Barometric method.

(i)Trend projection method: Future sales are based on the past sales, because future is the grand-child of the past and child of the present. Under the trend projection method demand is estimated on the basis of analysis of past data. This method makes use of time series (data over a period of time). We try to ascertain the trend in the time series. The trend in the time series can be estimated by using any one of the following four methods:

(a) Least-square method, (b) Free- hand method, (c) Moving average method and (d) semi-average method.

(ii) Regression and Correlation: These methods combine economic theory and statistical technique of estimation. Under these methods the relationship between the sales (dependent variable) and other variables (independent variables such as price of related goods, income, advertisement etc.) is ascertained. Such relationship established on the basis of past data may be used to analyse the future trend. The regression and correlation analysis is also called the econometric model building.

(iii) Extrapolation: Under this statistical method, the future demand can be extrapolated by applying Binomial expansion method. This method is used on the assumption that the rate of charge in demand in the past has been uniform.

(iv) Simultaneous equation method.-This involves the development of a complete econometric model which can explain the behaviour of all the variables which the company can control. This method is not very popular.

(v) Barometric technique: This is an improvement over the trend projection method. According to this technique the events of the present can be used to predict the directions of change m the future. Here certain economic and statistical indicators from the selected time series are used to predict variables. Personal income, non-agricultural placements, gross national income, prices of industrial materials, wholesale commodity prices, industrial production, bank deposits etc. are some of the most commonly used indicators.

Advantages of Statistical Methods

- The method of estimation is scientific
- Estimation is based on the theoretical relationship between sales (dependent variable) and price, advertising, income etc. (independent variables)
- These are less expensive.
- Results are relatively more reliable.

Disadvantages of Statistical Methods

- These methods involve complicated calculations.
- These do not rely much on personal skill and experience.
- These methods require considerable technical skill and experience in order to be effective.

Methods of Demand Forecasting for New Products

Demand forecasting of new product is more difficult than forecasting for existing product. The reason is that the product is not available. Hence, no historical data are available. In these conditions the forecasting is to be done by taking into consideration the inclination and wishes of the customers to purchase. For this a research is to be conducted. But there is one problem that it is difficult for a customer to say anything without seeing and using the product before. Thus it is very difficult to forecast the demand for new products. Any way Prof. Joel Dean has suggested the following methods for forecasting demand of new products:

1. Evolutionary approach: This method is based on the assumption that the new product is the improvement and evolution of the old product. The demand is forecasted on the basis of the demand of the old product. For example, the demand for black and white TV should be taken in to consideration while forecasting the demand for colour TV sets because the latter is an improvement of the former.

2. Substitute approach: Here the new product is treated as a substitute of an existing product, e.g. polythene bags for cloth bags. Thus the demand for a new product is analysed as a substitute for some existing goods or service.

3. Growth curve approach: Under this method the growth rate of demand of a new product is estimated on the basis of the growth rate of demand of an existing product.

Suppose Pears soap is in use and a new cosmetic is to be introduced in the market. In this case the average sale of Pears soap will give an idea as to how the new cosmetic will be accepted by the consumers.

4. Opinion poll approach: Under this method the demand for a new product is estimated on the basis of information collected from the direct interviews (survey) with consumers.

5. Sales Experience approach: Under this method, the new product is offered for sale in a sample market, i.e. by direct mail or through multiple shop or departmental shop. From this the total demand is estimated for the whole market.

6. Vicarious approach: This method consists of surveying consumers' reactions through the specialised dealers who are in touch with consumers. The dealers are able to know as to how the customers will accept the new product. On the basis of their reports demand can be estimated.

ECONOMICS AND LAW OF SUPPLY

Meaning of Supply

Supply is one of the forces that determine the price in the market. Supply of a commodity refers to the quantity of a product which a seller is willing and able to sell at a given price per unit of time. In words of Anatol Mirad, "The quantity supplied is defined as the quantity of a commodity offered for sale at a given price in a given market at a given time. Supply may also be defined as that part of stock that the seller offers for sale at a given price and at a given time. Thus, supply means the quantity of a commodity offered for sales at a particular price during a given period of time.

According to Meyers: Supply may be defined as a schedule of the amount of a product that would be offered for sale at all possible prices at any one instant of time, or during any one period of time, for example, a day, a week, a month, a year and so on, in which the conditions of supply remain the same.

According to Anatol Mirad the quantity supplied is defined as the quantity of a commodity offered for sale at a given price in a given market at a given time.

Supply is always expressed with reference to a particular price and a particular time period.

In economics, supply refers to the amount of a product that producers and firms are willing to sell at a given price when all other factors being held constant. Usually, supply is plotted as a supply curve showing the relationship of price to the amount of product businesses are willing to sell.

Law of Supply

The **law of supply** is a fundamental principle of economic theory which states that, all else equal, an increase in price results in an increase in quantity supplied. In other words, there is a direct relationship between price and quantity: quantities respond in the same direction as price changes. This means that producers are willing to offer more products for sale on the market at higher prices by increasing production as a way of increasing profits.

In non-differentiable terms, the law of supply can be expressed as:

$$(p - p')(y - y') \geq 0,$$

where y is the amount that would be supplied at some price p, and y' is the amount that would be supplied at some other price p' . Thus for example if $p > p'$ then $y > y'$

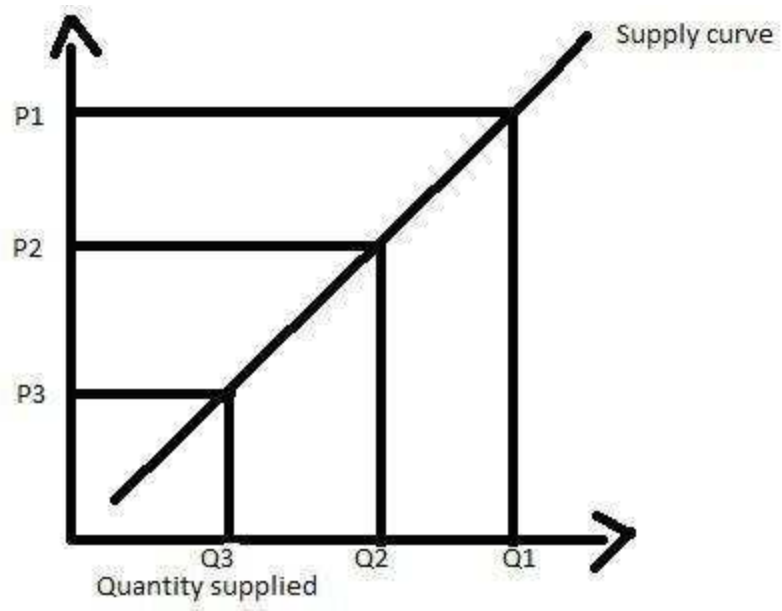
The law of supply states that "Other things being equal, quantity supplied of a commodity is directly related to the price of commodity."

Normally, at a higher price suppliers will be ready to supply more units of a commodity and vice versa.

"The law of supply follows, "The quantity supplied varies directly with price, when price falls supply will contract and when price rises, supply will extended."

According to S.E. Thomas, "A rise in price tends to increase supply and a fall in price tends to reduce it." If the price of a X increases, sellers will supply more X, on the contrary, if the price of X falls, sellers will offer lower quantity of X for sale.

Law of supply depicts the producer behavior at the time of changes in the prices of goods and services. When the price of a good rises, the supplier increases the supply in order to earn a profit because of higher prices.



The above diagram shows the supply curve that is upward sloping (positive relation between the price and the quantity supplied). When the price of the good was at P3, suppliers were supplying Q3 quantity. As the price starts rising, the quantity supplied also starts rising.

Classification of Supply

There are two categories of supply:

- Individual Supply
- Market Supply

Individual supply:

Individual supply can be defined as supply of a commodity offered by individual firm in the market. Individual supply schedule refers to a tabular statement showing various quantities of a commodity that a producer is willing to sell at various levels of price, during a given period of time.
The following table shows a hypothetical supply schedule for commodity 'x'.

Price	Quantity of Goods Supplied
1	5

2	10
3	15
4	20
5	25

As seen in the schedule, quantity supplied of commodity x increases with increase in price. The producer is willing to sell 5 units of x at a price of Rs. 1. When the price rises to Rs. 2, supply also rises to 10 units.

Market supply:

Market supply can be defined as supply of a commodity offered by all the firms dealing with or producing selling that commodity. Market supply schedule refers to a tabular statement showing various quantities of a commodity that all the producers are willing to sell at various levels of price, during a given period of time. It is obtained by adding all the individual supplies at each and every level of price.

Market supply schedule is expressed as: Sm = SA + SB + ……

Where Sm is the market supply and SA + SB +……. are the individual supply of supplier A, supplier B and so on.

Supply Function

Supply function explains the relationship between the supply and the factors determining supply of the commodity. In other words, supply function reflects the functional relationship between supply and determinants of supply such as price of the commodity, price of other goods, price of factors of production, goals or objectives of the firm. They explain variations in the quantity of good supplied. The supply function can be stated as follows:

$$\mathbf{Q_s = f\ (P_a, P_b, P_c, T, T_p)}$$

- ➔ Q_s = Supply
- ➔ P_a = Price of that good of which supply is made P_b = Price of other goods
- ➔ P_c = Price of factor input
- ➔ T = Technology
- ➔ T_p = Time period.

The supply function states that the quantity supplied of any good (Q_s) varies with price of that good (P_a), the price of other goods (P_b), the price of factor Input (P_c), Technology T and Time period T_p.

Elasticity of Supply

Supply is responsive to price changes. The extent to which supply extends for a given

price rise is known as elasticity of supply. Prof. Boulding uses a beautiful analogy to explain the relationship between price and supply, "The relation between price and the quantity supplied is rather like the relation between a whistle and a dog – the louder the whistle, the faster comes the dog; raise the price and the quantity supplied increases. If the dog is responsive – in economic terminology, "elastic" – quite a small crescendo in the whistle will send him bounding along. If the dog is unresponsive or "inelastic", we may have to whistle very loudly before he comes along at all."

Elasticity of supply may also be defined as the ratio of the percentage change or the proportionate change in quantity supplied to the percentage or proportionate change in price.

Es = proportionate change in supply/Proportionate change in price
= (change in quantity supplied/Original quantity supplied) × (Change in price/Original price)

- Q = Original supply
- ΔQ = Change of supply
- P = Original price and
- ΔP = Change of price, then
- $Es = (\Delta Q/Q) / (\Delta P/P) = (\Delta Q/Q) \times (P/\Delta P) = (\Delta Q/\Delta P) \times (P/Q)$

Example:

Suppose that the price of an article rises from $4 to $5 and as a result, supply rises from 200 to 300. Then

$E_S = (100/1) \times (4/200) = 2$.

Since both price and quantity move in the same direction, E_S has a positive sign.

Types of Supply Elasticity

There are two limiting cases of elasticity of supply, which are of economic significance.

- Elasticity of supply equal to infinity
- Absolutely inelastic supply

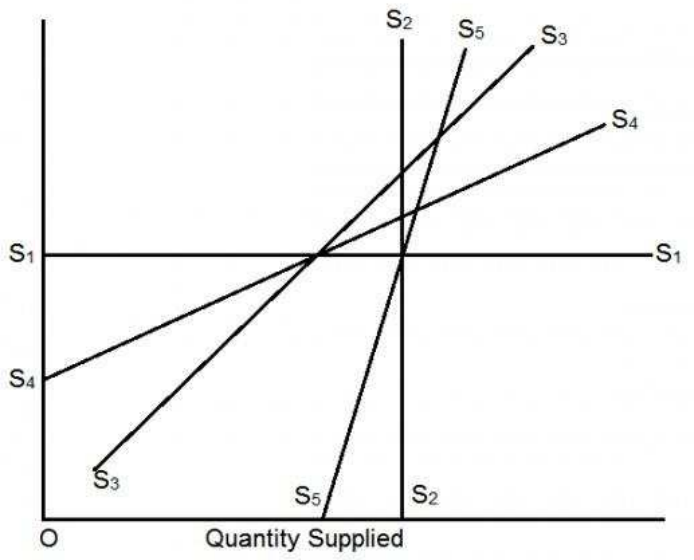
Another way of expressing the range of elasticity is that elasticity of supply is greater than one, less than one or equal to one.

Table 1: Types of Elasticity of Supply

Co-efficient	Elasticity
Supply elasticity = α	Perfectly elastic
Supply elasticity = 0	Perfectly inelastic
Supply elasticity = 1	Unitary elastic
Supply elasticity > 1	Relatively elastic
Supply elasticity < 1	Relatively inelastic

The following figure 1 illustrates the various types of elasticity clearly.

Figure 1



1. Perfectly Elastic Supply (S_1S_1 curve)

Perfectly or infinitely elastic supply signifies that a fall in price will completely cut off supply and a rise in price will cause an infinite expansion of supply.

2. Perfectly Inelastic Supply (S_2S_2)

Perfectly inelastic supply means that changes in price will not bring about any change in supply.

3. Unitary Elastic Supply (S_3S_3)

When elasticity of supply is unitary, a change in price will cause a proportionate change in quantity supplied. Any straight-line supply curve passing through the origin has a unitary elasticity throughout its length regardless of its slope.

4. Relatively Elastic Supply (S_4S_4)

When the proportionate change in quantity is greater than the proportionate change in price the supply is relatively elastic. Any straight-line supply curve that intersects the vertical axis has an elasticity greater than one throughout its length.

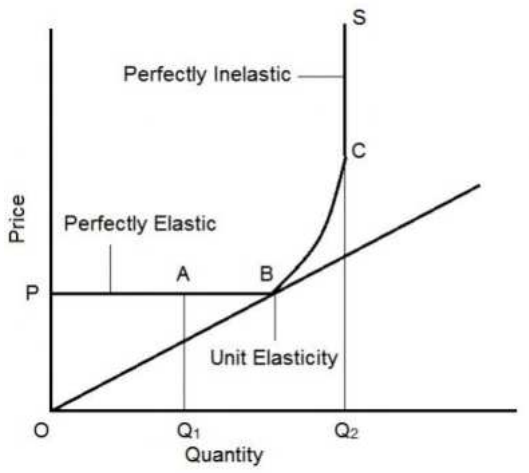
5. Relatively Inelastic Supply (S_5S_5)

When the proportionate change in quantity is less than the proportionate change in price, the supply is relatively inelastic. Any straight line that cuts the horizontal axis has an elasticity less than one.

Generally, elasticity of supply can vary from one price range to another.

At a low price and for small quantities, supply is perfectly elastic. However, as quantity continues to increase, supply becomes less and less elastic. At higher supply prices, supply is perfectly inelastic. This is shown in figure 2.

Figure 2



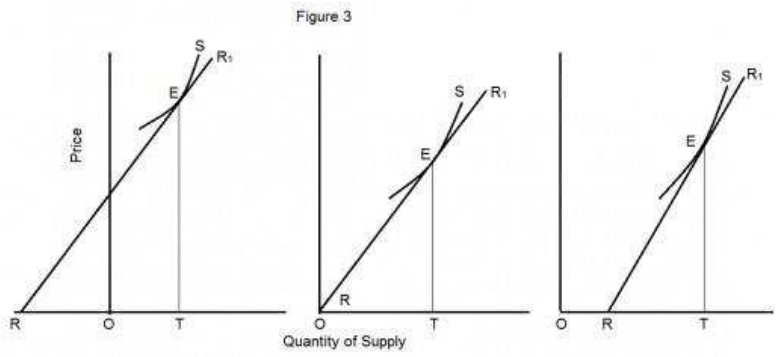
Measurement of Elasticity of Supply

Elasticity of supply can be measured by using two methods:

- The point method and
- The ratio method

The Point Method

On the given supply curve the price elasticity at a point is measured by the distance along a tangent to the horizontal axis divided by the distance along it to the vertical axis.



The elasticity of supply at point T is measured as RT/OT

In panel (a) RT > OT, therefore $E_s > 1$

In panel (b) RT = OT, therefore $E_s = 1$

In panel (c) RT < OT, therefore $E_s < 1$

The Ratio method

The co-efficient of elasticity of supply is obtained by using the ratio method as follows:

$E_s = (\Delta Q/Q) \times (P/\Delta P)$

The co-efficient of elasticity of supply varies from zero to infinity.

Factors Determining Elasticity of Supply

Elasticity of supply is determined by the following factors:

1. The nature of commodities

Based on nature, commodities are divided into perishable goods and durable goods. In the case of perishable goods like fish, vegetables etc., the supply is less elastic, whereas in the case of durable goods the supply tends to be more elastic.

2. Time

The element of time exercises an important influence on the elasticity of supply. In almost every industry, supply will be more elastic in the long-run than in the short-run.

3. Mobility of Factors

Availability of factors of production and mobility of factors of production also affect the elasticity of supply. Mobility of factors causes elasticity of supply and vice-versa.

4. Technique of production

The adoption of advanced technology or replacement of capital-intensive techniques, in the place of traditional or labor intensive techniques makes the supply more elastic.

5. Number of Markets and the Number of Products Produced

If a firm sells its product in different markets, then its supply will be elastic. This is because of the fact that a fall in price in any one market will induce the firm to sell in other markets. Again, when it produces a variety of products, it can easily transfer resources from production of one product to the others, so that each of his products will be elastic in supply.

6. Scale of Production

Goods can be produced either on a large-scale or on a small-scale. Goods produced on a large-scale are elastic while goods produced on a small-scale are inelastic.

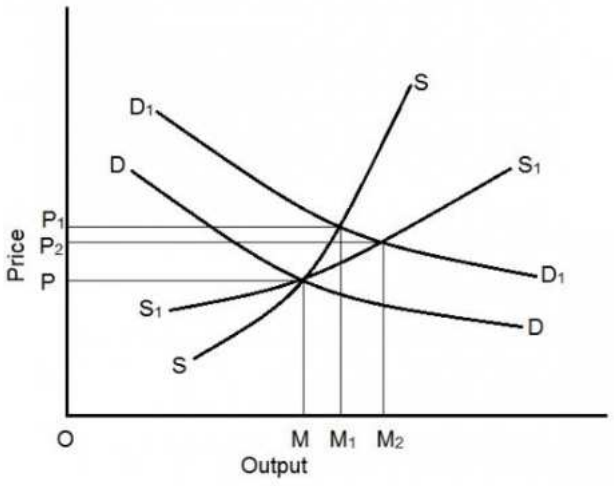
7. Natural Factors

The supply of agricultural goods are inelastic by nature. The influence of nature is more pronounced in agricultural production. That is why it is said that 'Nature does the business and man is merely a manager.' The presence of external factors beyond man's control tends to make the supply of agricultural products inelastic.

Significance of Elasticity of Supply

1. The elasticity of supply of a good is a major factor in determining as to how much of its price will alter when there is a change in the conditions of demand. Let us explain this with the help of supply of and demand for sugarcane as shown in figure 4.

Figure 4



In figure 4, DD is the demand curve and SS is the supply curve. OP is the price. If demand for sugar increases to D_1S_1 in the short-run it is inelastic, for its supply can be expanded only by adding labor, fertilizers etc. therefore, the supply increases only by a small amount (MM_1). However, in the long period more land can be put under sugarcane. Supply is, therefore more elastic and is represented by the curve S_1S_1. The long-run price falls to OP_2 and quantity increases to OM_2.

The elasticity of supply is significant in determining the extent of taxation.

Where the supply of a good is inelastic the government can impose a tax on the producer without having a great effect on the amount of the goods offered for sale. For example, a man owns a mineral well for which a maximum rent of $100 can be got. The owner gives it on rent for $1000 per month. Suppose the government levies a tax of $500 a year on this mineral well. This means that the owner will have to pay the tax from out of his own pocket, since he cannot get it from the user. If the tax amount is increased to $1000, the owner of the mineral well will stop letting it on rent because the net income from the mineral well becomes zero.

MARKET EQUILIBRIUM

Consumers and producers react differently to price changes. Higher prices tend to reduce demand while encouraging supply, and lower prices increase demand while discouraging supply.

Economic theory suggests that, in a free market there will be a single price which brings demand and supply into balance, called equilibrium price. Both parties require the scarce resource that the other has and hence there is a considerable incentive to engage in an exchange.

In economics, economic equilibrium is a state where economic forces such as supply and demand are balanced and in the absence of external influences the (equilibrium) values of economic variables will not change. For example, in the standard text-book model of perfect competition, equilibrium occurs at the point at which quantity demanded and quantity supplied are equal. Market equilibrium in this case refers to a condition where a market price is established through competition such that the amount of goods or services sought by buyers is equal to the amount of goods or services produced by sellers. This price is often called the competitive price or market clearing price and will tend not to change unless demand or supply changes and the quantity is called "competitive quantity" or market clearing quantity.

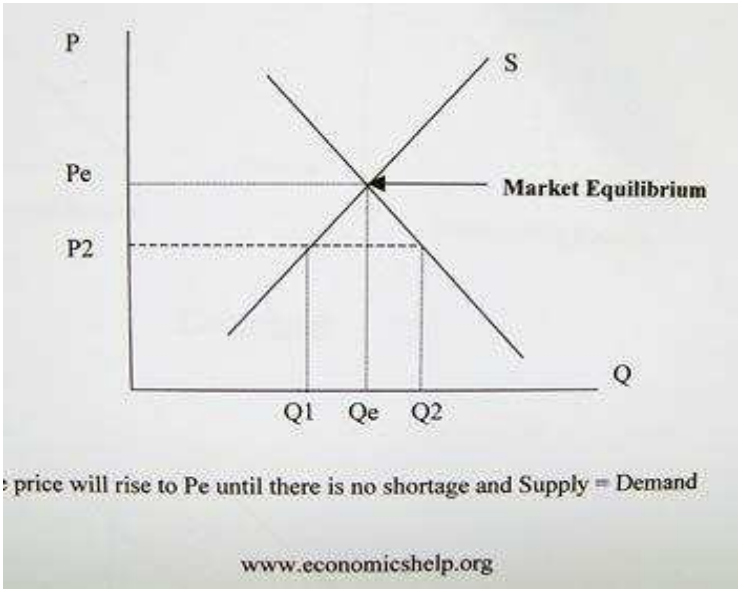
Market equilibrium is a market state where the supply in the market is equal to the demand in the market. The equilibrium price is the price of a good or service when the

supply of it is equal to the demand for it in the market. If a market is at equilibrium, the price will not change unless an external factor changes the supply or demand, which results in a disruption of the equilibrium.

If a market is not at equilibrium, market forces tend to move it to equilibrium. Let's break this concept down.

If the market price is above the equilibrium value, there is an excess supply in the market (a surplus), which means there is more supply than demand. In this situation, sellers will tend to reduce the price of their good or service to clear their inventories. They probably will also slow down their production or stop ordering new inventory. The lower price entices more people to buy, which will reduce the supply further. This process will result in demand increasing and supply decreasing until the market price equals the equilibrium price.

If the market price is below the equilibrium value, then there is excess in demand (supply shortage). In this case, buyers will bid up the price of the good or service in order to obtain the good or service in short supply. As the price goes up, some buyers will quit trying because they don't want to, or can't, pay, the higher price. Additionally, sellers, more than happy to see the demand, will start to supply more of it. Eventually, the upward pressure on price and supply will stabilize at market equilibrium.



➔ If price was below the equilibrium at P2 then demand would be greater than the supply. Therefore there is a shortage of (Q2 – Q1)

➔ Therefore firms will put up prices and supply more. As price rises there will be a movement along the demand curve and less will be demanded.

➔ Therefore price will rise to P_e until there is no shortage and Supply = Demand

A particularly notable feature of market economies is the effect of the price mechanism on demand and supply. The price mechanism determines the equilibrium in the market and consists of the interplay of the forces of supply and demand in determining the prices at which commodities will be bought and sold in the market. Market equilibrium is the situation, where at a certain price level, the quantity supplied and the quantity demanded of a particular commodity are equal. Thus, the market can clear, with no excess supply or demand, and there is no tendency to change in either price or quantity.

Diagrammatically, market equilibrium occurs where the demand and supply curves intersect, at the point where the quantity demanded is exactly equal to the quantity demanded. Let us first consider the case where there is excess demand, where the current price is below that of equilibrium.

The equilibrium price and quantity will be changed if there is a shift in either or both of the supply or demand curve. Shifts in the supply and demand curves are caused by changes in conditions behind supply and demand – not price changes.

For example, an increase in demand means that more of a good will be demanded at the same price. Factors that may cause an increase in demand include a rise in the price of substitute goods and a fall in the price of complementary goods, higher prices expected in the future, a good becoming more fashionable and rising consumer incomes. Because the demand curve shifts to the right, the quantity demanded exceeds the quantity supplied. Competition among buyers will begin to force the limited quantity of the good in question up, causing an expansion in supply and a contraction in demand. This will continue to occur until the market clears again at a new equilibrium point – both the equilibrium price and quantity have risen. Similarly, a decrease in demand will lower both the equilibrium price and quantity.

An increase or decrease in supply will also affect the equilibrium position. An increase in supply shifts the supply curve to the right, thus lowering equilibrium price while raising equilibrium quantity. A decrease in supply, which shifts the supply curve to the left, however, raises equilibrium price and lowers equilibrium quantity.

As mentioned earlier, the price or market mechanism plays the most important function in determining the solutions to the economic problem in market economies. The price determined in the market conveys important information that helps in providing answers to the questions about the production, distribution and exchange of goods and services in the economy. Producers will only produce those goods and services for which there is consumer demand. The quantity of goods and services produced and sold, is determined

through the interaction of supply and demand, resulting in the equilibrium price and quantity. Increasing demand for good X will be translated into a higher market price, which will signal producers to reallocate resources away from other areas of production, in order to produce more of product X.

In addition, it is said that the market mechanism also ensures efficiency in allocation in the economy. The demand curve gives us an indication of the value that consumers place on a certain product, while the supply curve gives us an indication of the producers' cost in supplying that product. The market mechanism ensures that equilibrium is reached at the intersection of those two curves.

In conclusion, the market forces of supply and demand interact to bring about the equilibrium price, clearing the market of excess demand or supply. In this way, it is said that the market mechanism achieves consistency between the plans and outcomes for consumers and producers without explicit coordination.

MODULE II

FUNDAMENTALS OF AIR TRANSPORT ECONOMICS

THE EVOLVING AIR TRANSPORT INDUSTRY

In the last 30 years the airline industry's earnings have fluctuated wildly (mostly downward). New carriers such as JetBlue and AirTran in the US, easyJet and Ryanair in Europe, Gol and Volaris in Latin America and a few others have entered the industry, but many others such as Eastern, Pan Am, and Midway have declared bankruptcy and ceased operation.

The Financial Condition of the Air Transport Industry

The US Airline Deregulation Act of 1978 dramatically changed the global financial condition of the airline industry as other countries began to follow suit and deregulate their own industries. Also, as mentioned earlier, prior to 1978, the industry was relatively stable, chiefly as a result of the government's enforcement of non-competitive regulation and pricing. During the post-deregulation era the industry took on the more cyclical nature of a competitive industry, in which periods of robust financial profitability could be followed by periods of severe economic distress. As in other competitive industries, the financial condition of the airline industry is highly related to economic growth, so it is not surprising that it suffered when the economy stalled.

In the early 1980s, shortly after US deregulation, the airline industry suffered a minor crisis as the economy slowed and competition soared. More specifically, the US domestic industry experienced overcapacity as the many new airlines that were formed as a result of deregulation either went bankrupt or merged with other carriers. The result was four years of global net losses for the industry, largely based on the situation in the United States.

A similar situation occurred in the early 1990s as the economy once again experienced a downturn, but this downturn was aggravated by political uncertainty from the first Gulf War and increased fuel costs.

While the early parts of each decade following deregulation have proved to be troublesome for the airline industry, the industry recovered sufficiently to post record short-run profits in the late 1980s and again in the late 1990s. This was partly due to the overall improvement in the global economy, but financial distress and competition also caused airlines to be more innovative and conscious of controlling costs. Tools such as revenue management and frequent-flyer programs were created and developed during these periods. In addition, technological innovations allowed the airlines to improve their profit margins. For example, simpler cockpit design has enabled the reduction in the number of flight-crew members, better engine design has reduced the number of engines required to fly long distances, and fuel costs have been reduced as a result of more fuel-efficient engines. All these technologies have enabled airlines to reduce their costs and/or

increase revenue. A more recent technological innovation has been e-ticketing, which allows airlines to reduce their ticket distribution costs.

The post-deregulation airline profitability cycle continued into the twenty-first century, with the global industry experiencing its worst downturn in the history of commercial aviation. Although the 9/11 terrorist attacks were the proximate cause of the global airline industry's financial problems, the root cause was a slowing economy that reduced passenger yields. Added to this were rising jet fuel costs, increased airline operating costs stemming from overcapacity in domestic markets, and increased security costs at commercial airports. In fact, the airline industry was in trouble before the 9/11 disaster, with many airlines losing money and with no significant initiatives to reduce costs and increase productivity. The outcome was record net losses of $13 billion and $11 billion for the airline industry in 2001 and 2002 respectively. With the resurgence of economic growth, the global airline industry returned to profitability in 2004.

However, political instability in various parts of the world, rising fuel prices, and persistent competition between network and low-cost carriers has meant that the road to recovery has been slow for the airline industry. The situation has been most evident in the North-American market where high-profile bankruptcies of US Airways, United, Delta and North-west highlighted the increasing effects of fierce competition from lower cost airline to bloated cost structure of most traditional airlines.

There have been some bright spots in the industry as bankruptcy protection has (in some cases) enabled carriers to restructure their costs and receive wage concessions from labor groups. Moreover, the overcapacity issue has been addressed, with carriers not only reducing capacity as a whole, but also shifting capacity to international markets that are less competitive. Only recently, in 2006, has capacity reached pre-2001Ievels. Several low cost carriers have also remained successful and profitable by continuing to expand while keeping costs relatively constant. Innovations such as e-ticketing and fleet rationalization have been instrumental in helping airlines achieve cost reductions, and these reductions have narrowed the cost gap between network airlines and low-cost carriers (LCCs).

Airline Industry Consolidation

The airline industry has been affected by economic recession, rising fuel costs, political uncertainty, and stiff competition. These factors have caused some major carriers, such as Eastern Airlines, Pan Am, and Piedmont into liquidation, and US Airways, United Airlines, Delta Air Lines, and Northwest Airlines into bankruptcy protection.

In 2000, Southwest Airlines overtook Delta Air Lines to become the largest domestic carrier (in terms of passengers flown) in the United States. This highlights the fact that low-cost carriers are capturing more of the domestic market share while legacy network

carriers are losing theirs. This is mainly due to the low-cost carriers' continual expansion and the advantages they possess because of their lower cost structure. Another major trend (in terms of market share) is the emergence of regional carriers. In 1998 ExpressJet, American Eagle, and Skywest had less than 1 per cent combined market share, yet in early 2006 they had acquired 7.5 per cent of the total US domestic market. In this case, the reason was the increased use of regional jets by legacy carriers to open up new markets and combat low-cost carriers.

The industry Herfindahl-Hirschman index (HHI) is a measure of how consolidated the domestic US market is. As Table 1.11 shows, since 1998 the industry has become less consolidated. This spreading out of competition usually equates to lower fares and increased service. In fact, an American Express travel survey has shown that average US domestic airfares have steadily declined since 2000 (Amex, 2006).

Historically, mergers rapidly increased following deregulation in 1978. For the ten years following deregulation there were 51 airline mergers and acquisitions (Dempsey, 1990). The result of these mergers and acquisitions was the creation of six legacy carriers from the 15 independent carriers that had close to 80 per cent US market share in 1987 (Dempsey, 1990).

Although the number of mergers reduced during the 1990s, critics argue that most mergers were still part of well-planned strategies to reduce competition in various markets. Consequently, starting in 1985, the US Department of Transportation (DOT) assumed approval authority for all airline mergers. To approve the merger, the DOT must now balance the consumer benefits resulting from mergers against the possibly negative effects of increasing concentration (Dempsey, 1990). On the other hand, the extraordinary financial problems of legacy carriers suggest that reductions in capacity, whether through mergers or alliances, may be inevitable. Some economists argue that less intense competition, through consolidation and coordination, can actually benefits the consumers by allowing airlines to build more efficient networks with greater economies of scale, scope, and density.

While mergers and acquisitions have slowed in the United States, the relatively low HHI and the poor financial condition of the legacy carriers indicates that there is still the potential for additional mergers and acquisitions within the industry. Moreover, airline mergers are not limited to the United States; they have played a large part in international aviation. A few recent international mergers include:

• Air France and KLM

• Lufthansa and Swiss Air

• Air Canada's acquisition of Canadian Airlines

• Japan Airlines' purchase of Japan Air System.

Historically, mergers have not been very successful in the aviation industry. Many mergers do not realize the benefits envisioned when planned, and one-off merger costs, such as aircraft painting and IT harmonization, end up being far more costly than planned. Airline mergers also bring difficulties in dealing with labor groups, especially with regard to such issues as merging seniority lists. Corporate culture can also be a much underestimated barrier to successful mergers as different companies' cultures may impede merger success. Finally, one of the greatest challenges a merger faces is managing multiple and powerful stakeholders; these can include, but are not limited to, politicians, regulators, labor leaders, and consumers (McKinsey & Company, 2001). Many of these stakeholders are suspicious of the mergers because they fear lessened competition and increased travel prices (McKinsey & Company, 20001). Many potential mergers have been thwarted by regulators, and one of the key measures that regulators use in analyzing potential mergers is the planned mergers' affect on the HHI.

However, there are, as mentioned, potential benefits from airline mergers. McKinsey & Company (2001) estimate that a merger of two mid-sized carriers could unlock synergies in excess of 7 per cent. The principal benefit of mergers is cost rationalization. Since the airline industry exhibits large economies of scale, merged airlines are able to spread their high fixed costs over a greater network. In addition, the new merged carrier can increase its bargaining power with key suppliers and merge such functions as parts inventories, back office functions, and sales forces (McKinsey & Company, 2001).

Another major benefit of mergers is network harmonization. This can include a variety of things, but in the final analysis the merged airline's route network is greater than that of the individual airlines. A good example of this is the America West-US Airways merger. America West was predominantly a west-coast airline while US Airways was primarily an east-coast airline, but the merged airline had a strong route network on both coasts. Without a merger either carrier would have found it difficult to in increase its presence on the opposite coast. The economies of scope that resulted from the merger allowed US Airways to widen its customer base and strengthen its market power throughout the United States.

Another way to look at consolidation in the domestic US industry is to look at it at the airport level. After deregulation the major carriers adopted a hub-and-spoke system, funneling passengers through a few airports (Dempsey, 1990). This in tum led to some carriers holding dominant positions at certain hub airports throughout the United States. Table 1.12 depicts the consolidation of carriers by enplanements and operating carrier at the ten largest airports in the United States.

The general trend in airport consolidation from 1998 through 2005 is one where the largest carrier has become less dominant. This has occurred for all the airports presented

in Table 1.12, except for Dallas. In Dallas, Delta's withdrawal left American Airlines as the only major airline still operating; this also left Dallas as the most consolidated airport of the top 10 domestic US airports in 2005.

The general reduction in consolidation at US airports can largely be attributed to two factors: first, increased competition, particularly from low-cost carriers; and, second, major carriers pushing more £lying to regional affiliates. Low-cost carriers such as Frontier and AirTran have situated themselves in the dominant hubs of Denver and Atlanta, and have been successful at taking away market share in those airports. With the emergence of regional jets, major carriers have been pushing capacity towards regional carriers in an effort to reduce costs.

In May 2007 Bombardier Aerospace introduced the next-generation versions of its CRJ700, CRJ900 and CRJ1000 regional jets. These new CRJ Next Gen aircraft have featured

Significant operating cost improvements and the increased use of composite materials.

Since the Form41 data used in Table 1.12 break data down by operating carriers, regional carriers are treated separately. For example, ExpressJet operations at Houston are separate, even though the flights are marketed by Continental. This could potentially distort the level of consolidation at airports with large regional carrier presence.

Factors Affecting World Air Traffic Growth

The factors that affect world air traffic growth are numerous and complex; they occur on global, national, regional, and civic levels. This complexity helps explain why air travel can be growing significantly in one country or city and why it is stagnant or floundering in another-chief among these factors is the level of prosperity in the region. This amount of economic prosperity is measured by such indicators as gross domestic product (GDP) or gross national product (GNP). GDP is the total market value of all final goods and services produced in a country in a given year. Increased prosperity derives increased demand for air travel in two separate, but concurrent, ways. First increased economic activity helps generate employment, which ultimately causes an increase in business travel, the most important segment of travelers for airlines. Business travel is the primary reason why world financial centers such as London and New York have experienced strong air traffic growth. In addition, increased economic activity also spurs air cargo growth.

The second result of economic prosperity is a decrease in unemployment and a concurrent increase in household income. People have more discretionary income and are able to afford more leisure travel trips. A good example of this has been China where a growing middle class has fueled a large expansion of air travel within the country.

A decrease in the real cost of air travel will also create air traffic growth. This was first experienced in the 1970s when deregulation resulted in a dramatic decline in the cost of air travel. A greater number of people could now afford air travel and they took advantage of the opportunities. Low-cost carriers generated increased air travel with low fares, and airports experienced tremendous growth in their passenger statistics as soon as a low-cost airline initiated service. This phenomenon has been coined the "Southwest Effect". Ryanair is accomplishing similar feats in Europe where almost everyone can now afford weekend getaways.

