AN ECONOMIC ANALYSIS OF LOCATIONAL FACTORS FOR INDUSTRIAL DEVELOPMENT OF BANGLADESH.

BY

AKHTARY KHANAM
B.A.(Hons.), M.A.

A Thesis Submitted for the Degree of Doctor of Philosophy
In Economics of the University of Dhaka

DHAKA

SEPTEMBER 1993

AN ECONOMIC ANALYSIS OF LOCATIONAL FACTORS FOR INDUSTRIAL DEVELOPMENT OF BANGLADESH.

CERTIFICATE

Certified that the work incorporated in this thesis is a bonafide work and is carried out by Mrs. Akhtary Khanam under my supervision.

m. u. Ahmed
28.10.93
Professor
Department of Economics
University of Dhaka

DECLARATION

The work incorporated in this thesis has been carried out by me in the Department of Economics, University of Dhaka, Bangladesh.

The work embodied in this thesis is original and I declare that it has not been submitted in part or in full for any degree or Diploma in any other University.

28.10.93.

Akhtary Khanam

ACKNOWLEDGEMENT

It is a pleasant duty to extend my heartful indebtness to Dr. Momtaz Uddin Ahmed, Professor of the Department of Economics, Dhaka University, who gave much of his valuable time as supervisor in guiding me in the preparation of the thesis on " An Efonomic Analysis of Locational Factors for Industrial Development of Bangladesh."

Dr. Muzaffer Ahmad, Professor, IBA, suggested to select the "transportation model" as the basis of "Locational Analysis" and preparing relevant questionnaires for the purpose. I am grateful to him for such and other acts of guidance. For record, I need to mention that Dr. Taherul Islam, an expert in the field of Industrial Economics and Professor of the Department of Economics, Dhaka University, initially inspired me to select the present field of research. I must also recall that Professor A.T.M. Zahurul Haque has taken trouble often in discussing different aspects of my work. Dr. Sham-sur Rahman of IBA helped me with the application of operations research technique as it appears in the thesis.

Dr. Shamsuddin Ahmed, Professor of the Department of Economics took enormous trouble in assisting me in my statistical analysis of the transportation model. I am also grateful to Mr. A.K.M. Khalilur Rahman Khan, Professor of IBA, who

provided significant assistance in the use of computer programme for completing the thesis.

I would like to express my gratitude to the University Grants Commission, Bangladesh for awarding me financial assistance for undertaking this research work. In this connection, particularly, I remember Professor A. Bari, former Chairman, the University Grants Commission, and Mr. Shahidullah, Secretary, the University Grants Commission of Bangladesh.

I am indebted also to my parent department for granting me deputation for four years during which I could face M.Phil examination and conduct necessary survey work.

I, most gratefully, acknowledge the help of all those who helped me in data collection for my empirical work. Chief Executives, Managing Directors, Higher officials were in most cases informative, helpful and hospitable. Owners of private enterprises were cordial enough to communicate their problems to me with possible suggestions.

Outside the official duty, Group Captain Rtd. Shamsul Haque, Professor Abdur Rashid, Director, Primary Education and Mr. Ashraf Hasan deserve to be mentioned for providing me with continuous inspiration.

My appreciation is also due to Mr. N.M. Jahangir, Senior Assistant, IBA, for quick and precise typing of the final draft of the thesis.

My parents' inspired me with their blessings and other ways for taking up and completing this study. No formal thanks to them bear any value. I also pay respect to the departed soul of my father in law, whose pleasure in my undertaking research was a living source of inspiration for going ahead with my research study programme in the initial stage, and was a meaningful reminder in completing the thesis work successfully. Above all, no wife owes such loving debt to her husband as I do to mine. My husband, Mr. Abdur Rashid (Lebu) enormously helped me during my field survey and research work. His experiences in the field of commerce and industry was a great help to me. Thanks are also due to my children for their constant inspiration and patience.

ABSTRACT

The objective of this study has been to analyze the importance of transport cost on the patterns of locational and regional distribution of manufacturing industries in Bangladesh. The study covered the period long from the birth of Pakistan to the late eighties. Bangladesh with an agro-based economy experienced a little change in its basic economic factors. The country's economy is still dominated by agricultural sector besides service sector while industrial contribution is very low. Having a narrow industrial base the large scale manufacturing sector contributes 61.4% of the manufacturing value added while small and cottage industries sector provides employment to about 82.2% of the total manufacturing labour force.

In so far regional distribution of industries is concerned, there exists significant concentration in the spatial distribution of industries with maximum concentration in Dhaka followed by Chittagong, Khulna and Rajshahi. The important locational factors contributing to the existing pattern of distribution of industries in Bangladesh are availability of raw materials, proximity to natural gas, market, cheap and skilled supply of labour, adequate supply of power and fuel etc. The role of government industrial policy is also significant in this case. The role of DFIs has also important

bearing on industrial growth in Dhaka conurbation and Chittagong metropolitan area.

The study however concentrates on the role of transport cost defined here as marginal cost of transporting a unit of input or output to or from the plant as the most significant determinant of location of industries in Bangladesh. The study further extends to make optimum location analysis in case of jute industry in Bangladesh. We attempted to examine whether the domestic jute transportation system (from jute growing area to jute mills) is optimal with respect to the location of jute industry in Bangladesh. A comparison between the present pattern of flow of the same shows that present location of the mills do not follow optimal cost benefit approach as such.

However, the opinion is in favour of either the change in the procurement of raw jute programme or the relocation of the mills to obtain minimal cost subject to the assumption ceteris paribus, that other factors affecting location have no impact in this regard.

