ENGINEERING
&
MANAGERIAL ECONOMICS

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AN ISO 9001:2008 CERTIFIED COMPANY

Vayu Education of India

2/25, Ansari Road, Darya Ganj, New Delhi-110 002

ENGINEERING & MANAGERIAL ECONOMICS

ISBN: 978-93-83137-23-7

Edition: 2013

Price: ₹ 90/-

Published by:

AN ISO 9001:2008 CERTIFIED COMPANY

VAYU EDUCATION OF INDIA

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Preface

This edition of "Engineering and Managerial Economics" has been written in accordance with the syallabus prescribed by MTU noida, for B.Tech 3rd year (all branches) and MBA.

However , it will also be useful for the students of other Technical Universities. This book provides all necessary information about Managerial Economics , An attempt has been made of this book to explain the various principles of Managerial Economics in easy, intelligible and lucid language.

The subject matter has been presented in a simple and systematic manner. Attempts have been made for the students to familiarise them with the latest developments taking place in the theory as well as practice of Managerial Economics.

I am thankful to Dr. Vihang Garg Chairman HIET,GBAD (MS From University of Texas-USA), Dr. S.N.gupta Director General HIET GBAD (IIT-BHU), Dr. G.S.Sandhu Director HIET GBAD, (PhD IIT DELHI),Dr. Rajesh Pathak HOD,CS Gniot, Greater Noida (PhD University of Collins- USA), Dr. S.K.Gupta Director GNIOT (IIT-BHU) for their continued encouragement and co-operation during the preparation of manuscript.

A WORD TO STUDENTS

One of the primary objectives in writing this book is to provide you, the student, with a book that enhances your learning experience in managerial economics. However, the degree of success you achieve in your managerial economics course will depend, in large measure, on the effectiveness of your study.

There is always a scope for improvement and we shall welcome the concrete suggestions to enhance the utility of the book.

GHAZIABAD
11 JUNE,2013

DR. SHIVAM AGGARWAL
PUNEET KUMAR SAINI

Acknowledgement

I wish to express my profound thanks to the people around me who helped to Make this book a reality.

There was , in and always will be the love of my students whom I taught, for what is written in this book has been the fruit of experience that I taught them.

Finally, My special thanks to my parents and to rest of my family for their patience and support during the long hours of writing this book.

And above all there is the one almighty whose humble children we are. It his his blessings we cherish and pray for. It is the blessing I wish for you.

I am extremely thankful to my friend Mr. Puneet Kumar Saini and Vayu Education publishers for doing his best in all aspects to publish this book.

Dr. Shivam Aggarwal

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1

Introduction

1.1 MEANING OF ECONOMICS

Managerial economics constitutes of economic theories & analytical tools that are widely applied to business dicision making. It is therefore useful to know 'what is economics.'

In simple terms economics is a social science. Its basic function is to study how peope – individuals, households, firms & nations – maximize their gains from their limited resources & opportunities.". In economic terminology, this is called maximising behaviour or more appropriately, optimizing behaviour. Optimizing behaviour is selecting the best out of available options with the objective of maximizing gains from the given resources. Economics at micro level studies the firms and households/individuals behaviour to allocate their limited resources far satisfying their needs & wants.

And at macro level economics studies how nations allocate their men & material, resources between competing needs of the society so that economic welfare of the society can be maximized. Also economies studies how government formulates its economic policies – fiscal policy, monetary policy, industrial policy etc.

Economics is obviously a study of the choice-making behaviour of people. To study the complex decision–making process, economists have developed a large kit of analytical tools & technique with the aid of mathematics and statistics & have developed a large corpus of economic theories with a fairly high predictive power.

Analytical tools & techniques, economic laws & theories constitute the body of economics.

DEFINITIONS OF ECONOMICS

The term 'economics' is derived from the ancient Greek word 'Oikou + Nimen' which means household management. It implies that economics is that domain

of knowledge which is concerned with the management of wants by households. But now the focus of economics has shifted from management of wants to the management of resources.

The various definitions of economics can be categorised under their heads:

(*i*) Economics as a study of wealth.

(*ii*) Economics as a study of welfare, and

(*iii*) Economics as a study of problem arising out of the scarcity of resources.

Economics as a Science of Wealth

Adam smith defined economics, "as the study of the nature & causes of the generation of wealth of a nation."