Another factor influencing world air traffic growth is population growth rates. Strong population growth rates in developing countries such as India and China have helped spur air travel growth. However, population growth must generally be accompanied by income growth for this factor to significantly affect air travel.

Economic liberalization is another major factor impacting on air transportation. Government restrictions on an economy, such as wage and price controls or excessive regulation, ultimately constrain demand. When such artificial barriers are lifted, the marketplace dictates demand for goods and services, and increased air travel is almost always the result. The reason for this is the fact that government regulation in the aviation industry usually involves ticket prices and market access - that is, favored air lines (usually a national airline) are granted monopoly access with some sort of a fare structure that is structured to cover average costs. This effectively eliminates competition and restricts the growth of air traffic. A good example of economic liberalization is the United States itself.

Following deregulation, airfares plummeted and air traffic growth increased significantly.

Moreover, the freedom for airlines to fly to whatever destination they wished made flying more convenient for passengers by providing more non-stop flights with greater frequency. Recent air transport liberalization in Europe and India has led to a tremendous growth in air traffic in these countries.

Politics and political stability also play a role in air travel. It is not surprising that countries that choose extremely protectionist and radical policies do not experience great air traffic growth; in these cases, the government restricts air travel as a matter of political policy. Political instability can also greatly influence air travel; since people do not want to travel to regions where they feel unsafe. It is likely that political instability can be blamed for the poor air traffic growth rates in those parts of Africa where governments are in constant turmoil. Finally, political instability reduces and/or restricts business activities within the country.

Terrorist attacks can also affect air travel. After the tragic events of 11 September 2001, air travel dropped off drastically as passengers no longer felt safe traveling. In addition,

many felt that it was also unsafe to travel to other international destinations in case some other terrorist attack should occur.

Finally, the amount of leisure time people have can affect the demand for leisure flights. Typically, individuals who possess greater discretionary free time have a greater demand for leisure and/or vacation flights. Tourism promotion can also help spur an increased demand for air travel to a particular destination. For example, Walt Disney World has turned Orlando into the number one destination airport in the United States.

ECONOMIC IMPACT OF AIR TRANSPORT INDUSTRY

Commercial aviation comprises two primary segments: large commercial air carriers and regional/commuter air carriers. Since the deregulation of the commercial airline industry in 1978, both the large commercial and regional/commuter air carriers have enjoyed more robust growth than the domestic economy. Generally, the commercial airline industry has closely followed the movement of the domestic economy. Since deregulation, the large US commercial air carriers have averaged an annual growth of 4.8 per cent in terms of revenues, compared to a 2.6 per cent average growth rate of the US GOP. During the same period, US regional/commuter air carriers grew at an annual growth rate of 14.3 per cent.

Despite the negative impact of the events of 9/11 and the concurrent recession, the US Federal Aviation Authority (FAA) forecasts long-term growth in enplanements for the large US air carriers to average 3.3 per cent through 2013, while long-term growth will average 5.5 per cent for the US regional/commuter airlines. And, as has been mentioned, international aviation continues to grow with lATA forecasting higher growth rates than the US industry (pearce, 2006). This growth has been largely spurred by the soaring economies in the Asia-Pacific region. So, what economic impact is the growth of air transportation likely to have on the economy?

Economic impact can be divided into three categories: direct, indirect, and induced. Direct impact represents economic activities that would not have occurred in the absence of air transportation. In the air transportation industry, both airlines and airports provide the economy and local communities with a direct economic impact. Examples of direct economic impacts include the salaries of airline personnel, fuel purchased, landing fees, salaries of airport personnel, and other similar purchases and expenditures. Indirect economic benefits include the financial benefits that are attributed to airport/airline activities. Examples of indirect economic impacts for air transportation include hotels, restaurants, and other retail activities. There is usually a causal relationship between the industry and indirect impacts.

For example, if a community experienced a reduction in air travel, the hotel industry in that community would most likely suffer a fall in room occupancy rates as well. Finally, induced economic impacts are the multiplier effects of the direct and indirect impacts. Induced impacts account for the increased employment and salaries that corne from secondary spending that results from the direct and indirect economic impacts. The total of these economic impacts measure the importance of an industry in terms of the employment it provides and the goods and services it consumes. The following sections explore the effect of air transportation on each of these economic impacts.

Direct Impact

Direct economic impacts are the consequences of what might be termed first-tier economic activities carried out by an industry in the local area. In the air transportation industry, airports provide the greatest direct impact to local economies. The reason for this is the more or less obvious fact that the economic activities that take place at the airport directly involve the local economy. Most direct impacts, like airport employment and fixed-based operations, occur at the airport; others, like the local production of goods and services for use at the airport, may occur off-site.

Expenditures by airlines, fixed-based operators and tenants also generate direct impacts, but only those expenditures thatlead to local business activity are relevant for a regional economic assessment. For this reason, it is important to distinguish between the local value-added component of expenditures and the regional import component. Thus, airline expenditures on fuel generate local fuel storage with distribution systems and also contribute to the importation of fuel into the region. In most parts of the country, only the former component is relevant for any local economic impact analysis. Therefore, the direct economic impacts of air transportation for a community are usually measured on the basis of the airport's immediate economic activity. In addition, large aircraft manufacturers can generate a huge direct economic benefit by locating their production facilities in a given community or state. For example, the direct economic impact of the Boeing 787 Dreamliner project on Washington State in 2006 has been estimated at approximately 11,470 jobs, with an economic output of $2.268 billion (Deloitte, 2004). There are, of course, numerous other examples of large direct economic impacts provided by the air transportation industry.

Indirect Impact

Indirect impacts derive from off-site economic activities that are attributable to air transportation activities. For example, indirect economic impacts include services provided by travel agencies, hotels, rental car companies, restaurants, and retail establishments.

These enterprises have a strong relationship to the air transportation industry and, like airport businesses, employ labor, purchase locally produced goods and services, and invest in capital projects. Indirect impacts differ from direct impacts because they originate entirely off-site. Typically, indirect economic impacts are generated by visitors to the area, who are traveling by air. A good example of an industry that has a strong indirect economic impact relationship with air transportation is the hotel industry. Airlines provide economic benefits to the hotel industry by requiring hotel rooms for passengers who have business, or are vacationing, in a city. This increased demand for hotel accommodation in the city creates employment and may require the construction of more hotels, thereby creating more economic impact. The large demand for hotel accommodation caused by air transportation is one of the main reasons why areas around major airports almost always contain numerous hotels.

Induced Impact

As mentioned earlier, induced economic impacts are the multiplier effects that are caused by the increases in employment and income generated from the direct and indirect economic impacts of air transportation. A simple example will help make this concept clear. Imagine a new airline employee who purchases a house in the local community. The builder of the house then uses this income to purchase other goods and services, and the income to the suppliers of these goods and services is also spent. This framework of expenditures is the basis behind the multiplier effect-that is, one transaction leads to multiple economic transactions.

Total Impact

Total economic impact is defined as the sum of direct, indirect, and induced impacts. It is usually expressed in terms of economic output, earnings, or employment (sometimes full-time equivalents). The basic formula for total economic impact is:

total impact = direct impacts + indirect impacts + induced impacts

As per a survey conducted on the comparison of the total economic impact in terms of employment for six airports located in the United States. The report for each airport was done independently and at different times, but the methodology used for each is similar. Although the six airports vary in they all provide strong economic impacts for their communities. When normalized in terms of commercial departures, Wichita and Memphis both generate one job for every departure. In Memphis one additional daily flight would generate approximately 365 new jobs for the region. Wichita's extremely high ratio is probably attributable to the large manufacturing and maintenance facilities for Cessna and Bombardier. The presence of FedEx in Memphis explains its high economic impact to departure ratio. And, finally, much of Seattle's total economic impact can be attributed to the simultaneous indirect economic impact of the presence of aircraft

manufacturing giant, Boeing, and of tourism. These disparate examples highlight the diversity (cargo operations, manufacturing, and tourism) and strength of the economic impact of the aviation industry.

Economic and Social Benefits of Air Transport

Air transport

- Air transport drives economic and social progress
- It connects people, countries and cultures
- It provides access to global markets
- It generates trade and tourism
- It forges links between developed and developing nations

Employment

- The air transport industry supports 58.1 million jobs globally
- It directly creates 8.7 million jobs worldwide
- Airlines, airports and air navigation service providers employ 7.6 million people
- The civil aerospace sector employs 1.2 million people
- 9.8 million indirect jobs are created via purchases of goods and services from companies in the air transport supply chain
- 4.6 million jobs are induced through spending by industry employees
- Almost 35 million direct and indirect jobs are created through air transport's catalytic impact on tourism

Economic benefits

- Aviation provides the only worldwide rapid transportation system which makes it essential for global business and tourism
- Aviation's total global impact is $2.4 trillion including direct, indirect and the catalytic effects of tourism
- Aviation transported approximately 3.1 billion passengers in 2013
- Aviation carried over 49.8 million tonnes of freight in 2013 and 35% of interregional exports of goods by value
- 52% of international tourists travel by air
- In a 2009 survey of over 2,200 business people, 52% said that restrictions on the numbers of flights they take would hurt their business
- Research conducted in the US suggests that every dollar invested in aerospace yields an extra $1.50 to $3.00 in economic activity

Air transport facts (2013)

- 1,397 commercial airlines
- 25,332 aircraft in commercial service (30,101 jets and 5,231 turboprops)
- 3,864 airports
- 36.4 million commercial flights worldwide

Air transport efficiency

- Aviation occupancy rates of 80% (2013 industry load factor) are better than those of road and rail
- Modern aircraft achieve fuel efficiencies of 3.5 liters per 100 passenger kilometers or 67 passenger miles per gallon

Social benefits

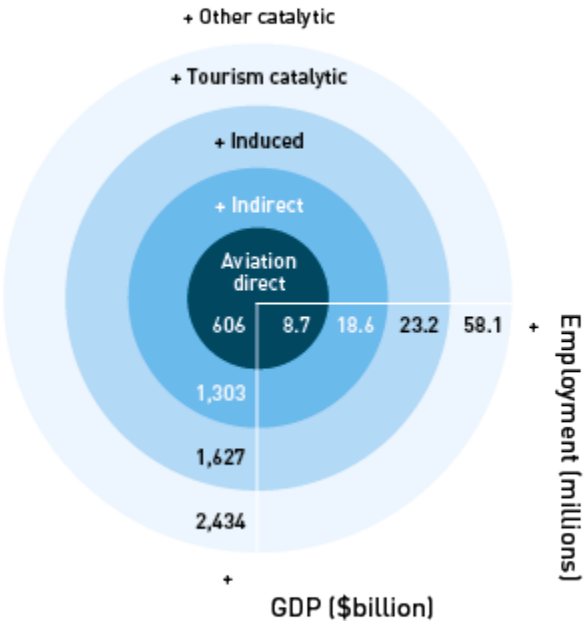
- Aviation broadens people's leisure and cultural experiences via wide choice/affordable access to destinations across the globe
- Improves living standards and alleviates poverty through tourism
- Often serves as the only means of transportation to remote areas promoting social inclusion
- Contributes to sustainable development by:
- Facilitating tourism and trade
- Generating economic growth
- Creating jobs
- Increasing tax revenues
- Facilitates the delivery of emergency and humanitarian aid relief
- Swift delivery of medical supplies, organs for transplantation

<u>Economic Growth</u>

Supporting over 58 million jobs and $2.4 trillion in global GDP, the air transport industry is a driver of the global economy. A third of all global trade by value is sent by air and aviation is a key component of global business.

1.1. Employment

The aviation industry supports 58.1 million jobs around the world. Some of these people work within the industry itself and other jobs are provided by the economic activity that air travel supports. The following section outlines where these jobs are created.



8.7 million Direct jobs

Around 8.7 million people work directly in the industry itself. These jobs are in the following areas:

- Airport operators: 470,000 (work for the airport operator).
- Other on-airport: 4,602,000 (retail, car rental, government agencies such as customs and immigration, freight forwarders and some catering).
- Airlines: 2,272,000 (flight and cabin crews, executives, ground services, check-in, training, maintenance staff).
- Civil aerospace: 1,203,000 (engineers and designers of civil aircraft, engines and components)
- Air navigation service providers: 195,000 (air traffic controllers, executives).

According to research by Oxford Economics, these jobs are, on average, around 3.6 times more productive than average jobs around the world.

9.8 million indirect jobs

These jobs include those in suppliers to the air transport industry. For example, aviation fuel suppliers; construction companies that build airport facilities; suppliers of sub-components used in aircraft; manufacturers of goods sold in airport retail outlets; and a

wide variety of activities in the business services sector (such as call centres, information technology and accountancy). Over 9.8 million indirect jobs globally are supported through the purchase of goods and services by companies in the air transport industry.

4.6 million Induced jobs

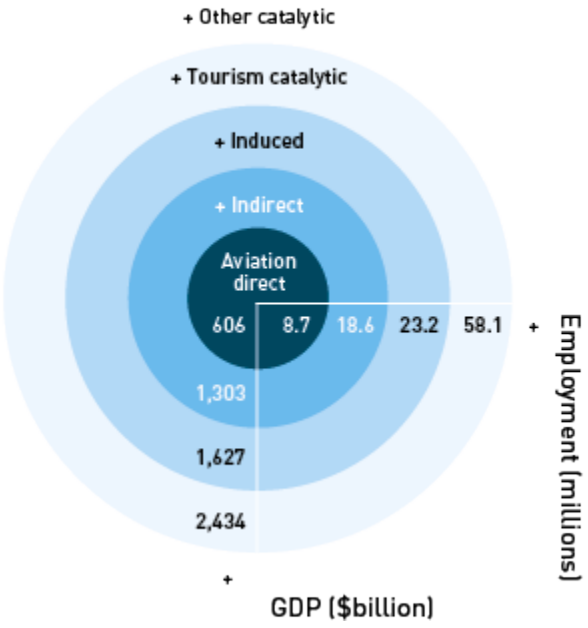
The spending of those directly or indirectly employed in the air transport sector supports jobs in industries such as retail outlets, companies producing consumer goods and a range of service industries (such as banks and restaurants). Worldwide, nearly 4.6 million induced jobs globally are supported through employees in the air transport industry (whether direct or indirect) using their income to purchase goods and services for their own consumption.

35 million jobs in tourism

Tourism is fast becoming the world's largest industry and air transport plays a very important role in supporting this sector. Conservative analysis suggests that aviation supports 35 million jobs within the tourism industry. Click here for some information on the role aviation plays in supporting the global tourism sector

Value to the economy

The aviation industry supports $2.4 trillion of the world's gross domestic product (GDP). The following section outlines from where this economic activity comes.



$606 billion in direct GDP benefits

The world's airlines carry over three billion passengers a year and 50 million tonnes of freight. Providing these services generates 8.7 million direct jobs within the air transport industry and contributes $606 billion to global GDP.

Compared with the GDP contribution of other sectors, the global air transport industry is larger than the pharmaceuticals ($451 billion), textiles ($223 billion) or automotive industries ($555 billion) and around half as big as the global chemicals ($1,282 billion) and food and beverage ($984 billion) sectors. In fact, if air transport were a country, its GDP would rank it 21st in the world, roughly equal to that of Switzerland and more than twice as large as Chile or Singapore.

$697 billion indirect GDP impact

These include employment and activities of suppliers to the air transport industry – for example, aviation fuel suppliers; construction companies that build airport facilities; suppliers of sub-components used in aircraft; manufacturers of goods sold in airport retail outlets; and a wide variety of activities in the business services sector (such as call centres, information technology and accountancy). These indirect activities contributed approximately $697 billion to global GDP in 2012.

$324 billion induced GDP

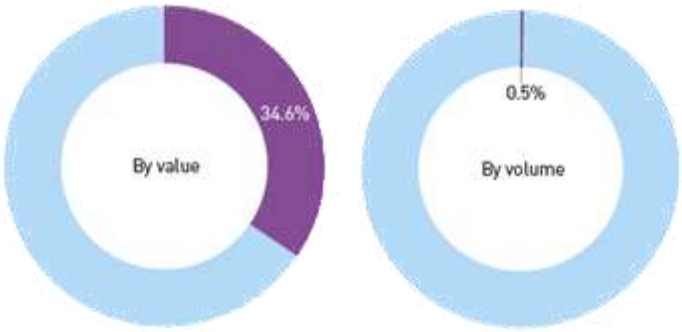
The spending of those directly or indirectly employed in the air transport sector supports jobs in industries such as retail outlets, companies producing consumer goods and a range of service industries (such as banks and restaurants). Worldwide, nearly $324 billion induced GDP impact globally is supported through employees in the air transport industry (whether direct or indirect) using their income to purchase goods and services for their own consumption.

$807 billion in tourism GDP

Tourism is fast becoming the world's largest industry and air transport plays a very important role in supporting this sector. Conservative analysis suggests that aviation supports $807 billion in economic activity within the tourism industry. Click here for some information on the role aviation plays in supporting the global tourism sector.

Trade

As an important facilitator of international trade, aviation promotes global economic growth and development. Forecasts suggest that the world's economies will become even more dependent on international trade over the next decade. World trade is expected to nearly double, rising at more than twice the rate of global GDP growth, with China, India and other emerging markets leading the way.



Compared to other modes of transport, air freight is fast and reliable over great distances. However, these benefits come at a cost. Consequently, air freight is mostly used to deliver goods that are light, compact, perishable and have a high unit value. This fact is made most apparent when you consider that around a third of all international trade is sent by air when counted by value of goods sent, but when you look at the volume of trade, air cargo makes up only 0.5%. In 2012, it is estimated $6.4 trillion in cargo value was sent by air.

Part of everyday manufacturing

Today, air transport is a vital component of many industries' global supply chains, used primarily for the transfer of time-sensitive goods. Rapid delivery is particularly important to businesses whose customers are running streamlined production processes or who need urgent delivery of spare parts for machinery and equipment. High-value, lightweight and sensitive electrical components are transported by air from manufacturing facilities all over the world to be assembled.

Supporting sustainable development

Exporters of perishable products such as food and flowers (many of whom are located in developing countries) can only reach export markets by air, providing steady employment and economic growth to regions that benefit from such trade. For example, it is estimated that 1.5 million livelihoods in Africa depend on such exports to the UK market alone. In Kenya, 90,000 jobs (and 500,000 livelihoods) depend on the cut flower industry, which supports 1.6% of the national economy, generating around $1 billion in foreign exchange each year.

The pharmaceutical industry also relies on air transport for delivery of time-sensitive medical supplies, particularly vaccines.

When the system stops

Thankfully, there aren't often opportunities to see what modern life would be like without air transport. The 2010 Icelandic volcano caused a week-long disruption of air traffic in Europe, and resulted in 10 million passengers being affected, and a cost to the global economy of $5 billion.

On 14 April 2010, Iceland's Eyjafjallajokull volcano erupted with an ash plume that rose over three kilometres and, with the help of winds, blew across much of Europe's airspace. It provides a useful study of how modern life might be impacted without aviation.

- Around 10 million passengers were disrupted and over 100,000 flights cancelled during the entire period of disruption.
- Total disruption at its peak meant just under a third of total global air traffic capacity was affected.
- The visitor spending impact realised by destinations around the world has been estimated at $1.6 billion in lost revenues, primarily to the hospitality sector.
- International trade was also severely disrupted as a result of the flight restrictions — particularly for perishable goods and for just-in-time production processes (e.g. high-value items which are also low-weight such as electronic parts and machine components).

Following the massive airspace shutdown in the first week, another 5,000 flights were sporadically cancelled. This added an additional 5% to the first week's impacts, bringing the total cost to $5 billion lost GDP between 15 April and 24 May 2010.

International trade was severely disrupted as a result of the flight restrictions. While some of the disrupted trade can be deferred, that is not the case for products that are either fast perishing (fresh-cut flowers, vegetables such as green beans, exotic fruit) or crucial for just-in-time production processes (high-value items which are also low-weight such as electronic parts and machine components).

The impact on producers of flowers and fruit and vegetables in African countries such as Kenya, Zambia and Ghana was widely reported, with delays in transportation meaning large quantities of fast-perishing produce rotted, leading to losses for producers. World Bank president Robert Zoellick stated that African countries lost $65 million due to the effect of the airspace shutdown on perishable exports. Exports of flowers to Europe are also important to South America, costing producers around $3 million due to the destruction.

In total, $48 billion of electrical and machine parts and equipment were supplied to the rest of the world from European producers in 2009. For example, the Korea International Trade Association has stated that losses for domestic industries between April 16 and 19 were an estimated $112 million, with suppliers of mobile phones and semi-conductors the

hardest hit. Car production lines in Europe and Asia suspended production as crucial components were unable to make it to the factories.

The future

Air transport is forecast to support 103 million jobs by 2032.

The contribution of the air transport industry in 20 years' time

Several aircraft manufacturers, including Airbus, Boeing, Bombardier and Embraer, estimate the future demand for air transport in the form of revenue passenger kilometres. The most recent estimates suggest that demand for air transport will increase by an average of 4.7% per annum over the next 20 years. That implies that demand for air travel will increase by a factor of two and a half over the period.

If this growth path is achieved, then in 2032 the air transport industry will contribute:

- 13.9 million direct jobs and $1.4 trillion of GDP to the world economy;
- Including indirect and induced contributions, 36.7 million jobs and $3.8 trillion in GDP;
- Once the impacts of global tourism are taken into account, a total of 103 million jobs and $5.8 trillion in GDP.

The impact of lower growth: a sensitivity analysis

As a result of any number of unexpected events, demand for air transport over the next 20 years may diverge from current expectations. How would the economic contribution of aviation change if global demand for air transport proves to be lower than expected? A sensitivity analysis can help to answer this question. By changing key assumptions driving the results, this type of analysis can indicate a reasonable range for alternative outcomes.

For example, if the average annual growth in passenger numbers for each region covered in this report turns out to be one percentage point lower than currently expected between 2012 and 2032, then in 2032:

- Worldwide, there would be 1.4 million fewer direct jobs in the air transport sector.
- Taking into consideration the direct, indirect, and induced impacts, there would be 3.7 million fewer jobs supported by air transport.
- Once the impacts of tourism are included, the air transport sector would support a total of 12.4 million fewer jobs than would otherwise be the case under the baseline scenario.
- Worldwide, the direct, indirect, and induced GDP for air transport would be $661 billion (2012 prices) lower than it otherwise would be.
- An additional $352 billion would be lost because of a reduction in tourism activity.

Social development

Aviation brings the world's people and cultures together like no other form of transport. Fast, reliable and safe services with greater value are allowing more people to experience the world and supporting the world's number one industry – tourism.

Skills:

Jobs in air transport cover a wide range of activities and skills.

These include:

- skilled work by technicians building and maintaining aircraft;
- a diversity of technical engineering jobs from aircraft and engine design to component production;
- air traffic control and airspace design planning;
- logistics for airlines and airports;
- complex information technology systems on board aircraft and in areas such as baggage handling systems design;
- service industry support jobs such as chefs in catering companies;
- creative positions in design and marketing;
- customer services occupations in airline ticketing, check-in, cabin crew and retail;
- manual labour on airfields;
- air traffic controllers and pilots;
- emergency response personnel at airports; and
- leadership, management and executive roles.

As this list indicates, many roles in the air transport sector require a highly qualified workforce and a significant amount of training. Value-added per employee in the air transport sector (direct employees, excluding non-airside activity at airports) generates 3.6 times as much value-added per employee than the economy as a whole – indicating a more productive workforce.

This is particularly true for the large populations of Asia-Pacific, Africa and Latin America. In addition, growth in the aerospace sector is helping to drive innovation and skills development in countries that have not normally been associated with aircraft manufacturing.

Help wanted

With the projected growth in air traffic and in order to replace industry professionals retiring over the next decades, there will be a need to recruit and train thousands of new staff for jobs across the sector. Whilst some on-airport occupations are not specialist aviation jobs (such as retail), there are a number of positions across the sector that require skill sets specific to aviation. Airports Council International (ACI) is working with the International Air Transport Association (IATA) and International Civil Aviation Organization (ICAO), as well as a number of universities to build professional skills in the industry.

Airlines project a need for more staff, particularly in highly skilled roles such as pilots and maintenance technicians. Civil aerospace companies are working to develop science, technology, engineering and maths skills in the education system, as they forecast a need for the future engineers and designers of aircraft.

Tourism:

The connectivity provided by international air transport facilitates the fast-growing global tourism industry. It is estimated that over half of international tourists travel to their destination by air.

The tourism sector

Tourism makes a major contribution to the global economy. It directly contributed $2 trillion to world GDP in 2012 and provided over 101 million jobs globally – 3.4% of total employment. By 2024, the World Travel & Tourism Council expects direct employment in the tourism industry to be more than 126 million people globally.

When looking at the jobs and GDP supported through the indirect and induced impacts of tourism, the figures are significantly higher at 261 million jobs (8.7% of employment) and $6.6 trillion, or 9.3% of the global economy. By 2024, tourism could support some 347 million jobs and $11 trillion in GDP.

Aviation's crucial tourism role

Aviation plays a central role in supporting tourism. Over 52% of international tourists now travel by air. Tourism is particularly important in many developing countries, where it is a key part of economic development strategies. In Africa, for example, the jobs of an estimated 2.5 million people directly employed in tourism are supported by overseas visitors arriving by air, representing 30% of all tourism jobs in Africa. In some island states, tourism can have an overwhelming influence on the national economy. St Kitts and Nevis, for example, relies on the industry for 25.9% of the economy and a quarter of its jobs. In some Caribbean countries, tourism provides one of the few means of economic growth.

The contribution of air transport to tourism employment and GDP:

- Direct: 14.6 million direct jobs in tourism globally are estimated to be supported by the spending of foreign visitors arriving by air. This includes jobs in industries such as hotels, restaurants, visitor attractions, local transport and car rental, but it excludes air transport industry jobs.
- Indirect: A further 13.4 million indirect jobs in industries supplying the tourism industry are supported by visitors arriving by air.
- Induced: These direct and indirect tourism jobs supported by air transport generate a further 6.9 million jobs in other parts of the economy, through employees spending their earnings on other goods and services.

Including direct, indirect, and induced effects, air transport supports 35 million jobs within tourism, contributing around $807 billion a year to world GDP.

Sustainable tourism

Tourism as a service industry can play a role in supporting sustainable economic growth. When developed in a responsible and strategic way, tourism can provide important service sector jobs whilst preserving (and, indeed, celebrating) natural resources, rather than depleting them. However, there needs to be a focus by both tourism operators and government to ensure that planned growth is done with sufficient regard to the environmental and social conditions, as well as the economic benefits it can bring.

There are great examples of economies taking a proactive strategic view of the development of tourism as a key national sector, doing so in an holistic and sustainable manner. New Zealand, Costa Rica, Iceland, and Bhutan are examples of countries that have taken this opportunity in an enthusiastic way. The World Travel & Tourism Council sets out some of the key aspects of responsible 'tourism for tomorrow' which, while growing:

- Impacts natural and cultural environments in a positive way
- Provides benefits to all sectors of society, including young people, women and indigenous peoples
- Attracts and develops a skilled workforce to support growing demand
- Stimulates consumer demand for sustainable products
- Uses latest technology to find innovative solutions to future challenges

How to harness the benefits of a growing tourism sector

There are some things governments can do relatively easily to boost their national tourism sectors. Whilst many governments spend lots of money promoting their countries as destinations, a number complicate visits by instituting lengthy visa processes, placing high taxes on arriving or departing tourists or not engaging in 'joined-up thinking' at a

regional level. There are signs of improvement in these areas, with some regional groups like APEC and ASEAN discussing ways they can make travel to and within their regions simpler. Europe, with a single Schengen visa, is a good example of regional thinking, but the UK government is missing out on tourists, as those applying for a Schengen visa have to apply for a UK visa separately.

Opening up air markets (allowing airlines to start services without having to go through lengthy government-to-government negotiations for every new route or airline) has proven to be a real driver of travel, tourism and the economic benefits that can bring.

Finally, States should ensure that they regularly review the capacity of their airport and air traffic infrastructure versus projected demand. This will ensure that aviation can continue to support tourism development and deliver wider economic benefits.

Community lifelines

For areas of the world with non-existent or poor road infrastructure, aviation is the community's lifeline.

In the Russian, Canadian and Scandinavian far north, and in many other remote communities and small islands, access to the rest of the world and to essential services such as health care is often only possible by air.

Over 1,000 communities in northern Russia are inaccessible by road; the number in Alaska is more than 200. Throughout Norway, thanks to an extensive network of regional airports and airline services, 99.5% of the remote population is able to travel to Oslo and back on the same day; around 400,000 patients are transported annually on scheduled flights between their homes and hospitals.

Small island states across the world rely on air transport to do business, connect to education and healthcare and provide access beyond the sporadic and infrequent boat services that would otherwise be their only connection with the world. In countries such as Indonesia, spread across 6,000 inhabited islands, air transport is relied upon for contact between communities and business links.

Even in the heart of Australia, the famous Royal Flying Doctor Service allows communities in the middle of this massive continent to receive regular medical attention. With a fleet of 61 aircraft, every day on average, the service transports 112 patients from the remote outback to larger centres for medical care.

Disaster response

Aviation's speed and reliability is perhaps most immediately apparent during times of natural or humanitarian emergency. Air services play an essential role in assistance to regions facing natural disasters, famine and war. They are particularly important in

situations where access is a problem, delivering aid, search and rescue services and medical supplies.

Whilst some of these efforts are undertaken by military or specialist air services, a great deal of the support is provided by the commercial air transport system. Airports become staging points for rescuers and relief supplies, cargo deliveries and refugee transfers. Airlines assist with the evacuation of people stranded by natural disasters or victims of conflict. But infrastructure is also vulnerable to the same natural disasters that hit their communities. Following the 2010 earthquake in Haiti, the local airport had to shift from an average of 35 flights a day to more than 100. With a damaged control tower, the US Federal Aviation Administration was able to bring in a temporary air traffic control facility to support the response effort. Airlines from around the world responded to the call for the movement of rescue teams and supplies of food and medicine.

The major manufacturers, too, respond routinely with flights using either test aircraft, or as part of delivery flights to airlines in the region.

As companies (and employees of those companies), airlines, airports, ANSPs and manufacturers are involved in corporate charity work and when natural disasters impact an area of the world, many respond with funds. However, it is the in-kind ability for commercial aviation companies to rapidly respond to emergency situations that make them valuable partners of aid agencies and governments.

But the disaster doesn't end when the TV cameras go home. Often, recovery efforts go on for months or years following a natural disaster and the re-establishment of scheduled air transport services are a vital part of an area's economic and social recovery. A number of airlines have established long-term and ongoing relationships with aid agencies to help provide passenger or cargo services well after the initial period of crisis has ended.

Air UN

The United Nations World Food Programme operates an airline, WFP Aviation, and also coordinates the United Nations Humanitarian Air Service (UNHAS). Air operations are necessary because access to conflict and disaster zones is often limited by insecurity, poor road infrastructure, long distances and lack of commercial air services. These UNHAS flights serve Central Africa, Yemen and Afghanistan and in 2012 carried 353,000 passengers and nearly two million tonnes of cargo. In 2013 the agency assisted more than 80 million people in 75 countries with food and aid deliveries. As passenger operations, they are mainly used by UN and international aid agency staff.

Importantly, the UNHAS also delivers training courses in the countries it supports to help build local skills and, in effect, make its services redundant in years to come.

Partnering with UNICEF

Since 1987, cabin crew and airline ground-staff around the world have collected more than $120 million in unused currency from passengers to support UNICEF's global Change for Good programme. Change for Good aims to reduce the number of preventable childhood deaths and, thanks to generous donations from passengers, UNICEF has been able to save more than 16,000 additional lives each day than was possible in 1990. The Change for Good programme is in operation on 12 airlines.

Safety culture

The aviation industry is renowned for its dedication to safe operations. The sector's impressive track record has been built up over many decades and is the result of an inbuilt conservative approach to operations and a safety culture which is providing a lesson to other industries.

Whilst there will always be incidents which gain high media attention, there is no doubt that commercial air transport is the safest form of travel today. However, it is incumbent on the industry to continue improving its record, particularly in areas of the world where a safety culture is not as developed.

The industry is joining forces with governments to do just that in Africa, where airports, airlines, air navigation service providers, pilots unions, manufacturers and local authorities are working together on the Africa Strategic Improvement Action Plan to improve safety on the continent.

Globally, there were 29.5 million commercial western-built jet flights in 2013 and six hull-loss accidents. This equates to a hull-loss rate of 0.41 per million flights, or one hull loss for every 2.4 million flights. This was a step back from 2012, which saw the lowest accident rate in aviation history. However, despite the number of accidents increasing slightly from the year before, the overall trend is downward. And accidents do not always mean fatalities – in 2013, there were 212 fatalities on western-built aircraft. When looking at all aircraft types, there were 16 fatal accidents in 2013.

Lessons from aviation

The way that aviation approaches even routine functions is being increasingly used by other sectors to improve their safety performance. Task checklists, common for pilots to use in the flight deck for years, are now being applied to the medical profession and in high-risk jobs like nuclear power stations.

But the simple checklist is not the only area where industries can learn from air transport. The development of a robust and open safety culture is where real progress has been made.

A system called crew resource management promotes a culture of open communications and teamwork by all parts of the operation. Where problems arise, or even have the potential to arise, any member of the crew (in the aircraft or on the ground) should feel

comfortable with speaking up and raising the issue. And some air navigation service providers (ANSPs) advocate a system known as ‘just culture’ whereby air traffic controllers are encouraged to report essential safety-related information without fear of punishment except in cases of gross negligence or wilful violations. Both systems prioritise working as a team and the open exchange of information. They allow the organisations to learn and improve operational procedures.

The industry also goes to great lengths to learn from faults that have caused accidents in the past, to ensure that these do not occur again. That is why the process to investigate aircraft incidents is a coordinated effort by all appropriate parties.

These methods have proved to be an invaluable tool for the evolution of aviation safety and are being applied to other sectors, such as health care and firefighting, where complex systems and hierarchies have the potential to create risks.

INTERNATIONAL ECONOMICS AND AVIATION

Although other opinions are addressed, the thrust of this chapter is to explain why economists largely agree that international trade, for the most part, benefits the economy. Aviation is generally not an exception to that rule, though it has some special complications. Anti-trade arguments are discussed and, with some slight exception, demonstrated to be mainly fallacious. This chapter lays the foundation for the next, which details international aviation agreements and industry alliances. Allowing international competition in aviation and elsewhere produces a net gain to the economy rather than a destructive "concession," as politicians often suggest. This chapter will cover the following topics:

- International economics and trade, including':
  - ✓ Arguments for and against free trade
  - ✓ National security concerns
  - ✓ Aircraft manufacturing and government subsidies
  - ✓ Trade deficit and surplus
- The logic of production possibility, absolute advantage, comparative advantage, and free trade, including:
  - ✓ Absolute advantage
  - ✓ Comparative advantage
  - ✓ International trade policy in air travel-optimality versus political realities
- Trade protections and trade barriers
- Foreign currency and exchange rates, including

- ✓ Exchange rate quotes
- ✓ Exchange rate regimes: fixed, floating, pegged, and the gold standard.

International Economics and Trade

Economists in general agree on most of the key policy issues relating to international economics. However, as is often the case in economics, this consensus has failed to break through many popular misconceptions, and therefore public policy in international trade deviates substantially from the ideaL All countries, regardless of their size, depend to some degree on other economies, and are affected by trade and transactions outside their borders. The globalization of the international economy has occurred in almost in every country and has led to the development of many regional trade agreements. International trade allows countries to take advantage of other countries' resources through the theory comparative advantage (explained later in the chapter). It has been successfully argued and empirically demonstrated that overall world production increases through trade and partnership

In 2006 the volume of world economy and trade increased by 8 per cent. Countries such as Germany, the United States and China have emerged as important exporters in world merchandise trade (Table 6.1). The United States is the world's largest market for exporting countries. In 2005 it imported more than $1732 billion worth of merchandise (Table 6.2). Japan exported more than $594 billion worth of products to the rest of the world-4.8 per cent of total exports-and imported $514 billion during the same period.

Among the ten leading exporters, the five most dynamic economies are Germany (9.3 per cent), United States (8.7 per cent), China (7.3 per cent), Japan (5.7 per cent) and France (4.4 per cent). The five leading importers comprise the same countries as the group of the top five leading exporters, except that the United Kingdom replaces France in fifth place with 4.7 per cent (World Trade Organization, 2006).

Globally, the Middle East was the region with the highest exports in 2005 (see Figure 6.1). This means that all the Middle Eastern countries collectively beat all the other regions even though no individual Middle Eastern country made it to the top ten exporting countries list.

Similarly, the Commonwealth of Independent States (CIS) was the region with the highest imports in 2005. 1 None of its member countries made it to the top ten importing countries list.

Arguments for and against Free Trade

There are many arguments for and against free trade. Today, most countries around the world impose some form of trade restrictions such as tariffs, taxes, and subsidies. The arguments most often heard against free trade are:

- It is important to keep jobs in the country.
- Imports should be limited to keep money in the country.
- Free trade may be a threat to national security.
- Other nations don't treat their workers fairly.
- A nation may become too specialized and dependent on other nations.