MI	= Material Index.
NCID	= National Committee for Industrial Development.
NIDDS	= National Import Duty Drawback Scheme.
NIP	= New Industrial Policy.
OLS	= Ordinary Least Squares.
PICIC	= Pakistan Industrial Credit and Investment Corporation.
PIDC	= Pakistan Industrial Development Corporation.
PIFCO	= Pakistan Industrial Finance Corporation.
RIP	= Revised Industrial Policy.
SIC	= Standard Industrial Code.
SFYP	= Second Five Year Plan.
Sq.	= Square.
$	= U.S. Dollar.
TFYP	= Third Five Year Plan.
TIP	= Trade and Industrial Policy.
TSP	= Triple Super Phosphate.

ACRONYMS

BANBEIS	= Bangladesh Bureau of Educational Information and Statistics.
BBS	= Bangladesh Bureau of Statistics.
BCF	= Billion Cubic Feet.
BIDS	= Bangladesh Institute of Development Studies.
BMRE	= Balancing, Modernization and Replacement of Equipment.
BPDB	= Bangladesh Power Development Board.
BSB	= Bangladesh Shilpa Bank.
BSCIC	= Bangladesh Small and Cottage Industries Corporation.
BSRS	= Bangladesh Shilpa Rin Sangstha.
CIF	= Chief Inspector of Factories.
CMI	= Census of Manufacturing Industries.
DFI	= Development Finance Institutions.
DPE	= Directorate of Public Education.
EFAS	= Exchange Rate Fluctuation Absorption Scheme.
EPIDC	= East Pakistan Industrial Development Corporation.
EPSIC	= East Pakistan Small Industries Corporation.
EPZ	= Export Processing Zone.
ESFPP	= Employment and Small Enterprise Policy Planning.
FFYP	= Fourth Five Year Plan.
GDP	= Gross Domestic Product.
GNP	= Gross National Product.
GOB	= Government of Bangladesh.
HIID	= Harvard Institute of International Development.
HYV	= High Yielding Variety.
ICB	= Investment Corporation of Bangladesh.
ICDDR,B	= International Center for Diarrhoeal Disease Research of Bangladesh.
IDBP	= Industrial Development Bank of Pakistan.
km	= Kilometre.
kwh	= Kilowatt hours.
LFS	= Labour Force Survey.
Mfg.	= Manufacturing.

MI	= Material Index.
NCID	= National Committee for Industrial Development.
NIDDS	= National Import Duty Drawback Scheme.
NIP	= New Industrial Policy.
OLS	= Ordinary Least Squares.
PICIC	= Pakistan Industrial Credit and Investment Corporation.
PIDC	= Pakistan Industrial Development Corporation.
PIFCO	= Pakistan Industrial Finance Corporation.
RIP	= Revised Industrial Policy.
SIC	= Standard Industrial Code.
SFYP	= Second Five Year Plan.
Sq.	= Square.
$	= U.S. Dollar.
TFYP	= Third Five Year Plan.
TIP	= Trade and Industrial Policy.
TSP	= Triple Super Phosphate.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1
INTRODUCTION

The question of locational decision, with the growing importance of industrialisation and need for disposal of industries has been and will continue to be a vital issue in industrial as well as regional and decentralised development of a country like Bangladesh. As the entrepreneurs make their choice of location i.e. select sites for setting up their plants in a particular place as compared to others, a spatial distribution pattern emerges. This pattern may be optimal with respect to given state of independent variables at the macro level. Such optimality may be questioned for micro non-economic as well as socio-economic considerations.

The process of industrialisation involves introduction of new industrial unit or a new type of industry to a specific region or a location. This raises the question whether the resultant location pattern of industry is the outcome of haphazard and fortuitous circumstances or whether some set of factors were responsible in creating the resultant outcome. To seek an answer to the above question a systematic study of the location aspect is necessary. In Bangladesh a strategy of planned development has been followed. The study attempt to examine certain aspects of locational pattern of some major industries in Bangladesh.

The emergence of locational studies as a distinct area within spatial economic analysis is an outcome partly of the increasing topical specialization and partly of the need to test the rationality hypothesis of investment behaviour vis-a-vis location pattern of industries in terms of economic costs and benefits.

1.1 Literature Review

The theory of the location of industrial activity is a well developed field of study beginning with the work of Von Thunen[1], a German agriculturalist, best known for his pioneering work on the effect of transportation cost and land cost on agricultural location. The problem on which he tried to work is how will agricultural production develop and how will the shorter or longer distance from the city affect the cultivation of available land if it is to be carried on in the most rational i.e. economically efficient manner. He showed that heavy products, in proportion to value, and perishables would be produced close to the town while lighter and durable goods would be produced on the periphery. As transport costs to the city increased with distance, ceteris paribus the returns to the land would diminish as well. At a certain distance from the city, land rent would become zero following the Ricardian theory of rent. The exact distance would be a function of price relationships. Moreover if land rent vary,

then the intensity of cultivation will vary, with land being used less intensively as it become less valuable.