Wealth are all those goods which command value-in-exchange & value-in-use. According to this defintion economics seeks to explain & analyse the generation of wealth & its distribution.

But this definition has been critisized because–

(*i*) it laid emphasis only on wealth but ignored man & this welfare.

(*ii*) it includes only goods not services.

(*iii*) it ignores social interest of a man

Economics as a Science of Material Welfare

Alfred Marshall evolved a better definition which shifted the emphasis from the study of wealth to the welfare of man. According to Marshall, "Economics is a study of man's action in the ordinary course of life. It enquires how he gets his income & how he spends it." Thus, it on one hand, a study of wealth and on the other & more important side, a part of the study of a man. This definition also failed to emphasize the problem of allocation of scarce resources which is the fundamental problem of a moderm economy.

Economics as a science of allocation of Scarce Resources

According to Robbins, "Economics is the science which studies human behaviour as a relationship between ends & scarce means which have alternative user." This defition focused its attention on a particular aspect of behaviour i.e.–behaviour concerned with utilization of scarce resources to acheive unlimited ends.

End — refers to human wants which are unlimited in number.

Means — refers to good / resources headed to satisfy ends.

Alternative Uses — refers to good / resources can be employed to satisfy different nuds / wants.

According to Prof. Samuelson

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

1.2 NATURE OF ECONOMICS

Nature of economics an be discribed as

Economics as a Science

Science is a systematized body of knowledge about a particular branch of universe & which contains concepts, theories & principle which are based on cause & effect relationship & are universal in nature.

Similarly economics contains economic laws about human behaviour. It decides conclusion or generalisations after observing, collecting and examining facts.

Economics as a Art

A science teacher us to know and an art teacher us to do science is theoritical & art is practical. Economics is also an art as its several branches like consumption, production and public finance provides pratical guidence to solve economic problems.

For ex. — the law of demand & elasticity of demand helps a businessman to set price of the product.

Economics as a Positive Science

The classical economist proposed that economics should be concerned only with 'what is, what & what will be'. They said that economics should not explain rightness & wrongness of things & economics should not pass moral judgements. It relates to only actual situation.

Economics as a Normative Science

Challenging the views of classical school; Marshall, Pigou & others defined economics as a normative science. Economics being a normative science relates to ideal situation or 'what ought to be'. The statement 'a government deficit will reduce unemployment & cause an increase in prices' is a hypothesis in positive economics; while the statment 'in setting policy, unemployment ought to matter more than inflation is a normative hypothesis.

The postive economic theory on one hand attempt to develop hypothesis which explain why it happened & in case of normative economies, it relates

to problem like what the objectives * policies of business ought to be & how to go about them.

Economics as a Social Science

Economics is a social science as it relates with the study of human behaviour far satisfying their needs with the help of their limited resource. It relates with study of individuals, firms and natons all are comprises of human beings.

1.3 SIGNIFICANCE OF ECONOMICS

Economics is useful not only to individuals but also to business firms & society as a whole. Economics provides certain tools which can be used for solving various problems.

Importance for Individuals

An individual can realize the market forces & take decision about the time, quantity & price at which to buy desired products. The concepts of marginal utility, indifference curve etc. help the individual to maximise his satisfaction will use of minimum resources.

Importance for Business Firms

Different laws & economic theories help the firms to maximise their gains by using their scare resources in different economic situations.

The law of production are particualrly helpful to business to decide an optimum factor mix to bring down the cost of production by using law of variable proportions.

Economics helps in demand forecasting, studing the market structure, studing elasticity of demand, formualting pricing polices etc.

Economics also help a business manager to analyse the external environment of business. For example, the govt. influence business through its fiscal, monetary & industrial policies. A businessman must be aware of these policies & the implications on his business.

A businessman should also understand the economy of other countries in the era of interdependencies of economies. He/she should have understanding of force rates etc.

Importance for the Nation/Economy

Economics deals with the laws & principles which govern the functioning of an economy & its various parts.

An economy exists because of two basic facts—

(*i*) human wants for goods & servies are unlimited and

(*ii*) productive resources with which to produce goods & services are scarce.

Therefore an economy has to decide how to use its scarce resource to obtain the maximum possible satisfaction of the members of society.

SCOPE OF ECONOMICS

Scope of economics will be studied under micro-economics's scope & macro-economic's scope as decribed latter.