Economists generally argue that the world at large will benefit from free trade and that trade liberalization can promote development. Free traders claim that trade protection always harms all the trading partners. The main political objections to free trade center on fears that cheaper imports will destroy jobs and reduce income. Labor unions and management may oppose free trade if they believe that the competition from free trade will cause them to lose jobs and/or bankrupt the firm or industry. In the simple two- good case illustrated later in the chapter it is easy to see that, for the economy as a whole, this fear has no basis in reality. Although free trade may indeed render some jobs obsolete (or lost), other jobs are created. The new jobs are more productive, so average wages and overall income rises. Again, this is easy to see in the two-good case (where the country lost jobs making one product, but gained more productive jobs making another).

Proponents of free trade cite the following advantages:

1. It reduces the price of every item sold in the market.
2. It increases the supply of products in other markets and results in lower prices for those products.
3. It encourages other nations to trade more freely with their trading partners, which helps the global economy.
4. It increases the number and variety of products for consumers to choose.
5. It is a driving force behind a high standard of living.

Even though free trade increases average wealth, some individuals will probably be made worse off. This, after all, is true of any advance in technology. For example, discovering a cure for cancer would destroy some jobs. In an advancing economy most people will be able to adapt to new job opportunities with little or no serious problems, although in extreme cases some individuals may require substantial assistance to survive and adjust to technological advances. But with trade, as with improving technology, overall wealth is increasing in society, so such assistance is more readily affordable. Low trade barriers inherently create hundreds of billions of dollars more in benefits than they impose in costs (Pugel, 2007). The same comparative advantage principle holds when there is trade with many goods, but the impact is not so obvious. Suppose, for instance, a country dramatically increases purchases of imported automobiles. Everyone will be able to see the resulting layoffs in the domestic automobile sector-the downside of this international trade. However, the new jobs created by this trade are Widely dispersed and not at all obvious. When consumers are able to buy cheaper automobiles some will then be able to

spend more on computers, some will enjoy more air travel, some will buy new clothes, eat out at restaurants more, buy a nicer home, and so on. Thus, cheap automobile imports allow us to produce more of other products and create additional job to enable this new production. However, the job gains will be widely dispersed throughout many, seemingly unrelated, industries.

The individual who obtains an airline job made possible by the availability of cheaper automobiles in the economy is unlikely to see the connection. In other words, even though the benefits of trade far outweigh the costs, free trade is often controversial because the costs are concentrated, visible to even the least discerning citizens, and therefore easy to politically exploit. Hufbauer and Elliott (1994) state that the average protected job costs $170,000. So, rather than using trade barriers to "protect jobs," it would be cheaper for consumers to allow free trade and then compensate all workers who lose jobs to more efficient foreign competition.

National Security Concerns

In a very few special cases it may be true that national security justifies a particular trade barrier. It would not be prudent, for example, to allow aircraft from hostile nations to have "open skies" access to our airspace. But, more typically, free international trade enhances national security by raising income and promoting friendly relations. This is particularly true for aviation, since free trade in air travel inherently "makes the world smaller," promoting more economic integration and social interaction between nations.

When economies are strongly integrated, many of each country's citizens have a large stake in other countries, and therefore a strong vested interest in avoiding the massive destruction and attendant loss of wealth associated with war. This is why wars between major trading partners are relatively unusual in world history. Indeed, it was the desire to promote peaceful interaction, even more so than economic development, which initially motivated European leaders to form the European Union (van den Berg, 2004).

Some try to argue that allowing foreign airlines, even those from friendly nations who are staunch allies, to compete freely in domestic markets somehow inherently jeopardizes national security. They insist that airlines must be domestically owned just in case the government needs to use civilian aircraft in some emergency to, say, move military troops within the country. Most economists are very skeptical of such claims.

All governments reserve the right, for example, to confiscate private property (hopefully, with just compensation being paid at the appropriate time) in emergencies, regardless of who owns the needed property. Instances where government would need to confiscate or commandeer civilian aircraft are rare, possibly even non-existent in many cases, but if the situation ever arises, the government has the power to take what it needs.

In the United States, the government does have a contract in place with some airlines to provide troop transport if ever needed (US Air Force: Air Mobility Command, 2006).

Given the relative efficiency of US airlines and the availability of military transport aircraft, even if the US domestic air travel market were completely open to foreign competition it is unlikely in the near term that foreign carriers would so dominate the market that there would not be enough US aircraft to move troops. If, in the distant future, foreign carriers begin to achieve such dominance there seems to be no reason why the United States could not arrange the same sort of contract with a foreign carrier; it could even be required as a condition of the carriers being allowed to compete in the US market. Other countries could do likewise. National security does not provide a reasonable argument against free international trade and competition in air travel.

Aircraft Manufacturing and Governmental Subsidies

It is commonly alleged that Airbus and Boeing are unfairly subsidized by their respective governments, allowing them to charge less than full price for their aircraft at a disadvantage to other manufacturers. For example, in the case of Boeing, partisans argue that the US government should impose some sort of tariff on Airbus to offset the subsidy and afford Boeing a level playing field. Airbus disputes this analysis and its conclusion, but economists point out that, even if the subsidy exists as alleged, it would be harmful to the United States to impose a tariff. In 2005 the governments of both the United States and Europe agreed to stop subsidizing Boeing and Airbus for a short period of time while they try to resolve a decades-old dispute over billions in subsidies to the aircraft-makers.

If people in the United States can buy aircraft more cheaply, they will have more resources to produce and consume additional aircraft and whatever else they might desire-total wealth clearly increases. The impact would generally be the same if European taxpayers mailed checks directly to US consumers rather than giving money to Airbus. If there is a loser in this case, then it would be the European taxpayers who see some of their wealth transferred to the United States

Boeing does suffer some lost sales from the subsidy, but Boeing's loss is less than the combined gain to airlines, air travelers, and the economy in general. Notice that the general effects of trade are not significantly affected by the existence or lack of a subsidy.

Boeing loses less than the general economy gains if Airbus provides a better aircraft for the price. Regardless of whether that better price comes from a subsidy, hard work, luck, better technology, or whatever, the impact is the same.

Trade Deficit and Surplus

It is useful to point out first that the term "trade deficit" is completely arbitrary and might just as easily be called a "trade surplus." If imports are greater than exports that is, more goods and services are flowing into a country than flowing out-a deficit exists.

Conversely, if the difference in the value of a nation's exports over imports is positive, the country enjoys a trade surplus. To illustrate this point, suppose someone came to your house and brought a number of products to you. Although they took some of your goods in return, the value of what they gave you was greater than the value of what they took.

Would it not be more natural to say you enjoy a surplus of trade with this individual, rather than following convention which would term this situation a trade deficit?

But is it harmful when money "leaves the economy?" First, remember that the world's leading currencies are no longer backed by gold or any other real assets. Dollars, yen, and euros are pieces of paper, valuable in exchange, but very inexpensive to print in virtually limitless quantities. Of course, printing too much currency results in the devaluation of that currency-in other words, inflation-but printing currency simply to replace that which leaves the country will not be inflationary at all (as long as foreigners just hold the dollars). So suppose that United States was to experience the ultimate trade deficit foreigners acquired dollars and simply collected them, refusing to buy anything from the Unites States. If the government did nothing to offset the effect of dollars pouring out of the United States, then the country would experience deflation - pervasive falling prices.

So, to keep the value of the currency stable, the government needs to create new currency and put it into circulation to replace the currency leaving the country. To put money into the system the authorities (the Federal Reserve System in the United States) buy existing US Treasury debt. Because interest is paid on this debt, the government is now paying interest to itself; in effect this debt is retired and no longer a burden to taxpayers. Thus, the more money that leaves the country the better!2 The United States is able to trade currency, cheap pieces of paper, for real goods plus retire substantial portions of debt. For this reason the United States, and all governments, generally encourage other countries to use their currency. Another way of looking at this is to state the obvious fact that the principal place where dollars can be spent is in the United States. Obviously, this will increase the demand for US goods and services or, as is more likely to be the case, investment in productive resources in the United States. There are currently more dollars circulating outside the United States than inside-something the United States welcomes (Elwell, 2004).

But what if those outside dollars are suddenly returned and spent in the United States? Although this would not be catastrophic, it would be somewhat costly. Consumption would have to fall as foreigners traded their dollars for goods and services-in other

words, rather than having pieces of paper leave and goods and services flow in, the United States would now see the reverse. To prevent the returning currency causing inflation, the United States would have to take some currency out of circulation. Some of that US Treasury debt would be resold, and taxpayers would now be charged to make the outside interest payments to the buyers of the US Treasury debt. The currency gained from reselling that debt would be held out of circulation.

Of course, foreigners willingly hold dollars because they believe that it is in their interest to do so, so they are very unlikely to suddenly change their minds en masse and flood the United States with returning currency. But it is comforting to know that, if such a thing should somehow happen, the negative impact is not at all overwhelming.

As indicated in Figure 6.2, the United States has generally been experiencing a perpetual, growing trade deficit since about 1980. A few trade surpluses have occurred, but only when the economy has weakened in recessions. Although some currency has flowed out of the country, the trade deficit is basically balanced by a surplus of capital inflows.

The capital account surplus (capital inflows minus outflows), also shown in Figure 6.2, is essentially the mirror image of the trade deficit. In other words, foreigners who wish to invest in the United States have largely outbid foreigners who wish to consume US goods. When the United States "sends dollars out of the country," they largely "come back" in the form of capital flows-for instance, foreigners directly build factories in the United States or buy stocks and bonds from US companies which then expand in their home country (US Department of Commerce: Bureau of Economic Analysis, 2007). The United States is seen as an ideal place to invest: international investors are attracted to the world's largest economy, political stability, and a substantial degree of economic freedom. As long as this holds true, the United States is likely to continue to see capital surpluses/trade deficits for the foreseeable future.

The Logic of Production Possibility, Absolute Advantage, Comparative Advantage and Free Trade

Whenever the structure of production is addressed within an economy of any scale, it is helpful to understand the concept of a production possibility curve (PPC). APPC shows all different combinations of output that an economy can produce by using all the available resources. The curve is plotted along a two-dimensional axis in which the y and the x axes each signify a quantity of a good, making it a "two-good" analysis. The curve itself is seen as a frontier outside of which production of the two goods is impossible. Any combination of outputs within the curve would prove to be inefficient, and maximum efficiency lies only along the curve. Therefore, any point within the production

possibility curve represents inefficiency and any point outside the production possibility curve represents something unattainable, given available technology and other resources.

"Food and Clothing" and any two combinations of these two products, such as A, B, C; alternatively, any others could be chosen. For example, at point A, a quantity of 600 units of food can be produced along with 300 units of clothing, and at point B 200 units of food can be produced along with 700 units of clothing. Hence, the opportunity cost to create 400 more units of food than at point B can be said to be 400 units of clothing. Point M represents a level of production that can't be achieved with current levels of resources and technology; therefore it lies outside the production possibilities curve. Point N, lying inside the curve, represents a level of inefficient production.

Absolute Advantage

A country is said to have an absolute advantage over another in the production of a good if it can produce the good with less resources. If a country can produce more output per unit of productive resources than its trading partner, then that country is said to have an absolute advantage in the terms of trade. Through specialization, different countries can produce and export goods where they have a natural or acquired absolute advantage and import those goods they don't specialize in. Table 6.4 shows an absolute advantage situation for the United States with respect to China in aircraft and China with respect to the United States in automobile production. Assume that, as shown in Table 6.4, China can produce 100 aircraft or 100,000 automobiles per one unit of productive resources, while the United States can produce 150 aircraft or 80,000 automobiles per unit of productive resources. Clearly, the United States has an absolute advantage in aircraft production whereas China has an absolute advantage in car production:

China: 1 aircraft 1000 automobiles (100,000/100)
United States: 1 aircraft 500 automobiles (80,000/160)

Using this information, we can calculate the opportunity cost of producing each product in each country. To produce one aircraft means that China must forego 1,000 automobiles, giving an opportunity cost of 1,000 automobiles. Furthermore, to produce one aircraft, the United States must forego 500 automobiles, giving an opportunity cost of 500 automobiles.

With an absolute advantage a country can charge a lower price than a competing trading country since more of the good with the absolute advantage can be produced with fewer resources. In the absence of free trade, in China one unit of aircraft will exchange for 1,000 automobiles, and in the United States one unit of aircraft will exchange for 500 automobiles. With the introduction of free trade, both the United States and China can gain benefits. If the United States can get more than 500 cars per unit of aircraft, then it will be better off than it would have been without trade. On the other hand, China has been giving up 1,000 cars to get one aircraft so if it can get an aircraft for less than 1,000

automobiles, then it will be better off. This means that the terms of trade should fall somewhere between 500 and 1,000 automobiles per unit of aircraft. In terms of the production possibilities curve introduced above, trade has effectively moved the curve to the right, thereby making available more of both goods.

Clearly, this simple example shows that there are significant gains to trade when each country has an absolute advantage in the production of one of the goods. However, what happens when one of the countries has an absolute advantage in the production of both goods? This situation is discussed in the next section.

Comparative Advantage

In 1817 David Ricardo outlined the theory of comparative advantage which shows how the gains from trade can still come about even if one country has an absolute advantage in the production of both goods. A country has a comparative advantage in the product with the lowest opportunity cost of production, so China should specialize in automobiles and the United States should specialize in aircraft. To demonstrate this, let us alter the numbers in the example we presented above to provide a simple proof of the benefits of international trade when one country as an absolute advantage in both goods. Suppose now that the United States is a superior producer of both automobiles and aircraft.

Table 6.6 shows that the United States has an absolute advantage in both products. Nonetheless, Ricardo argued that both countries can still benefit from trade. In the United States the opportunity cost of 1,000 cars is one aircraft. This includes the opportunity cost of production, meaning that, if labor, energ)j material and other resources are reallocated away from automobile production to aircraft, then US firms can produce another aircraft but will lose 1,000 automobiles in its output. Likewise, if we reverse the reallocation and devote more resources to making automobiles, then US firms can produce another automobile, but will have to sacrifice 1/1000th of an aircraft. Meanwhile, in China the opportunity cost of an aircraft is 1,600 automobiles, with the opportunity cost of an automobile, equal to 1/1600th of an aircraft. Thus, even though the United States has an absolute advantage in the production ofboth automobiles and aircraft, it has a comparative advantage only in the production of aircraft, since each aircraft costs 1,000 automobiles compared to a cost of 1,600 automobiles in China. On the other hand, China's firms have a comparative advantage in the production of automobiles since their cost is only 1/1600th of an aircraft compared to 1/1000th of an aircraft opportunity cost in the United States.

If unrestricted trade is now permitted, then firms in each country will naturally shift production into the product with the comparative advantage. Given the numbers in Table 6.7, it is clear that the terms of trade will fall somewhere between 1,000 and 1,600 automobiles for each aircraft. Thus, US firms will produce aircraft and convert" each aircraft into (say) 1,300 automobiles through trade. Note that, without trade, the Unites

States could gain only 1,000 cars for each aircraft given up. By trading aircraft for automobiles the United States is able to acquire more automobiles and US citizens can afford to consume both more cars and more aircraft.

China's wealth also increases since it can now trade 1,300 automobiles for an aircraft rather than having to give up 1,600 automobiles for each aircraft it directly produces (see Table 6.8). This simple mathematical proof confirms common sense-when a society produces goods at the lowest possible cost of resources, it is possible to produce more. Allowing free international trade unambiguously increases overall wealth. Likewise, it follows that international trade barriers - such as tariffs (special taxes on imports), import quotas, discriminatory regulation, or outright import bans-reduce wealth (see Figure 6.4). In a 2004 stud)j economists estimated that trade barriers reduced world GDP by about $500 billion, about $30 billion in the United States alone (Bradford and Lawrence, 2004).

Table 6.6 Comparative Advantage

	craft per unit of Airports	nobile per unit of Airports
China	50	80, 000
US	100	1,00, 000

Table 6.7 Production Costs without Trade

US	**China**
l aircraft costs 1,000 automobiles	1 aircraft costs 1,600 cars
l car costs 1/1000th of an aircraft	utomobile costs 1/l600th of an aircraft

Table 6.8 Production Costs with Trade

US	**China**
mobile costs 1/1300thh of an aircraft posed to l/lOOOth without trade)	ft costs 1,300 automobiles posed to 1,600 without trade)

International Trade Policy in Air Travel- Optimality versus Political Realities

Economists generally agree that free trade is the best policy, in aviation and almost everything else. Ideally, foreign airlines from friendly nations should be allowed to freely compete; indeed, there is no reason for government policy to favor domestic airlines over foreign airlines. Implementation of this policy would maximize competition and efficiency in air travel- prices would be lower, there would be more variety of service,

and consumers would have more choices. Overall wealth would increase because air travel would be more efficient in its use of resources, and the improved transportation system would help virtually all industries to be more efficient. A more efficient air travel industry has impacts analogous to a more efficient road system-it allows firms to expand into more output markets, gather resources from more input markets, and, as appropriate, take more advantage of economies of scale in production.

We mentioned earlier that it has been estimated that establishing free international trade in 2004 would have increased annual world income by about a half trillion dollars. Formal estimates for the impact of free competition in air travel alone are not available, but income would certainly increase by many billions.

Given the huge benefits of free trade in air travel, why have politicians in most nations failed to implement it?

Most citizens are "rationally ignorant," and are unaware of the benefits of free international trade; there is no strong consumer movement clamoring for free trade in air travel or anything else. However, all firms, including airlines, like to avoid increased competition as much as possible. Consequently, governments have a tendency to act in the interests of airlines rather than in the interests of the nation as a whole. In other words, absent a well-informed public, politicians tend to give into the special interests of the domestic airline industry.

This is reflected in the typical language of trade politics. Whenever foreign firms are allowed to compete in a market-that is, reduce prices and increase the importing nation's wealth-politicians refer to this as a "trade concession," something they appear to reluctantly agree to in exchange for rights for domestic firms to compete in the other country. The entire attitude of politicians is that increasing import competition is an awful result that must be tolerated in order to negotiate export rights for domestic firms. This, understandably, is the perspective of the domestic firms these politicians seek to please: access to more markets is welcomed, more competition and lower prices are not welcomed, and even though national wealth increases, the wealth of companies facing more competition usually does not. But it is ironic that politicians who increase national well-being by reducing trade barriers feel compelled to cloak these good steps by calling them concessions.

The optimal policy favored by economists would be for a country, of course, to unilaterally open its own market to foreign competition. We would want to see increased competition and lower prices as soon as possible, with no negotiations necessary. It is useful to summarize the likely results of such a policy in the US market. If the United States allowed cabotage foreign carriers handling domestic traffic within the country, the immediate results, though beneficial, are unlikely to be spectacular. US airlines have been deregulated for a long time and are quite efficient by world standards-the market is

not an easy one to make a profit in. Thus, foreign airlines would not be anxiously pouring into this market. Some, Virgin America Inc. for instance, would enter in a major way. Others might enter a few markets they already have some link to. For example, foreign carriers are already flying some blind routes where they are currently prohibited from handling domestic traffic. In other words, an airline might already fly, for example, from London to New York to Los Angeles, but is currently prohibited from picking up passengers in New York and dropping them off in Los Angeles. With the prohibition lifted they could freely market that segment.

From the perspective of US domestic carriers' self-interest, the disadvantage of increased competition would be at least partially offset by the injection of foreign capital. In abolishing the laws prohibiting cabotage the United States would inherently also be abolishing the laws prohibiting foreign controlling investment in US airlines. Likewise, the best strategy for a foreign airline looking to break into the US market might be to team up with a US partner. Current airline alliances achieve only a very limited amount of this sort of cooperation.

Since this would result in lower prices and greater efficiency there would be more airline passengers and therefore higher demand for labor in the airline industry; consequently, employment in the US airline industry would rise. Some of the new jobs might go to foreign workers brought in by foreign-based airlines, but net airline employment for US workers is still likely to rise since airlines, like most service industries, prefer to hire locally in order to promote better customer relations.

The impact on average wages in the airlines is more complex. In competitive labor markets, rising labor demand would normally bid up the wages. However, much of the US airline industry is dominated by unusually powerful labor unions. Essentially these unions band workers together to bargain as a labor monopoly and thereby raise wages above competitive levels. Since increased competition tends to erode union monopoly power, the effect from cabotage could theoretically reduce average wages. In other words, rising labor demand tends to raise wages, while increasing competition tends to reduce union power and union wages, so the overall wage effects of cabotage are not immediately clear.

It is beneficial to review the US experience since airline deregulation occurred in 1978. In this case, the effect of increased labor demand swamped the effect of eroded union monopoly power, and wages generally rose after deregulation. Even after major union concessions following the 9/11 terrorist attacks, US airline employees were compensated at a level almost twice the average for all US industries (Ben-Yosef, 2005, p. 251).

Since the move from regulation to deregulation probably impacted on airline competition far more dramatically than cabotage would, it seems reasonable to conclude that airline wages would not be driven down following the opening of the US market. Of course, the

effects on the US economy overall are unambiguously beneficial, though, as mentioned earlier, these effects are unlikely to be dramatic (at least in the short run) given the relatively efficient state of the US airline industry and the likelihood of only moderate initial new entry.

The same general impact, naturally, would occur in any country that opened its airline market, though the effects would often be more intense. In a number of cases it is quite possible that efficient foreign carriers would drive prices so low that flag carriers could not survive. To most economists, this loss would not be at all tragic, since the gains for the broader economy deriving from a more efficient air transport system would easily exceed the sentimental regret at the loss of an inefficient flag carrier-there is no more reason to insist that air travel be supplied internally than there is to insist on locally grown pickles.

But, does "national pride" justify preserving an inefficient flag carrier? One response is to note that, if the market is opened, the flag carrier is free to market itself to travelers on the basis of national pride-if consumers feel it is important to support the flag carrier they can do so. Naturally there are likely to be limits on how much of premium consumers would be willing to pay-a flag carrier that is vastly less efficient than the competition is probably doomed. But, if so, this clearly implies that people don't value "national pride" that much; in some sense, this argument in defense of the flag carrier is inherently invalid if consumers won't freely support it.

It may also be possible to compromise with, and overcome, the politics of protectionism in this sort of case by requiring foreign carriers to exclusively employ native-born employees, and maybe use aircraft painted in the home nation's colors with appropriate insignia. This would preserve much of the feel of having a flag carrier while still enjoying at least some of the benefits of open competition.

It is ironic that government interference has rendered air travel-an industry that should naturally be more global than most-far less global in its operations than virtually any other large industry. The pace of government reform is mostly very slow, but the direction of the trend is at least somewhat encouraging. Deregulation of air travel within the European Union has been impressive. The United States and Europe seem to be slowly moving toward establishing a 'Trans-Atlantic Common Aviation Area' (European Commission: Directorate General, Energy and Transport, 2004). Perhaps, open skies in lieu of cabotage will eventually become routine and allow a true flourishing of the air travel industry; one day, it may truly be a very small world. Foreign ownership of US airlines is another restriction that prevents a full open market for airlines in the US airline industry: US law limits the amount of foreign ownership in its domestic airlines to a maximum of 49 per cent, with a maximum of 25 per cent control. Nonetheless, many other countries protect their domestic markets in a similar fashion.

Trade Protection and Trade Barriers

Trade barriers are attempts by the government to regulate or restrict international trade. They all work on the same common principle of imposing an additional cost on the imported good that will result in an increased price for that good. A country can protect domestic industry by imposing a trade tariff, a quota or a trade subsidy.

A tariff, a common trade barrier, is an additional tax on imported goods. Some tariffs are intended to protect local industries from cheaper foreign goods, while others are an attempt by government to generate revenue from the imported good. Tariffs are the easiest trade barrier to impose and can successfully reduce free trade (Husted and Melvin, 2007).

Assume that Figure 6.5 shows supply (S) and demand (D) for automobiles in the United States In the absence of trade restriction, automobiles will be imported at the prevailing market price of (PFr). In this example:

- ✓ OQ4 = total consumption in US
- ✓ OQl = total domestic production
- ✓ QIQ4 = total import
- ✓ OQ4= OQJ+ QIQ4

PNT and ~T are the unit price and quantity available in conditions where there is no international trade and hence no international competition. PFT and Q4 are the unit price and quantity available in conditions where there is free international trade and no international trade barriers.

Suppose the United States imposes a tariff, equal to M per aircraft, on imported automobiles.

As a result of this, the price of automobiles will rise by the amount of the tariff, to PT' In the absence of any retaliation by other countries, the increase in price of the automobile reduces consumption and increases domestic production. This would change the values to:

0<2: total consumption in the United States

Another case is a subsidy- that is, when a government gives financial aid to a company to help produce or purchase a product. Subsidies have been used to aid a new or failing industry if that industry cannot generate enough revenue to maintain itself and it is in the interest of the general public (Carbaugh, 2007). Amtrak, for example, has received government subsidies in the form of loans to keep'its service running. In 2007 the Bush

Administration agreed to pay $900 million of Amtrak's estimated $3.1 billion budget. One of the more controversial subsidies is that which allegedly exists between Airbus and

its associated countries. As the World Trade Organization (WTO) began a hearing on the plane-maker's dispute with Boeing in March, 2007, the United States accused Airbus of benefiting from more than $100 billion in illegal aid (US Delegation 2004). According to WTO rules, government protection of domestic industries is illegal if another member can prove that the subsidy has harmed one of its companies or industries. The European Union (EU) has brought the same charges about the US aid given to Boeing, claiming that the plane-maker's 250-seat 787, to be introduced in 2008, has benefited from $5 billion in assistance (EU Delegation, 2004). The EU claim rests on the fact that Boeinghas received government contracts for other aircraft, and the EU asserts that this amounts to government funding. However, viewing these contracts as subsidies is a novel way of looking at things, since the US government expects a product in return, whereas the governments contributing to Airbus simply expect a return on their original monetary investment.

The objective of an import quota, like a tariff, is to protect domestic producers from outside competition. Import quotas limit the quantity of various commodities that can be imported into a country during a specified period of time. In Figure 6.6 import quotas on automobiles will induce domestic manufacturers to expand production from Ql to Q2I QQ being the total supply including both domestic production and the quota. US dairy products are a good example of this as they are subject to annual import quotas administered by the Department of Agriculture.

Another, more controversial trade practice is so-called "dumping." Dumping supposedly occurs when a manufacturer in one country exports its product and sells it in another country at an unreasonably low price, usually claimed to be below the cost of production. It is then usually alleged that workers in the second country may become unemployed because of this "unfair competition." However, free-market advocates see dumping, if it actually occurs, as beneficial to consumers since it obviously lowers the price of the product in question. According to WTO regulations a government may act against dumping when material injury to the domestic industry has occurred. One can argue that this directive is intentionally vague in order to allow each government to decide on its own to what extent dumping will be permissible.

Foreign Currency and Exchange

International trade-imports and exports-require foreign currency in order to complete the transactions. When goods and services are bought in a country, they are bought using that country's currency. To obtain foreign currency, one must trade in one's own local currency via the currency exchange rate. The exchange rate, or the price of one nation's currency in terms of another nation's, is a central concept in international finance. Exchange rates are influenced by a wide range of different factors, and the importance of each differs from country to country. For example, one factor affecting the exchange rate between currencies is the rate of inflation. As a general rule, the currency from countries

with lower inflation rates rises in value, while the currency from countries with higher inflation rates falls in value. Consequently, the products from countries with low inflation rates become more attractive than the products from countries with higher inflation rates.

Another factor affecting the exchange rate between currencies is interest rates. Everything being equal, a higher interest rate on US securities (compared to, say, Canadian securities) would make investment in US securities more attractive. Therefore, increases in the US interest rate increase the flow of Canadian dollars into US securities, and decrease the outflow of American dollars into Canadian securities.

This increased flow of funds into the US economy would increase the value of the US dollar and decrease the value of the Canadian dollar. Hence, the ratio of US dollar to Canadian dollar, as it is represented in the foreign exchange market, would decrease.

Finally, a country's balances of payments with the rest of the world influence that country's exchange rate. Demand for foreign currency arises from the import of foreign merchandise, payment for foreign services, or from the redemption of foreign capital obligations. The supply of foreign currency, on the other hand, comes from the export of goods and services, or from an inflow of foreign capital.

Exchange Rate Quotes

An exchange rate quotation is the value of one currency in terms of another. For example, a quotation of 1.06 CAD/USD signifies that 1.06 Canadian dollars will be needed to acquire 1 US dollar. In this quotation, the price currency is CAD (Canadian dollars) and the unit or base currency is USD (US dollars). When the base currency is the home currency (the United States in this example), itis known as a direct quotation. Using direct quotation, the exchange rate decreases when the home currency appreciates (strengthens) and increases when the home currency depreciates.

Exports generally increase the exchange rate of the domestic currency (appreciation) since they cause more foreign currency to come into the domestic country. For example, if Japan Airlines bought large numbers of wide-body aircraft from the US-based Boeing Company, it would have to convert its Japanese yen to US dollars to complete the transaction. This would result in the US banks receiving the Japanese yen and exchanging them for the requisite amount of US paper dollars at the current exchange rate. This increased demand for US dollars acts like any increase in demand - that is, the price of dollars in yen is increased. This increase in price is illustrated in Figure 6.7.

Imports reverse this procedure-that is, US consumers demand yen to purchase Japanese products (demand for yen shifts to the right). This acts exactly the same as the demand for dollars in the previous example, except that now the vertical axis is US dollars for yen rather than yen for US dollars and it is dear that the price of yen in dollars is increased. In

other words, fewer yen are required to purchase dollars and this results in the depreciation of the dollar relative to the yen.

Exchange Rate Regimes: Fixed, Floating, Pegged, and the Gold Standard

Under fixed exchange rates, the central bank tries to keep the exchange rate at a predetermined level by buying or selling foreign currencies in financial markets. During the Second World War, the United Nations held the "UN Monetary and Financial Conference" at the Mount Washington Hotel in Bretton Woods, New Hampshire, in July 1944. It was there that the Allied nations, which represented most of the world leading industrial nations, signed the Bretton Woods Agreement. One of the main features of the Bretton Woods system was the attempt to maintain a fixed price of currencies in relation to gold. This agreement came to be known as the "gold standard" and was nothing more than an attempt to maintain fixed exchange rates by pegging the value of currencies to the price of gold.

Up unti11973 the longstanding Bretton Woods system was the major source of monetary management of the worlds leading industrial nations. When the price of gold and various global economic factors caused a devaluation of the US dollar, the gold standard was abandoned, and the US dollar became a floating currency (subject to complex factors that include open-market operations). Up until that time many countries had had their currencies pegged to the US dollar, since it was one of the few currencies that would readily convert to gold. After the collapse of the Bretton Woods system, relatively few countries remained pegged to the US dollar. Some private organizations are still pegged to the gold standard, but it has officially been abandoned by all nations.

Floating exchange rates are just what the name implies. That is, the value of the country's currency is allowed to fluctuate on the basis of the supply and demand for goods and services and/or capital investment. Over time, the exchange rate will fluctuate so that the real goods markets are always tending toward an equilibrium position.

The appendix to this chapter contains a fairly detailed description of the various regional trade agreements that have been established worldwide. The extent and scope of these agreements provide conclusive proof that, regardless of what domestic politicians might say, the governments involved have concluded that reducing trade barriers is an effective means of increasing domestic wealth.

This chapter has discussed the international aspect of the airline industry. Economists generally argue that the world at large will benefit from free trade and that trade liberalization can promote development. Trade protectionists claim that trade protection in most cases benefits all the domestic economies. The arguments for and against free trade have been explored, along with a presentation of the theories of absolute and comparative advantage. These theories were illustrated with quantitative examples. Next,

the determination of foreign exchange rates was analyzed, along with historical methods for controlling exchange rates. Finally, the topic of free trade agreements was discussed.

MODULE III

AIR TRANSPORT ECONOMICS: CORE PRINCIPLES

MARKET DEMAND AND SUPPLY FOR AIRLINE SERVICES

This section builds on the demand and supply concepts introduced in the previous chapter by examining airline demand in much more detail.

The chapter combines theory, applications, and exercises to illuminate the importance of the theory of demand and supply for airline companies. Other topics include: elasticity of demand and its managerial application; different types of elasticity related to passenger demand, including how they react to changes in economic environment; and how to calculate elasticity and the various determinants of price, income, and cross-price elasticities of demand. A full list of topics covered is as follows:

- Demand schedule
- Demand curve
- Demand function
- Determinants of demand for air transportation
- Characteristics of demand for air transportation
- Source of demand
- Elasticity of demand, including:
  - ✓ Price Elasticity
  - ✓ Cross-price elasticity
  - ✓ Income elasticity
- Supply of airline services
- Factors affecting supply of airline services
- Characteristics of supply for airline services
- Airline supply and demand equilibrium.

Overview of Demand and Supply Concepts

Demand Schedule

As stated earlier, the law of demand states that, ceteris paribus, as price increases, the quantity demanded decreases. In order to understand the law of demand's practicality, consider a transcontinental flight from New York to Los Angeles. For this round-trip flight, what would be the maximum a passenger would be willing to pay? $500? $1,000? $5,000? The fact is that, at some price, the passenger would consider it too expensive to fly and not take the trip. This decision to not fly is the law of demand in practice, that is, at some price the quantity demanded will decrease.

When this decision is presented to all possible travelers there will be different responses because people have different purposes for travel and varied incomes. These different

responses help create a demand schedule, which is simply a table showing the quantities of a good that customers are willing and able to buy at alternative prices in a given time period, ceteris paribus. Such a table outlines the number of customers who would purchase a product or service at the given price. It is important to remember that demand is cumulative-that is, a consumer who is willing to pay $1,000 for the flight would certainly also be willing to pay $500 for the same flight. Table 3.1 provides a hypothetical demand schedule for the New York to Los Angeles flight.

The demand schedule contained in Table 3.1 highlights the law of demand, since the quantity demanded (number of passengers) for the $200 airfare is significantly more than the quantity demanded for the expensive $5,000 airfare. At an airfare of $5,000 very few people are willing and able to pay for the ticket-perhaps only a few extremely wealthy and/or time-sensitive passengers.

Table 3.1 Hypothetical demand schedule for the New York to Los Angeles flight

Ticket Price of New York to Los Angeles Round Trip	Quantity Demanded (No. of passengers)
$200	735
$500	690
$1,000	615
$2,000	465
$3,000	315
$5,000	15

Demand Curve

From the demand schedule above, a demand curve can be constructed. A demand curve graphically describes the demand schedule and the quantities of a good that customers are willing and able to buy at alternative prices in a given time period. The law of demand can then be derived from this schedule, and it states that the demand curve will always be downward-sloping.3 It should be noted that the demand curve does not portray actual purchases, but only what consumers would be willing and able to purchase. Figure 3.1 provides the demand curve for the New York to Los Angeles trip. In this example, the demand curve is a linear negative sloping line.

Demand Function

Using information from the demand schedule and/or the demand curve, a demand function can be constructed. A demand function is simply the functional relationship between the quantity demanded and factors influencing demand. There are numerous factors that influence the demand for air travel, for example, in the New York to Los Angeles market, and therefore price is not the sole determinant of demand. (However, when the other determinants are held constant, the relationship between price and quantity demanded is always negative.} These functions can be classified into two categories based on their composition: implicit or explicit. Implicit demand functions simply state a general relationship between the quantities demanded and the factors affecting demand. Explicit demand functions are mathematical relationships between the quantity demanded and the various variables impacting on demand. Implicit functions do not have the actual mathematical relationships, but rather a more generalized statement of the factors affecting demand. For example, the implicit demand function for the New York to Los Angeles flight could be:

DNY-LA = f (Px, Pz, Y, H}

- ➔ Px is the own ticket price
- ➔ Pz is the competition's ticket price
- ➔ Y is the annual income or state of the economy
- ➔ H is a composition of other factors, such as service, customer loyalty, and random factors.

The implicit demand function simply states that a relationship exists between the dependent variables and the independent variables, but it does not state the extent to which the variables are related. The numerical relationship that displays the degree of influence that each factor has on the quantity demanded is the explicit demand function. Using the information obtained from the demand schedule and the demand curve, an explicit demand function for the New York to Los Angeles flight could be written as:

DNY-LA = 15000 2P

Based on this linear demand function, two statements can be made about the nature of demand for a round-trip New York to Los Angeles flight. First, when the price of the ticket is $7,500, then demand for this trip drops to zero. In other words, demand for any product or service is always limited by the extent of the market demand (in this case, any price above $7500).

The other statement concerning the linear demand curve is that the negative price coefficient (or slope) of -2, which means that for every dollar increase in the ticket price, the demand drops by two passengers. This change in demand occurs for all price points, creating a constant negative slope. While the linear demand function is simplistic and

clear to understand, the fact remains that the demand schedule rarely has a perfect linear form. This makes intuitive sense since passenger demand does not drop off evenly with price increases, but instead drops off in steps. Often there is a major inflection point where demand decreases dramatically.

Two other types of demand function are the semi-log function and the log-linear function. 4 The general forms for the two functions are:

Semi-log: $LnQo = X_O + X_I P$

Log-linea~: $LnQo = X_O + X_I LnP$

- Qo is the quantity demanded,
- P is the ticket price, and
- $\mathbf{X_O}$ and $\mathbf{X_I}$ are the coefficients.