At the turn of the century, Von Thunen's scheme in his agricultural location was used by a German economist, Alfred Weber[2], to derive the theory of the location of industries. Till the Second World War industries were located following the Weberian Material Index, MI (Material Index is equal to weight of the raw materials divided by weight of the final product) (see 6.4.3 for details). If MI is greater than one, the industry is located near the place where raw materials are available, if MI is less than one, it is located near the market place and if equal to one, it is located anywhere between the two. In Weber's simplified world three factors influence industrial location. These are the two general regional factors of transport and labour costs and the local factors of agglomerative or deglomerative forces. In his opinion a plant should be constructed at a location where the cost of production including transportation cost to consumption centres will be lowest. Weber, however, ignores the concept of market area and demand factors, which should be considered carefully in location decision. Least transportation cost might be one of the most important determining factors beside market area and demand factors. As soon as demand is allowed to vary in space the least cost location does not necessarily yield maximum profit since it may be preferable to move to a new location with higher unit

costs but where greater sales will increase total profit. Alternately modes of transportation have to improve to outweigh influences of other factor. Transport revolution since World War II is a testimony to this and relocation of industries by generation of technology and value added is a testimony to this.

The next major contribution came from the Swedish Economist Tord Palander[3] in 1935. He deals with the problems of market area by taking the simple case of two firms making the same product for a linear market. Given the place of production, the competition condition, factory costs and transportation rates, Palander demonstrates how does price affect the extent of the area in which a certain producer can sell his goods and how the boundary between the two market areas will be arrived at. Palander illustrates a number of variation on the situation which changes the relative values of the plant prices and the freight charge, both of which affect the boundary between the two market areas. The size of the market area that a firm controls will influence the profit that it makes. The sales area and the profits of any one firm will be influenced by the locational decisions and other actions of competitors, and Palander, in his two producer cases develops a simple theory of spatial duopolistic competition. Palander's work is much more than a refinement and extension of Weber. The introduction of market area analysis in the context of spatial

competition between firms added an important dimension to the Weberian framework.

Edgar Hoover's[4] contribution to the industrial location theory deserves to be considered next. Hoover starts with the assumption of perfect competition between producers or sellers at any one location and perfect mobility of factors of production and takes transportation costs and production or extraction costs as the determinants of location. To consider extractive industries he assumes further that the location of deposits are given. Under these two assumptions he attempts to determine the area that each producing point will serve. Hoover considers that the delivered price to any buyer will be the cost of extraction plus transport costs. As long as the cost of extraction does not vary with output, transport cost are the only variable affecting price, but Hoover extends his analysis to include the influence of diminishing returns. He argues that extractive industries characteristically operate in a situation where average cost rises with increase in production as the market area gets bigger. Under this circumstances other producers will be encouraged to set up in intermediate locations to serve areas with relatively high delivered price, but if delivered price differs a little from the point of production a small number of producers will tend to supply large areas.

After introducing his analysis in the context of extractive industries, Hoover turns to manufacturing. Following Weber he points out that in the absence of difference in production cost the best location will be at the point of minimum transport cost, which may be at a material source, at the market or at an intermediate point. But Hoover goes further than Weber by showing how different sections of the market will be served by different producing points, a matter that is considered by Palander also.

The early location theory, however, has been criticized for its abstraction from demand. Location is seen largely as a product of spatial cost differences, with variations from place to place in sales potential virtually ignored. Hoover's works do not escape this criticism for his analysis of the demand factor was confined to showing what market area a given location would serve, with the effect of the volume of demand on location not being considered. It was 1954 when the German Economist August Losch[5] produced the first general theory of location with demand as the major spatial variable. Losch rejects the least cost location approach of Weber and his followers and also the alternative of seeking the location at which revenue only is greatest. He remarks that the greatest profit attainable at any point of factory location can be determined from the cost and demand considerations jointly and ~~form~~ such a place of greatest financial profit would also indicate the optimum location of an industry. Losch assumes a

broad homogeneous plain with an even distribution of raw materials and uniform transport rates in all directions, while the agricultural population is evenly distributed and all individuals have identical tastes, technical knowledge and economic opportunities.

In considering industry, the question posed is if farmers start producing a surplus of some commodity, what spatial economic pattern will eventually constitute a state of equilibrium. Losch demonstrates if a single farmer decides to produce a surplus then his sales area will be circular bounded by a locus of points at which his price becomes too high. But if other can produce a surplus and enter into trade, competition gradually would reduce the size of sales areas till ultimately become hexagonal (not circular) in shape as all space becomes filled.

As different goods are produced a system of hexagons will arise for each industry, with the size of market area varying firm industry to industry according to the nature of the product. Losch then superimposes all the individual systems so that all have at least one production centre in common. At this centre, where every product is made, there will be metropolis and at other places where two or more production points coincide there will be town or cities. Losch shows how concentration of towns will occur in certain parts of the uniform plain. If the individual systems of hexagons are all

rotated about the common centre of the metropolis, it is found that a pattern can be formed in which there are six sectors with many production sites coinciding, where the greatest coincidence of production sites exist, the maximum number of purchases can be made locally and transport costs are minimised. This is the optimal spatial arrangement of economic activity which fulfils the original equilibrium conditions.

Like any other attempt to theorize about the location of economic activity Losch's work has its weaknesses. Perhaps the most serious of those is his failure to consider special cost variations, which were eliminated by his assumption of uniform plan with evenly distributed materials and population. It is seen that after criticizing the one-sidedness of the least cost approach, Losch goes to the other extreme and creates an idealized space economy in which demand in effect determined the location of producers. In the equilibrium situation the viable location is one that commands a sales area of certain size. Cost factors enter the analysis only through transport costs limiting the size of market areas (i.e. by their effect on demand) and through the agglomeration advantages implicit in the emergence of Losch's six sectors of many towns the pattern that maximises effective demand. Losch has also been criticized on the grounds that "his ideal system of location could be brought about only by strong and effective state direction in a regimented system; in other words, it is

irrelevant to a competitive capitalist economy where location decision by individual producer is more complex a phenomena.