1.4 MEANING OF SCIENCE, ENGG. & TECHNOLOGY

Science

Science is the systematic body of knowledge pertaining to a particular field of enquiry. Such systematised body of knowledge pertaining to a particular field of enquiry contains concepts, theories & principles which are universal & true.

Science is an approach involving the use of several key values or standards. The values & standards which are essential components of scientific approach are.

(*i*)	Accuracy	:	Gatheing & evaluating information about the world in careful, precise & error-free manner as far as possible.
(*ii*)	Objectivity	:	Commitment to obtain & evaluate such information in a bias-free manner.
(*iii*)	Skepticism	:	Accepting findings as accurate only after they have been verified over & over again by many different scientists.
(*iv*)	Open mindedness	:	Changing one's view (even strongly held ones) when there is evidence that there views are inaccurate.

Science has following features:

(*i*) Scientific methods of observation

(*ii*) Test of validity & predictability

(*iii*) Universal application of principles

(*iv*) Systematised body of knowledge

Science & Economic Development

Science passes through their stages of growth befare coming to the elvel of production which results in economic development thoe stages are:

Stage I : Formulation of scientific principles

Stage II : Application of scientific principles known as innovations. Innovation may be two types process & product innovation.

Stage III : Development of innovation to the the point of commerical exploitation e.g. (development of steam engine)

Science, the cause of innovations contributes towards economic development in following ways:–(role of science)

(*i*) Increasing productivity

(*ii*) Changing the combination of factors (Land, Labour, Capital)

(*iii*) Increasing standard of living

(*iv*) Creating demand of new products

(*v*) Achieving economies of scale.

ENGINEERING

Engg. involves application of scientific knowledge for the betterment of quality of life as economically as possible. It deals with design, building & maintenance of machines, devices & structures.

According to Engineer's council for professional development, "Engg. is the profession in which knowledge of mathmatical & natural sciences gained by study, experience & practive are applied with judgement to develop ways to utilize economically, the materials & forces of nature for the benefit of mankind."

The purpose of a scientist is to add to mankind's inventory systomatic knowledge and to discover universal laws the purpose of an engineer is to apply his knowledge to particular situations to produce products & services. To the engineer, knowledge is not an end itself but is the fool from where he fashions structures, machines & processes.

Engg. has following features:

(*i*) application of scientific knowledge for welfare of economy

(*ii*) doing thing economically (with loss cost).

(*iii*) using natural resources for doing useful activities (ex using air to run wind mill, using water to generate electricity etc).

Engg. & Economic Development

Engg. facilitates economic development in following ways + (role of engg.)

(*i*) **By mechanisation of production process:** Mechanisation means that various operations required for various stages of production are done with help of machines instead of manual labour the introduction of machines in production of goods & services results in large scale manufacturing, saves time & labour. The per unit production cost is also reduced.

(*ii*) **By development of Infrastructure:** Engg. is extensively used in the construction of various means of infrastructure like means of transport, means of energy & means of communication. Application of engg. has made it possible to construct various components of infrastructure efficiently, economically and rapidly.

Engg. is used in construction of roads, bridges, railways tracks, railway engineer, coaches & wangons, construction of hydro-power plant, nuclear thermal power plant, communication devices, purifying water etc.

Hence we can conclude that by creating machines & constructing various components of infrastructure, engg. stimulates the process of economic development.

TECHNOLOGY

Technology is the current state of our knowledge of how to combine resources to :

→ produce desired products

→ solve problems

→ fulfill needs and

→ satisfy wands

"Technology in this sense includes body of knowledge, skills and procedures for preparing, using and doing useful things." for ex – in various uses it called construction technology, medical technology, information technology etc.

Technology is a type of knowledge the know how, necessary for the creation of goods & services demanded by economic activity. Technology development is a continuous process. Improved technology replace the existing technology to increase productivity & quality of production.

Technology may be of following types:

(*i*) **Labour intensive technology:** In this type of technology more of labour & less of capital are used for per unit of output.

(*ii*) **Capital intensive technology:** In this type of technology more of capital & less of labour are used for per unit of output.

(*iii*) **Intermediate technology:** It is that technology which is somewhere between labour & capital intensive technology.

Technology & Economic Development (role of tech.)

(*i*) Technology leads to greater output, shorter working hours creation of various skilled jobs in design, maintenance & engg. safer working conditions, production of new & better goods of standard quality with more efficient use of raw material etc.