For the airline industry, it is usually assumed that the typical demand function takes the log-linear shape. Unlike a linear demand function where the slope of the function is constant throughout, the slope of a log-linear demand function changes. In Figure 3.2 the initial slope of the function is fairly steep, indicating that a unit drop in the ticket price does not generate a similar increase in the quantity demanded. This is partly a result of the fact that the ticket price is still considered expensive by the majority of potential customers. Eventually, as the price decreases, the quantity demanded for the product or service becomes greater and greater to the point where a small drop in the price generates a large increase in the quantity demanded.

Determinants of Demand for Air Transportation

While price is a major determinant of demand for any product or service, it is not the sole determinant of demand for air transportation. There are many other factors that affect demand for air transportation; however, discussing each factor in detail could consume an entire book. Realistically there are only a few major determinants that affect demand for air transportation, and these will be explored in this section. They include:

- ticket price
- competitor's ticket price
- passenger income
- state of the economy
- availability of other modes of transportation
- customer loyalty
- in-flight amenities
- frequency of service
- safety
- random factors, such as SARS and 9/11 or the threat of terrorism.

Table 3.2: Updated demand schedule for the New York to Los Angeles flight

Ticket Price of New York to Los Angeles (Round Trip)	Quantity Demanded (No. of Passengers)	New Quantity Demanded (No. of passengers)
$ 200	735	960
$ 500	690	915
$ 1000	615	840
$ 2000	465	690
$ 3000	315	540
$ 5000	15	240

To illustrate the impact that these factors might have on the demand curve, consider the previously used demand schedule for the New York to Los Angeles flight. As we said earlier, a change in the ticket price is always defined as a ceteris paribus movement along the demand curve. For example, if the current ticket price for the flight was set at $3,000 and then lowered to $2,000 (all other things remaining constant), the only effect this change would have would be on the quantity demanded. This is reflected in the demand schedule shown in Table 3.2 in column 2 where the quantity demanded moves from 315 to 465. This movement is displayed graphically in Figure 3.3, where the quantity demanded moves from point A to point B along the demand curve. Ticket price is the only determinant of demand that causes a movement along the demand curve. Changes in the other determinants of the demand cause a shift in the entire demand curve Continuing with the New York to Los Angeles example, suppose that the competition increases its airfares. This will cause demand for this airline's flight to increase as some consumers switch to this airline. This increase in demand is reflected in Table 3.2's third column, where the quantity demanded at each price level increases by 225 passengers from column 2. The increase in the quantity demanded across all price levels creates a rightward shift in the demand curve from 0 1 to O2, as depicted in Figure 3.4.

For every price level the quantity demanded has increased by 225. Conversely, a negative impact on demand would create a leftward shift in the demand curve.

The demand for a single flight is affected by multiple factors, but for many, especially price-sensitive leisure travelers, the price of the flight and the price of competing flights are probably the most important variables. With the advent of the Internet, where airline ticket price information is readily available to potential consumers, price and competitors' prices have probably become even more important. However, these price variables affect different segments of the population. For time-sensitive travelers, ticket price versus a competitor's ticket price may not be as important as for price-sensitive travelers.

For the competitor's price variable, the coefficient would be expected to be positive, since an increase in the competitor's price would make the competition's product less competitive, and ultimately increase demand for the company's product. Consider airlines A and B which both have flights on the same route and have introductory fares of $400.

If airline B were to increase its airfare to $450, this would make it less competitive and ultimately increase demand for airline A. Conversely, if airline B were to drop its airfare to $350, this would make it more competitive, which would decrease demand for airline A and increase demand for airline B. Regardless of the viewpoint, the price coefficient would be negative and the cross-price coefficient would be positive. The general form of a log-linear demand function can be expanded to include the competition's price:

$$\mathbf{LnQ_D = B_O + B_1 LnP_x + B_2 LnP_Z}$$

- ➔ **B**o is a constant
- ➔ Px is the own price and
- ➔ Pz is the competitor's price
- ➔ B, B_2 and B_3 are the coefficients

Income is another important determinant of demand. Consumers with higher incomes are able to purchase more goods and services; therefore, an increase in disposable income will provide an increase in demand for air travel. In addition, increased consumer income is usually correlated with increased business activity, indicating a higher demand for business travel. Because of this direct relationship between demand and income, the coefficient for consumer income is positive.

The general log linear demand function for air transportation can now be expanded to include income:

$$\mathbf{LnQ_D = B_O + B_1 LnP_x + B_2 LnP_Z + B_3 LnY}$$

- ➔ B, B_2 and B_3 are the coefficients

Although own price, substitute price, and income are the three major determinants of demand for air transportation, there are other factors that affect demand. An important one of these is the availability of substitutes. For air travel, this includes other modes of transportation. In the United States, driving is a reasonable substitute for many short flights, while in Europe high-speed rail can greatly affect the demand for select air services. For example, the high-speed Brussels to Paris rail line has created a situation where there is little demand for Brussels to Paris air transportation. However, where there is a lack of other modes of transportation-for example, air services to a remote Caribbean island -demand for air travel can be expected to increase. On the basis of this discussion, the expected coefficient for the availability of substitutes could be either positive or negative. The final pricing variable that impacts on the quantity demanded is the price of a complementary

product or service-that is, a product or service that is usually used jointly with the primary good. A good example of a complement for the airline industry is the hotel and rental car industries. Since many leisure and business travelers have to stay in hotels while on their trip, the price of the hotel will affect the demand for airtravel.

This is a result of demand for air transportation being derived (that is, being generated by) from something other than air travel). For example, if the average price of a night's stay in Cancun were to increase, fewer people would want to take a vacation in Cancun. Therefore, the demand for flights to Cancun will be reduced. On the basis of this typical example, one would expect the coefficient for the price of a complement to be negative.6

In a competitive market environment, the frequency of an airline's service between two cities will also affect demand. Flight frequency is especially important for business travelers since they are generally more time-sensitive than leisure travelers. An airline with several flights between two cities has a greater probability of meeting a travelers' schedule than an airline with only a few flights. Moreover, a robust flight schedule provides the traveler with greater flexibility in case of schedule changes. This is a primary reason why regional jets have become more popular-they enable airlines to provide increased flight frequency while holding steady the total number of seats offered in the market. We would therefore expect a positive coefficient between flight frequency and demand. Whether an airline has a nonstop or connecting service between two cities will also affect demand. The availability of a nonstop flight will generally increase demand because passengers usually prefer nonstop flights over connecting flights. However, this assumption may not apply to all markets, especially ultra-long-haul markets in which passengers may appreciate a stopover. Therefore, we would expect that a nonstop flight variable would generally have a positive relationship with demand (with some possible exceptions on long-haul flights).

Customer loyalty is another key determinant of demand for air transportation. In this regard, one of the more successful marketing tools that the airline industry has implemented has been loyalty or frequent-flyer programs. By offering free flights and perks for loyalty, airlines have been successful in obtaining repeat business, especially among business travelers.

While customer loyalty is important, it is also important to attract new customers. Here, airlines have emphasized service which can incorporate a host of factors, including aircraft seat placement (more room), in-flight entertainment, food and beverages, airport amenities, baggage handling, and, most importantly, friendly customer service. Although service is ultimately an intangible variable, it does impact on demand. Airlines that are perceived to provide a high level of service will have a greater demand for their flights.

Airlines such as Virgin Atlantic, Emirates, and Singapore Airlines have been very successful at generating increased demand through a perceived level of strong service.

Finally, there are stochastic and random factors that can materially affect demand. For example, the terrorist attacks of 11 September 2001 crippled demand for air travel for quite some time.

Characteristics of Demand for Air Transportation

The demand for air travel also has many unique characteristics that present problems for the airline industry. While all of the following characteristics shape the demand for air transportation, only the first five will be examined in detail:

- ➔ constant fluctuation
- ➔ cyclicality
- ➔ seasonality and peaking
- ➔ directional flow
- ➔ perishability
- ➔ schedule wait time
- ➔ airport access time
- ➔ flight time
- ➔ hub connection time
- ➔ denied boarding time.

The first major characteristic of demand for air transportation is that, unlike the demand for many products, it is constantly fluctuating. Because of the numerous determinants highlighted in the preceding section, demand for individual flights is constantly changing.

Moreover, no two routes exhibit the same properties of demand, making every route unique in its demand characteristics.

Cyclicality, a second characteristic of demand for air transport, refers to a long-term trend of peaks and troughs of economic activity. The national economy has long been known to experience such cyclicality. And, since the airline industry is highly correlated with the national and global economy, it is not surprising that it also experiences some cyclicality.

Figure 3.5 depicts the number of passengers carried by US airlines since 1970. While the chart shows overall steady growth, there remain three pronounced drops in US airline industry enplanements: the early 1980s, early 1990s, and post-91ll.

Another major characteristic of air-transport demand is peaking, more commonly called seasonality. Unlike cyclicality, which is a long-term cycle, peaking is more of a short-term event where demand spikes. The most common form of peaking is seasonality where demand increases during the summer months and then declines during the winter months. This trend is particularly true of leisure destinations, where the weather is more favorable and individuals have more time off. For example, Mediterranean resort destinations are in

high demand during the summer months, but demand declines during the winter months. This situation also applies to most domestic routes in the

United States. As a specific example, consider the Chicago to Seattle route. Figure 3.6 displays a 10 per cent sample of the route's passenger enplanements per quarter since 2002. As Figure 3.6 shows quite clearly, the route experiences tremendous demand during the third quarter of every year, while demand is quite low for the first quarter of every year. This is a fairly regular pattern partly attributed to Seattle's summer cruise ship industry and the Pacific-Northwest's more favorable summer weather. In addition to seasonality, other peaks in demand include Thanksgiving, Christmas holidays, and other statutory holidays.

Since peaking is fairly predictable, airlines can add capacity, if they choose, by either increasing the frequency of the flights on an existing route, or by introducing seasonal-only service. However, in order for airlines to be able to add seasonal capacity, they either have to take the aircraft off other routes or have excess capacity in reserve, which is very expensive. Ideally, airlines would like to add aircraft during the summer months and retire them during the winter; however, short-term leases for aircraft are rare. This means that seasonality can present a sizeable financial, operational, and scheduling burden for airlines, as they want to be able to meet the seasonal demand, but must also bear the assets for the remainder of the year. This is one reason why North American carriers have robust aircraft maintenance schedules during the winter months when their schedule is not as busy. Some carriers, such as American Airlines and Air Canada, have been successful at moving capacity to Central and South America during the northern hemisphere winter season. Another characteristic of airline demand that is similar to peaking is directional flow which relates to the increased demand of passengers in one direction for a period of time. While cyclicality spans decades and peaking spans years, directional flow is usually assessed on a weekly basis and is fairly short-term. An example of directional flow could include customers flocking to a city a few days before a major sporting event (such as the Super Bowl) and then immediately demanding to leave after the event has finished. The key factor is that directional flow is essentially one-way for a short period of time. This creates another unique scheduling problem for airlines, since, in order to accommodate the directional flow of passengers, some aircraft will be flown in a relatively empty condition in the opposite direction?

The principal problem with cyc1icality-peaking-and directional flow is that demand for air transportation is perishable. The moment the plane leaves the gate, any empty seats are lost as revenue-generating products-a situation that does not, of course, pertain to a manufacturing company, which can keep its product in inventory for sale on another day. Consequently, the close matching of demand and supply is essential for success in the aviation industry. Because of situations such as peaking and directional flow, airlines are faced with the prospect that a good portion of their seats will go unsold, simply due to the nature of demand and the structure of their operation. Because of this, pricing is extremely

important in order to help offset issues related to the structure of demand.

Source of Demand

The source of demand is very critical to understanding the nature of demand for air transportation. Depending on the source, demand can be categorized as direct or derived. Direct demand refers to demand that directly satisfies a consumer's need. For example, a consumer's need for a dessert can be satisfied by a cheesecake, while another consumer's need for entertainment can be satisfied in a variety of ways, such as by a movie or live sporting event. In both these examples the product or service directly satisfies the need.

In the airline industry there is no direct demand since passengers do not purchase tickets just for the sake of flying. Instead, passengers fly in order to arrive at a resort, visit family or conduct business, as well as for a variety of other reasons, and this make the demand for air transportation a derived demand. Derived demand occurs when the demand for a product or service depends on the demand for other products or services. This means that airlines are generally not able to directly affect the demand for their products. And this further creates a situation in which the airlines largely react to demand. On this basis, airlines must be continually aware of the multitude of factors that can impact on their demand curve.

Supply of Airline Services

One of the key reasons why the airline industry has faced financial difficulties and has profit margins well below many other industries is that its demand fluctuates constantly but its supply is relatively fixed. Lack of flexibility in the supply function makes it very difficult to manage capacity effectively. Therefore, it is important to understand the factors impacting airline industry supply in some detail.

Airline supply refers to airlines' ability and willingness to provide a specific number of seats at alternative prices in a given time period and in a given market. In the air transportation industry, supply is usually expressed in available seat miles (ASMs) or available ton miles (ATMs). An ASM is simply one seat carried through the air for one mile, regardless of whether it contains a passenger or not. The presence of a revenue passenger in the seat is the key difference between RPMs (demand) and ASMs (supply), as RPMs only measure seats that have a revenue passenger in them. A similar distinction can be made between ATMs (supply) and RTMs (demand).

An implicit supply function for the airline industry can be written as:

$$\mathbf{Qs = f\ \{P,\ P_{RES},\ Tech,\ Comp,\ Rand,\ Govt.\}}$$

- ➔ P ticket price
- ➔ P_{RES} price of resources, including aircraft costs, fuel, labor costs, maintenance costs, and so on
- ➔ Tech technological improvements
- ➔ Comp = behavior of the competition
- ➔ Rand random factors
- ➔ Govt. = government regulation.

The major determinant of supply, just like demand, is the ticket price of the good or service. This relates to the law of supply in that the quantity of a good supplied in a given time period increases as its price increases, assuming all else is held constant. In the airline industry this simply means that airlines are willing to supply more seats as ticket prices increase. Based on the law of supply, the supply curve slopes upward, so that any change in price is simply a movement along the supply curve.

Table 3.5 provides a hypothetical supply schedule for the New York to Los Angeles flight.

The next major determinant of supply is the price' of resources. For the air transportation industry, production resources include, but are not limited to, aircraft, fuel, maintenance, labor, and landing fees. All these factors, and many more, impact on supply because they affect the cost of production. If the cost of production increases, the airline's total costs increase, causing a leftward shift in the supply curve. In the airline industry, an increase

Table 3.5 Hypothetical supply schedule for the New York to Los Angeles flight

Ticket Price of New York to Los Angeles (Round Trip)	Quantity Demanded (No. of passengers)
200	15
500	315
1000	465
2000	615
3000	690
5000	735

in the costs of production may force the airline to cut some flights that would no longer be profitable. This reduction in flights is a leftward shift of the supply curve-that is, fewer seats are offered at the same ticket price. Conversely, if the price of resources decreases, the supply curve shifts to the right-that is, more seats are offered at the same ticket price. Applications of the impact that the price of resources have on supply are numerous.

For example, during bankruptcy protection, Delta Air Lines was able to significantly reduce its costs by receiving wage concessions and reducing aircraft leasing rates. As a result of this, Delta dropped many domestic destinations and redeployed resources to new international markets. Similarly, with skyrocketing fuel costs, airlines eliminated a number of flights that were previously viable.

The next major factor that determines supply for air transportation is technology. The impact of technology on the supply of air transportation has been vast. Technology has advanced civil aviation to the point where it is one of the safest modes of transportation. The introduction of the Boeing 747 in 1970 created a rightward shift in the supply curve as the jumbo jet was able to carry more passengers on a flight than any other aircraft (Boeing, 2007). The new Airbus 380 will also cause a shift in the supply curve of airlines that receive the aircraft. However, perhaps one of the best examples of technology'S impact on air transportation supply is the introduction of ultra-long-range aircraft, such as the Boeing 777-200LR and the Airbus A340-500, which allowed routes such as Singapore to Los Angeles and New York to Dubai to be be operated on a nonstop basis. Finally, the introduction of ETOPS (extended-range twin-engine operations) enabled a greater supply of air transportation over the Atlantic and Pacific Oceans through the use of smaller twin engine aircraft.

Competitive factors are another important determinant of supply for air transportation. Since airlines have historically aggressively competed over market share, competition from other airlines has had a considerable impact on supply. Airlines regularly adjust capacity and supply in markets in response to competition and changing market forces, although there have been cases where they have taken this to an extreme. For example, in 1999 American Airlines faced antitrust lawsuits over its competitive actions against smaller rivals, particularly Vanguard Airlines out of Love Field (American Cleared, 2003).

The lawsuit alleged that American Airlines had "dumped" capacity on routes where Vanguard Airlines was competing with American (American Cleared, 2003). Eventually American Airlines was cleared of the charge. Similarly in 2000, El Salvador-based Grupo TACA accused Continental Airlines of capacity dumping following a liberalization of the US-El Salvador bilateral air agreement (Knibb, 2000). Since the financial downturn in the

US aviation industry, airlines have begun to compete less on market share and focus more on profits.

Just as in demand, random factors playa large role in affecting supply. The tragic events of 11 September 2001 not only created a dramatic one-off shift in the demand curve, but also impacted on the supply curve, albeit not to the same extent. Because of the terrorist attacks, all commercial flights were grounded for two days, then, when flights resumed, security procedures were added that added some costs. In addition, the two carriers involved in the accidents-American Airlines and United Airlines-lost aircraft, thereby reducing their fleet size and ability to transport passengers.

The deregulation of air transport has also significantly affected the supply curve. Since regulation generally prohibits market forces from determining supply, an artificial cap is usually set on supply. Therefore, when air transport deregulation occurred, the artificial cap on supply was withdrawn, and supply subsequently increased.

Amore current example would be the United States-China air transportation agreement. The current agreement limits the amount of supply between the two countries, thereby placing an artificial cap on supply. However, whenever additional rights are granted, the supply of air transportation between the two countries will shift to the right.

The final factor impacting on air transportation supply is government regulation. Despite the fact that aviation industry has gone through massive privatization and financial deregulation, almost all aspects of safety and operations remain highly regulated. On 20 January 2005 the FAA mandated that the vertical separation between aircraft above the United States at altitudes from 29,000 to 41,000 feet be reduced from 2,000 feet to 1,000.

Characteristics Of Supply For Airline Services

Two important characteristics of supply that help shape the air transportation industry are seasonality and rigidity. Both these characteristics make it difficult for airlines to match supply and demand.

One major feature of air transportation demand is its constant fluctuation, and airlines must react to this by adjusting the supply to match the passenger demand. In order to accommodate seasonality, airlines need to either pull capacity off existing routes, or have idle capacity available to accommodate additional flights. Both these options entail embedded costs, and, airlines typically use a mix of both. Although the increased costs of a seasonal schedule can be offset by increased revenues, airlines have greater difficulty adjusting supply on a short-term basis due to the second major characteristic of airline supply- rigidity.

An airline's supply is fairly rigid as it can be difficult for it to reduce and/or increase supply dramatically. Airlines create their schedules at least six months in advance, and accept bookings up to a year in advance, so they must adhere to their schedules or face

re-accommodation fees. Fixed costs, such as investment in infrastructure at hub airports, aircraft leases, and labor contracts have to be paid regardless of the schedule, making it impractical for airlines to reduce capacity at short notice. This is a particular problem for those major US carriers that operate in a hub-and-spoke network and is one reason why a non-hub carrier, such as Southwest Airlines, has greater flexibility with supply.

Ultimately, this rigidity in supply limits the airlines' ability to match supply and demand effectively.

Airline Supply And Demand Equilibrium

While Chapter 2 introduced the conceptual framework of market equilibrium, here we present a concrete example of both supply and demand functions to determine market equilibrium price and quantity. Suppose that the demand and supply functions for DirectJet's flights from New York to Seattle are the following:

$$Q^D = 500 - 5Px + 2P_Z + O.OIY$$

$$Q^S = 800 + 3P_X - 2P_{RES}$$

Assuming that the competitor's ticket price is $300, the annual average income is $50,000 and the cost of resources for the flight is $100, both the demand and supply functions can be rewritten solely in terms of the ticket price:

$$Q^D = 500 - 5P_X + 2(300) + 0.01(50,000)$$
$$Q^D = 500 - 5P_X + 600 + 500$$
$$Q^D = 1,600 - 5P_X$$
$$Q^S = 800 + 3P_X - 2(100)$$
$$Q^S = 800 + 3P_X - 200$$
$$Q^S = 600 + 3P_X$$

In order to find the market equilibrium price for the flight, the demand and supply functions need to be set equal to each other:

$$Q^D = Q^S$$
$$1,600 - 5P_x = 600 + 3P_x$$
$$1,000 = 8P_x$$
$$P_x = \$125$$

Based on this calculation, the market equilibrium price for DirectJet's flight between New York and Seattle is $125. At this price point, the quantity demanded equals the quantity supplied. Since the supply and demand curves are equal to each other at the equilibrium price, either the demand or supply function can be used to determine the market equilibrium quantity.

COST AND PRODUCTION ANALYSIS IN AIR TRANSPORT INDUSTRY

General Concept of Cost and Production Analysis

The theory of supply and production is one of the principal theories of economics and is the foundation upon which many other economic theories are based. This chapter adopts a modem approach to the principles and practice of airline supply, production and cost analysis. It is rigorous and clear in its presentation of the techniques involved in cost accounting, and goes one step further by demonstrating how this technical knowledge can be applied across a whole range of management decisions. Although this chapter has been prepared primarily for students, it may also be useful to the industry and government agencies.

In this chapter we discuss a number of topics related to production and cost theory. We are specifically interested in applying this theory to the airline and aviation industries.

The chapter provides a body of knowledge that will allow readers to understand how the costs of production are minimized through either the mix of inputs or the reallocation of resources across multiple plants. It also illustrates which costs are relevant for specific airline decisions.

Profitability can be improved by increasing revenues or decreasing costs. More precisely, the amount of profitability is the difference, or contribution margin, between unit revenues and unit costs.

Cost Classification

The economic definition of a cost is the foregone alternative use incurred in the exchange, transformation, use, and production of goods or resources. For example, for a manufacturer, the costs could be the alternative uses of raw materials, labor, buildings, and general overhead supplies. In the airline industry, costs incurred include labor (of various types), fuel, maintenance, aircraft, catering, and airport landing/usage fees-to name just a few.

Typically, fuel, labor, maintenance, and aircraft ownership costs are the four largest costs for any airline. All these costs represent a foregone alternative to the organization. Costs are generally separated into different categories, and these classifications are Current, Future, Replacement, and Sunk Costs

Costs can be classified depending on time. Historical costs are the costs actually incurred to acquire an asset, whereas current costs are the costs incurred under prevailing market conditions. For example, assume that DirectJet bought an aircraft in 2007 for $25,000,000, but today the aircraft is worth $20,000,000 in the open market. In this example, the

historical cost for the aircraft would be $25,000,000, while the current cost would be $20,000,000. Although historical costs are used in accounting to value assets, current costs provide the best representation of the present situation. And, quite obviously, future costs are the expected costs that may be incurred sometime in the future; these will be affected by such macroeconomic variables as the (uncertain) rate of inflation and the rate of interest. Replacement costs are the costs required to duplicate the productive capabilities using current technology. For example, in the airline industry, an older-generation 737 could be replaced by a modern 737NG for the cost of the 737NG. The final, and perhaps most important, costs are sunk costs-that is, costs that have been incurred in the past and are not recoverable. Since these costs have already occurred and they are not recoverable, they should never influence business decisions.

Unfortunately, they commonly do. As an example of such misguided decision-making, suppose an airline has already purchased eight additional lavatory units and is considering installing these units in new aircraft. However, additional detailed analysis shows that these lavatory units would increase fuel costs, decrease passenger revenue (by removing seats), and increase maintenance costs. Suppose, further, that there is no secondary market for these lavatories. Clearly, installing the aircraft lavatories would be costly to the airline, but managers may want to install the lavatories anyway, since "we already have them." In this example, the pre-purchase of the lavatories has now become a sunk cost, and therefore should not affect the final decision whether or not to install them.

Cost Division: Total, Fixed, Variable, Average, Mixed, and Marginal Costs

While costs categorized by time are important in accounting & in economics the most common and practical method of classifying costs is by their relation to output. Costs that remain fixed in the short run, regardless of the level of output, are termed fixed costs (FC). Costs that directly vary with changes in production are termed variable costs (VC). When fixed and variable costs are added together, the result is total cost (TC).In simple terms the formula below provides the equation for determining total cost:

TC=FC+VC

As pointed out above, the timeframe is important when categorizing costs based on their relation to output. In the short run, some costs are fixed, since they have already been incurred and they are difficult or impossible to change. In the long run, however, all costs are assumed to be variable, since over time a company is fully able to change fixed costs (by selling and lor altering the fixed cost asset). An example of this could be long-term aircraft leasing contracts. Since airlines are legally and contractually obligated to pay aircraft lease payments to the lessee, in the short run the airline would be unable to avoid these payments no matter how it adjusts output. Therefore, lease payments are a fixed cost in the short run, but in the long run they are variable because, eventually, the contractual obligations will expire. At this point the airline can cut the aircraft from the fleet in order to adjust capacity.

There is usually no set timeframe when fixed costs will turn into variable costs; however, the specific situation will dictate when all costs become variable.

Firms and industries have different ratios of fixed to variable costs. The airline industry tends to have high fixed costs, which increases barriers to entering the industry. The ratio of fixed to variable costs is called operating leverage, and this topic will be investigated later in the chapter.

If we divide the total cost function by output, we obtain another important category of costs, called the average costs (Boyes, 2004). By definition, then, average total cost is the total amount of costs (both fixed and variable) per unit of output. Average fixed cost is the fixed costs per unit of output, and average variable cost is the total variable costs per unit of output. Because fixed costs remain constant regardless of output, average fixed costs will decrease with increases in output, since the fixed costs are spread out over a greater range of outputs. This provides an incentive for a firm to increase output if it has high levels of fixed costs. Average variable costs tend to decrease over the first units of production (since so few units are initially produced) and then increase as production increases. Finally, average total costs will behave like average variable costs since they are made up of fixed and variable costs. The formula below describes the relationship between average total costs, average variable costs, and average fixed costs:

$$\mathbf{ATC = AFC + AVC}$$

Cost Functions

A cost function is a mathematical relationship between total cost and units of quantity produced. While every company has a unique cost function, there are several general forms of cost functions.

The linear cost function can be represented by the formula:

$$TC=a+bQ$$

where: a and b are both constants.

In a linear cost function, the constant, a, would represent the fixed cost, while the constant, b, would represent the marginal cost component, and bQ the total variable cost component.2 The underlying assumption of a linear cost function is that there are constant returns to scale. That is, successive units of output can be produced for the same cost (in this case the constant, b).While linear cost functions are never attainable for all levels of production in the long run, in the short run they may be approximated within a given production range. A linear cost function generally applies best to a mechanized and automated production line where unit costs are approximately the same. For example, if the production capacity of an assembly line is 300 cars per day, a linear cost function can

approximate this process up to that point. For units above 300 per day, a new assembly line would have to be built, and the cost function would shift accordingly.

Economies of Scale, Scope, and Density

Economies of scale are advantages gained when average unit costs decrease with an increase in the quantity being produced. Economies of scale are common in highly capital- intensive industries with very high fixed cost such as aircraft manufacturing, airline industry, railroads, and the steel industry. The following are the sources of economies of scale:

- lower cost and higher productivity due to the division of labor
- increase in labor productivity due to concentration on a fewer number of tasks and more experience on the job (learning curve).

The reverse is diseconomies of scale, where average unit costs increase with an increase in production quantity. There are different causes for diseconomies of scale:

- an inability to efficiently coordinate material flows and manage employees due to larger facilities
- a slow decision ladder
- workers and management becoming more segregated and communication becoming less effective
- inflexibility
- capacity limitations on entrepreneurial skills (hiring qualified employees).

Depending on the firm's cost function, economies of scale usually do not exist for every level of production. Companies will have levels of quantity where economies of scale are present and levels where diseconomies of scale exist. This is exactly what occurs for cubic cost functions. Referring back to Figure 4.4, the average total cost function is u-shaped, indicating economies of scale for production quantities of 1 through 7 and diseconomies of scale for production quantities 8 and above.

Economies of scope refer to the situation in which the company can reduce its unit costs by leveraging efficiencies through sharing resources for multiple projects or production lines. Put more simply, multiple projects/processes can be more cost-efficient when they are done together rather than individually. The presence of economies of scope provides benefit by allowing a company to house activities together and concurrently. Possible synergies achieved through economies of scope could include shared labor, shared knowledge, and shared capital equipment. For example, Boeing houses three production lines (747, 767, and 777) at its large Everett production facility (Boeing, 2006). By operating three production lines in the same building, Boeing is able to share resources such as labor and equipment between all three lines to maximize resource efficiency. If all three production lines were individually located throughout the country, Boeing would not be as cost-effective in

manufacturing aircraft since resources could not be shared among all three production lines. Also, Boeing is able to leverage capital knowledge by reducing R&D expenses through utilizing technology developed in other projects. These savings can be considerable when developing new aircraft such as the Boeing 787. Another example of economies of scope would be Aer Lingus, which in 1970 began to seek new sources of revenue by offering engineer training, maintenance services, computer consulting, and data processing services to other airlines (Harvard Business School, 2000).

Economies of density are achieved through the consolidation of operations. The airline industry is a good example of this as it has developed the so-called hub-and-spoke system for air travel. That is, airlines have found it more cost-effective to consolidate operations at a single airport rather than operate a point-to-point service. For example, consider five airports that could all be connected together either by using one airport as a hub, or by flying between each city. Using a hub, all the airports can be connected to each other with a minimum of four flights, while the point-to-point service would require ten flights. The difference in the number of required flights is a cost saving as the airline can provide service to all the cities with less resources. Of course there are other benefits to flying point-to-point services, such as being able to offer nonstop flights for the passengers. In addition, the advent of the regional jet has enabled airlines to offer an increased amount of point-to-point flying. However, the hub-and-spoke network is still the dominant flying structure in the United States, and will probably continue to be so for the foreseeable future.

Airline Industry and Cost Structure

Since every airline's operation is unique, it can be difficult to compare airline operating costs from airline to airline. The most common metric used to standardize airline costs are CASMs (costs per available seat miles). An available seat mile (ASM) is one aircraft seat, flown one mile, regardless of whether it is carrying a revenue passenger. Costs per ASM, or CASM, are the cost of flying one aircraft seat for one mile. CASMs can be created for a variety of costs, such as operating costs, total operating costs, or simply crew costs.

Fuel Costs:

In terms of direct operating costs, fuel costs in 2005 represented the greatest share of an airline's direct operating costs. This was due to the record high prices of oil that were experienced in that year. The general formula for airline fuel costs is:

$$\text{Fuel Cost} = \text{ASM} \times \frac{\text{Fuel Price Per Gallon}}{\frac{\text{ASM}}{\text{Block Hour}}} \times \frac{\text{Gallons}}{\text{Block Hour}}$$

An airline's fuel cost per available seat mile is a result of two factors: the price of fuel and fuel efficiency. Although the price of fuel is generally beyond the airline's control, the airline can lessen the impact of this cost by using more complex investment strategies.

Investment strategies such as these help offset increases in the cost of fuel. However, these gains are recorded as investment gains in the airline's consolidated financial statements and not as fuel cost benefits. The second way in which airlines can adjust their fuel costs is by being more fuel efficient. The simplest way to do this is to operate new, fuel-efficient aircraft rather than older, less fuel-efficient aircraft. Although the capital expenditures required to purchase new aircraft are considerable, they may outweigh the fuel costs associated with operating older aircraft Other fuel efficiency methods center on technological advances-for example, the installation of blended winglets. Aviation Partners Boeing, the joint-venture company that manufacturers blended winglets, estimates that the winglets reduce fuel bum by 3.5-4.0 per cent on flights greater than 1,000 nautical miles for Boeing 737NGs (APB, 2006). The winglet technology does not provide substantial savings on short flights as the fuel-bum advantage is offset by the increased weight. Winglets were originally offered on just 737NG aircraft, but their success has led to their installation on a number of different aircraft types?

While the methods highlighted above usually require substantial capital investments to reduce fuel costs, more subtle fuel management strategies by airlines can also increase fuel efficiency. One strategy commonly employed by airlines is to use only one engine during normal taxiing procedures, thereby reducing the fuel costs associated with operating an engine during these maneuvers. The more congested the airport is, the greater the amount of taxiing, and the bigger savings such a program can provide. In addition, airlines can selectively shut do\A.'ll an engine(s) during ground delays when the aircraft is forced to sit idle.

Flight planning plays a significant role in fuel efficiency in that it can help plan flights for minimum fuel-bum routes and altitudes. Flight planning can also be enhanced by measuring onboard weight more accurately in order to avoid carrying extra fuel around. Altering the location where fuel is purchased allows airlines to take advantage of lower fuel prices in certain regions. Employing this strategy involves a cost-benefit analysis as the fuel cost savings from lower prices needs to be compared with the additional fuel burn generated from the additional weight involved in tankering the extra fuel to the desired region. Airlines can also pool resources when purchasing fuel in order to achieve bulk discounts. This is a strategy a few Star Alliance carriers have explored. It has been estimated that joint fuel purchasing could provide around $50 million in savings for alliance members over three years (Ionides, 2004).8

At airports, airlines can employ self-imposed ground delays to reduce airborne holding, and can also redesign hubs and schedules to reduce congestion. All these factors can and do contribute to airlines being more fuel-efficient.

Flight and Cabin Crew Expenses

The next greatest direct operating cost for US airlines is crew expenses. Prior to the recent downturn in the health of the aviation industry, crew costs constituted a much greater proportion of an airline's direct operating costs; however, mainly through bankruptcies, airlines have recently been able to dramatically reduce their labor costs. Since most airlines deal with a heavily unionized labor force, it can be difficult for airlines to adjust labor input to output, causing the crew costs to resemble mixed costs. In other words, contractual agreements with labor groups make it difficult for the airline to furlough employees, causing long lag times for airlines to respond to decreasing travel demand and output. Productivity gains may also be limited by unions and government regulations concerning work rules. The general formula for flight personnel costs is:

$$\text{Flight Personnel Costs} = \text{ASM} \times \frac{\text{Labour Rate}}{\text{ASM/Block Hour}}$$

Maintenance Costs

Another considerable cost for airlines is maintenance costs. However, since safety is the number one priority for every airline, maintenance costs are usually not under as much cost-saving scrutiny. That said, airlines must still cost-effectively manage their maintenance operations and staffing levels, while also being safety-conscious. In order to accomplish this, a major innovation in the maintenance area has been the outsourcing of maintenance activities to third-party vendors, especially for aircraft heavy checks. Maintenance costs can be calculated by using:

$$\text{Maintenance Costs} = \text{ASM} \times \frac{\text{Maintenance Labor and Materials/Block Hour}}{\text{ASM/Block Hour}}$$

Each airline is unique in the amount of outsourcing that it does. American Airlines, for example, does the majority of its maintenance internally and also does contract maintenance work for other airlines. On the other hand, Continental Airlines does all its wide-body heavy maintenance externally, but has internalized some maintenance operations with the opening of a 757 heavy check line. At the opposite end of the spectrum, JetBlue externally sources almost all its heavy maintenance and performs only line maintenance internally.

Other Operating Costs

The final category of operating costs included in Table 4.5 was other operating expenditures. These costs can include a variety of things, such as airport-related expenditures (that is, landing fees, gate agents, and baggage handlers) and in-flight catering costs. Being easy areas for immediate cost-cutting, these expenditures have shown dramatic reductions, particularly catering. The majority of airlines now use third parties to

supply their airport and catering services. Continental's costs can possibly be explained by the fact that it still owns its own catering kitchen. If airlines once again begin to offer more elaborate services, other operating expenses should be expected to increase. Other operating expenditures, or indirect costs, can also be described using the simple formula:

$$\text{Indirect Costs} = \text{ASM} \times \frac{\text{Indirect Cost}}{\text{ASM/Block Hour}}$$

Indirect operating costs can also be grouped as the following:

- distribution cost (sales and promotion)
- station cost
- ground expenses
- passenger services
- administrative expenses.

Airline Economies of Scale, Scope and Density

The airline industry is affected by economies of scale, scope, and density. Economies of scale playa significant role in the industry since, as we have seen earlier, fixed costs are extremely high. These high fixed costs and marketing requirements encourage expansion in the industry. This is a major reason why there are very few small airlines in the industry and why there is continual consolidation. From an operational standpoint also, economies of scale playa significant role. Because of the need to train pilots and maintain a stock of spare aircraft parts, it is less costly to simplify aircraft fleets and focus on just a few aircraft types. Therefore, airlines generally prefer to operate a minimum number of aircraft types where possible. The optimum number of aircraft required to achieve economies of scale is unknown, but JetBlue believes that it achieved all economies of scale from its 80-strong Airbus 320 fleet. The airline decided to order an additional fleet of 100 Embraer 190 aircraft in 2006 (JetBlue Airways, 2006). Thus, although the airline has decided to use two types of aircraft, it believes that both fleets are of sufficient size to maximize economies of scale.