Melvin Greenhut[8], however, took the first major attempt to integrate the least cost and locational interdependence theories in his "Plant Location in theory and in practice." Greenhut argues that it is somewhat surprising that Losch attempted to abstract from cost by assuming a homogeneous land surface. Much more surprising is the fact that he failed to stress that even under this tenuous assumption unequal costs would arise at alternative locations. Since differential follow normally from the differences in trading areas of diverse products, these differences in market area manifest the advantages of agglomeration, in turn, the advantages of agglomeration may be governing on the intra-industry as well as between industries interaction.

Greenhut's general location theory doesn't, unlike that of Losch, abstract from costs. Instead he attempts to determine the conditions of locations of locational equilibrium when firms aim at maximizing profits, but where costs are allowed to vary and where demand influences are affected by the possibility of locational interdependence. He first assumes a well developed economy, and that at a given point of time a new product is innovated. Under the simplifying assumptions of zero costs everywhere and identical demands the innovating firms locates at the centre of the market area. As firm enter

the industry they will locate either in the areas not previously supplied, at the side of the innovator, or at a site distant from him depending upon demand influences. If the assumption of zero costs is relaxed, cost differentials will also exert their impact on the ultimate locations. Each new entrant will seek the location from which its sales to a given number of buyers can be supplied at the lowest total costs. As more and more competitors arrive both costs and relative demand at each site will change. Eventually, the successful attempts of competitors to locate at the maximum profit site will so reduce the market areas of firms as to cut profits, ultimately leading to a state of locational equilibrium. Equilibrium can be disturbed either by changes in demand or by changes in costs. Demand changes will not simply affect the number of firms in the industry, but may also lead to direct changes in sites. In this way, demand becomes an active determinant of each location.

Walter Isard[7], in 1956, in his location and space economy, attaches great importance to the fusion of location theory with other branches of economic theory, which he attempts through the well known substitution principle coupled with the concept of transport inputs. Like most earlier location theorists, Isard gives much attention to the transport factor. The generalized theory of Isard defines the transport input "as the movement of a unit of weight over a unit distance" that could be substituted for other inputs such as labour,

taxes, land and capital, in the profit maximizing decision process of the firm. Like most earlier location theorists, Isard gives much attention to the transport factor. He puts transport inputs, previously referred to as distance inputs, on the same level as the four conventionally recognised factors of production (land, labour capital and enterprises) as requirement of the productive process. He does this not necessarily to point out that transport need be regarded as another factor of production, but to emphasize the important role transport inputs play in production and consumption decision processes.

The development of location theory in the 1960's has become highly mathematical. Linear and nonlinear programming has been introduced as a method of theoretical analysis. A prime example of this trend is the work of Cooper[8] who has a generalized Weber's problem of finding the minimum transport cost site for one firm to that of n factories given m demand sites.

Theory by itself can do nothing, the effectiveness of a theory should stem from its capability in operation. A major weakness of the general theory of location and space economy lies in the fact that it neglects the generalization, comprehensiveness and total action of various forces both in political and socio-economic interrelationships. W. Alonso[8] noticed how the location pattern is carried out in practice.

The majority of businessmen do not consciously go through the analysis in the form of logically deciding the location of industries. They are familiar with the operation of their industry, they know where their market is and where their raw materials come from, and from this general knowledge they can pick the likeliest spots and investigate them further. The businessman will then, if he is prudent, do a careful comparative examination of the alternatives. He will check transport costs, frequency of schedules, labour availability rates, quality and organization, power costs, local taxes and prospects, available sites, climate, the housing situation, educational opportunities, availability of finance and cost of borrowing, Government (industrial) policy and any other factor that has importance for his operation.

The rise of modern industrialization in the mid eighteenth century to the early parts of the nineteenth began in Britain. The momentum came from innovations in the spinning and weaving of cotton and cotton textiles which overtook wool manufacturing to become the leading value added product in manufacturing sector. The modern concept of industrialisation is the process of creation of institutions for manufacturing which adds value to inputs through transformation into final or intermediate product. The early industrialisation centred around two basic components i.e. improvement of technology and specialisation. With higher productivity taken as the objective Adam Smith in 1770's emphasized specialisation and

the division of labour as the basis for higher productivity. The innovation that allowed coal to be used in melting iron and James Watt's improvement of Steam Engine opened the door for superior technology.

The introduction of new technology in the field of cotton textiles, iron melting and steam engine ushered in a new era in the field of industrialization. The impact of this development in Railway integrated the national markets and stimulated demand for steel and iron. With steel and steam power, bigger and more reliable ships could be built. Freight cost dropped, which enabled such previously remote areas as the American Mid-West to produce agricultural product on a large scale for a distant market in Europe such as Belgium, France, Germany and the United States began also to industrialize during this period through adoption of technology and protective tariff.

The fast expansion of large scale and heavy industries during the first one hundred years of modern industrialization was characterised by a substantive boost in world output and international trade. The trend has generally been attributed to economic specialisation and export promotion policies practised by Western advanced economies during the period between 1820 to 1970 together with the transport revolutions brought by railways and steam ships. Consequently the concept of a world market with competitive trading interests grew.

It was still left for the early twentieth century economic thinkers to identify transport and communication as an essential component of the infrastructure for economic growth.

The locational analysis of industries in Bangladesh in the present study is not linked with the perspective of industrialization in the past two centuries. The study is essentially an attempt to find out if at all there exist cause and effect relationship between transport and determination of an industrial site on the basis of empirical evidence. The earlier two studies carried out prior to 1971 basically described concentration of industries and calculated index of concentration[10].