(*ii*) The firms/countries using latest technology in various fields enjoy a competitive edge over others.

(*iii*) More productive of natural scare resources.

(*iv*) Generation of employment with invention of new ways of doing work & new goods.

Combined Role of Science, Engg. & Tech-in Economic

Science, engg. & tech. have played a vital role in the transformation of human society. They have facilited the use of resources of earth, the ocean & the air to harness the energy which makes the whole of production & distribution move. They have contributed as

(*i*) Better utilization of existing natural resources.

(*ii*) Use of existing resources in an efficient manner to get greater outputs.

(*iii*) New resource & substitutes for production process.

(*iv*) Minimization of wastage.

(*v*) Removing scarcity of various goods as also the basic requirements of human beings for ex food grains.

(*vi*) Improvement in quality of produced goods.

(*vii*) Cost reduction of finished as well as intermediate goods.

(*viii*) Generation of employment opportunities.

(*ix*) Improve public services.

(*x*) Improve distribution methods of goods/service for customer convenience.

(*xi*) Increasing efficiency.

(*xii*) Discovery of new resources & substitutes to feed the production process.

(*xiii*) Substitution of one factor for another depending upon availability of the factors.

1.5 ECONOMIC DEVELOPMENT

Economic Development includes economic growth and economic changes that are necessary to fulfill the wider objectives of economy.

Economic Development = Economic Growth + Change

Economic growth refers to the sustained increase in national income over a long period of time. National income refers to sum total of market value of all the finished goods and services produced in a country, plus exports minus improts during the period of one financial year.

Change refers to the there should be continuous improvement in poverty

reduction, greater employment, equitable income distribution, health care facilities, infrastructure, literacy rate etc.

In others words economic development involves growth in national output as well as change the way it is produced & distributed.

Central problems of An Economy

(*i*) Utilization of scarce resource (how to utilize these resources to produce maximum output).

(*ii*) Determination of goods to be produced (both quality and quantity to lift standard of living).

(*iii*) Choice of techniques of production (type of technology, its impact on cost & quality as well as production volume)

(*iv*) Distribution of products (to ensure each & everyone should get necessity of life economically & easily)

(*v*) To acheive efficiency of production system (ratio of output to input)

(*vi*) To acheive growth of economy by optimum utilization of natural resources, technology development & capital formation.

1.6 CLASSIFICATION OF ECONOMICS

Economics can be classified as accordingly traditional & modern approach.

Traditional Approach

Stonier & Haugue have divided the subject-mattre of economics into there categories—

(*i*) **Economic theory:** It is a theoretical part of economics. It contains economic theories, laws concepts & tools. to analysise & study different economic situations.

(*ii*) **Applied Economics:** It applies the knowledge of different disciplines. ex–Industrial economics, managerial economics & agricultural economics etc.

(*iii*) **Descriptive Economics:** In descriptive economics, relevant facts about a particular economic subject or topic are collected for the purpose of study. The subject 'Indian Economics' is the example of descriptive economics.

Modern Approach

According to modern approach economics can be classified into two parts — Micro–economics and macro–economics.

(i) Micro–economics

Micro is a term which means "small". As the name suggests it is not aggregative but selective. According to Prof. Boulding "Micro economics is

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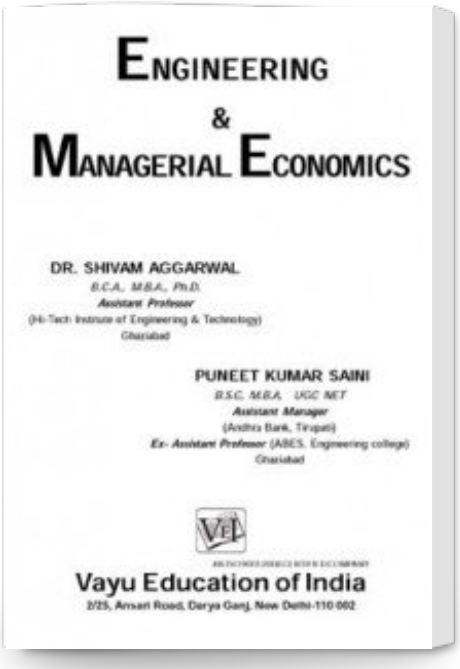

Publisher : Vayu Education

ISBN : 9789383137237

Author : DR. SHIVAM AGGARWAL, PUNEET KUMAR SAINI