Hub airports also contribute significantly to economies of scale, in addition to the economies of density mentioned earlier. Hubs are extremely costly operations, and the costs that they generate, such as multiple labor shifts, terminal leases, and ground equipment, are fixed costs in the short term. Therefore, in order to spread the costs over more units of output (air seat miles), airlines have a strong incentive to use these assets as intensively as possible. While most airlines operate banked hubslO to provide shorter connection times for their passengers, airlines such as American and Delta have experimented with rolling hubs in order to better utilize hub assets. With banked hubs, assets sometimes remain unused for extended periods of time between banks. On the other hand, rolling hubs use hub assets throughout the day, making the airline's use of assets more efficient and thereby achieving greater economies of scale.

Economies of scope also play an important role in the aviation industry. As mentioned earlier, aircraft manufacturers such as Boeing capitalize on economies of scope when producing aircraft. Airlines achieve economies of scope by operating various ancillary programs/services, such as frequent-flyer plans, maintenance activities, catering, and ground handling. Ultimately, the amount of outsourcing an airline does depends on how many synergies exist between the organizations that are creating economies of scope. For example, frequent-flyer programs are usually more effectively run by the airline itself, since a frequent-flyer program's main cost is inventorying reward seats, and economies of scope are achieved when this is done internally (because the airline already has a staff to schedule seats). One frequent-flyer plan, Air Canada's Aeroplan, is bucking this trend by allowing their loyalty programe to become a separate operation. Airlines have also experimented with economies of scope by becoming involved in other related industries (such as cruise lines and hotels), but history has shown that most of these external activities have failed (for example, Sabena hotels, Carnival Airlines), and the economies of scope that were envisioned either did not exist or were not achieved.

Economies of density exist in the airline industry through the use of hubs and the consequent reduction of flights. Similarly, aircraft size exhibits both economies of scale and density. Economies of scale are realized when airlines can put more seats into the aircraft to reduce unit costs, but economies of density are also achieved by using larger aircraft. For example, suppose an airline could use a 100-seat aircraft or two 50-seat aircraft to service a route. On shorter domestic flights the airline may opt for a higher frequency of flights, while on longer domestic and international flights it will usually select the larger aircraft in order to capture the economies of density (that is, the extra costs of pilots, gate agents, landing fees, and baggage-handling for the high-frequency decision). While airlines typically have moved toward smaller aircraft to provide increased frequency on a route, this strategy is less effective if the flights have to depart within minutes of each other. In this case, the single larger aircraft will always be cheaper to operate than the two smaller aircraft on account of the various fixed costs required to operate a flight (that is, pilots, gate agents, landing fees, and baggage-handling). This trade-off benefit is another example of economies of density and is common in the airline industry, especially on very long-range flights, where (due to time zones) most flights depart at around the same time.

Airline Break-even Analysis

An important measurement of any company's cost structure is its break-even analysis. Break-even analysis is the number of units or revenue required in order for the firm's costs to be recovered. In manufacturing, the break-even point is represented in product units. For example, the revised break-even forecast for the Airbus A380 program is 420 aircraft (Shannon, 2006). Airbus will have to sell 420 aircraft to simply recoup the fixed costs related directly to the A380 program.

The basic formula for break-even in units is:

$$Q_{B\text{-}E} = \frac{\text{Fixed Costs}}{\text{(Price-Variable Costs)}}$$

Since the difference between the price and variable costs of a good is also called the contribution margin, the break-even formula can be rewritten as:

$$Q_{B\text{-}E} = \frac{FC}{P\text{-}V} = \frac{\text{Fixed Costs}}{\text{Contribution Margin}}$$

Break-even in the airline industry is usually expressed as a percentage of total ASMs. This provides a break-even load factor, or a load factor which the airline must meet to recover all its fixed costs. The general formula for airline break-even is the following:

$$RPM \times RRPM - ASM' \times CASM = 0$$

- ➔ RPM =revenue passenger miles
- ➔ RRPM = revenue per revenue passenger mile
- ➔ ASM '" available seat miles
- ➔ CASM = cost per available seat mile.

Airline Operating Leverage

Operating leverage is a powerful metric that highlights the ratio between operating profit growth and sales growth. More directly, the degree of operating leverage is an elasticity of the overall company's financial health with respect to sales growth. Operating leverage can also provide an indication of the company's cost structure, especially with respect to fixed costs. The general formula for the degree of operating leverage is:

$$DOL = \frac{\%^{\wedge} \text{ in EBIT}}{\%^{\wedge} \text{ in Sales}}$$

The degree of operating leverage can vary considerably among companies in the same industry. Companies with a high degree of operating leverage are much more reactive to changes in output. This is partly a result of the company having sizeable fixed costs, which can either be leveraged effectively during times of increasing sales (because of decreasing average costs), or become a burden to the company during decreasing sales. As a concrete numerical example, if the degree of operating leverage is 2, this means that a 1 per cent increase in ticket sales will result in a 2 per cent increase in the airline's operating profit. In this case there would be increasing returns to scale. Unfortunately, the reverse is also true during downswings in the economy with the company experiencing a greater operating loss. Therefore, companies with a high degree of operating leverage will experience greater volatility of operating profit than companies with smaller degrees of operating leverage.

Operating Leverage can also be negative. This scenario indicates decreasing returns to scale, probably due to the fact that the company has grown too quickly and is not effectively

leveraging its fixed costs. Therefore, in order to improve its degree of operating leverage, the company should reduce its fixed costs while keeping the same level of output, or increase its output with the same fixed cost infrastructure. Furthermore, changes to the company's contribution margin will also dramatically affect the company's degree of operating leverage. An airline may choose between a high or low level of fixed assets. For instance an airline company may substitute self-check in machines at different airports for check-in agents. If labor is not replaced with check-in machines, fixed costs are held lower, and variable costs are higher. With a lower level of operating leverage, the airline shows less growth in profits as sales rise, but faces less risk of loss as sales decline. This overall understanding of an airline's cost structure is critical in a company's strategic planning phase. It provides the company with a comparison between sales and operating profit, and, depending on the value, can help guide strategic direction. It should be noted that operating leverage should not be confused with financial leverage, which deals with the amount of borrowed money that a company is using to finance its activities.

Operating leverage is the percentage of fixed costs in an airline's cost structure. Generally, the higher the operating leverage, the more a company's income is affected by fluctuation in sales volume.

AIR TRANSPORT MARKET STRUCTURE AND MONOPOLISTIC MARKETS

Market structure refers to the competitive environment that surrounds the firm. It generally can be described in terms such as barriers to entry, numbers of buyers and sellers competing in the market, the individual seller's control over price, extent of product substitutability, and the degree of mutual interdependence between firms. Market structure determines the type of competition that is found in the industry.

Perfect Competition

A perfectly competitive industry is one in which there are a large number of small buyers and sellers who can enter and exit the industry with no restrictions. This creates a situation in which the individual firm has little or no power over the price of their good. The price is dictated by the market, and this makes the individual firms price-takers. On this/basis, each firm has a simple decision: to sell at the market-bearing rate or not to sell at all.

Conditions of Perfect Competition

In order for perfect competition to exist, four conditions must be met. Since very few markets satisfy all four conditions exactly, examples of perfectly competitive markets are limited. Nonetheless, as many industries approximate these conditions, the idea of a perfectly competitive market is a useful construct when comparing market structures.

The four conditions are:

- ➔ homogenous identical product
- ➔ many small buyers and sellers
- ➔ perfect dissemination of information
- ➔ very low barriers to entry.

Perfect Competition in the Short Run and Long Run

In the short run, in a perfectly competitive market, firms are considered as price-takers. Individual firms are unable to affect the price for their product, and must accept the market price. Since the market determines the price for the product, the market price is set at the point where market demand equals market supply.

However, markets are not static, but continually evolving. Since the barriers to enter and exit in perfectly competitive markets are low, new firms will enter the market when the industry is profitable and firms will exit the market when the industry is sustaining losses. So, it is not the high number of firms that keep profits low but, rather, the entry of new firms. To see the effects that market entry and exit have on firms in a perfectly competitive market, consider the situation where the firm is making an economic profit, or where the intersection between marginal revenue and marginal cost is greater than average total cost. Since firms are making a short-nm profit, new firms easily enter the market (due to low barriers to entry) in hopes of also obtaining a profit.

On the basis of these market adjustments, firms in perfectly competitive markets have zero economic profits in the long run. Since this is a long-run phenomenon, the market will continuously adjust in response to firms freely entering and exiting the market. Market adjustments do not occur in just one direction. If some firms are losing money in the industry, then these firms will exit the market, causing a leftward shift in the market supply curve. This reduces the total quantity supplied by the market, but also increases the quantity demand (and the price) for an individual firm. Over time, the individual firm will return, to the point where marginal revenue equals marginal cost and average cost and economic profit (or loss) equals zero.

Monopoly

At the opposite end of the market continuum are monopolies. By definition, a monopoly is a market where there is only one seller. However, monopolies are all judged with respect to a certain market or geographical area. For example, the only paper manufacturer in a small town may be considered to have a monopoly over paper manufacturing with respect to the town, yet when the geographical scope is widened to include other towns, the county, or the state there are invariably other paper manufacturers competing in the market. Thus, the market structure for paper manufacturing would be considered a monopoly with respect to just the small town, whereas the market would be an oligopoly

on a state level. This means that, depending on the level of analysis, a monopoly can exist in many different ways. Since monopolies can exist in industries, especially when the term is narrowly defined, it is important to understand their economic principles.

Monopolies are largely created by the existence of barriers to entry in a given industry. As mentioned, a barrier to entry is any obstacle that makes it unprofitable or impossible for new firms to enter an industry. However, there is some disagreement as to which barriers are significant. Economists agree that government can and does erect barriers that seriously harm the economy. The common government prohibition of cabotage, for example, obviously eliminates foreign competition and allows domestic air carriers to keep prices somewhat higher; incumbent carriers benefit at the expense of consumers, and the industry is prevented from being as large and efficient as it would otherwise be.

The issue, discussed more fully in the Chapter 9, is whether a barrier to entry outside of government can seriously harm the economy. Some commonly mentioned barriers in the aviation industry are listed below and explained in the following paragraphs:

- legal and government barriers
- capital requirements
- technology
- natural barriers
- labor unions
- structure of airports

Airport Market Structures

Another aspect of the aviation industry where market structure plays a significant role in shaping the industry is airports. Once again, the major issues concerning airports are the significant barriers to entry. The lack of available gates and slot controls at some airports serves to protect incumbent carriers and make it difficult for new entry. And at hub airports, it can allow an airline to exert monopoly power.

For an airline looking to serve a new airport, one of the first requirements is the availability of gates and ticket counters. Without the availability of both, the airline will not be able to service the airport. Although these requirements are universal, the ease of obtaining them varies considerably worldwide.

In the United States, the majority of gates and ticket counters are closely held by the individual airlines either through lease agreements with the airport or under full ownership. Leases with the airport provide the airline with exclusive control over a set number of gates, enabling the airline to utilize the facilities as they see fit. In a practical sense, the airline acts as the owner of the gates so that the airline can update its facilities as it sees fit. In return for this control over airport assets, airlines must make lease payments that are

prescribed in a lease agreement with the airport authority. Depending on the terms of the lease agreement, airlines may be stuck with the facilities unless they can find another user for them. In some instances, airlines have found it profitable to sublet these facilities to competing airlines; in other instances, airlines have successfully terminated the lease agreements under Chapter 11 bankruptcy, although this is a rather drastic remedy.

At hub airports airlines may own facilities. For example, Northwest Airlines invested heavily in their World Gateway hub at Detroit International Airport, while Continental Airlines owns Terminal E at Houston Intercontinental Airport. Under these scenarios airlines may invest a large sum of capital in the airport in order to construct or revamp an entire terminal.

Regardless of the technical structure, US airlines have significant control over airport facilities, and this control represents a significant barrier to entry as any new airline will have to acquire airport facilities in order to commence service. At airports where there are idle facilities, this usually does not pose a significant problem to the new entrant but at airports with scarce resources, the reverse is true. While the airport authority will attempt to work with all the airlines to accommodate the new entrant airline, this may not always work if all the resources are already committed. The other option for the new entrant would be to enter into an agreement with an incumbent airline to either use or sub-lease their facilities. This option is usually costly, and there may be some instances where, in order to suppress competition, incumbent airlines may be unwilling to allow a new entrant to the airport. This is particularly true at hub airports where the hub carrier may go to extensive means to obtain gates in order to block new entrants, especially low-cost competitors.

Moreover, such a structure may not be economically efficient since airlines may sign gate leases to block competition, even if they themselves do not require the gate. Even if leases contain minimum usage requirements, airlines can adjust their schedule or add extra flights to meet the minimum requirements. This creates a situation in which the assets may not be used in the most efficient manner.

Another solution to airport facility usage is common use facilities, implemented by the majority of airports outside of the United States and even by a few airports within the country. These are facilities that all airlines can use and are assigned by the airport daily, depending on demand, on a fee per use basis. In this way, use of facilities is maximized, and, in theory, because of this, the cost per use should be become lower. However, airlines dislike common use because it offers less control over the facilities and their operation.

Common use facilities generally do not constitute significant barriers to entry, since, if facilities are available, an airline can use them. Even though facilities may be full at peak periods, an airline is unlikely to be unable to enter an airport using common use facilities at some time of the day.

However, whereas gates and other airport facilities rarely provide a significant barrier to entry outside of the United States, in Europe and other parts of the world, barriers to entry remain in the form of airport slots-namely, the rights to land or take off from an airport at given times.

Slots are allocated through a variety of mechanisms, but there are two primary rules to slot allocation according to EEC No. 95/93. The first rule, the "grandfather right," entitles an airline to the same slot in the future (if they are currently using it). Although this rule was enacted to provide stability, in practice it provides the airline with quasi-ownership of the slot. Slot usage is determined by the "use-it or lose-it" rule which states that the airline must use the slot for at least 80 per cent of the time during the scheduled period. If the airline fails to meet this requirement, the grandfather right does not apply and the slot is lost. This provides an incentive for the airline to continue using the slot, even if it is not economically efficient. The remaining slots are then dispersed to applicants, with only 50 per cent of new slots allocated to new entrants (Matthews and Menaz, 2003). As a result of the "grandfather right," the "use-it or lose-it" rule, and the new entrant slot limit, very few slots become available for new entrants. For example, in the summer of 2000,97 per cent of London Heathrow's slots were grandfathered, leaving only 3 per cent of the total slots available, with only 1.5 per cent available to new entrants (DotEcon, 2001). Moreover, in all likelihood, the slots were available at inconvenient times. These slot controls represent a significant barrier to entry, and the grandfather rule enables an airline to accumulate a significant number of slots over time. Slots in Europe and airport facilities (gates, ticket counters) in the United States pose significant barriers to entry at the airport level. Furthermore, Dresner, Windle, and Yao (2002) have determined that high gate utilization during peak periods is the major airportbarrier to entry in the United States. All these factors have allowed incumbent carriers to increase their market power at airports, particularly at hub airports. Indeed, the near monopoly power that some airlines have acquired at hub airports has been a significant barrier to entry at these airports.

Many studies have investigated the hypothesis that airlines have exerted their strong market power at the hub airport in the form of hub premiums which involve charging originating or terminating passengers a higher fare than other passengers traveling throughout the carrier's system (Gordon and Jenkins, 1999). However, opinions on whether hub premiums actually exist are mixed. Gordon and Jenkins (1999) used proprietary Northwest Airlines data to show that there was actually a hub discount at Minneapolis St Paul airport. However, some studies have found that hub premiums do not exist, and others have shown that they do (Borenstein, 1989). Lijesen, Rietveld, and Nijkamp (2004) claimed that a few carriers in Europe, specifically Lufthansa, Swiss, and

Air France charged hub premiums. However, even if hub airlines do charge higher prices, this may simply reflect higher quality not adjusted for in such studies. For example, the dominant carrier may have more amenable airport facilities, may benefit from goodwill in

the community where they are perceived as the "home-town company," may be perceived as having established greater credibility on safety, or have higher valued frequent-flyer awards. The fact that most businesses and communities seem to like having a hub airline nearby supports this view.

Since the evidence for a hub premium is not conclusive, and since hub airlines are often in bankruptcy, it stands to reason that, if any actual premium exists, it is likely to be small. Furthermore, even if there is some slight monopoly power at that airport, the positive network effects from hub-and-spoke systems also produce benefits that, as Economides (2004) shows, may be substantially greater than the damage of higher prices at the hub. In other words, the efficiency gained from economies of scale, scope and density in the hub network may help reduce prices and increase product availability in the overall network.

While specific studies appear to have reached differing conclusions on hub premiums, the actual case of Pittsburgh International Airport' provides a good real-world example of what may happen when a hub airport is open to competition. In fall 2004, US Airways announced that it was going to significantly scale back its Pittsburgh hub. The total number of flights at Pittsburgh was dramatically reduced, and a greater number of gates became available. As the barriers to entry were lowered, low-cost carriers Southwest, JetBlue, and Independence Air all entered the market. Whereas the total number of passengers using the airport decreased, originating passengers increased by 12 per cent (McCartney, 2005). Moreover, airfares dropped significantly, especially on a few dominated routes. For example, the average airfare between Pittsburgh and Philadelphia (a route between two US Airways hubs) fell from $680 to $180 (McCartney, 2005).

Market Structure in Aviation Industry

Aircraft Manufacturing

Modern aircraft manufacturing is a heavily capital-intensive industry requiring immense expenditures in research, development, and manufacturing. As technology has increased and economies of scale benefits have become more important, the cost of designing and marketing an aircraft have become substantial, strengthening the barriers to entry into the industry. This trend has also caused a drastic reduction in the number of firms competing in the commercial aircraft industry, so that there are now very few firms competing in the industry, creating a market structure that resembles an oligopoly. Lockheed's L-1011 Tristar project is a prime example of the risk involved with aircraft manufacturing. The Tristar project experienced delays that reduced its competitiveness against the similar McDonnell Douglas DelO; these delays ultimately doomed the project.

Although Lockheed is still a defense contractor, the financial failure of the L-lOll caused the company to exit the commercial aircraft manufacturing market, leaving only two (at

that time) large US commercial aircraft manufacturers. The remaining two companies, Boeing and McDonnell Douglas, pursued separate strategic business paths. Boeing developed new aircraft types, while McDonnell Douglas focused on redesigning existing aircraft types. The'McDonnell Douglas strategy was not successful in the commercial aircraft market, and their US market share fell below 20 per cent in 1993 (Harrison, 2003). In 1996 Boeing announced a $13 billion merger with McDonnell Douglas. This left only one US commercial aircraft manufacturing firm and created a duopoly in the global market for large commercial aircraft (Harrison, 2003). A similar trend occurred in Europe where BAE and Fokker exited the commercial aircraft manufacturing business. This global trend is largely a result of the enormous cost of doing business in the market.

Today there are four major aircraft manufacturers, with two competing fairly evenly in each market. Boeing and Airbus compete in the large commercial aircraft market, comprising aircraft with over 100 seats, while Bombardier and Embraer compete in the regional jet market. The firms compete aggressively with each other in almost all segments of their individual markets. Until recently, the biggest exception to this rule was the very large aircraft market, in which Boeing had a monopoly with its 747. However, with the introduction of the Airbus A380, Boeing will no longer continue to enjoy a monopoly in that market.

The primary reason for Boeing's long-held monopoly of the very large aircraft market was the very high barriers to entry in this market. Not only were the financial requirements immense, but the technological and manufacturing requirements were also huge. In 1965, when Boeing decided to develop the 747, the projected launch costs were $1.5 billion (Esty, 2001). The project was widely viewed as a "daring, bet-the-company gamble on an untested product" (Esty, 2001). In addition to the large capital requirements, Boeing needed new technological breakthroughs, and it also had to construct an entirely new manufacturing complex in Everett, Washington. The tremendous project risk, coupled with the other extensive technical and capital requirements, make it difficult to enter the very large aircraft market, especially since a new entrant will not have a monopoly and must compete with Boeing. However, in 2000, Airbus announced its intention to develop a very large double-decker aircraft to compete with the Boeing 747 in the very large aircraft market. The project was estimated to cost Airbus $13 billion, yet with subsequent delays and problems that figure has climbed to $14-15 billion (Esty, 2001). Furthermore, the original break-even forecast of 270 aircraft has climbed to 420 (BBC News, 2006). Although it is a risky project, the new competition in the very large aircraft market will undoubtedly cause greater competition between Boeing and Airbus. Examples of competitive actions already utilized in other commercial aircraft market segments include discount prices, attractive financing, and the purchase of older aircraft.

Very few firms, or countries, have the resources to design and manufacture commercial aircraft, and this is a primary reason why manufacturing aircraft has become something of

a global enterprise For example, Boeing's 787 Dreamliner has development costs between $8-1(I billion and utilizes partners from multiple countries, especially Japan (Kotha, Nolan, and Condit, 2005). Another example is Boeing's 777, which was launched in 1990 with an estimated development cost of $4-5 billion (Gollish, Clausen, Koggersvol, Christey, and Bruner, 1997).

In 2007 China announced its intention to start manufacturing large commercial aircraft by 2020, providing a possible new entrant to the market (Associated Press, 2007). Although the barriers to entry are immense, China may be able to overcome them by having a robust economy with a positive trade balance, a strong domestic economy, and an abundance of labor. China is expected to buy 2,230 new aircraft before 2025, so the demand is clearly there; however, the required technological skills will still be a major barrier for the Chinese (Associated Press, 2007). In an attempt to overcome this barrier, China reached an agreement with Airbus to open an A320 final assembly line (Associated Press, 2007) In the hope that the technological skills gained from this venture will translate into success for its large aircraft program. So while the barriers to enter the market are extremely high, they are not impenetrable.

Whereas the broad market for commercial aircraft is largely a duopoly, for some airlines the market is more like a monopoly. Thus, while most airlines are able to play one manufacturer against the other in negotiations, some are more constrained by operational limitations. For example, consider Southwest Airlines, an all-Boeing 737 operator. Part of Southwest's success has been due to having a common fleet; this has increased crew flexibility, reduced crew training cost, and reduced spare part inventories, to name just a few benefits. Under these circumstances, switching to an Airbus aircraft would entail substantial costs. This may put Boeing in a position where it can exert a degree of monopoly power over Southwest Airlines, although this is greatly tempered by the resale market for aircraft-Southwest could buy new aircraft indirectly through a third-party airline that was better positioned to strike bargains with Boeing, then the third party could immediately resell to Southwest.

Furthermore, Boeing must also consider the possibly severe damage to their reputation if it ever were somehow able to exploit such situations. If it is perceived to have betrayed one of its best and most loyal customers, then other airlines take care to avoid repeating Southwest's mistake. It is likely that any possible gain from exploiting Southwest would be far less than the loss from declining sales as the world learned that it was a grave mistake to become too dependent on Boeing. Indeed, since most companies are likely to be hesitant about relying too much on a single supplier, it may be vital for Boeing to be able to point to a very satisfied, successful U dependent" in order to encourage other airlines to follow Southwest's example.

Jet Engine Manufacturing

An industry with a market structure similar to the commercial aircraft manufacturing industry is the commercial aircraft jet engine manufacturing industry. Not only are the products of the industries highly related, but they exhibit similar barriers to entry: high capital requirements, economies of scale, and advanced technological knowledge and skills. Unlike commercial aircraft manufacturing where there are four major firms competing in two distinct market segments, engine manufacturing is an oligopoly of three, or the "Big Three": General Electric (GE), Rolls-Royce, and Pratt & Whitney (P&W).

In addition to the "Big Three," two consortiums were formed in order to add more players to the engine market. CFM International (CFMI) was a partnership between General Electric and Seneca, the French state-owned engine manufacturer. International Aero Engines (IAE) was formed in 1983 between Pratt & Whitney, Rolls-Royce. These consortiums not only pooled technological knowledge, reduced risk, and lowered production and development costs for individual manufacturers, but also created an interesting situation where manufacturers could be both partners and competitors concurrently. In addition to the two consortiums, P&W formed an alliance with GE for the development of the GP7200 platform, an engine designed for very large commercial aircraft such as the A380.

The technological knowledge and skills required in the commercial aircraft engine manufacturing industry are substantial, and are major barriers to entry. Moreover, this knowledge requirement is a primary motivator for the number of alliances and agreements generated in the industry, as resources and risk are spread across multiple firms.

While the market broadly has three major firms (plus the two major consortiums), just as in the aircraft manufacturing industry there may be certain situations where the market is, in reality, a duopoly or monopoly. For example, on the new Boeing 787 only two engines are being offered to customers: General Electric and Rolls-Royce. Therefore, the competitive actions of the firms will largely be based on duopoly competition theory.

Furthermore, all Boeing 737NGs are powered by CFMI engines, which means that CFMI has a monopoly on the supply of engines for 737 aircraft. This creates an interesting dynamic as an engine's success is highly tied to an aircraft's success. Moreover, if CFMI wants to enforce monopoly power by attempting to raise the engine's price, this would hurt the competitiveness of the 737. However, with CFMI also being one of two suppliers for the rival Airbus 32X family, CFMI holds an extremely strong position in the narrow-body jet engine manufacturing industry.

Although engine manufacturers can hold some market power, airlines routinely play one engine manufacturer against the other in order to get the best deal. This means that engine manufacturers may have to provide deep discounts on engine purchases, but are able to recover costs through maintenance agreements or "power by the hour" contracts. Therefore, whenever possible, engine manufacturers capitalize on economies of scope

benefits. This is especially true of General Electric which leases aircraft with GE engines through GE Commercial Aircraft Services (GECAS). Economies of scope represent another barrier to entry into the industry because they give incumbent firms a competitive advantage.

The capital requirements for engine manufacturing are quite large and, for the existing firms, have come mainly from earlier military contracts. The "Big Three" all have roots tracing back to military applications. Rolls-Royce and Pratt & Whitney were heavily involved with engine manufacturing during the Second World War, while General Electric made the jump from military applications in the late 1960s (Smith, 1997). Without military applications and grants, a new entrant would find the required technology extremely expensive to acquire.

If a new aircraft project looked profitable, then undoubtedly one of the "Big Three" would become involved, leaving new entrants the less desirable aircraft designs.

The two industries discussed above-namely, aircraft manufacturing and jet engine manufacturing-are industries with firms that are capable of exerting substantial market power. The airline industry is somewhat unique in that its major suppliers all have substantial market power and, depending on circumstances, can exert near-monopoly power. On the other hand, the airlines compete in a fierce oligopoly where the customers have substantial power and where switching costs are low. The combination of these forces squeezes the airlines from both sides, creating a difficult market structure for the industry.

AVIATION FORECASTING REGRESSION AND ANALYSIS

Forecasting is one method for reducing the uncertainty in the business world, and, whether we realize it or not, we all forecast in one way or another. For example, if I take an umbrella out with me, I am obviously forecasting rain with some degree of probability. And, of all industries, the aviation industry stands out as one of the most uncertain and unpredictable. Since the variability of such inputs as jet fuel prices and passenger demand can dramatically affect airlines, forecasting is extremely useful in reducing the uncertainty associated with this volatility.

Aviation Forecasting Applications

Forecasting has many applications in the aviation industry, and probably the chief among these is the forecasting of demand. Since demand is not monolithic and varies for every flight, sophisticated forecasting tools need to be applied to help forecast the size and the nature of demand. As forecasting the nature of demand could include the mix between price-sensitive (leisure), time-sensitive (business) travelers and the expected booking rate for the flight, when these forecasting methods are applied to every flight, the forecasting

operation becomes quite large. Moreover, demand forecasting is probably one of the most important applications of forecasting in the airline industry since strategic planning and yield management are dependent on it. However, forecasting is not just limited to demand forecasting, and the methods employed can range from the rudimentary to the sophisticated. Planning of human resources, financial resources and needs, route developments, aircraft fleet, and infrastructure expansion are all based on some expectation of future events. In 2006

Airbus forecasted that between 2006 and 2025 world passenger traffic would increase by 4.8 per cent per year. This traffic growth, combined with fleet replacement, will require the production of 21,860 additional new passenger aircraft with more than 100 seats. Other examples, important for airlines, might be forecasts concerning the amount of flying, crew requirements, training schedules, absenteeism, and employee turnover ratios.

In addition, project viability and profit projections are all based on the expectation of future events. Since projects are analyzed over their lifespan, forecasts need to be created concerning future expected cash flows. On the basis of these forecasts, multi-million dollar projects are either approved or rejected. For example, evaluating whether to install AVOD (audio-visual on-demand) in-flight entertainment systems across the fleet could be based on forecasts concerning the installation schedule, future maintenance costs, and the passengers' opinions of the new system.

As the above examples highlight, forecasting spans multiple functional areas. Therefore, it is critical to understand the many aspects forecasting. To do this, four critical skills are needed:

- knowledge of the airline industry
- knowledge of economic principles and statistics
- computer applications
- communication

Although all four skills are required to forecast, this book only covers the first two skills in detail. The overall text itself provides knowledge of the airline industry and basic economic principles, while this chapter will discuss the basic statistics used in forecasting.

Of course, the chapter cannot replace a complete statistics textbook, but is meant to provide an introductory and applied overview. A variety of computer applications can be used to help forecast, including Microsoft Excel that can help perform basic regression and statistical analysis.

Qualitative Forecasting Methods

Forecasting methods can be broken down into two categories: qualitative and quantitative. Qualitative forecasting methods use subjective techniques to help forecast. Qualitative

forecasts do not use statistical databases or provide measures of forecast accuracy since they are based on opinions, surveys and beliefs. On the other hand, quantitative forecasts use statistical relationships to help forecast future events and, while they are more mathematical in nature, they mayor may not be any more accurate than qualitative forecasts. Table 10.1 displays a few of the main advantages and limitations of qualitative forecasting.

One of the main advantages of qualitative forecasts is that they are flexible and can be easily altered to reflect any changes in the economy or environment. The flexibility of qualitative forecasting also enables early signals of changes and anomalies in data to be recognized.

On the other hand, one of the limitations of qualitative forecasting is that it can be difficult to track and isolate the primary variable that is causing changes in the dependent variable. In addition, the lack of tests for accuracy always creates a situation where there is no way of knowing how good the forecast is.

Of the numerous types of qualitative forecasts, six major methods will be discussed here. They are:

- focus group
- market survey
- market experiment
- barometric forecasting
- historical analogy
- Delphi method

Focus Group

A focus group is a relatively informal information gathering procedure in marketing research. It typically brings together 8-12 individuals to discuss a given subject. Usually focus group participants are brought into a room where a moderator asks questions to help move the discussion forward. Researchers observe the participants and their responses, providing a quick and relatively inexpensive insight into their research problem. Focus groups can be quite effective in evaluating new product options, such as new aircraft seats or in-flight entertainment systems. However, researchers need to be aware that participants may not produce completely honest responses and may feel pressured into accepting what everyone else believes. Furthermore, if the focus group is not a representative sample of the target population, then the responses are likely to be inaccurate. By forming a focus group, an airline can reach out to its potential passengers for feedback and comment. Airlines generally use focus groups in planning, marketing, or serving a new destination domestically or internationally. Finally, a focus group can help airlines managers to identify the right level of in-flight and cabin crew services.

Market Survey

A survey is simply a method of acquiring information by asking people what they think will happen. The most common method of a market survey is by questionnaire, but there are many other methods. Depending on the nature of the questions asked, questionnaires can provide the researcher with both quantitative and qualitative results. One of the principal benefits of market surveys is that they are easy to use and do not require advanced theory or econometric analysis to interpret the results. One of their potential flaws is that the accuracy of the survey depends on the size and responsiveness of the sample. In the aviation industry, market surveys are often used to find out what improvements an airport can make, and airlines use them in the form of customer comment cards to find out ways of improving service.

Market Experiments

Amore expensive method of qualitative forecasting is a market experiment, which involves testing new product factors, such as prices or packaging, in a few test markets. Market experiments use real-life markets, and this can be risky if the change is not accepted by consumers in that the change may permanently alienate them from the product. Due to the costs involved, market experiments are rarely used in forecasting demand in the aviation industry. However, market experiments have been conducted with in-flight food and beverages. For example, an airline may wish to test the acceptance of new buy-an-board meals on a few flights to help forecast demand for the product.

Barometric Forecasting

Barometric forecasting involves using current values of certain variables, called indicators, to help predict future values of other variables. A leading indicator is a variable whose current changes give an indication of future changes in other variables. A lagging indicator is a variable whose changes typically follow changes in other economic variables. Depending on one's point of view, the relationship between any two variables can either be a leading or lagging indicator. For forecasting, a leading indicator is the most useful, since it provides an early signal of what may come. In aviation, GOP is a leading indicator of airline demand as changes in GOP are usually followed by changes in demand for air transportation. Therefore, if the GOP growth rates decline sharply over a period of time, airlines can expect a decline in demand shortly afterwards. Part of the reason for this lagging relationship is that consumers are generally slow to adjust their spending patterns to reductions in income

A final type of indicator, a coincident indicator, is not tremendously useful for aviation forecasting, but does have other applications. Coincident indicators are variables whose changes roughly coincide with changes in other economic variables. In aviation, crude oil prices are a coincident indicator of jet fuel prices. Since changes in the price of crude oil

occur at the same time as changes in jet fuel prices, crude oil is not a useful indicator for predicting jet fuel prices. However, crude oil could be used as a proxy variable in jet fuel hedging, since crude oil is more heavily traded than jet fuel.

Historical Analogy

Historical analogy is a simple forecasting technique where the future is forecast on the basis of historical events. While many quantitative forecasting methods use historical data to help predict the future, historical analogy is, by definition, on a qualitative level. The success of historical analogy largely depends on the depth of knowledge and history that the forecaster has. A forecaster who has seen all facets of an industry over a long period can probably better predict the future than a more recent employee. Therefore, historical analogy is only as good as the person making the forecast.

Delphi Method

The Delphi method is related to historical analogy in that the forecast is largely based on opinion, but differs in the fact that it collects forecasts and opinions from an independent panel of experts. Each expert provides their analysis and opinion independently, and then a consensus forecast is created, based on the analysis provided by each member of the panel. By having members independently submit their opinions, the Delphi method benefits from not having steamroller or bandwagon problems (Hirschey, 2006). In addition, the Delphi method benefits from having multiple experts analyze the issue rather than just one or a few people as in historical analogy. In theory, the accuracy of the forecast is based on the collective knowledge of the expert panel; however, because every opinion is equally weighted, the collective knowledge may not be as reliable as the forecast of just a few experts.

Quantitative Forecasting Methods

In contrast to qualitative methods, the quantitative methods use statistical data to analyze and forecast future behavior of specific variables. Statistical information is divided into time-series and cross-sectional data. Cross-sectional data are data compiled for different variables at a point in time; for example, the number of passengers over different geographically located airports, or the number of aviation accidents over different countries for one time period. Time series data, on the other hand, represent observations of a particular variable over a number of time periods-for example, the number of passengers at various past points in time at a given airport.

Although there are many methods of quantitative forecasting, we shall cover only two broad categories: time-series analysis and regression analysis. Time series analysis looks for patterns in data whereas regression analysis assumes a casual relationship between two or more variables. Both methods will be analyzed in greater detail below.

One of the main advantages of quantitative forecasting is that tests of reliability can easily be performed to determine the accuracy of the forecast. In time-series analysis the most accurate forecasting method can be chosen, based on the test of reliability. In regression analysis forecasters are able to provide a not only a probability of how accurate the overall forecast is, but also the reliability of the individual variables in the forecast. Two major drawbacks of using only quantitative forecasting are, first, that history is not always a correct predictor of the future, and, second, that, historically, that forecasts have required extensive data collection and processing.

However, the introduction of advanced statistical computer software, has now made data collection and processing a much simpler task, making quantitative forecasting much easier. Another limitation of quantitative forecasting is the quality of the data that is used.

Depending on how good the data are, quantitative forecasts may distort reality or model it perfectly. The garbage-in-garbage-out cautionary statement would apply here.

Descriptive Statistics

Prior to analyzing various forecasting methods in detail, a fundamental understanding of elementary statistics is required, and, for most forecasting, that amounts to three basic statistics: the mean, the variance, and the standard deviation. Descriptive statistics are numerical estimates that organize, sum up, or present the data, and provide simple summaries about the sample and the measures. To meet that objective, a full range of indicators has been developed, and we will provide definitions and applications of the most important ones.

Mean

The mean-probably the most common indicator of a data set-is simply the average of the data. For students, a commonly used mean is the class average which measures the average scores of all the students in the class. For instance, assume that the class has three students. Student A received a 92 on the final exam, student B received a 65, and student C received a 77.2 Based on this information, the class average, or mean, for the final exam was 78. This was calculated by taking the sum of the students' marks, and dividing by the number of students in the class.

Variance

The variance of a sample measures how the observations are spread around the mean. Large variance means that the observations are widely scattered around the mean. The variance shows the dispersion of the data from the mean. The variance of a data set is important, since it gives some idea of the accuracy of the mean.

Standard Deviation

Standard deviation is directly related to variance since it is the positive square root of the variance. The standard deviation is a statistic that shows how tightly all the observations are clustered around the mean in a set of data. When the observations are spread around the mean, it indicates that we have a relatively large standard deviation. In order to avoid problems with the negative signs of some deviations from the mean (note that the sum of the values of the deviations from the mean in the above example is zero, and this will always be true by definition), the values of the deviations are displayed in squared terms.