In addition to seeking the amounts to be shipped from origins to destinations, Cooper[11] (1971) attempts to find at the same time the optimal locations of these sources with respect to a fixed and known set of destinations. Cooper's (1971) problem is known as transportation location problem. He formulated this problem in the following manner:

$$\min Z = \sum_{i=1}^{m} \sum_{j=1}^{n} B_j W_{ij} \Psi(X_{dj}, Y_{dj}, X_i, Y_i)$$

$$Subject\ to \sum_{j=1}^{n} W_{ij} \leq C_i, \quad i = 1, \ldots, m.$$

$$\sum_{i=1}^{m} W_{ij} \geq R_j, j = 1, \ldots, n.$$

$$W_{ij} \geq 0 \ all \ i,j.$$

Where,

n = Number of fixed and known locations called destinations with coordinates (X_{dj}, Y_{dj}).

m = Number of sources from which the products are to be shipped with coordinates (X_i, Y_i).

C_i = Limitations on the capacity of source i to supply the product.

B_j = Weight relating to destination requirements.

The arc joining a source and a destination represents the route through which the commodity is transported.

W_{ij}= amounts to be shipped from sources i to destination j.

The above mentioned mathematical formulation states that the locations for the sources designated by coordinate (X_i, Y_i) and the amount to be shipped from sources i to destination j (designated by W_{ij}) are to be determined with the objective of minimization of total cost subject to capacity and requirement constraints. Cooper (1971) defines a set of "cost functions" that depend on the relative locations of the sources with respect to the destinations, designated by $\Psi(X_{dj}, Y_{dj}, X_i, Y_i)$

= cost of supplying unit quantity to the jth destination from the ith source.

The present study tried to make the use of the simpler version of Cooper's (1971) problem. The objective here is to minimize the total transport cost between number of sources and fixed destinations. Detail description of this problem, its application and analysis is given in Chapter 7.

1.2 Objectives of the Study

The present study drew my attention in view of its importance in finding out right dimension of industrialisation and determining even regional distribution of industries aiming at economic development in a developing country like ours. This study is an enquiry into the question whether transport cost is the basic determining factor of localisation of major industries in Bangladesh. Transport cost means cost of transporting marginal unit of input to or output from the plant. Our attempt is to test the hypothesis that the regional change in an industry's value of output is a function of the marginal cost of procuring input or transporting output and of agglomeration variables (Chapter 6) and make use of simpler version of Cooper's (1971) problem (Chapter 7).

The objective of this study is to provide part of the basis for policy decisions with respect to the location of major industries in Bangladesh. With this end in view, an attempt

has been made to present the existing locational pattern of industries and to identify the factors explaining the locational behaviour of industries.

1.3 Methodology

Location is not a new area of study. So far a number of approaches to solve the locational problems have been developed by different theorists beginning with the work of Von Thunen discussed in short in Literature review. On the basis of rather well developed discussions and debates on the subject there seems to exist a great scope for conducting empirical research in this field in our country. Further, as very little systematic study has so far been done on location of industries in Bangladesh, the importance of such a study would fill in a void.

Our present attempt is to make a locational analysis of some selected industries in Bangladesh on the basis of transportation model. The model used in this study has been derived from Harris, Curtis C. Jr. and Frank E. Hopkins as presented in their book, "An Interregional Econometric Model of Agriculture, Mining, Manufacturing and Services". The model has not been used here in the original form as some changes here were required mainly in selection of variables due to data constraint and estimation problems. We selected the explanatory variables through trial and error basis. In this connection we had to run stepwise regression first for

selecting significant variables. Then we ran linear regression including all variables ordered by their theoretical importance. For alternative specification we had to run log-linear regression.

In view of the above, the transportation variables, however, have been accorded preference in our model; the hypothesis is that locational change in output of an industry is a function of transportation cost for obtaining marginal unit of input to the industry and distributing marginal unit of finished product to the market. We have considered some other agglomeration variables like density of population, value of land, major demand and supply of major raw materials and regional industrial output. The variables selected and the way they are estimated will be presented in the 6th chapter along with the necessary regression equations and results.

In addition, we have done an operation research analysis to see if the jute mills in effect minimize transport cost of procuring raw materials. This is done following Cooper's (1971) simplified version and is discussed in Chapter 7. For this study, we prepared comprehensive questionnaire for collecting time series data from individual firms by visiting them and examining their accounts and sometimes interviewing the executives. This way we tried to collect data about total procurement cost and total distribution cost in order to calculate marginal costs which entered into our regression

equation as important explanatory variables. For other statistical data like value of land, density of population, total regional output by industry we had to resort to BBS informations. Transportation variables were entered first in regression equation primarily because of their treatment in the literature and also because of interest in testing their significance. The meaningful coefficients were obtained using ordinary least squares regression.

As with most if not all econometric models there is some degree of linear dependence among the independent variables which at times creates problems of multicollinearity. To avoid this multicollinearity amongst independent variables they were examined for and significance of their inter dependence was scrutinized. After running step wise regression such variables were excluded from equations. For operations research analysis, we did a more limited exercise with primary data collected for two mills for a single year.

1.4 The Plan of the Study

To facilitate the analysis of the study a eight fold division into chapters has been made. The second chapter outlines the structure of Bangladesh Economy showing a very little change from the primary to non-primary activities from the sixties upto early eighties. The third chapter examines the structure of manufacturing industry sector in Bangladesh during that period. The location pattern of major industries in Bangladesh

is evaluated in the fourth chapter. This highlights the degree of localization of major industries in the four divisions of Bangladesh and the main factors contributing to this differential distribution. The essential pattern of location has not changed in recent years. The fifth chapter discusses the industrial location policy of the Bangladesh Government. The main focus is on the measures taken and actually implemented by the government to attract entrepreneurs in the less developed areas and their short comings.

The sixth chapter presents Location Analysis and Location Equations of some selected manufacturing industries in Bangladesh. The location analysis is based on the transportation model, where transportation inputs are given top preference for change in output of industry by region or as a whole followed by regression results. The seventh chapter presents a simplified operations research.

The major findings of the study are summarized in Chapter 8 and conclusions and policy recommendation following from them are also presented in that chapter.

Footnotes

1. Johaun Heinrich Von Thunen - Der Insoliete staat in Beziehung auf Landwirts - chaft and Nationalokonomies (Brded. S-Chumacher-Zarchlin, 1975).

2. Alfred Weber: Theory of the Location of Industries (1909).

3. Tord Palander: Location theory, 1935.

4. Hoover, Edgar: "Location Theory and the Shoe and Leather Industries," Harvard University Press, Cambridge, Mass., 1937.

5. Losch, August, "The Economics of Location," Yale University Press, New Haven, 1954.

6. Greenhut Melvin: Plant Location in Theory and in Practices, University of North Carolina Press, Chapel Hill N.C., 1956, pp.269-272.

7. Isard, Walter: "Location and Space Economy," The MIT Press, Cambridge, Mass., 1956.

8. Cooper, Leon: "Solutions of Generalized Locational Equilibrium Models," Journal of Regional Science, Vol.7, Summer, 1967.

9. Alonso W., Location and Land Use Theory. Cambridge, Harvard University Press, 1965.

10. Rijvi el al., Department of Geography, Dhaka University, Location of Industries in East Pakistan (Mimeo), 1968 and Rahman, A. Huq and Ahmad M., Concentration of Manufacturing Activities in Pakistan, UBL, 1969.

11. Leon, Cooper: Transportation Location Problem. Southern Methodist University, Dallas, Texas (Received January 18, 1971).

CHAPTER 2
THE STRUCTURE OF BANGLADESH ECONOMY

2.1 Introduction

Bangladesh is one of the least developed countries in the world with a per capita income (GNP) of only US $210 in 1990[1]. She shares aspirations of economic development with all other countries especially those which are underdeveloped. Bangladesh emerged as a war-ravaged country characterised by an unfavourable man-land ratio coupled with a high dependence on agriculture, low level of overall technological development and under utilised population exploding at a rate of 2.03 per cent per annum and low rate of savings and investment (Gross domestic savings 3.03, and investment 10.40 as percentage of GDP[2] in 1990/91 and Foreign aid (net) 9.8 percent of GNP in 1990[3].

The area covering Bangladesh is 148,393 sq. km. The country enjoys generally a sub-tropical monsoon climate. The major natural assets of Bangladesh are its access to the open ocean, the abundance of good soils and the seasonal abundance of rainfall and river flow. The economy of the country is mainly based on agriculture. The other important sectors are

industry, construction, power and gas, transport, trade and commerce, housing etc.

The purpose of this chapter is to highlight the salient features of Bangladesh economy. The chapter is organised as follows. Section 2 analyses Demographic features. Section 3 examines Sectoral composition of GDP. The important features of agriculture are discussed in Section 4. This is followed by a discussion on Industry and trade in Section 5. Section 6 discusses service sector and some concluding remarks are presented in Section 7.

2.2 Demographic Features

People are producers and consumers. It requires people to create economic activities. The facts about Bangladesh population are not precisely known. Censuses are seldom very accurate and in an underdeveloped country such as Bangladesh they are liable to considerable error despite all efforts to check the data and monitor the performance of the enumerators.

At present, with a population of 106.7 million Bangladesh is now one of the most densely populated country with 726 persons per square kilometre[4]. The rate and the pattern of increase in population in Bangladesh have been shown in Table 2.1 since 1961.

Table 2.1

Growth of Population in Bangladesh

	Census 1961	Census 1974	Census 1981	LFS 1983-84	Census 1991
Total Population (Million)	55.2	76.4	89.9	95.7	109.8
Density (Per sq. km.)	350		615		726
Growth Rate	From 1961-1974		From 1974-1983/84		From 83/84-90/91
	2.5		2.3		2.0

Source: BBS, Preliminary Labour Force Survey 1983/84, Statistical Pocket book 1992, p.88.

The growth rate of population in Bangladesh during 1974 to 1984 declined to 2.3 percent from 2.5 percent during 1961 to 1974. The birth rate and death rate in 1990 have been estimated to be 35 and 14 per thousand respectively[5]. The population of the country is apprehended to stand at 128.0 million by the end of the century if the present growth rate continues. It is quite natural that with a high growth rate of population Bangladesh experiences a high growth rate in the labour force. Table 2.2 shows the average annual growth rates of labour force for the period 1961 to 1983/84, 1961 to 1974, 1974 to 1983/84 and 1983/84 to 1989 separately.

Table 2.2

Annual Average Growth Rates of Labour Force for 1961-1989

Period	Both Sexes	Male	Female
1961 to 1983/84	2.3	2.2	4.7
1961 to 1974	2.0	2.1	0.8
1974 to 1983/84	2.7	2.3	10.0
1974 to 1989	12.9	5.3	48.0

Source: BBS, Preliminary Labour Force Survey, 1983/84, p.24, and Report on Labour Force Survey 1989, p.18.