By taking the square root of the variance, the standard deviation returns the variance to a more easily interpretable number. However, it should be noted that, while the squaring procedure eliminates the problem of negative deviations canceling out positive ones, it also gives much greater weight to outlying observations. That is, the further away from the mean the observation is, the greater the difference between the observation and the mean, and therefore the greater the squared value of this observation. The concept of standard deviations is not difficult to understand. Assume that we have collected one month of ticket prices-for example, from New York to London, about 1250 observations-and entered them into a spreadsheet to calculate the average. Suppose the average price is calculated as $870. This number, by itself, is of limited value. By measuring the standard deviation of the ticket price, however, we can gain an idea of how volatile the ticket price really was (the larger the standard deviation the more volatile the ticket price).

For a perfectly normal distribution, 68.4 per cent of all the observations fall within plus or minus one standard deviation of the average, 95.4 per cent fall within plus or minus two standard deviations of the average, and 99.7 per cent of the observations fall within plus or minus three standard deviations of the average.

Time-Series Analysis

As mentioned earlier, time-series analysis measures the status of some activity, such as aviation accidents, number of aircraft operations, or number of enplanements over a period of time. Time series records the activity by means of measurements taken at equally spaced intervals using a consistent activity and method of measurement. Observations may be carried out annually, quarterly, monthly, weekly, daily, or every hour. All time-series data contain these four components:

- trend analysis
- seasonal variations
- cyclical variations
- random effect.

Trend Analysis

The trend component accounts for the movements of time series over a long period of time. Any regular patterns of values above and below the trend component are probably attributable to the cyclical component of a time series. For the air transport industry, this shifting, or trend, is usually attributed to factors such as liberalization, deregulation, change in disposable income, introduction of new technology, population growth and/or privatization.

Seasonal Variations

The seasonal component accounts for regular patterns of variability within certain time periods, such as over a year. For an airline, the number of passengers may be very high in certain months or seasons and low in others.

Cyclical Variations

The cyclical component refers to long-term fluctuation of time-series statistics over time.

In general, it is harder to predict the cyclical components of time-series data than trend and seasonal variations. The most recent cycle was in 2000 when air traffic started to decline, and this cycle continued until late 2003.

Random Effect

Finally, random factors of a series are short-term, unanticipated and non-recurring factors that affect the values of the series; these factors are part of the natural variability present in all measurements. For example, events such as those of 11 September 2001 are impossible to predict. The trend component analyzes the data over a long period of time, the cyclical component occurs over a medium term, seasonal variations occur in the short term (say, over a year), while random events are unique incidents.

Regression Analysis

The other principal quantitative forecasting method is regression analysis. Regression analysis assumes a casual relationship between the dependent and independent variables.

The specific two-variable linear regression model is:

$$Y_i = B_O + B_1 \times X_i + E_i$$

- ➔ Yi is the dependent variable
- ➔ B_O and B_1 are the coefficients of the regression line (also known as the intercept and slope)
- ➔ Xi is the independent variable
- ➔ e i is the predictor error, or so-called residual.

Data Sources

In order to perform successful forecasting in the aviation industry, various data are required. This section outlines some of the data sources commonly used in aviation applications. It also indicates whether the data is freely accessible or can only be obtained through subscription fees, and, where appropriate, the web addresses are provided.

MODULE IV

AIRPORT-AIRLINE ECONOMICS

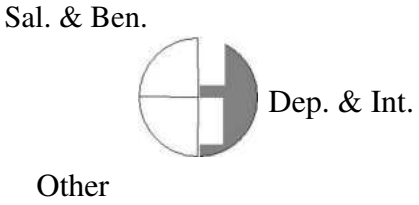
EXPENDITURE AND REVENUE STRUCTURE IN AIRPORTS

EXPENSE PROFILE

At the risk of overstatement, it must be emphasized that each airport is unique, and the following information is cast in only the most general terms.
Any airport's total expense is composed of (1) operating expense and (2) capital expense, with the major components frequently looking like this:

	Operating Expense:	Salaries & Benefits Other (Utilities, Supplies, etc.) .
+	Capital Expense:	Depreciation Interest
=	Total Expense	

The following pie chart illustrates the customary relationship of these major expense items at a typical medium-sized airport:



This chart represents a reasonably normal situation but should not be interpreted as an optimum model by which any specific airport should be judged. Its real value is its illustration of these important points

* Airports are very capital intensive.
* The largest category of operating cost is usually salaries and benefits.
* Within the category marked "Other", utility expense (electric power and gas) is frequently the largest single item.

Any particular airport can vary significantly from this model for a variety of reasons, some of which will be outlined later in this chapter.

REVENUE PROFILE

As difficult as it is to describe a typical airport's expense profile, the typical revenue profile is even more difficult to generalize. Total revenue should be sufficient to cover expense; however, there are as many ways of achieving this goal as there are airport managers.

An examination of several airport income statements will reveal that the revenue profile varies significantly by airport size. Larger airports (over 2,000,000 enplanements per year) are able to generate significantly more concession revenue than smaller airports; smaller airports frequently depend on general aviation users for a larger percentage of their revenue stream.

A common thread among many (but not all) airports is dependence on a single aviation market for a significant portion of airport revenue. *Single aviation market* refers to such market segments as:

* Scheduled domestic airlines
* Transient, corporate general aviation
* Charter travel to a significant tourist destination

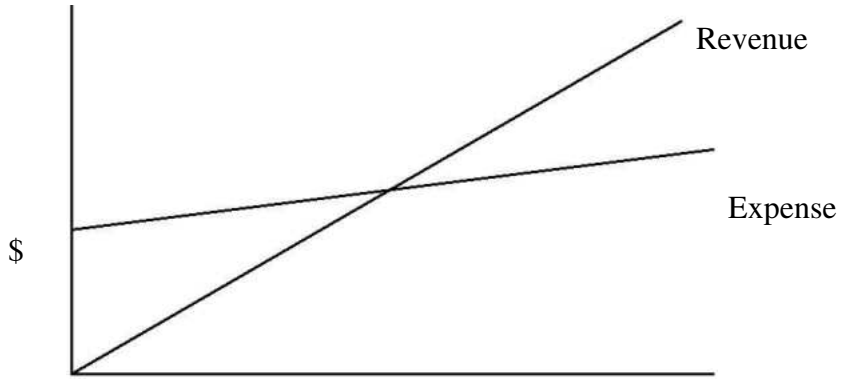
In some instances, the airport's revenue stream may be heavily dependent upon a single aviation *company* as is the case with many airline hubs

Notice that this chapter is organized by discussing expenses first, then revenues. This is backwards from common business logic wherein an entrepreneur first identifies a market need and estimates the potential *revenue* from a product that serves that need. If the product can be produced for less *expense* than the revenue it produces, the project is worth pursuing.

This backwards organization is deliberate and meant to reinforce the point that many airport owners traditionally determine expense first and then proceed to identify sources of income that will produce a break -even situation. This mindset is typical for a public service entity that provides an infrastructure product. It also explains why revenue profiles vary so much from airport to airport since different management philosophies will profoundly influence how an airport "goes after the money" it needs to recover its expenses.

RELATIONSHIP OF REVENUE AND EXPENSE

If the income statements of all U.S. air carrier airports were summarized on one diagram, it would look something like this:



Notice that revenue starts near zero since presumably no customers equals no income. Expense, on the other hand, begins at a fixed amount whether or not any passengers walk through the front door. It costs a minimum amount of money to build and equip a new airport regardless of the potential market size. Like aircraft carriers or suspension bridges, it is not feasible to build half of an airport.

Airport revenue increases as passenger traffic increases; however, the expense line rises more slowly due to the relatively fixed nature of airport costs. The two lines cross at the break-even point where revenues match expenses.

The F.A.A. and many independent researchers have attempted to define the expected break-even point for U.S. public airports and their answers range from 200,000 to 1,500,000 annual enplanements. From personal experience, somewhere near the midpoint of these two numbers (500,000 to 800,000) seems reasonable. As with previous generalizations, the reasons a particular airport may vary from this norm are more important than the norm itself.

REASONS FOR VARIANCE

Airports with less than 500,000 annual enplanements have been known to stand on a firm financial footing while some larger airports flounder. Possible reasons for these variations are as follows:

* UNION Vs. NON-UNION LABOR : Some airports have higher personnel costs due to the local workforce culture (remember, personnel costs are a large component of total airport costs).

* HIGH CONSTRUCTION COST ENVIRONMENT : Airports are always building or rebuilding facilities; therefore, poor soil conditions, harsh weather or long distance from raw materials can permanently increase an airport's cost base.

* ONE BIG UNUSUAL ITEM : An airport may have an unusual revenue item (airport controls all fuel sales) or an unusual expense item (empty warehouse built as a speculative venture) that alters the financial profile. Once this item is removed from the analysis, the profile looks normal.

* CITY Vs. AUTHORITY : City-owned airports may move some expenses "offshore" by not detailing the true cost of intergovernmental services such as police and fire. Conversely, airport revenues may be directed to other city departments by contracting out airport concessions to the management of other city departments.

AIRPORT LIFECYCLE : The financial life of most air carrier airports centers around the terminal building . Since any new terminal is built to serve its citizens for a number of years, it is deliberately overbuilt for conditions on its opening day. Accordingly, expenses will appear high relative to revenue. As passenger traffic (and revenue) increase over time the airport's financial profile will grow into a normal condition. In later years, if the operation continues after the terminal is fully depreciated, total expense may appear low relative to revenues (although an "eyeball examination" of the facility will convince the investigator that a large reinvestment will soon be required).

STRATEGIC IMPLICATIONS

As stated earlier, airports are extremely capital intensive. Comparing the total assets of most U.S. airports (found on their Balance Sheets) to their total annual revenue (found on their Income Statements) produces a ratio that averages near 10:1 ($10 in assets are required to generate $1 in annual revenue). For comparison:

* The Forbes 500 as a group average 2:1

* Electric utilities as a group average 3:1

Another way to view this issue is to examine total assets to total employees. In this case, the numbers are approximately:

* U.S. Public Airports : $1,000,000/employee

* Utilities : $'employee

* 00 : $'employee

On a more human scale, consider that it is not unusual for a small-hub airport to hold $100,000,000 in total assets on its Balance Sheet. Compare this figure to the total assets of local banks, real estate development companies, or municipal governments and a better understanding of *capital intensive* comes to light. This leads to these important implications:

* Management of depreciation is extremely important. Many airport professionals concentrate on the management of cash flow; however, depreciation is a real expense even if it doesn't appear so in the short run. Many surplus World War II airports were caught short by collecting only enough revenue to pay for salaries, utilities, and supplies. When the runways and taxiways reached the end of their useful lives, the cost of rehabilitation was astonishing and the local aviation market was simply unprepared to pay the necessary fees and charges to cover this expense. As an additional note, it should be mentioned that inflation is especially ruinous to capital intensive industries.

* U.S. airports significantly undercharge for the use of their assets. They are able to do so because much of their capital expense is subsidized, either through outright gifts (F.A.A. grants), exemptions to taxes (e.g. property taxes) or reduced-interest financing (tax-exempt bond market). If U.S. airports were completely privatized and these subsidies were taken away, average airport fees could double or triple, and the assets/income ratio might approach that of electric utility companies.

* If an airport organization is planning large cuts in its expense base, it has to begin with its capital expense, usually debt service or planned construction. After debt is refinanced and construction rescheduled, the next prime expense to examine is personnel cost (sorry to have to say that). Third comes the power bill and fourth comes everything else. In other words, cutting the travel budget or closing the employee lounge may be useful to establish the tone of management's intent, but it will not significantly impact the bottom line.

USEFUL PARAMETERS

Recently, a study of airport financial statements was conducted in order to define the typical financial structure of U.S. airports. Of the busiest 108 U.S. airports (which collectively board 95% of all passengers), representative samples were selected and their annual financial statements analyzed. Following are median figures for selected financial parameters:

*	Current Ratio:	1.7
*	Average Age of Accounts Receivable:	27 days
*	Long Term Debt per Enplanement:	$75
*	Debt to Equity Ratio:	1.3 to 1
*	Total Assets per Employee:	$1.3M
*	Total Assets per Enplanement:	$140

* These results correlate closely with similar data found in government and private industry databases.

FINANCIAL MANAGEMENT AT AIRPORTS

Concept of Financial Management in Airports

In ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082, Section I, paragraphs 9-10) the Council of ICAO endorsed the application of principles of best practices of good corporate governance1 for airports. With the aim of promoting transparency, efficiency and cost-effectiveness, airport management should apply best practices in operation and management in all areas of an airport regardless of whether it is owned and operated by the public or private sectors, and of whether or not it is profitable.

Paragraph 9, Section I of Doc 9082 recommends that, to ensure the use of best practices of good corporate governance of airports, States should consider:

- objectives and responsibility of the entities;
- shareholders rights;
- responsibilities of the board;
- role and accountability of the management;
- relationships with interested parties; and
- disclosure of information.

This would involve, for example, that airports recognize aircraft operators, passengers and others doing business at airports as customers who want to be satisfied that services are provided to an appropriate standard of quality, in a timely and cost-effective manner. The airport development plan should document a two-way exchange of information and an in-depth consultation process between the airport operators and the users showing the relationship between the quality of service, the level of investment, and the level of charges.

Transparent accounts, published on a regular basis, should enable costs, revenues and (where appropriate) subsidies and cross subsidies to be clearly identified. At airports where all non-aeronautical revenues are taken into account when calculating aeronautical charges (the so-called "single-till" approach, which is described in Chapter 4, Part F, paragraph 4.121), there should be no differentiation between the income and costs from the two sources. Subsidization of aeronautical charges should not be regarded as a substitute for bearing down on operating costs. Where it is necessary for wider public interest reasons to subsidize airport operations, from public funds or from revenues generated by other airports in a common system (an airport network), the accounting system should clearly show this.

The State should objectively assess proposals for investments against financial and broader cost-benefit analyses, including evaluation of social needs, impact on national or local economy, and environmental effects. Proposals should also reflect safety and security requirements. The possible role of government, at the national and local level, in defining these criteria should be acknowledged in the proposals.

In addition to the considerations, the airport could also apply principles of best practices in many other areas, such as: budgeting, bank and cash management, presentation of financial statements, measuring performance and productivity and benchmarking, service level agreements, economic pricing, collection of charges and concessions and rentals.

A service level agreement (SLA) is a tool by which airports and aircraft operators define the level of service and the terms of engagement or rules that will govern the airport/users relationship on the agreed services. Guidance material describing the objectives, characteristics, implementation aspects and the various possible forms of an SLA is included in Appendix 2.

Financial accounting refers to the system according to which revenues and expenses are recorded and summarized so as to present an aggregate financial picture of the provision of airport services. How elaborate and detailed the financial accounts are depends on the extent of detail required and the size of the airport concerned. It is, however, essential from the outset to ensure that all accounting procedures are applied in accordance with recognized accounting rules, standards or conventions. Good internal controls as well as external auditing are also important.

Financial accounts may also be supplemented by management accounts which apply accounting techniques for the purpose of assisting all levels of management in planning and controlling all the different functions and services at an airport.

The basic purpose of financial control is to ensure that the resources used to operate airports are spent in an effective, timely, reliable and accountable manner. This involves monitoring and controlling the provision of services in financial terms to ensure that the expenses and revenues incurred in a particular year are in accordance with a previously approved budget.

Financial control and accounting are of course interrelated, since management cannot exercise financial control effectively without having at its disposal the data provided by a sound financial accounting system. It is therefore essential that any procedure being established to provide financial control be accompanied by a thorough examination of the accounting system to ensure that the latter can adequately provide the financial data necessary for this purpose.

Financial control essentially involves three steps: 1) a comparison of actual revenues and expenses with those planned; 2) where the two differ significantly, a determination as to whether the cause lies within the budget itself, in the management of the airport or is the result of external factors outside management's control; and 3) what corrective measures need to or can be taken.

Any substantial divergence from the original budget for a major specific revenue or expense item may also call for a review of the forecast outcome, to determine the extent to which any other items and the overall financial situation of the entity providing the airport concerned are likely to be affected. This will be particularly beneficial in cases where the shortfall could ultimately affect the operating efficiency of the airport.

At the end of each accounting period, which as a rule covers a one-year period, the entries in all individual financial accounts are totalled for presentation in two complementary forms or tables, namely the income statement (also referred to as revenue and expense statement or profit and loss statement) and the balance sheet. The former summarizes all revenues and expenses arising during a specified period, with the difference between the two totals being either a profit or a loss. The balance sheet summarizes assets and liabilities at a point in time. The profit or loss for a period goes to retained earnings on the balance sheet and, together with the balance in other equity accounts, provides the net worth of the airport.

An income statement and a balance sheet do not identify the movements in assets, liabilities and capital which have taken place during the accounting period. A statement of cash flows should be prepared to highlight movements in cash flows for the period concerned. This statement also provides information on the entity's liquidity position (this is addressed in Chapter 4, Part A). It should be noted that a statement of cash flows, when provided for a number of years, is of particular relevance and assistance when financing is being sought, because it shows the changes in the cash position of the airport, and can thereby influence the size and terms of the loan or financing being sought.

Economic Performance Management

Performance management involves engaging in activities to ensure that objectives are consistently being met in an effective and efficient manner. Since airports employ considerable

resources in their day-to-day operations, performance shortfalls can result in suboptimal use of airport facilities and in additional costs to their users and society as a whole. In contrast, the good performance of airports will have a positive impact on other members of the aviation community including ANSPs and regional planning entities.

ICAO's policies on charges in Doc 9082 (Section I, paragraph 16) recommend that States ensure, within their economic oversight responsibilities, that airports develop and implement appropriate performance management systems3. The need for an appropriate performance management system is independent of the organizational format of the airports. This is because the performance of an airport is more related to its governance than to its ownership and control structure.

Performance management is a systematic and iterative approach within an organization that consists of defining a strategy and executing it through the alignment of resources and behaviors, so that the performance of the airport improves over time. Performance management should be part of the business plan of an airport. An airport will generally implement a performance management system through a series of steps as outlined below:

- identify Key Performance Areas (KPAs);
- define performance objectives taking into account the interests of aircraft operators, end-users and other interested parties;
- select performance indicators (and supporting metrics);
- establish performance targets taking into account the interests of aircraft operators, end-users and other interested parties;
- create and implement a plan, in cooperation with other members of the aviation community, to achieve performance targets;
- consider, and where appropriate, provide performance incentives;
- periodically assess actual performance results by using benchmarking, as appropriate; and
- publish performance reports on the results achieved.

ICAO's policies on charges in Doc 9082 (Section I, paragraph 16) recommend that providers focus on at least four KPAs (safety, quality of service, productivity and cost-effectiveness), it being understood that States may choose additional KPAs according to their objectives and particular circumstances, and that they select at least one relevant performance indicator and its target for each KPA.

An important feature of performance management is the feedback loop. The performance management process uses the results of assessments of actual performance to periodically adjust KPAs, performance objectives, targets and plans to achieve results, as appropriate.

In setting performance monitoring targets, the airport should consider the interests of various types of users, including end-users. As individual parties tend to have different expectations,

opinions and priorities, the airport needs to adopt a process that seeks to reconcile these differences insofar as this can be done. However, in many cases there may be mutually exclusive requirements. Where differences cannot be reconciled, the airport operator should prioritize in the interests of current and future users (i.e. consider dynamic as well as productive efficiency) to ensure that adequate and appropriate provisions are being made in this regard. The regular consultation process with users, as outlined in Chapter 1, should include the presentation of performance monitoring results.

It is also important to recognize that a number of entities, such as approach/aerodrome control services providers, aircraft operators, ground handlers, catering companies, fuel suppliers, customs agencies and security companies, generally have a role in the aeronautical and/or non-aeronautical activities at the airport. All such entities contribute to the overall performance of the airport. As part of its role as manager and operator of the airport, an airport should, through the use of service level agreements (SLAs) and incentive/penalty systems, ensure that the various entities perform their functions in such a way as to optimize the outcome from the perspective of the users, including end-users.

There is no single global, all-encompassing application of the performance management process, but many simultaneous — and often interrelated — applications at more specialized and localized levels. The level and complexity of an appropriate performance management system depend on various factors, including the size of the airport, the nature of its customer base, the degree of competition between airports and their position in the market, the costs and benefits related to various options, and the legal, institutional and governance framework. It is important to ensure that the introduction of such a system will improve overall service quality from a customer perspective, and not artificially skew the business by seeking to optimize specific indicators.

Airport performance is frequently discussed in relative terms, which can be internal or external. Internal performance measurement means considering an airport’s performance against itself over time (internal benchmarking, or self-benchmarking). External comparisons involve comparing airports with one another at a single point in time and through time (external benchmarking)

PRICE REGULATIONS & AIRPORT CONCESSIONS

PRICE REGULATIONS

Introduction

Traditionally, airports have, rightly or wrongly, been perceived as monopolies. As such, airport with private governance structures may be subjected to price regulation to protect their customers from overly high prices due to the exercise of potential market power. Typically such regulation controls only the price of aeronautical and non-aeronautical services offered to their customers.

This section lists alternative models of regulation. It covers not only traditional forms of regulation but also incentive, trigger and self regulatory forms.

There are four main types of regulation:

- Rate of Return Regulation
- Cost of Service Regulation
- Price Cap Regulation
- Intervention Regulation

Each of these is discussed in turn, along with two other regulatory options: self regulation and regulation by contract. First, a general discussion of the types of airport charges is provided.

Types of Airport Charges

Aeronautical versus non-aeronautical fees

Airports have two broad categories of costs: aeronautical and non-aeronautical. Aeronautical costs are those associated with providing a) runway services, and b) terminal services for ticketing and boarding passengers.16 Non-aeronautical costs are those associated with other terminal services, commercial land development, etc. Airports charge fees to carriers and other users for the provision of these services.

At most airports, separate accounts are kept for aeronautical and non-aeronautical cost categories. There are several reasons for this. One is that industry conventions require that fees for aeronautical services, such as landing and terminal fees, cover no more than their respective costs. In the United States, the Federal Aviation Act provides for regulations which enforce this provision. In most other jurisdictions, it is industry convention (strongly enforced by the countervail power of air carriers) embodied in policies of ICAO, IATA and ACI which recommend that aeronautical fees be no greater than cost. Further, these policies recommend that carriers be consulted prior to implementation of any fees.

Typical Airport Charges

While each airport differs somewhat, most will assess the following types of fees and charges.

- *Landing fees*. These are fees for use of the runway. Most airports charge fees based on the weight of the aircraft. Heavier aircraft pay more both because of the greater weight and because the fee per tonne of landed weight itself is often higher. In Canada, it is common for airport to have three "weight classes," with the highest class capturing almost all jet aircraft. Landing fees are paid by passenger airlines, cargo airlines and non-commercial aircraft.
- *Terminal Fees*. These are fees for use of the "common areas" of the airport terminal, such as boarding gates and queuing space in ticketing areas. These fees are typically assessed on the basis of the number of seats on the aircraft. A few airports assess fees based on the number of on-board passengers, but this requires more detailed data collection. Only passenger carriers pay terminal fees. Cargo carriers and non-commercial users do not require terminal services. Other Terminal Fees. Some airports will have additional charges for terminal services. For example, the Vancouver International Airport has a "turn around fee" charged only to those carriers who use the transborder customs facility. This fee allows for cost recovery for space and facilities required for U.S. preclearance operations.
- *Security Charge*. Prior to transfer of airports, security services were provided at no charge by federal security services. After transfer, these services were withdrawn and airports were required to provide their own security services. Most airports instituted a fee on air carriers to recover these costs. Generally this is a cost per seat or a schedule of fixed fees based on type of aircraft.
- Emergency Response Fee. A few airports have separated emergency response services costs into a separate category and assess a separate fee.
- Airport Improvement Fees. These fees are assessed by not-for-profit airport authorities on passengers. These fees do not have direct costs associated with them. Instead they are fees intended to generate cash current with or in advance of construction projects. While airport accounting practice varies somewhat, these fees are not generally considered to be aeronautical fees.
- Commercial Fees. These are charges for a large variety of non-aeronautical services. They include fees for space rentals for commercial activities, airline business class lounges, fees for advertising and other displays, land rentals for cargo and maintenance facilities,19 fees for provision of network/phone/electric services, curb use fees for commercial transportation vehicles, etc.

Scope of Price Regulation

Having described types of airport charges, I now turn to regulation of airport charges. In most jurisdictions in the world, only aeronautical fees are price regulated. Commercial services are considered to be provided in markets which have a degree of competition and thus regulation is not necessary. In Australia and New Zealand, for example, airport services are divided into contestable and non-contestable. The latter primarily embraces aeronautical charges. Court cases have tested the boundaries of what is and is not contestable, and have generally upheld that non-aeronautical services do not require price regulation.21

Rate of Return Regulation

Historically, this has been the type of regulation used for privately owned electric and telecommunications utilities, as well as for pipelines. A firm is allowed to set prices so long as the overall corporate rate of return on the shareholder's capital investment does not exceed a "fair" rate of return. As the firm cannot set prices too far above economic costs it cannot exploit its monopolistic position.

In practice, utilities spend considerable effort with the regulatory process. There are two main areas of dispute. The first is what constitutes a fair rate of return. While initially this was a source of much debate, most regulators have set reasonable rates of return recognising the debt-equity ratio of the firm, the underlying riskiness of industry financial performance and what return is required to attract and sustain equity investment.

A second area of dispute is determining the capital investment. A major concern is whether capital investment is to be measured in historical costs versus replacement costs. The record in practice is a lack of consistency. Some industries and countries allow use of replacement costs while others do not.

Another second major concern involves whether new capital investments will be "allowed" into the "rate base." A utility would not want to invest several billion dollars in capital only to find that the regulator felt it was not necessary and thus a return on that investment not being allowed. Thus regulators are requested to approve all capital investments prior to the utility company's commitment of financial resources. This regulatory form is complex, unresponsive, and expensive. Any time the airport operator wishes to change a charge or fee, a detailed regulatory application must be developed and submitted.

An interesting twist is that some economists believe that over time the regulatory agency is captured by the utility. The concept is that over time the regulated spends so much time educating the regulator that the latter comes to adopt the "religion" of the utility company. The utility thus receives favourable decisions on a consistent basis.

Cost of Service Regulation

Historically, this has been the regulatory type used for airlines, rail and other transportation carriers. This is a much more intrusive regulatory format, as the regulator must approve every price change and, in some cases, service decisions.

As applied to transportation carriers, approval of each price change requires documentation of cost increases. If the carrier can demonstrate that its costs have risen, then the requested price increase is approved.

In practice, regulators are good at examining documentation of price increases, but poor at discerning whether the cost increase was required or not. Carriers were often able to pad costs or over-invest without effective constraints on prices they could charge. It was somewhat like having an unlimited expense account: if you could produce a receipt, you would be reimbursed. Regulatory economists generally have been of the view that cost of service regulation results in inefficient (high cost) operations by carriers. Deregulation was largely concerned with restoring cost efficiency pressures to those industries.

This regulatory form is expensive, unresponsive to changing market conditions, and at least in the view of some economists, has not served consumers particularly well.

Price Cap Regulation

In the past few decades, a new set of approaches toward price regulation have arisen. These attempt to provide an effective discipline on firms with monopoly power, but at a lower regulatory cost, and in a form which preserved incentives for firms to be cost efficient.

The most widely known, and now widely adopted regulatory type is price cap regulation.23 This format has two dimensions. The first is the cap itself. The format allows a firm to increase prices whenever there is inflation or an increase in costs. Prices can be increased up to the cap. Usually the cap is set at inflation, less a provision for efficiency gains expected to be achieved by the firm. This is usually shown as CPI-X or RPI-X, where CPI stands for the consumer price index (or retail price index, as it is called in the U.K.) X represents efficiency gains. Most firms become more efficient at what they do over time. Thus even if your unit labour costs rise, because fewer labour hours are required to produce the same output, you don't have to increase your prices as much as the inflation rate.

The second dimension of price cap regulation is the price basket. The price cap does not have to apply to all goods the firm sells. Some goods are allowed to have greater price increases than the cap – provided other goods have price increases under the price cap. It is only the average increase in prices of all goods in the "price basket" which must not exceed the price cap. This allows the firm considerable flexibility to change prices within its product or service line without the need for regulatory approval. It enables desirable long term shifts in relative prices of different services which cost based regulation might prevent.

Price caps have typically been set for periods of time such as 5 years. Once every five years, the regulatory does an audit and review. It then sets a new price cap for the next five years. Thus the firm is free of regulatory proceedings and costs for a considerable period. So long as the firm stays within the cap, it is free to change prices at will.

This regulatory method is low cost for both the firm being regulated as well as the government regulator. It provides a high degree of flexibility for a price regulated firm. It also provides incentives for innovation and efficiency. If the firm figures out a way to lower costs, it is not forced to lower its prices until the next five year review. The review process also recognises the need for above inflation price increases to cover the costs on new capital investment negative. Second, industries and the conditions of competition changed. In the rail sector, for example, the emergence of competition from trucking and publicly financed roads removed much of the market power of rail carriers. Third, some economists believed that in the long term regulatory capture took place, leading to regimes in which regulation served producers and not consumers.

Two popular versions of the price cap approach in use at various airports around the world are the single-till price cap and multi-till price cap.

Single-till price cap. In this version, all airport activities are included together when applying the price cap. This includes activities for which the airport operator faces competition as well as activities which are non-contestable. Effectively, any gains made in contestable activities must be transferred in full to the aeronautical users.

The strictest version of this regulation is referred to as residual pricing and incorporates the costs and revenues of all of the airport's activities. Total operational costs, both aeronautical and non-aeronautical, are subtracted from the non-aeronautical revenues. The difference, or residual cost, is then divided by the number of aircraft landing units yielding the aeronautical fee. With residual pricing, all gains accrue to aeronautical users (removing all incentives from the airport operator), and all financial risk of operating the airport is shifted to the aeronautical users, with the airport company bearing little risk.

Multi-till price cap: Under the multi-till approach the aeronautical areas of airport operation are not subsidised by the non-aeronautical sources of revenue. This retains incentives to develop commercial activities at the airport, and more consistent with economic principles in congested conditions. This model is not favoured by the airlines as it generally results in higher charges

Trigger Regulation

This is a regulatory format which relies on the threat of regulatory intervention to constrain monopolists from unfairly increasing prices. With trigger regulation, the government has a power to intervene and set prices. However, there is no exercise of the regulatory powers until a complaint is received and determined to require a response. The concept relies on firms "behaving themselves", knowing that unreasonable price increases would not be allowed.

There are considerable advantages of this regulatory format. Neither the firm or the regulatory incurs costs of regulatory procedures (unless the trigger is pulled). The firm has considerable freedom for setting and changing prices. The firm has incentives to be efficient, as it is able to keep all or a portion of its efficiency gains.

Typically trigger regulation will have some provision to prevent indiscriminate use of the trigger. Some variations on this are:

- There are minimum and costly application requirements. This prevents nuisance complaints.
- If the regulator finds for the target firm, then the applicant who had invoked the trigger pays for the costs of the regulatory procedure.
- Final offer arbitration is used. The applicant must submit their best proposal for what the price should be. The defendant then has time to respond. The arbitrator can only choose one of the "offers", and cannot "split the difference. Here the applicant could end up with nothing.
- The applicant must show material harm before the application will be considered. This prevents use of the trigger for minor disagreements on prices.
- The applicant must show "public interest", a costly burden.

Self Regulation

Here the industry or firm adopts a set of standards or code of conduct which is acceptable to customers. Provided the firms stays reasonably within the code, customers will neither dispute price changes or pressure governments for a regulatory regime.

This is the most flexible and least costly regulatory mechanism. The challenge is to find a set of standards which the customers find acceptable yet provides the firm with the required flexibility. As well, for this to be effective, all firms in the industry must discipline themselves to adhere to the code, otherwise the one exception runs the risk of inducing a formal regulatory regime.

Airport pricing guidelines by ICAO and ACI are examples of codes which can be used for self regulation. (These specify, for example, that prices must be based on costs.) The ICAO/ACI price guidelines are very powerful in that they have become convention throughout the world. Deviations from these principles are rare. In part, this is because air carriers have strong interests in seeing that all airports adhere to the cost based principles contained in the guidelines. An airport which deviates is the target of massive pressures from the airlines collectively in order to ensure continued worldwide compliance with the principles.

Airlines have significant countervail powers vis a vis airports. They are, for example, able to delay or deny payment. In some U.S. cases, airlines have paid fees to trust funds rather than to an airport directly. Often, airlines have veto powers over airport capital programs. In the US, the bond guarantees provided by the airlines give them veto over capital programs through majority-in-interest clauses. In Canada, many airports have entered into agreements with air carriers (through the Air Transport Association of Canada) for collection of airport improvement fees (AIFs) on airline tickets. These agreements give carriers initial veto power over airport authority capital programs, which allow delay of capital programs by up to 3 years. In fact, the countervail power of the air carriers is so strong that when Air Canada and Canadian merged, the Competition Bureau required that the AIF veto powers be reduced so as to prevent a single carrier from controlling airport capital decisions.

Regulation by Contract

An often overlooked mechanism for constraining monopoly power is by contract between the firm and its customers. This type of "regulation" is possible where a firm has a small number of customers, and these customers are able to enter into a long term contract. Airports may be excellent candidates for this type of relationship. Many airlines enter into long term contracts for terminal services or usage. The approval process for major capital programs and their accompanying changes to rates and charges provides an opportunity to enter into long term contracts regarding rates and charges.

The concept here is that airport users (airlines) enter into contracts with full knowledge of the economics and dynamics of the industry. If a customer freely enters into a long term contract with a service provider, then that contract would normally contain pricing provisions which would prevail for the duration of the contract. Typically these will include provisions for cost adjustments.

In such cases, there is no need to protect the customer by imposing a government price regulation regime. The same end is achieved by contractual agreement.

Price Regulation of Airports: Practice

Price Cap Regulation in the U.K.

The United Kingdom has been the earliest and strongest user of price cap regulation for a whole range of industries. When the British Airports Authority and Manchester Airports were privatized in 1987, price cap regulation was immediately applied to their activities. Note that for BAA separate price caps are established for each airport.

Smaller airports in the U.K. are subject to trigger regulation. At present they are unregulated. However, upon complaint or on the initiative of the Government, the price cap regulation regime may be applied. Currently there is some consideration of extending regulation to some of the smaller airports.

The UK regulatory regime for airports is characterized by the following:

- A regulatory determination is made once every five years, at the beginning of the five year period. Once the determination is made, airports have complete pricing freedom, provided they stay within the cap.25
- The regulatory determination is a public process conducted by the Monopolies and Mergers Commission (now the Competition Commission). Any interested party may make representation to the MMC.
- The MMC makes recommendations to the Civil Aviation Authority. It is the CAA which actually regulates the prices of the airports. The CAA may accept, reject or vary the MMC recommendations. In practice, the CAA has made some variations in the MMC recommendations.
- The price cap is set at the Retail Price Index less an adjustment for productivity. In recent years, the productivity adjustment (the X in RPI-X) has been quite large and exceeds the inflation rate. This results in a requirement for the airports to lower prices.
- At the five year review the airports are allowed special price increases to deal with a) new capital and b) other extraordinary items. Thus when a new terminal or runway is planned, the CAA allows the airport to increase its prices above RPI-X to reflect the increased cost of the new facilities. An example of an extraordinary adjustment is an upward adjustment in prices to compensate BAA when intra-Europe duty frees sales is no longer allowed.
- The price cap only applies to airfield and terminal charges. Retail, land rents, etc. are not regulated during the five year period.
- However, when the five year reviews are done, non-aeronautical revenues are considered. This means that during the five year period, the airport company is free to charge what it will for concessions, parking, etc., and it is allowed to keep any and all profits. At the end of the five years, if non-aeronautical revenues have grown, then there will be a downward adjustment in aeronautical fees for the next five years. In other words, non-aeronautical fees are never regulated, but if they are profitable, once every five years landing fees will be reduced by the amount of increased profits from non-aeronautical activities.
- There is no regulation of the prices of BAA subsidiaries. BAA has entered into a wide range of businesses via subsidiaries, including purchasing and developing off airport land, investing in and/or operating other airports, consulting, etc. Here is an example: in October 1997, the CAA made its ruling on the price cap for Manchester for the third 5-year period (1998-2003):
- airport charges are limited to RPI-5% in each of the next five years
- this was computed as RPI-11.5% but with an offset of 6.5% per year for the loss of intra-EU duty free sales. This was a slight variation from what the MMC recommended. (MMC recommended RPI-6.6% for first year and RPI-5 for years 2-5).

A final comment: during the MMC five year reviews there are large numbers of submissions. A frequent theme is “lack of consultation”. This has been dealt with by requiring the airport companies to submit a report to the CCA every year on consultations.

Revisiting Price Cap Regulation for Airports

In the past one to two years, a number of eminent transportation economists have been calling into question the desirability of price cap regulation at airports. The debate was stimulated by Michael Beesley. As the economic advisor to the government of Margaret Thatcher, Beesley played a key role in the design of the privatization of airports in Britain and establishment of the accompanying price cap regulation regime. In 1999, Beesley claimed that he had reconsidered price cap regulation of airports and concluded that it was distorting the market and providing seriously incorrect price signals.27

David Starkie, another prominent UK transportation economist, undertook to study the matter and has recently published a major peer reviewed paper on the subject. Starkie too concludes that price cap regulation, as applied in the UK, is bad economics and undesirable.

A key to understanding the alleged perversions of price cap regulation in the UK is the use of the single till approach, which is reviewed every 5 years. The London airports are required by the single till to reduce their charges by the amount of commercial (non-aeronautical) revenues earned. The consequence is that prices to airlines at these airports have declined continuously. So strong has been the price decline, that it is expected that at the next review landing fees could be ordered to be set at zero.28 But London Heathrow and Gatwick are two of the most congested airports in the world, especially the former. A zero price for use is the wrong price signal to give to carriers at a severely congested facility. This is very bad economic policy.

Both Beesley and Starkie conclude that prices at the London airports should be rising with congestion, not declining. The issue then becomes one of whether an alternative pricing approach should be used, such as dual till. With dual till price regulation, the airport operator is limited in how high its aeronautical fees can rise based on inflation and productivity, but there is no "give back" of non-aeronautical revenues earned. These revenues are considered to be provided in competitive markets and thus do not need to be regulated.29

Starkie, however, investigates the economics of airports further. He observes that the degree to which non-aeronautical revenues can be earned is primarily dependent on the number of airport passengers. The economic model he puts forth is one of casual complementary demands. The demand for non-aeronautical service offerings depends on the demand for aeronautical services, but not vice versa. If the quantity demanded of the latter can be increased (i.e., if there are more passengers using the airport) then demand for non-aeronautical services (such as parking, food/beverage/retail, land development for airport services such as catering, etc.) will increase proportionately.

Starkie says that airports have natural incentives to stimulate aeronautical demand, in part by constraining their aeronautical prices. Regulation is not needed.

Starkie then looks at the issue of whether rents can be earned. He distinguishes the two broad types of rents: those arising from monopoly exploitation and those arising from increasing land

values. The former are regarded by economists as undesirable while the latter are desirable (as they reflect increasing productivity and value of the land). An operator who undertakes conduct which increases the level of non-aeronautical airport traffic is creating land rents. The only issue is who reaps the land rents: the landlord, the operator (if different from the landlord), the airline or the passenger. But this is an issue of the distribution of income and not one of economic efficiency. Economic regulation of industries arose as a remedy for addressing economic inefficiencies, and was never intended (and is not suitable for) addressing income distribution issues.31

The solution put forth by Starkie (and by Beesley) is that airports in the UK should no longer be price regulated.

AIRPORT CONCESSIONS & ITS IMPACT ON REVENUES

Many airports rely on their concessionaires in order to generate a significant part of their non-aeronautical revenues. The aim of this paper is to identify the principal features of airport concessions. In order to achieve the above aim, the paper is divided as follows. First an overview of the airport operating revenue sources is detailed. This provides the context for following section which outlines the factors influencing concessions revenues. This is followed by a detailed examination of the process for successful letting of concessions and various contract terms. The fourth section analyzes the example of Dubrovnik Airport with regard to various components of a contract between the tenant or lessee and the airport authority. The survey consists of data that was gathered via an interview with airport legal services adviser in December 2007 at Dubrovnik Airport. Finally certain conclusions emerging from the previous mentioned sections are drawn.

Airport Revenue Structures

Traditionally commercial issues have been a peripheral concern to the needs of aeronautical operations. The aim of the airport authority has been to process passengers as quickly and efficiently as possible.1 However, two different approaches must be emphasized, the traditional view of an airport, i.e. that it exists to ensure the efficient movement of passengers between one destination and another, and an alternative approach, which views airports within a broader framework of economic change and commercial opportunity. This change of emphasis represents one of the most significant contemporary developments to affect the industry.

The so -called “commercial-oriented airport approach “suggests that the airport evolves to become a more sophisticated market entity that may be described as “multipoint service-provider firm“.

The capital required to develop and maintain an airport is generated from two sources: aeronautical charges and non-aeronautical or commercial revenues (Table 1). Aeronautical

charges are levied on airlines by the airport operators for using their facilities and include landing and apron charges and passenger fees.

Airport operating revenue sources

Aeronautical	**Non-aeronautical**
Landing fees Passenger fees Aircraft parking fees Handling fees (if handling is provided by the airport operator) Other aeronautical fees (air traffic control, lighting, airbridges etc.)	Concessions Rents Direct sales (shops, catering and other services provided by the airport operator) Car park (if provided by the airport operator) Recharges (for gas, water, electricity etc.) Other non-aeronautical revenue (consultancy, visitor and business services, property development etc.)

Over the last two decades, the trend has been for commercial revenues to grow at a faster pace than aeronautical revenues, as European airports have greatly expanded their retailing outlets, as well as other service offerings.5

Factors Influencing Concession Revenues

Concession in its original context means the payment that the airport authority charges the owner or manager of an operation to conduct commercial activities in the airport, whereas rent or lease refers to the right to occupy certain defined premises or a specific area of realty. In general, however, concessions confer all commercial activities to sell goods and services in the airport, and sometimes the meaning of concession, rent and lease is used indiscriminately.6

Currently, most airports all over the world are striving to generate more concession revenues. Therefore, it is very significant for every airport to bear in mind the principal determinants of concession performance.

These include the following:

- total traffic handled by an airport,
- total amount of space allocated for retailing and other commercial activities,
- characteristics of passenger traffic and buying behaviour8 of those passengers,
- operations and management of concession,
- characteristics of contract and rental fees,
- marketing strategy
- pricing strategy.

In practice, many airports use concession revenues to cross-subsidize aeronautical operations. The common explanation for the phenomenon is that airports appear to face a constraint on aeronautical charges either because of airline opposition to increase in aeronautical charges or because their own governments hold back or limit such increases.10

Selection of Concessionaires and Contract Terms

As previously mentioned, concession revenues are those generated from non-aircraft related commercial activities occurring within terminals and on airport land. Concession business includes running or leasing out shopping concessions of various kinds, car parking and rental and banking and catering, with terminal concessions and car parking and rental being the most important of these. Many airports generate a much higher proportion of their income from concession activities than from aeronautical operations.

Typically the concessionaire pays a fixed rental, plus additional income to the airport once a predetermined profit or turnover level has been reached by the concessionaire. Some agreements, usually those devised by the airport to encourage increased retail presence, are entirely based on the profit/turnover of the concession. These agreements can vary from outlet to outlet at the same airport depending upon location, nature of business, forecast turnover and whether or not the outlet is new.

The process for successful letting of concessions is summarized as follows:

- develop portfolio strategy,
- define market strategy for each concession,
- determine space and location requirements,
- proactively market the airport to potential concessionaires,
- prepare design concepts and specifications for contracts,
- tender/negotiation/selection process,
- monitor and review concessionaire performance,
- work with concessionaires on improvements and redevelopment.

Like average aeronautical charges, average concession revenues per passenger decline with volumes. Concession revenues per departing passenger are lower at hubs, probably because of a high share of connecting passengers, who do not consume rental car and parking services. More concentrated airports make less concession revenue per passenger, possibly because vertical relations imply that a bigger share of such revenues accrues to airlines.

The duration of each concessionaire agreement and the financial conditions attached to each will vary by airport and retailer. It is unusual to have specified rentals for different parts of the terminal and unlike the majority of concessionaire contracts in the domestic market, rent reviews are uncommon over the duration of the contract. The length of the contract is dependent upon a number of criteria. One of the most important is the level of investment required from the

retailer. If little investment is required then a contract is often short term. If any significant level of investment is required from the retailer then a contract of five years would be considered the minimum.

The following section examines various components of a contract between the tenant or lessee and the airport authority using the example of Dubrovnik Airport.

The contract period is generally known to be 3-10 years for duty-free shops and food and beverage stores, and 5 years for retail and convenience stores. The airport legal services adviser indicated some details of the contract period, i.e., 1 year for the parking contracts, for the rent-a-car and travel agencies and 3-5 years for the office lease, food and beverages and retail.

Whatever the length of the contract period it is important, if an airport aims to maximize concession revenues, that no contracts are renewed automatically on expiry.20 With reference to recontract type, it is worth pointing out that special priority is given to existing operator. As a matter of fact, according to the Croatian Law on Lease, the lessor is obliged to offer the existing lessee renewal of the contract 60 days the latest before the contact expires, under the same of different terms provided that lessor had settled all debts to the airport. The airport adviser also emphasized that that stipulation referred only to the facilities described as business lease in the mentioned Act so it didn`t apply to the outside parking lease, for instance.

Finally, in the case of recontracting, the new contract period can be the same as the existing contract period, as well as shorter or longer than the current one. In conclusion, it is accurate to underline that the performance of the contract strategies within airport concessions has become of crucial importance in the generation of commercial revenues.

Conclusions

In this paper, a few points have been made. A perception of airport concessions cannot be separated from the wider developments occuring within air transport industry.

First, it is important to focus attention on commercial activities of an airport in such a way that these activities are given the importance they are worthy of, since they may be bringing about very high percentage of an airport`s total revenues. This is reasonable, and significant, due to the fact that many airports generate a much higher proportion of their income from commercial activities than from aeronautical operations. Second, given the role that commercial activities play in the revenue generally, and concessions in particular, the contract strategies of airport concessions remain of vital importance. Third, the majority of airports have some form of concession arrangement and the generation of revenue by this method is regarded as one of the most widely accepted forms of commercial contract. Airport management must be aware of the fact that the fee revenue from the concessionaires is a field over which it has ascendancy through the contractual agreements that it enters into for its concessions. Consequently, the procedure used in choosing concessionaires has considerable influence on airport`s commercial revenues.

CHAPTER IV: AIR TRANSPORT INFRASTRUCTURE: SUPPLY AND DEMAND

The Nature of Air Transport Infrastructure

The English-language definition of infrastructure is the basic physical and organizational structures needed for the operation of a society. Infrastructure is vital to economic growth and development and, therefore, to improving a country's general living standards, alleviating poverty, and enhancing social cohesion. Its contribution was aptly described by Prud'homme (2004) as a "space shrinker," enlarging markets and lowering trade barriers. Infrastructure is generally thought to include a nation's housing, hospitals, schools, and buildings. Infrastructure also includes the networks required to remove sewerage; deliver water, electricity, and communications; and provide the roads and railways that facilitate the connection of people to places.

Air transport infrastructure (ATI) provides nodes in a network of domestic and international air links that is vital for the delivery of air transport. It includes the physical structures, namely, airports and air traffic control (ATC) centers, and the organizations involved in coordinating their provision and use. Without ATI, air transport cannot function, and without a well-functioning air transport system and the international linkages it provides, national markets will be smaller and some markets may not even exist, particularly for landlocked, isolated, and low-population-density countries (World Bank 2005). Air transport epitomizes the economic and sociopolitical aspects of globalization, which is defined by Shariff (2003) as the worldwide process of homogenizing prices, products, wages, interest rates, and profits.4

While air transport plays an important role in terms of generating economic activity, its main role in the increasingly global environment is to facilitate economic activity. Air transport is central to the transportation of manufactured goods, as well as to the ability of companies to trade more effectively by enabling face-to-face meetings.6 International trade enriches countries and often constitutes a significant share of a nation's gross domestic product (GDP), the most common measure of the size of a nation's economy.

Whether domestic or foreign, good air transport plays a crucial role in companies' investment decisions, especially in manufacturing and services, where face-to-face contact is important.8¶ Investment enriches countries by introducing new production capacity and jobs. While the profits of domestic industry flow back into the economy, thereby furthering growth, foreign direct investment results in transfers of technology and know-how, as well as linkages to the global marketplace. Air transport is vital to tourism, which also is a source of enrichment for countries. Tourists consume goods and services, and residents of the country are given the opportunity to work and advance in the tourism industry.

Given society's demand for well-functioning air transport systems and the increasingly important roles these systems play in the global economy, demands are growing on the infrastructure needed to facilitate air travel. Optimal provision of ATI is critical to an economy's competitiveness because it provides the necessary inputs in the provision of air transport. Optimal provision of ATI requires, on the one hand, optimal provision of the physical structures and, on the other, optimal allocation of the organizational responsibilities that complement these structures. Both sets of responsibilities traditionally have been vested with governments; however, for a number of reasons, they increasingly are being vested with private firms.

In the current global marketplace, ATI is critical to development. Airports and ATC constitute an essential component of a nation's infrastructure by providing domestic and international links that are vital to economic development through flows of human capital, commerce, and tourism. Air links enlarge markets, and the development of new tourism trade-driven markets is especially dependent on efficient and effective ATI.

ATI, like all infrastructure, is a capital good. It is not consumed directly but rather, in combination with labor and other inputs, it provides services. According to Prud'homme (2004), what matters is the service, much more than the infrastructure needed or used to produce it. Policies, therefore, should focus on the end (service provision) rather than the means (infrastructure). This is consistent with the idea that infrastructure includes the physical structures, namely, airports and ATC centers, and the organizations involved in coordinating their provision and use. ATI is lumpy and long lasting, which has major implications for financing and maintenance. ATI also is space specific and immobile, which, combined with the lumpy and long-lasting characteristics, means that investments will shape the economic geography or regional policy of a country. ATI is not a pure public good, and therefore, it is capable of being priced and is chargeable. Consequently,

ATI has the potential to be financially self-sustaining.

Supply of Airport and Air Navigation Services

Basic Description

Airports provide the infrastructure and facilities necessary to facilitate air transport. The essential elements of an airport include runways, taxiways and airfield lighting, aprons and ramp facilities (to park and process aircraft), terminal buildings (for passenger processing through check-in and security, baggage sorting and freight), and gate lounges (where passengers congregate to board aircraft). Airport operation involves the activities required to coordinate the use of the capacity and facilities that provide these essential elements, including maintenance and provision of essential services such as security, firefighting, and cleaning. Airport operators allocate space and resources between, on the one hand, airlines and their handling agents and, on the other, commercial

concessionaires. Terminals are provided as common user facilities in most countries, but in some countries (for example, Australia and the United States), they may be owned and operated by airlines, either as exclusive or common user facilities.

Ground-handling services are provided within airports. They require expensive equipment, such as check-in desks, aircraft tugs, baggage transport vehicles, and buses to transport passengers to remote aircraft parking stands. Responsibility varies for the provision of this equipment and the services it facilitates in combination with labor. In many countries, airport operators retain the exclusive rights, while in other countries, the dominant (home or "flag") carrier assumes the responsibility. In Europe, established conditions facilitate competition in the provision of ground handling within airports. Airlines with operations at these European airports are offered choices of providers. In some situations, the airport operator or flag carrier assumes responsibility for the provision of ground-handling equipment and allows independent specialist service providers to use the equipment. Responsibility for ensuring the provision of security and fire and rescue generally has been vested with the airport operator. Increasingly, however, airport operators are providing the necessary equipment and divesting responsibility for the labor function that is combined to provide the service. Policing, immigration, and customs generally are provided by the government departments or agencies responsible for these services in a national context. Doganis (1992) stated that "airports . . . facilitate, for both passengers and freight, the interchange between air travel and surface transport." Surface transport requires the necessary infrastructure (roads and railways) and vehicles (taxis, buses, and trains). Local councils generally are responsible for the airport infrastructure, although the involvement of airport operators in the financing of such infrastructure is an increasing trend.

Airports also provide or facilitate the provision of a range of ancillary services, such as car parking, car rental, local information, and retail. These services increasingly are being provided by private concerns that lease space at the airport for their business. Car parking, however, often is provided by airport operators, who assume responsibilities for the provision of the physical car parks and the labor function required to coordinate their use and transport passengers between car parks and terminal buildings.

The provision of ANS involves airport and en route ATC. Airport ATC involves the control of landings and takeoffs and of surface aircraft movements within the airport, and it usually is carried out from a control tower at the airport. En route ATC involves the control of aircraft passing through a nation's airspace at higher altitudes. As aircraft approach or take off from an airport, control passes between airport ATC and en route ATC, requiring the two systems to be integrated for operational purposes. Government departments or agencies, such as a civil aviation authority (which often are responsible for the enforcement of safety standards), typically have been made responsible for ANS. An increasing acceptance of the feasibility of providing air navigation on a commercial

basis, however, has led to an evolution toward vesting the responsibility with state-owned enterprises (SOEs).

Recovering Costs of Supply

The principle recommended by the International Civil Aviation Organization (ICAO) and adopted in statements to contracting states is that users may be required to pay their share of the properly allocated costs (ICAO 2004). Under this recommendation, costs of providing services should be borne by the users of the infrastructure, that is, by airlines and aircraft operators, and eventually by the airlines' customers.

Airport operators receive revenues from charges for facilities and services deemed to be "essential" to accommodate aircraft movements and to process passengers. These usually include takeoff and landing charges (typically based on aircraft weight), aircraft parking charges (typically based on aircraft size and duration of stay), and passenger handling charges (usually expressed as a rate per departing or arriving passenger and sometimes differentiated based on domestic and international departure or arrival). Some airports (for example, Dublin) charge separately (on a per passenger basis) to handle passenger security.

Facilities that are viewed as supplementary, such as departures, baggage systems, check-in desks, and cargo and maintenance sheds, are subject to separate charges because different airlines have different requirements in these areas. The ICAO guidelines for airport operators set out broad principles on the costs to be recovered through airport charges and on the structure of those charges. Such guidelines are not mandatory and often are not followed by airport operators. For instance, although the ICAO guidelines recommend that passenger charges be levied on airlines and passed through to airline tickets, many airports levy these charges directly on international passengers.

Airport charges, however, are constrained by paragraph 15 of the Chicago Convention, which requires nondiscrimination on airport access and charges. Further constraints may be imposed in bilateral air services agreements. Charges paid by airlines for these "essential" services typically are set according to a type of sharing rule known as the single till. Under this rule, revenues from ancillary commercial activities (such as property rentals, car parks, and retail and concession outlets) are netted off the total airport cost base to calculate the residual to be recovered through airport charges. The cost of the essential facilities can be subsidized by commercial activities.

The idea of single till prices resulted from the fact that commercial activities would not exist without the airlines that bring passengers to the airport.

Although single till airport charges stimulate demand in the presence of spare capacity, a main drawback is the artificial constraint on prices at congested airports, where it may be necessary to ration excess demand through higher charges.

Airports (particularly major ones) have the potential to earn various forms of economic rent, namely, location and monopoly rents. Location rents exist because users of the airport for economic activity are prepared to pay a premium for preferred locations. Central to this notion is the scarcity value of land. Monopoly rents arise from airport market power and discretion over price; however, more often than not, they are difficult to distinguish from location rents.

In setting charges for en route ANS, air navigation service providers (ANSPs) (Typically a statutory monopoly) calculate cost based on the total facilities and labor used to provide services, which may include military equipment used to provide services to commercial air traffic. Combined with the projected workload, the cost base is used to calculate a rate per unit of service.

ICAO requires, where possible, a "single charge per flight," which is achieved through a formula that incorporates the unit rate, distance flown, and aircraft weight. All ANSPs in states that are contracted to the European Organization for the Safety of Air Navigation (EUROCONTROL) are obliged to apply ICAO principles, and recent legislation introducing the Single European Sky within the European Union mandates the adoption of this approach by EU member states.

The application of ICAO principles envisages that ANSPs should earn a reasonable return on capital employed to contribute toward future investment and, thus, implicitly accepts the concept of "prefunding" projects through charges. ANSPs, however, are at risk of revenues being lower than costs, if traffic forecasts are incorrect or if shocks occur that reduce demand or increase costs beyond those that were expected. In these ,circumstances, unrecovered costs can be included in the cost base of future years.

Although the ICAO recommendations are simply recommendations, a considerable number of states, airports, and ANSPs follow them—including a significant bloc in Europe made up of members of EUROCONTROL. In some important aviation markets, this approach is not adopted.

Some nations support ATI through subsidies out of general taxation or other government income (for example, privatization income or cross-subsidy from other SOE activity), taxes on aviation-related activities, loans, equity injections, accepting low returns on past investments, or preferred tax treatment. In the United States, for example, the costs of the Federal Aviation Administration (FAA), including responsibilities for the support of ANS infrastructure and operations, are covered partly by national government funds and partly by taxation on aviation activities. Efficient pricing of ATI should discourage use of

the airport during congested periods. Allocate efficiency is achieved by setting prices to ensure that scarce capacity is allocated to those airlines that value it most. During congested periods, each extra user imposes delays on all following users until the end of the busy period (sometimes the end of the day). A valuation of these delays will provide estimates of marginal congestion costs and the basis for efficient marginal cost prices. Peak pricing can test the true valuation of proposed capacity expansions. Airlines willing to pay peak surcharges send a signal that they are willing to pay for investment in new capacity. Airline organizations, such as the International Air Transport Association (IATA), however, have vehemently opposed peak pricing of airports and ANS, claiming that such price would be unlikely to affect airline behavior because charges for ATI constitute only a small proportion of airline costs, and also that the benefits of scheduling in peak periods would dwarf any surcharges. In the absence of peak pricing, spare capacity at European airports has been rationed using the administrative system of airport slots, while at many U.S. airports, queuing is imposed.

Cost Conditions

ATI, and airports in particular, typically are characterized by the fact that capacity can be increased (or, indeed, initially built) only in large chunks. In other words, enhancements to existing (or new) infrastructure required to meet demand are indivisible and entail lumpy investment at considerable intervals.

New airport terminals or runways are classic examples of lumpy investments. Lumpy investments, by their nature, require heavy finance and are inherently risky because construction and maintenance costs may rise significantly during the period between design of the facility and acquisition of finance and its construction (maintenance), because of changes in project design, and because of demand uncertainty. If demand does not quickly reach the levels required to fill the capacity, the company may not achieve the scale necessary to recover the investment.11 Demand forecasts are a function of the macroeconomic cycle—that is, estimates of microeconomic conditions that reflect local demand fluctuations, income, and price elasticities of demand. Forecasts tend to be inaccurate in the short term (three to five years) and are all but useless in the long term. Lumpy ATI investments are subject to policy risk as well. Governments and their agencies can take actions that affect the profitability of such investments. For example, a tightening of monetary policy by the Central Bank might cause a recession, which would significantly affect demand growth.

The ability of airport infrastructure providers to deliver increased capacity and improved services at reasonable cost to users will be a substantial determinant of whether the air transport industry will be able to respond to anticipated demand growth (Holt, Horncastle, and Phillips 2006). The basic choice is between investing now and avoiding a deterioration of quality in the event of a surge in the demand for air transport, or delaying

investments and avoiding (in the short term at least) large fixed investments that come with varying levels of financing costs (which increase with the levels of private sector participation [PSP]). ANS are highly manual in nature and labor costs are not as flexible as in other industries. In particular, the amount of labor resources required is established and largely fixed for the whole year according to projected summer peaks. Moreover, an average three-year lead time for air traffic controller (ATCO) training adds to the relative inflexibility in responding to short-term demand fluctuations. In addition, control personnel usually are required to exercise their license for a minimum amount of time each year at prescribed maximum intervals, and labor union and legal restrictions often apply to the use of overtime.

The Civil Aviation Authority (CAA) and EUROCONTROL both have recognized the poor relationship between ANS charging structures and costs. Typically, ANSPs have been able to raise prices to allocate fixed costs over smaller volumes during a traffic downturn, which causes airlines' costs to rise when their position has deteriorated as a direct result of the same downturn. Given the highly competitive nature of the airline industry and the general desirability of encouraging air transport, the relevant agencies should work harder to find a more optimal allocation of risk and incentives.

Although airport and ANS costs are a relatively small proportion of airline costs (for example, for British Airways, these costs accounted for £556 million of a total operating cost base of £7,273 million in fiscal year [FY] 2004/5), increases in this share of costs could have a detrimental effect on airline operations in times of falling revenues.

Evolution of ATI Provision

In many developing and developed economies, the perception of ATI as a strategic asset requiring government provision for political and social reasons, such as its role in general economic development and prosperity or in sustaining employment, prevails. It can be perceived as a source of economic rent to be extracted from the users and suppliers of air transport. For these reasons, high levels of political ownership and control persist in the industry.

The recent drive toward PSP, particularly in airports, has, as in many other sectors, arisen from the wider recognition that government provision can be inefficient by prioritizing the objectives of politicians rather than striving toward greater efficiency for the benefit of the growth and development of air transport. Consequently, governments have sought to divest themselves of assets that are underperforming or that are now viewed as noncore government services. Likewise, governments have faced constraints on resources, precluding the infrastructure investment required to deal with significant growth in air transport. Moreover, many state-owned companies were not meeting cost-recovery targets. The process commenced in the United Kingdom with the 1987 privatization of

the British Airports Authority plc (BAA), which was accompanied by privatizations in several sectors, including communications and energy. Other countries have begun to follow suit, such as Australia with the privatization of Sydney Airport in 2001.

Large airport operating companies (such as BAA, Copenhagen, and Schiphol) have been heavily involved in PSP initiatives as "cornerstone" investors, while others, such as New Zealand's Auckland International Airport, have involved share registers incorporating individual and institutional investors with no specific airport management expertise among them. Certain privatized or soon-to-be-privatized airports will benefit from the introduction of the airport management expertise that a cornerstone investor can bring, such as in India. For others, general public offerings will be more suitable— For example, Hong Kong International Airport (whose privatization is widely expected in the near future) is relatively well run and has a good understanding of contemporary airport management "best practice." Of course, there are ways of drawing on specialist knowledge other than from the ownership group (such as by employing specialist advisors).

There has also been an emergence of what might be termed airport public-private partnership (PPP) vehicles, such as Macquarie Airports and HOCHTIEF AirPort, which each have interests in airports on several continents. These PPPs have tended to result in highly leveraged airport companies, as they structure their investments with high levels of debt. The future of such organizations remains to be seen, but those with good in-house expertise and market presence in airport management are likely to feature more prominently in future privatizations, as either minority or majority investors.

In addition, low airspace user satisfaction with the cost and responsiveness of ANS provision has increased the pressure and demand for greater commercial, customer-oriented management skills within the service providers.

Both of these factors (and others) have led to the growth of corporatization within the state sector to provide ANSPs with access to the necessary capital and commercial skills.

Air Transport Demand

Demand for ATI is a "derived demand" from the market for airline services. In other words, the demand for air services determines the demand for ATI. Therefore, to understand the nature of demand for ATI, it is necessary to understand the evolution of and demand for air transport. Demand for air transport has a domestic and international dimension that varies according to a country's circumstances. Demand for domestic air travel depends (to a greater or lesser extent) on the quality of other transport infrastructure links, namely, road and rail. International travel depends on the openness of the economy (including for people). The greater the extent of liberalization, the more demand that needs to be accommodated, and the greater the amount of competition, the

more complex ATI provision becomes because of several different (and new) types of customers, namely, airlines operating small and large aircraft, operating quick-turnaround low-cost operations versus traditional full-cost operations. The demand for international travel also depends on the geography of the country. For example, in Europe, an island nation such as Iceland is far more dependent on international air travel than continental countries that have access to continent-wide railways and highways.

The Institutional Framework That Characterizes Demand for ATI

The conditions under which demand for air transport manifests have been controlled carefully through the Convention of International Civil Aviation (commonly known as the Chicago Convention).12 It was signed by 52 states in Chicago on December 7, 1944. It came into force on April 4, 1947, with the 26th ratification, and even today, with its 188 signatory states, remains the basis for the governance of international civil aviation. The Convention's preamble declares that the signatories have agreed "on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically."

Liberalization

Increasing liberalization is creating new opportunities for the industry in response to a growing recognition that more open relationships between states can benefit air transport and the economy. For example, if ASAs limit the number of operators or the amount of capacity on a route, removal of such restrictions can facilitate increases in the supply of capacity as well as new market entrants. Demand is stimulated by price reductions, as are the direct and indirect economic benefits that the industry generates. Naturally, increased demand for air services will have a direct impact on airports and ANS providers. It may create demand at previously undeveloped airports and on new routes that require ANS cover, or it may require additional or different forms of infrastructure at existing locations. Air transport liberalization encompasses the idea of removing nationality constraints on airline ownership and permitting cross-border investment, which would contribute to needed industry restructuring and enhanced efficiency.

The United States has initiated the process of international liberalization by adopting less restrictive "open skies" agreements with some of its trading partners. The first open skies agreement was signed with the Netherlands. Although less restrictive than the typical bilateral ASA, the detail in open skies agreements has not completely swept away restrictions on market access. The typical agreement promoted by the United States is, in fact, restricted to unlimited open third and fourth freedoms, to unlimited designation (that is, any number of carriers from either side), and unlimited capacity offerings. In some cases, the agreements have included fifth and sometimes seventh freedoms, but usually

cargo carriers benefit from these. The agreements do not incorporate cabotage (that is, access to domestic markets by trading partners' airlines) and, in some cases, there are limitations on the points in the United States that the other side can serve. Anecdotal evidence shows limitations on the points served by nondomestic airlines operating in a number of EU states. Moreover, these limitations do not include rights of establishment. In other words, foreigners cannot own more than 25 percent of the voting equity in U.S. airlines. To date, the United States has signed more than 70 open skies agreements, with Thailand and India being recent partner signatories.

A more radical step toward more complete liberalization is currently under active consideration by the United States and Europe—that is, an Open Aviation Area (OAA). The concept of an OAA encompasses a wider range of market issues. The approach to competition and regulation would be more systematic; in particular, tackling the issue of state aid to airlines and the potential for it to distort market conditions. Although the evolution of privately owned U.S. airlines is different from that of the state-owned EU flag carriers, the issue of state aid is not addressed in the current U.S. model.

An OAA would allow for cross-border investment, thereby stimulating new entry and beneficial competition, while at the same time relaxing the rules on airline ownership, allowing requisite industry consolidation.

Implications for ATI Demand

With increased competition in the recently liberalized air transport industry, airlines have sought areas in which to cut costs. This has placed pressure on ATI providers to increase efficiency and reduce costs so that they can reduce air transport input costs (airport and ANS charges). Such pressures have been heightened by the perception that ATI providers appear to face relatively little overall financial risk and have continued to be profitable while airlines struggle to survive.

Air transport liberalization and, in particular, the success of the low-cost airline concept have made competition between airports a reality. Dedicated low-cost airports have positioned themselves as quite serious competitors to the traditional hub airports—for example, Hahn Airport in Germany. The combination of these two factors has resulted in a constantly expanding number of route alternatives becoming available to passengers, and competition for passenger flows, both at the regional level in point-to-point travel and at the intercontinental level, is now a reality (Booz Allen Hamilton 2005).

Success will be defined not only by efficiency gains with measurable associated cost reductions but also by quality improvements (that is, improving the processes and flows that are valued by passengers).16 Established airports can no longer rely on guaranteed volumes of business from their regional catchment areas, but must compete for them. All

airports need to examine their strategic alignment in response to the pressures for clear product differentiation.

Understanding the requirements of airline customers and effective communication between airports and airlines to facilitate mutual understandings of forward strategies will be crucial to success. Information disclosure and consultation on quality of service and capacity expansion issues will be vital.

INTERNATIONAL AVIATION: OPEN SKIES AND GLOBAL AVIATION

One of the great benefits of aviation has been its ability to make the world smaller and promote globalization. From aviation's very roots, the international regulatory environment has been critical to the success of the aviation industry. This chapter will explore two major themes encompassed in international aviation: open skies and global alliances, Open skies deals with the legal framework surrounding the rights granted to airlines, with its roots tracing back to the original air transportation agreements between countries. (While the true ideal of open skies has yet to be achieved, it is the goal for international aviation.) Global alliances deal with the arrangements that airlines have made with one another to expand their scope on a global basis.

Open Skies Agreement

In 1992 the United States and the Netherlands signed the first "open skies" agreement. This was followed by similar "open skies" agreement between the United States and Canada in 1995 (Field, 2005). As of 2006, the United States had signed 77" open-skies" agreements with countries ranging from Germany to Chad, and from Chile to Uzbekistan. The general trend in international aviation is to do away with complicated and restriction-laden bilateral agreements and move towards "open skies". In March 2007 the United States and the EU entered into an open skies agreement that will open all of the EU and United States. This agreement came into effect in March 2008 and is estimated to have an impact of over 12 billion dollars per year.

Characteristics of Open Skies Agreements

US open skies agreements generally contain eight key provisions (DOS, 2006). The first, and probably the most important, provision contained in all open skies agreements is the absence of restrictions on international route rights (DOS, 2006). This means that carriers from either country are free to fly between any two cities they wish, with whatever size aircraft they wish, as many times a day/week as they want. This lack of restrictions lowers barriers to entry for airlines, but does not entirely eliminate them as carriers may

still require landing slots at foreign airports in order to initiate a new flight. However, open competition will allow airlines to bid for these rights and, ultimately, they will be assigned to their highest valued economic bidder.

The second major provision included in open skies agreements is that airline pricing should be determined by market forces (DOS, 2006). While, under a true open skies agreement, the governments would play no role in airline pricing, the US model does include a "double-disapproval" stipulation, whereby a fare can be disallowed if both countries agree (DOS, 2006). In practice, carriers are allowed to set whatever fares they want, but the presence of a "double-disapproval" stipulation could possibly prevent some low-cost carriers from entering certain international markets and offering deeply discounted fares, if disallowing such fares happened to be politically attractive to the two governments involved.

The third major provision contained in US open skies agreements is a clause ensuring fair and equal opportunity to compete (DOS, 2006). This clause covers a wide variety of issues, such as non-discriminatory airport slot allocations or user fees. This provision also covers issues such as availability of ground-handling and establishing sales offices. In essence, countries should allow airlines of both countries equal opportunity to be able to compete fairly.

The fourth major provision allows airlines to enter cooperative marketing agreements. As will be pointed out later in the chapter, airline alliances are critical to the success of airlines. Prior to open skies agreements, restrictions could be placed on the air carriers' ability to enter alliance agreements with airlines of both countries. For instance, while both British Airways and American Airlines are both founding member of the oneworld alliance, they are not permitted to code-share on each other's flights under the current Bermuda 2 agreement (Button, 2002). Ideally, under open skies, airlines are permitted to enter whatever code-share agreements that they wish. Thanks to the open skies agreement between the United States and the Netherlands, Northwest Airlines and KLM were able to enter a strong alliance that included revenue-sharing between the airlines. In order for this cohesive agreement to occur, the open skies agreement had to be in place, and the extensive code-share agreement between the airlines was given antitrust immunity from the US Department of Justice (Doganis, 2001). While US open skies agreements allow full code-share agreements, they do not address issues pertaining to foreign ownership of airlines. This is a sticky point in current US-EU open skies negotiations.

Other provisions that are often contained in open skies agreements are mechanisms for dispute settlement, consultation pertaining to unfair practices, liberal legal charter agreements (whereby carriers can choose to operate under the charter regulations of either country), and agreements pertaining to the safe and secure operation of flights between the two countries (DOS, 2006). In open skies agreements the United States also

seeks the provision that all-cargo flights be granted seventh-freedom rights (DOS, 2006), so that cargo flights can operate between the other country and a third country via flights that are not linked to their homeland. This stipulation enables airlines like FedEx and UPS to operate cargo hubs in foreign countries. Currently only about half of the open skies agreements signed by the United States contain this optional eighth provision 2006). Fifth-freedom rights are rarely provided for in open skies agreements. However, one agreement that does allow this is the new US-Canada open skies agreement whereby Canadian carriers received unilateral fifth-freedom rights from the United States in exchange for seventh-freedom all-cargo rights for US carriers.

Benefits of Open Skies Agreement

The benefits achieved from open skies agreements are similar to those obtained from domestic deregulation. As a result of open skies agreements, airlines are able to fly more routes, which ultimately leads to increased competition, resulting in lower average airfares. Open skies also enables new city pairs (domestic to foreign) to be flown that were previously not possible. In general, consumers benefit from open skies as they receive more frequent service and pay lower prices as a result of increased competition. From the airline's perspective, however, open skies may also result in greater fluctuations in profitability.

Airlines also benefit from open skies agreements, but those benefits vary, depending on the airline's position in the market. For example, the airline that already has extensive rights to the foreign country is currently receiving some windfall profits from the protection it is receiving in the market. With open skies, that airline would no longer receive the protection and would face more competition. Carriers that are currently excluded from a market (or have limited service) gain more from open skies agreements than carriers that already have extensive route rights. This is the major reason why airlines such as

Continental and Delta have been lobbying hard for an open skies agreement between the United States and the UK, while carriers such as American, which has extensive London access rights, have been relatively quiet in their lobbying. As mentioned above, the United States signed one of the first open skies agreements with Canada. In a study conducted by the US Department of Transportation three years after the signing of the open skies agreement, it was found that trans-border traffic averaged an 11.1 per cent yearly growth rate compared to 1.4 per cent per year for the three years prior to the agreement. Moreover, the number of nonstop markets with over 50,000 annual passengers increased from 54 in 1994 to 77 in 1997

It is estimated that 38 new city pairs were opened up between Canada and the United States as a result of the agreement. While this tremendous growth rate in the market will

not continue, the figures clearly show the large latent demand, from both business and tourism, which was being suppressed before the open skies agreement. The original open skies agreement between the two countries has been recently amended (in 2005) to provide both countries with increased freedoms, but some, including Air Canada President, Robert Milton, want to see the North American market resemble the European market in which a Canadian carrier would essentially be granted US cabotage rights, and vice versa (Field, 2005). However, the likelihood of such rights being granted is probably slim.