It is seen from the table that over the last 23 years from 1961 to 1983/84, the total labour force has grown at an average annual rate of 2.3 percent, very close to the average growth rate of the population during 1974 to 1983/84. The most striking change is noticed in the sharp increase in the rate of females entering the labour force, which is estimated to be 48.0 percent during 1974-1989 as against 10.0 percent during 1974 to 1983/84 and 0.8 percent during 1961 to 1974. This increase in the female employment might be due to several reasons like increase in female literacy rate, provision of female quota in service, absorption of female labour in garments industries, creation of job opportunities in rural based projects initiated by different organisations under foreign financial assistance like BRAC, UNDP, UNCTAD, OXFAM,

Red Cross Society, ICDDR,B etc. Moreover, a good number of educated women are employed by newly set up banks and insurance companies in private sectors. An awareness amongst rural illiterate women has been perceptible due to increased economic activities in the rural areas encouraged by Grameen Banks, Krishi Banks etc. The economic pressure on household has also contributed towards greater participation of women in remunerative activities.

Another important demographic feature of Bangladesh is the pattern of age distribution of her population which is presented in Table 2.3. The most notable observation emerged from the table is the extremely high demographic dependency ratio which is defined as the ratio of population below 15 years plus 65 years and above to the population of 15 to 64 years age groups. The percentage of population of working age group has been estimated to be 56 percent in India, 62 percent in Sri Lanka, 59 percent in Thailand and 68 percent in Japan compared to that in Bangladesh to be 53 percent in 1987.[6]

The rate of growth of working age population increased to 2.8 percent during 1974 to 1983/84 from 2.2 percent during 1961 to 1974. The LFS 1989 shows an increase in the percentage of 15-64 age group and a decrease in 10-14 age group. However finding gainful employment for the vast increase in population is the major economic problem in Bangladesh. The incremental labour force tends to increase unemployment and

Table 2.3

Percentage Distribution of Population by Broad Age Group

Age Group	1961	1974	1981	83/84	1989	Growth Rate	
						61-74	74-83/84
Less than 10	37.0	35.3	33.2	33.9	34.5	2.2	1.8
10 - 14	9.1	12.8	3.4	12.5	10.8	5.2	2.0
15 - 64	50.8	48.6	50.0	51.1	52.0	2.2	2.8
65 & above	3.1	3.3	3.4	2.4	2.7	3.2	-0.9
TOTAL	100.0	100.0	100.0	100.0	100.0		

Source: BBS, LFS 1983/84 & 1989.

underemployment. The rate of labour force absorption into Agricultural and non-agricultural sector and unemployment rate have been shown in the following Table 2.4.

The table shows a positive rate of absorption of labour force at 1.3 percent per annum in the agricultural sector over the sixties. But during the period of 1974 to 1983/84 the sector experienced a decline in its labour force at the rate of 0.3 percent per annum. This is significant to indicate the saturation point in terms of new absorption in the agricultural sector. The new entrants to the labour force therefore either remained unemployed or underemployed within the sector or were absorbed in non-agricultural sector. However, during the period 1974 to 1989 the growth rate in agricultural occupations increased to 12.1 percent. This sharp increase in growth rate is due to recent entrance of rural

Table 2.4

Labour Force Absorption Growth Rate and Unemployment Rate

	1961-1974			1974-1983/84		1974-89
Agriculture		1.3			0.3	12.1
Non-agriculture		4.5			9.7	n.a.
Employment Total		1.9			2.7	13.0
Unemployment rate (Excluding under-employment)	1961	1974	1981	1983/84	1985/86	1989
Both Sex	0.5	2.5	2.3	2.5	1.1	2.0
Male	0.6	2.4	2.0	2.0	0.8	2.3
Female	0.2	3.6	7.5	7.4	3.2	1.7

Source: BBS, LFS, 1983/84, p.III, LFS 1989; BBS, Statistical Pocket Book 1992, p.95.

females into agriculture based economic activities. The non-agricultural sector experienced a positive and high growth rate of 9.7 percent in employment over the seventies than over the sixties.

2.3 Sectoral Composition of GDP and Employment

The size and composition of gross domestic product of Bangladesh reflects a low resource base, inadequate development of resources and under utilization of the potential in agriculture, forestry, fish culture and industry. The size and sectoral composition of GDP of Bangladesh is shown in Table 2.5.

Table 2.5

Sectoral Shares of GDP in Percentage

	1974/75	1978/79	1982/83	1986/87	1989/90	1990/91
Agriculture	55.6	50.0	49.4	39.8	38.2	36.0
Industry (Including mining and Utilities)	10.5	10.7	10.2	10.0	10.0	8.7
Construction	3.5	4.8	4.0	5.5	6.4	5.7
Transport, Communication	n.a.	6.9	7.0	11.5	10.2	11.7
Trade Services	11.1	9.4	8.6	8.5	8.4	8.2
Housing	4.5	7.7	7.4	7.6	9.0	8.8
Other sectors	14.8	10.5	13.4	17.1	17.8	20.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Source: BBS, Statistical Yearbook 1983/84, 1989/90, & Statistical Pocket book 1992.