While the EU and United States have not signed and ratified a unified open skies agreement, the benefits from such an agreement would be immense. In a study conducted by the Brattle Group, it is estimated that an EU-US open skies agreement would increase transatlantic traffic by up to 11 million passengers per year-a 24 per cent increase-and boost intra-Europe travel by an additional 35.7 million passengers per year-a 14 per cent increase (Robyn, 2003). This increase in traffic would create an additional $5.2 billion increase in consumer benefits (through lower fares), while increasing economic output of related industries by $3.6 billion to $8.1 billion a year (Robyn, 2003). As these numbers indicate, an open skies agreement in the biggest international market would provide substantial economic benefits. This will be discussed in more detail in the next section.

Open Skies in Europe

Europe has had a successful experience of open skies with the creation (in 1997) of a single European aviation market (Kinnock, 1996). Under this single European aviation market, European carriers are free to fly routes throughout Europe. For instance, British Airways could fly from Paris to Frankfurt or Amsterdam to Rome. This granting of seventh freedom rights also included the granting of eighth-freedom rights, or cabotage. This further enabled a British airline to be able to offer Frankfurt to Munich flights or Barcelona to Madrid flights. In fact, British Airways created a German subsidiary to fly domestic German routes. National ownership has become irrelevant for intra-European flights, and this is the primary reason why low-cost carriers such as easyJet and Ryanair have been able to expand rapidly. Although European liberalization has increased competition and helped reduce airfares throughout Europe, making aviation a viable competitor to train travel, it has also caused many airline bankruptcies; this, of course, is similar to what happened in the United States after deregulation (Kinnock, 1996).

Although the European Union has successful liberalized intra-Europe travel, global travel from Europe is still largely dominated by each country's respective flag carriers (de Palacio, 2001). German airlines cannot fly from London to the United States, while British Airlines cannot fly from Paris to Japan. This is a result of the current bilateral agreements between individual European countries and other countries around the world; these agreements limit international flights to airlines with full national ownership (de

Palacio, 2001). This problem is made more complicated by the fact that individual European countries have signed bilateral agreements with foreign countries at a time when the European community is attempting to become a single market. Because it has had stronger leverage over each individual nation than over the collective whole, the United States currently has open skies agreements with most European nations. However, these nationality clauses have been deemed illegal in a 2002 European Court of Justice (ECn ruling, and this has placed pressure on the European Union to create multilateral aviation agreements with foreign countries (Baker, 2005).

As mentioned in the previous section, the largest such multilateral agreement would involve the European Community and the United States. Both sides want to reach an open skies agreement whereby all EU and US airlines can fly from any point in the European Union to and from any point in the United States, provided they can reach agreements at airports concerning landing rights, gates, and counter space (Phillips, 2006). Such a multilateral open skies agreement would permit Lufthansa to fly Paris to New York, while US carriers would have unlimited rights into Europe. This would effectively end the current nationality clauses that are deemed illegal in the current bilateral agreements.

Although a tentative open skies agreement between the EU and the United States has been reached, its ratification has been held up in courts (Phillips, 2006), but very recently has been ratified. A technically unrelated issue concerning foreign ownership of US airlines has been tied together with the open skies agreement, causing the process to stall (Phillips, 2006). Currently US airlines are allowed only 25 per cent foreign ownership with foreign owners being denied management control. The EU wants to increase the limit to 49.9 per cent foreign ownership and allow limited management direction of the US carrier. Such a change in the ownership cap will require Congressional approval, while the EU Council of Ministers has stated that it will not approve the open skies deal unless Congress improves foreign ownership issues (Phillips, 2006).

This has left both sides at a stalemate, and has stalled an open skies agreement between the parties. This is unfortunate since an open skies agreement would benefit both airlines and consumers from all the participating countries. For the US airlines, one of the greater attractions of such an agreement is that it would end the Bermuda 2 agreement, and enable US airlines access to London Heathrow (assuming that there are slots available)?

For their part, EU airlines would be provided with unfettered access to the world's largest aviation market, although they would probably not be granted cabotage rights to fly domestic US flights. For consumers on both sides of the Atlantic, the largest international market would grow considerably as the number of routes increased and ticket prices decreased. As history has shown, with any liberalization of aviation markets there have been airline bankruptcies and failures as airlines compete in the new markets. Since the

current regulatory framework between both parties is inefficient and illegal, a multilateral open skies agreement between the United States and the EU is bound to happen but the question is: 'When?'

Open Skies in Asia

While most of the world's aviation industries have adopted liberalized aviation markets, the Asia-Pacific region has not implemented open skies largely on account of perceived national interests identical to those that prevented the United States and Europe from liberalizing their airspace (Oum and Yamaguchi, 2006). One reason for this is the fact that the aviation industry in the Asia-Pacific region is still developing in comparison with the mature North American and European markets. Despite the fact that these markets have shown that the benefits of open skies far outweigh the benefits of protectionism, it may take some time before this is fully appreciated in this region. Two of the more successful airlines in the region are Emirates Airlines and Singapore Airlines. These two carriers play a large role in promoting their relatively small countries and have been successful, through the adoption of open skies agreements, in the creation of global aviation hubs.

Australia is another country that has implemented open skies by creating a single aviation market with New Zealand. Australia has also eliminated foreign ownership restrictions (Oum and Yamaguchi, 2006). This removal of foreign ownership restrictions has enabled Richard Branson to start up Virgin Blue in Australia. On the other hand, although Australia has considerably liberalized aviation, it has also denied Singapore Airlines' request to fly from Sydney to Los Angeles. This decision was taken undoubtedly to protect Qantas Airways from competition on this route India, a long-time highly regulated aviation market, has slowly become more liberalized as the economy has grown; however, much of this liberalization effort has only occurred in the domestic market. Nevertheless, this liberalization has spurred tremendous growth in domestic air travel, and the industry has created several successful low-cost carriers. Only recently has the Indian government permitted private Indian carriers to fly internationally, and many of the country's bilateral agreements have severe capacity restrictions placed on them.

In northern Asia, Japan and Korea still are highly regulated, with most international routes containing capacity restrictions. Liberalization of the Japanese market is even more difficult due to airport restrictions at congested airports such as Tokyo N arita.

Although Japan does not have an open skies agreement in place with the United States, both Northwest and United operate significant hub operations out of Narita airport as a result of the fact that the United States was granted liberal fifth-freedom rights after the Second World War. In fact, very few countries in the Asia-Pacific region have open skies agreements with the United States.

Probably the most attractive country for foreign carriers to fly to in the Asia-Pacific region is China. However, for political reasons, China has also historically been one of the most restrictive countries in the region. One of the political sanctions that affect the aviation industry was the prohibition of direct flights between China and Taiwan. While this hindered both Chinese and Taiwanese carriers, the regulations benefited Macau which was used as a transiting point between China and Taiwan. While China has opened up its country to foreign business ownership, the liberalization of the aviation sector has progressed at a much slower pace.

Domestically, the Chinese aviation industry used to be all government-owned, but operated by multiple small carriers. Recently, the domestic industry has consolidated, forming three large Chinese carriers-Air China, China Southern Airlines, and China

Eastern Airlines-which are based at Beijing, Guangzhou, and Shanghai respectively (Francis, 2004).This consolidation has enabled the Chinese carriers to become stronger internationally, and allowed slow, progressive reform in international aviation. In addition,

China has allowed private ownership of airlines, including a foreign ownership cap of 49 per cent, which might possibly be raised in the future (Francis, 2004). While China has liberalized some of their international aviation agreements, these agreements are still quite restrictive. For instance, China and Singapore reached an "open skies" agreement, but the "open skies" agreement forbids Singapore low-cost carriers from flying into Shanghai and Beijing (Francis, 2005). The agreement did, however, permit full open skies to all other Chinese cities. In this respect it is just a further example of certain"open skies" agreements not truly being open skies. China is also experimenting with other liberalized air policies, such as creating an entirely open aviation policy for the Hainan region of China (Francis, 2004). Under this open skies policy, foreign carriers are permitted unlimited access to the Hainan region, and have full fifth-freedom rights, as well as limited cabotage rights to other Chinese cities other than Beijing, Guangzhou, and Shanghai (Francis, 2004). This policy constitutes an effort to open up aviation markets outside China's three dominant cities, and is probably also protectionist in nature since these three cities also happen to be the hubs of China's three largest airlines (Francis, 2004).

Probably the most ambitious economic liberalization project to occur in the AsiaPacific region is the multilateral open skies agreement between the ASEAN (Association of Southeast Asian Nations) countries. The ten members of the ASEAN are Brunei, Singapore, Thailand, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, and Vietnam. Under the proposed agreement between these countries, all member nations would permit unlimited flights between their capital cities by December 2008 and full open skies to other cities by December 2010. These reforms would be a giant step

forward for air transport liberalization in the region, since many of the ASEAN countries have historically had very protectionist viewpoints toward aviation. Such air transport liberalization would benefit not only individual countries, but also the economic region as a whole in both the short and long term (Forsyth, King, and Rodolfo, 2006). Although a few member countries have pushed for early adoption of this open skies agreement, the Asia-Pacific region still remains a heavily regulated industry.

Global Airline Alliances

In order to help overcome restrictive barriers to entry in international markets, many airlines have formed alliances with foreign carriers. The purpose of these alliances has generally been an attempt to introduce service in those countries and regions where there have been legal or financial restrictions. Although the initial global alliances started as simple code-share agreements between airlines, they have evolved into global alliances with multiple airlines that span the globe. The introduction of global alliances has also magnified the prominence of global or regional hubs. Today nearly 60 per cent of the world's total air traffic flies on some sort of a global alliance (Baker, 2006).

Benefits of Global Alliances

The major benefit of global alliances to the airlines and consumers is an expanded and optimized route network. Through global alliances, passengers can, in theory, easily travel from one destination to another, anywhere in the world, with one ticket from one airline.

Before global alliances or code-share agreements, international travel was more complex because passengers might have to purchase multiple tickets on multiple airlines to fly to their desired destination. Through global alliances the airlines are now able to sell tickets to destinations that they previously could not serve for one reason or another.

Global alliances provide a traveler with greater flight options and help make the traveling experience more enjoyable. The various routings that are available from the three alliances reduce the international travel time for passengers. From an airline's perspective, while it might not find it profitable to fly directly to a certain city, it can still carry passengers to that city on connecting flights. In this way, alliances enable airlines to achieve benefits from economies of scope, and this is why the alliances are seeking a strong presence in every major market worldwide.

To be successful, the connections between carriers in an alliance must be seamless and easy. Information technology is critical to success in this area. Alliance members all operate different information technology platforms, but they still need to interact effectively. Each of the three alliances are addressing the information technology and ticketing structures differently. Whereas Star is creating a common platform that all

carriers may choose to use, Sky team is not pursuing a common information technology approach. One world is the first airline alliance to have full e-ticketing between all its members. Sky team undoubtedly will have difficulties achieving full e-ticketing connections since Russian law requires that Aeroflot provide paper tickets (McDonald, 2006). Nonetheless, full e-ticketing is probably critical to the future success of these alliances on account of its convenience for passengers and cheapness for the airlines. Although the exact traffic and revenue benefits of joining an alliance are difficult to quantify, one world has estimated that the alliance generated almost $400 million in additional revenues for the eight alliance members. Oum, Park, and Zhang compared traffic increases on alliance routes to non-alliance routes. In the short-lived USAir/British

Airways alliance, British Airways was able to increase traffic by 8.3 per cent on alliance routes over non-alliance routes (Oum, Park, and Zhang, 2000). Iatrou and Skourias compared the traffic difference on alliance routes between the pre- and the post-alliance periods for all three major alliances. On average, they found that traffic increased by 9.4 per cent as a result of airline alliances; however, the greatest increases in traffic were experienced by Skyteam and Star, while traffic for oneworld actually decreased (Iatrou and Skourias, 2005). They also found, not surprisingly, that traffic increased the greatest when an alliance received antitrust immunity.

Another major benefit of airline alliances is cost red uction in maintenance and operational activities as a result of bulk purchasing and sharing of resources. As mentioned above, joint information technology could greatly reduce costs among alliance members. One area that the Star alliance has pioneered is joint purchasing with the aim of achieving greater volume discounts. In an effort to reduce fuel costs for alliance members, the alliance launched Star Fuel Co. in December 2003 (Mecham, 2004). Using volume discounts, Star Fuel Co. was able to reduce fuel costs for Star alliance members at Los Angeles, San Francisco, and London Heathrow by $50 million in 2004 (Mecham, 2004). Star alliance members Air Canada, Austrian, Lufthansa, and SAS all explored a joint regional aircraft purchase in the same year, but the initiative did not come to fruition because Air Canada and Austrian made independent purchase decisions (Field and Pilling, 2004). Although the airlines concerned were able to develop common specifications for the aircraft, the failure of the joint purchasing agreement highlights the difficulties that may be encountered when separate alliance members have unique and different requirements and objectives. The Star alliance intends to pursue joint aircraft purchasing again in the near future, but its best strategy is probably to focus on the joint purchasing of commodities such as fuel and aircraft parts (Field and Pilling, 2004).

Airports are another major area in which alliances are looking to reduce costs. Airlines commonly use personnel from alliance members in order to help reduce costs, but alliances are seeking to extend this further by hosting operations all under one roof. Under this scenario not only would the carriers be able to share airport resources, but they

would also provide passengers with easier connections. The airport at which all the alliances would like dedicated facilities is London Heathrow. With the opening of Terminals in spring 2008, airlines will begin shuffling all over the airport in order to consolidate their operations (Thompson,. 2004).

The creation of dedicated alliance terminals such as that described at Heathrow would not only help reduce costs, but also enable alliances to have shared business lounges, self-service check-ins, and possibly ground service. The Star alliance is actively pursuing similar "one-roof" initiatives in such airports as Paris Charles de Gaulle, Nagoya, Tokyo Narita, Miami, Bangkok, and Warsaw (Thompson, 2004). Additionally, in an effort to improve customer service, the Star alliance has initiated a program at three airports, where Star alliance customer service teams meet incoming flights and ensure that passengers and their baggage make their connecting flight (Thompson, 2004).4 While the program may seem more like a customer service idea, the Star alliance claims that the program saves approximately $3.3 million per year by reducing passenger misconnects and lost baggage claims (Thompson, 2004). Having a strong global presence also enables the alliances to obtain global corporate travel agreements for corporations that require global travel (Field and Pilling, 2004).

Skyteam estimates that there are about 75-100 organizations that require global corporate travel agreements (Field and Pilling, 2004). This additional source of revenue can be substantial for alliances, and the attractiveness of their products over competing alliances depends greatly on the alliances' global market coverage.

Another benefit that frequent travelers enjoy is the fact that global alliances enable travelers to accrue and redeem miles on a variety of airlines. No longer do frequent-flyer programs limit travel to just one airline; they may now include 20 or even 30 airlines.

Furthermore, depending on the passengers' frequent-flyer status, they can receive reciprocal benefits such as upgrades, priority boarding/check-in, and/or lounge access.

This is also one of the reasons why alliance members have to adhere to a certain level of quality, and it is also one of the principal reasons why no low-cost carrier has yet to join an alliances.

Disadvantages of Global Alliances

The greatest cost involved in joining global alliances is that incurred in bringing information technology systems in line with other alliance members. These costs can be considerable, especially if the system needs a complete overhaul. The time needed for harmonization of IT systems is one of the reasons why alliance members usually announce their intention to join an alliance 6-12 months before they actually join. In the

case of South African Airlines, it took nearly two years for the airline to finally join the Star alliance (Star Alliance, 2006).

There are additional costs associated with global alliances, such as increased overhead costs. The Star alliance is the most structured alliance with a full-time staff of around 70 people (Field and Pilling, 2004). The reason for this is not only the fact that the Star alliance is so large that it needs some oversight, but also because it is the most aggressive of the three alliances in creating a master brand (Field and Pilling, 2004). oneworld is slightly less structured, with a full-time staff of 23 people, but the'majority of these people are employed in sales for the various oneworld ticket packages (Field and Pilling, 2004). Finally, Sky team is even less structured with no true overhead group, instead relying on conversations between airlines to create alliance structure (Field and Pilling, 2004). Regardless of the alliance's structure, such coordination efforts raise overhead costs to some degree.

One area of potential concern for various alliance partners is that, as new airlines are added to the alliance, the importance of an existing airline may be reduced. In other words, carriers can be in competition with their own alliance partners. An interesting example of this is Delta's and Continental's battle on transatlantic routes, even though both airlines are Sky team members and should technically be working together. Because of these issues, Gudmundsson and Lechner (2006) argue that airlines will drop out and switch alliances in order to achieve the greatest benefits. This has already begun with Aer Lingus and Mexicana dropping out of oneworld and the Star alliance respectively. While switching costs may prohibit a high degree of alliance movement by airlines, there will still be situations where airlines may feel that it is in their best interests to switch.

Future of Global Alliances

Since their inception, global alliances have been very successful as airlines have been able to expand their presence throughout the world. Whereas originally there were various alliance groupings, they have now consolidated into three major global alliances: oneworld, Sky team, and Star. All three alliances have grown from their inception and will continue to do so, especially in India and China. Other than these two areas, all three alliances have sound geographic coverage in all of the world's major markets. And, with most of the world's major carriers already in a global alliance, there are few large airlines left to join established alliances. This means that any future alliance growth will probably be a result of the addition of smaller, regional airlines that can serve a specific niche that the alliance may be lacking. Moreover, given the uncertainties inherent in the aviation industry, the alliances are certain not to remain stable.

In the future, it will be interesting to see how aggressive each alliance is in promoting its brand. The Star alliance has heavily promoted its brand, with alliance members all

painting their aircraft in the Star alliance color scheme. The extreme end of the spectrum for alliance branding is that every flight is sold as a Star alliance flight, but operated by an individual airline. This is not likely to happen, however, since there are legal issues associated with this approach, and the individual airlines would not like to lose their identity in their domestic markets.

International aviation is extremely important to the success of airlines as, for many, it is the last frontier for profitability. Awareness of international air service agreements and the push for open skies is critical to the evolution of international aviation, while global alliances enable airlines to exploit international opportunities.

ECONOMICS OF AVIATION SAFETY AND SECURITY

In common usage, the term "safety" is often used incorrectly as an absolute value-that is, one is either safe or unsafe. However, safety is never absolute, since there is always some probability of an accident. Thus, safety depends on the given situation and the risks that are part of that situation. Nevertheless, many people claim that safety should be maximized, regardless of the cost. The reasoning goes something like this: if human life is deemed sacred, then it may seem reasonable to consider human safety to be sacred-shouldn't our goal be to achieve as much safety as possible? But, if this is true, then we should outlaw any activity where fatalities are even remotely possible. We need to ban swimming, skin~ fishing, flying, pregnancy, social gatherings (where disease may spread), driving at more than 15 miles per hour, and virtually everything else that people enjoy doing!

As the examples above point out, increases in safety are optimal only when the benefits of safety justify the costs; thus, minor increases in safety that impose major costs are never cost-efficient. This is the reason why people do not wear helmets all the time, or the country does not establish a national speed limit of 15 mph, although clearly both of these actions would reduce the risk of accidents. So, despite the fact that expressions like "safety must be preserved at any price" are commonly used, safety still needs to be judged within the economic context of a simple cost-benefit analysis.

The benefits of safety are undeniable-not only from a moral standpoint, but also from an economic standpoint. Some of the potential economic benefits of aviation safety include: strengthened consumer demand, strengthened labor supply, reduced insurance costs, lower cost of capitat lower liability risk, and reduced costs associated with government fines or penalties. While this chapter will generally analyze aviation safety from an economic standpoint, it will also provide some more specific facts and figures on aviation safety.

Incentives for Aviation Safety

While some observers (usually in sensationalized media stories) will assert that airlines occasionally cut comers that compromise safety in the interests of greater profit, we will argue in the paragraphs below that just the opposite is probably true. There are strong incentives for airlines to avoid any accidents or incidents, so they are not likely to deliberately cut comers to compromise safety.

As the above data show, aviation is a tremendously safe mode of transportation. However, why do some people still believe that aviation is still unsafe? And why is the aviation industry continually focused on safety to the exclusion of many other considerations? The answers to these questions lie mainly (although there are other reasons covered below) in what might be termed asymmetrical media coverage of aviation accidents and incidents. While many more people in total are involved in automobile accidents and fatalities, aviation accidents typically involve more people in a single accident. Therefore, rightly or wrongly; the media sensationalize every aviation accident or incident. Such extensive media coverage creates a situation in which, if an airline has an accident, their logo may be emblazoned into the minds of consumers across the world for all the wrong reasons. While the media does not document the thousands of routine safe flights a day and the incredibly low probability of an aviation accident, any minor safety slip by an airline will draw extensive media coverage; this creates a climate where airlines have a very strong incentive to insure aviation safety.

However, media coverage is just one of many incentives that airlines have to provide safe and secure air travel. The other incentives for aviation safety can be grouped into five broad categories:

- passengers' reaction
- labor reaction
- financial concerns
- insurance cost and liability risks
- government enforcement.

Passengers' Reaction

Since consumers can choose amongst firms in the market, they can decide how important safety is to them. Therefore, an airline that is perceived to be less safe, as a result of an accident or investigation, is likely to see a decrease in demand compared to "safer" airlines. For passengers, the perception of the level of safety is ordinarily the key decision factor;

- this is opposed to the actual level of safety, since passengers usually know very little about

- the actual level of safety of their flight (Squalli and Sa ad, 2006). Perceptions of aviation
- safety are largely a result of accidents, particularly accidents that receive extensive media
- attention. In addition, perceptions are difficult to change and may persist for an extended
- period of time; this creates a situation where a single aviation accident may have a longterm
- impact on an airline's demand

Labor Reaction

Similar in vein to passengers' reaction, the labor supply may also react adversely to an aviation accident. Employees do not want to work in an environment which they believe is unsafe. Therefore, an airline may experience two labor issues as a result of an accident: increased turnover and/or increased wage demands. As a result of the perception or the reality of reduced safety, employees, particularly flying crew, may feel that the airline is engaging in questionable safety practices. This could cause employees to leave the company or have the union enforce new safety measures.

Moreover, an accident, or series of incidents, could make it more difficult for an airline to attract high-quality employees. The other outcome affecting the labor supply resulting from decreased safety would be increased wages. Employees may demand better compensation for having to work in a less safe environment. In essence, this would be a form of "combat pay," where employees are compensated for working in an uncertain environment. While such demands may be difficult for employee groups to obtain in the short term, an airline's safety could become bargaining issues in the long term.

These impacts represent real costs to the airline, and therefore provide strong incentives to avoid accidents and incidents. Hence, the airline has an economic incentive to continue operating safely in order to avoid the costs imposed by the market forces resulting from an accident.

Financial Concerns

The stock market will always react negatively toward an airline that experiences an accident, particularly one that involves fatalities. The reason for this is the more or less obvious belief that such an accident will cause great uncertainty over the future of the airline in question. Borenstein and Zimmerman (1988) found that, on average, aviation accidents caused a 0.94 per cent equity loss for the firm on the first day of trading, which was statistically significant to the 1 per cent level. This value is slightly lower than found by two other studies that determined equity losses amounting to 1.18 per cent and 1.19

per cent on the first day of trading (Borenstein and Zimmerman, 1988). Mitchell and Maloney (1989) went one step further in analyzing the impact of an aviation accident on the firm's equity value in the long term. They found that, if the accident was proved to be the airline's fault, then the equity value dropped by 2.2 per cent. However, if the accident was not deemed to be the airline's fault, equity value dropped by only 1.2 per cent. Regardless of who is to blame for the accident, the airline's equity will decline, which is another incentive to avoid aviation accidents and promote safety.

A loss of equity value for an airline will have other, and possibly greater, negative financial effects-namely, a large increase in the cost of capital. Because of the greater risk and uncertainty associated with the decline in equity value, the, airline will find it more expensive to raise capital, and this can be quite serious since airlines are highly capital intensive.

While a loss of equity through a decline in the stock price is not an explicit cost against the airline, an increase in the cost of capital is a direct cost to the airline, providing yet another major incentive to avoid accidents and incidents.

Insurance Costs and Liability Risks

When an aviation accident occurs, airlines are usually fully indemnified from the losses through insurance. Insurance companies will payout various liability and damage claims for the airlines, so that airlines suffer little direct financial loss from an accident. However, as a result of an airline accident, particularly if the airline is determined to be liable to any extent, the airline's insurance premiums are likely to increase dramatically in the future.

Like automobile insurance premiums, airlines will see insurance hikes if they experience an accident or incident. Moreover, the insurance rate hike does not occur for just one year, but lasts for several years. Such increases can have a significant effect on an airline's profit margins. This is true since not only do airlines currently pay substantial insurance premiums, but it has also been estimated that increases in insurance rates explain about 34 per cent of equity loss (Wong and Yeh, 2003). Related to insurance premiums, airlines will find that their liability risks will increase substantially as a result of an accident. Therefore, the threat of increased liability risks provides airlines with one more economic incentive (from increased insurance premiums) to promote safety and avoid aviation accidents. Government Enforcement

The final major incentive-the threat of government penalties-for aviation safety is not a true market incentive, but is nevertheless a very real one. Like traffic laws, where the threat of a speeding ticket helps deter many from speeding, aviation regulations are designed to deter airlines from violating safety procedures. However, unlike traffic penalties, safety fines levied by the FAA can be substantial. For example, in 2000 the

FAA levied fines totaling $988,500 against Alaska Airlines for maintenance violations (FAA 2000). Another example would be the $805,000 fine against United Airlines in 2002 for improper maintenance techniques (FAA, 2002). Although, clearly, fines levied by the FAA are substantial and provide an incentive for safety, the greatest threat posed to an airline would be that of a complete shutdown due to a severe violation in safety practices. The FAA has the authority to order an airline to cease operations: in such an event not only would the airline's revenue be effectively cut off, but it would also have to pay sizeable costs and penalties. The fear of shutdown is one of the greatest threats to an airline and, while the FAA has rarely used its authority to temporarily shut down an airline, the mere existence of this threat provides a tremendous incentive to adhere to FAA safety practices.

Therefore, the presence of the FAA or other aviation regulators, provide airlines with a final very real financial incentive to promote safe air travel. For example, ValuJet, Kiwi Airlines and Nation's Air all were shut down by the FAA for safety violations.

Causes of Aviation Accidents

Aviation accidents occur for a variety of reasons, and every accident is thoroughly investigated to help prevent future accidents. Accidents are rarely attributed to just one cause, as a variety of factors must go wrong for the accident to occur. Understanding the nature of the accidents and how they occur is important for the continual improvement of aviation safety and for helping to understand the economic principles of safety.

Flight Crew Error:

Flight crew error, or human error, is the number one cause of aviation accidents worldwide. New technology has helped make aviation safer, but it still cannot compensate for errors made by humans. Much research has been conducted into reasons why flight crews make errors, and although areas such as crew resource management have helped reduce human error, the fact is that as long as humans are in control of the aircraft, flight crew error will probably occur.

Although aviation accidents are commonly a result of several contributory factors, most could have been avoided if the crew had done something differently. For instance, one of the worst aviation accidents in history was a result of human error. The 1977 Pan-Am-KLM accident in Tenerife was a result of the KLM pilot entering the runway prior to receiving ATe clearance. The subsequent collision with a PanAm 747 killed 583 passengers in total. That said, many other fatal aviation accidents have been avoided due to exemplary efforts by the flight crew. For example, an Aloha Airlines 737-200 was able to land safely (with only one fatality) after part of the fuselage was torn apart by a sudden

decompression. Therefore, while human errors have caused accidents, flight crews have also saved numerous lives.

The development of realistic flight simulators has made it possible for pilots to experience a variety of problems without ever taking to the sky. Thus, while technology has successfully made aviation safer, future effort towards better crew training and management may result in fewer flight crew errors.

Aircraft Malfunction

The second major determinant of an aviation accident is an aircraft-related malfunction, with 17 per cent of aviation accidents since 1996 attributed to this cause. Current aircraft are sophisticatedly designed with safety in mind; however, systems may still malfunction, and this can ultimately cause a serious aviation accident. Parts ranging from multimillion-dollar engines to trivial items have all been the cause of serious aviation accidents.

The Aloha Airlines flight highlighted above is an example of an aircraft-related accident. In this case, metal fatigue caused part of the fuselage to deteriorate, and the aircraft experienced rapid decompression. Another example of an aircraft malfunction accident is United Airlines flight 232. Here, the aircraft crash-landed in Sioux City, Iowa, after one of the engines failed and thereby disabled the hydraulic systems on the aircraft. Most fatal aircraft malfunction accidents usually occur when the engines experience a problem, although other systems can also cause fatal accidents.

Weather Conditions

The third major cause of aviation accidents is the weather. Through the development of the jet engine, weather-related accidents have become less of a concern, since jet engines enable aircraft to fly higher and avoid any troublesome weather. In addition, the development of instrument landing systems allows aircraft to auto-land in adverse weather, reducing the chance of error during landing in bad weather conditions. However, weather-related accidents still occur.

Airport/Air Traffic Control

Air traffic control can also be prone to human error, resulting in accidents. Air traffic controller fatigue and stress, as well as poor communication, are important human factors that contribute to accidents. Also, the US air traffic control system generally dates from the mid-1960s and has had great difficulty in managing the recent huge increases in aviation traffic.

One of the more recent aviation accidents attributed to air traffic control was a 2002 mid-air collision between a Bashkirian Airlines Tupolpev 154 and a DHL 757 near the border of Germany and Switzerland. The air traffic controller ordered the TU-154 aircraft to disobey the aircraft's TCAS (Traffic Collision Avoidance System) warning, resulting in both aircraft descending and making contact. In this accident, a series of events led to the air traffic control system failing, resulting in the fatal crash.

Air traffic controller fatigue has also been blamed for several aviation accidents in the United States.4 For example, although the 2007 Comair accident in Lexington, Kentucky was caused by several factors, the investigation found that the controller was working on just two hours of rest (Ahlers, 2007). Had the controller been better rested, it is possible that he may have noticed the CRJ aircraft beginning to take off on the wrong runway. Several other incidents may have resulted from air traffic controller fatigue, and regulations have been amended in order to help minimize human error by air traffic controllers.

Maintenance

The maintenance department of any airline is critical to ensuring that the airline operates safely. Aviation accidents sometimes occur as a result of maintenance being performed either incorrectly or not thoroughly. However, maintenance has accounted for only 4 per cent of hull loss accidents worldwide from 1996 to 2005; this in itself is a strong testament to the generally high quality of work maintenance personnel do on a worldwide basis. Through domestic and international regulations and inspections, maintenance is usually performed to strict standards. However, unfortunately, there have been exceptions to this rule.

In 1985 a Japan Airlines 747 crashed outside of Tokyo, killing 520 passengers and crew.

The accident resulted from the aircraft losing its rear stabilizer and hydraulic systems due to an explosive decompression. The accident investigation determined that repairs performed by Boeing on an earlier tail strike of the aircraft were inadequate. Over time, the repairs began to fatigue, and finally the fuselage cracked causing a massive depressurization in the rear of the aircraft.

Miscellaneous/Other

The final category of aviation accidents is miscellaneous/other, which can include a variety of things, with hijackings representing the largest share. Unfortunately, commercial aircraft are still used for ulterior (usually political) motives, as the terrorist attacks of 11 September 2001 showed. Increased screening and security will assist in helping to prevent further terrorist attacks. However, increasingly restrictive and onerous security regulations can rapidly become more detrimental to the traveling public than any

small (to non-existent) increase in safety that they generate. Finally, the cause of some aviation accidents is simply unknown due to a lack of evidence or unusual issues.

The Basic Economics of Safety

To understand the economics of aviation safety, one needs to look at the industry from the macro-level, where the benefits of safety regulations to consumers and companies are weighed against the costs of imposing the regulations. Since the costs and benefits of safety are both explicit and implicit, it is sometimes difficult to fairly evaluate a regulation; this difficulty is one of the main reasons why many aviation safety regulations put into place by the government do not always make economic sense.

Many safety regulations enacted by governments are blanket responses to potential threats, or media-generated reactions that merely alleviate passenger concerns while not increasing safety in any substantial way. An example of this would be the requirement for all passengers to always take off their shoes while going through security screening.

This regulation was created immediately following a potential terrorist threat, but the increased level of security that this extra check provides is probably negligible. This example highlights the fact that there is a strong probability that a number of aviation safety regulations generate more costs than benefits. Indeed, it is quite likely that some costly airline regulations, even if they provide some positive safety benefits to aviation, will actually decrease net safety in society! This follows because airline regulation will drive up prices for consumers, as well as sometimes making flying more cumbersome and time-consuming, thus causing some who would have otherwise flown to instead travel by rail or, worse, drive. Since, as explained earlier, these other modes of transportation are far more dangerous than flying, lives are lost whenever costly regulations convert air travelers to ground travelers. Likewise, eliminating costly airline regulations that do little or nothing to improve safety would reduce ticket prices, draw people away from cars and rail and to aircraft, thus improving total travel safety. To some extent, we can increase total safety by decreasing airline safety.

The "Southwest rule" is a good example ofa regulation that, if abolished, would probably increase total safety. In fact, the benefit of this regulation is probably about zero, since in all the years prior to the rule there were no injuries caused by the aircraft slowly taxiing toward take-off position as passengers continued to settle into their seats.

Breyer (1993) maintains that the interaction of public misperceptions and the political process produces an essentially random agenda. It is, of course, difficult for politicians to rise above the politics of safety and make decisions based on costs and benefits. The notion that airlines may well be too safe, forcing travelers into riskier transportation modes, appears to be too sophisticated to be effectively dealt with through the political process. Perhaps this will change in time with continued efforts to educate the public in

this regard; however, such efforts have so far been remarkably ineffective and probably will not succeed in the future.

The very basic analysis provided above is an example of a simple economic cost-benefit analysis for aviation safety. Such an analysis could be conducted for almost all safety regulations to determine whether the regulation is economically efficient. However, since it may be difficult to quantify all the benefits from improved safety, such analysis is rarely undertaken. Therefore, and as pointed out above, the political and bureaucratic process usually assumes, especially where aviation safety is concerned, that the benefits of almost any safety or security regulation outweigh the costs. Moreover, as mentioned earlier in the chapter, the reasons for this are easy to identify; although commercial aviation is a critical sector of the economy, the. vast majority of people who fly do so only a few times a year. Therefore, the actual number of people who fly on a regular basis is only a small proportion of the population.s Add to this the media tendency to sensationalize all aviation-related accidents or incidents, and the natural inclination of regulators to avoid even the remote appearance of not being vigilant on safety, and one can readily see that even elementary cost-benefit analysis would be difficult to implement in this culture.

Furthermore, it is also probably true that, if one were to perform the economic costbenefit analysis for all safety regulations, many would pass due to the substantial benefits from improved safety. However, many regulations would also fail, largely because they were enacted in response to political pressure. Some safety decisions do not receive economic scrutiny because there are other competitive factors in play. For example, the regulation banning aircraft push-back until everyone is seated was created in part as a response to other airlines lobbying against Southwest's practices. Therefore, for the reasons discussed earlier, it is probably true that, contrary to popular belief, aviation safety and security exceed the levels that might be considered economically efficient

Safety Prevention

The main reasons for the rapidly decreasing aviation accident rate since the 1950s are the various safety programs/inventions' adopted by safety regulators, airlines, and aircraft manufacturers. All three groups have combined resources to make aviation the safest mode of transportation. This increase in safety has ultimately helped stabilize the industry, and make it a more attractive transportation option for consumers. Based on the incentives described previously, methods to increase safety have sizeable economic benefits. Some examples of these are: aging aircraft regulations, collision avoidance systems, wind-shear detection, de-icing, and human factors.

As mentioned previously, aging aircraft can compromise aviation safety in some specific cases. In order to help minimize this problem, the FAA and JAA (Joint Aviation

Authority if require specific component overhauls at specified intervals (well ahead of the time the components would be expected to fail). Some countries take aging aircraft regulations to an extreme by not allowing airlines to operate commercial aircraft over a certain age. As pointed out in the previous section, this type of rather arbitrary safety regulation might improve safety somewhat, but it will also impose significant extra costs on the industry which will, of course, ultimately be passed down to the passengers. From an economic standpoint, passengers may not be better off as a result of such stringent aircraft age regulations (with no decrease in overall safety levels).

Although mid-air collisions have never been the number one cause of aviation accidents, joint research by governments and industry resulted in the development and deployment of the Traffic Alert and Collision Avoidance System (TCAS). TCAS alerts pilots of a possible mid-air collision and provides instructions to help avoid a serious accident. The invention of the TCAS has reduced the number of mid-air collisions, although it has not eliminated them altogether, as evidenced by the fatal accident involving the DHL and Bashkirian Airlines aircraft over Europe in 2002. Furthermore, the TCAS is not immune to human error, as pilots and air traffic controllers can still make mistakes and disobey TCAS warnings, resulting in tragedy.

Wind-shear represents another significant threat to aircraft, since it can cause an aircraft to become uncontrollable. Previously wind-shear was undetectable; however, through government and industry research, warning devices have been created to alert pilots of possible wind-shear conditions. Based on the wind-shear warnings, regulations have been developed to help insure that aircraft do not fly during dangerous windshear conditions. The wind-shear alerts enable a pilot to take appropriate action to avoid dangerous situations.

Although the American Eagle ATR72 de-icing accident highlights the fact that fatal accidents still occur due to ice forming on the wings, advances in anti-icing have significantly reduced this type of accident. Aircraft manufacturers have designed aircraft with anti-icing boots, while chemical compositions have enabled de-icing to be carried out on the ground.