It is evident from the table that the agriculture sector dominates the economy of Bangladesh. Agriculture includes here crops, forestry, fisheries and livestock. The percentage shares of agricultural components will be discussed in a separate section on Agriculture. The other important contributing sectors to GDP are Industry, construction, trade services, transportation, housing and other sectors. Though the table shows a declining trend in the share of agriculture it still remains dominant, contributing over a third of the country's GDP. In fact the contribution of Agriculture sector

is much higher in Bangladesh compared to other neighbouring countries like India, Pakistan, Sri Lanka and Thailand[7] (Table 2.6).

The Table presents respective share of Agriculture, industry, and service sector to GDP of some low income group countries for two separate years 1965 and 1990. A change is observed over the period but still agricultural contribution is the highest in Bangladesh. Industry sector includes here manufacturing mining and quarrying and also utility sector like electricity, power, gas etc. and hence differs from BBS data. However, it is known that economic development should mean structural change in the economy and shift towards

Table 2.6

Structure of Production

Figures in Percentage of GDP

	Agriculture		Industry		Manufacturing		Service	
	1965	1990	1965	1990	1965	1990	1965	1990
Bangladesh	53	38	11	15	5	9	36	46
India	44	31	22	29	16	19	34	40
Pakistan	40	26	20	25	14	17	40	49
Sri Lanka	28	26	21	26	17	15	51	48
Thailand	32	12	23	39	14	26	45	48

Source: World Development Report 1992, published for the World Bank, Oxford University Press.

industry and services such as trade, transport, and finance, etc. increasing their share in the National Income while agriculture would relative loose its prominence.

The change in the rate of labour absorption into different sectors is also noticeable. We present here in Table 2.7 the employment structure by two major sectors Agriculture and Industry and the growth rate of employed labour force.

Table 2.7

Employment in Percentage and Absolute Number and Growth Rates of Employed Labour Force by Broad Activity Group

Sector	Census 1961	No. in 000	Census 1974	No. in 000	Census 1981	No. in 000	LFS 83/84	No. in 000	IFS 1989	No. in 000
Agriculture	84.6	14239	78.7	16839	61.2	14472	58.6	16389	64.9	37007
Manufacturing	4.8	810	4.8	1026	4.3	1005	7.5	2108	13.9	6976
Other sectors	10.6	1779	10.5	3543	34.5	8140	33.9	9475	21.2	6165
TOTAL	100.0	16828	100.0	21408	100.0	23617	100.0	28972	100.0	50148

Broad Activity Group	Growth Rates 1961-1974	Growth Rate 1974-1983/84	Growth Rate 1974-1989
Total	1.9	2.7	13.0
Agriculture	1.3	0.3	12.1
Non-agriculture	4.5	9.7	n.a.
Manufacturing	1.8	7.5	29.4
Trade and Other services	2.4	14.6	19.0

Source: BBS-PLFS 1983/84, p.IV, LFS 1989; BBS - Op. cit, p.157.

The table shows a declining percentage share of employment in the agricultural sector whereas the share of employment in the

industrial sector remains almost the same upto 1981. The year 1983/84 shows a change in the share of employment indicating higher employment in the industrial sector. The share further increases in the year 1989. The picture on the growth rate of employment by broad activity group shows a positive growth rate of 1.3 per cent per annum in the agricultural sector including forestry, fishery and livestock over the sixties. But over the next decade, the agricultural sector experienced an absolute decline in its labour force at 0.3 percent per annum while the period 1974-1989 experiences an annual growth rate of 12.1 percent. On the other hand non-agricultural sector experienced a higher rate of growth of employment over the seventies than over sixties. According to LFS 1989 agricultural sector employs 64.9 percent of total labour force against 13.9 percent in manufacturing sector and 21.2 in other sectors. This indicates a transition of the economy no doubt but a satisfactory growth path, however, is yet to be charted. The very low share of industry in GDP is striking..

2.4 Agriculture

Agriculture is the mainstay of economic life in Bangladesh. Its importance in the economy is overwhelming not only in terms of its contribution to the gross domestic product but also in terms of the economic activity it generates in the transport, trade and manufacturing sector. This sector contributed about 38.2 percent to the GDP and employed about

64.9 percent of the labour force in 1989 (Table 2.5 & 2.7). About 65 percent of exports in 1983/84 were either agricultural products or manufactures of them.[8]

Bangladesh, with total land area of about 35.7 million acres, has cultivable area of 22.5 million acres.[9] The main features of Bangladesh agriculture are like those present in most primary producing countries. Small subsistence farming and fragmentation of holding is the main characteristic of Bangladesh agriculture. Table 2.7 exposes percentage size of holding in three separate years. The notable feature is that the percentage of small holding and large holding has fallen in 1977 to 49.7 percent and 9.4 percent respectively from 51.6 percent and 10.7 percent in 1960. In the year 1982/83 the percentage of small holding remarkably increases to 70.3 percent while the percentage of medium and large holding has fallen to 24.7 and 5.0 percent.[10] This percentage size of holding is however no index of the size distribution of the consolidated operating units. This is because of the extensive fragmentation of holding. About 97.4 percent[11] of farm land was found to be held in fragmented holdings in 1977.

One of the most important feature of Bangladesh agriculture is low yield per acre. Because of some structural characteristics of the sector i.e. small size of holding, high degree of fragmentation, land tenure system, lack of sufficient

Table 2.8

Percentage Size of Holding

	1960	% of total	1977	% of total	1983/84	% of total
Total Number of Farm Holding	6138	100.0	6258	100.0	10045299	100.0
Small (upto 2.5 acres)	3170	51.6	3112	49.7	7065957	70.3
Medium (2.5 to 7.5 u)	2313	37.7	2556	40.9	2483210	24.7
Large (above 7.5 u)	655	10.7	590	9.0	496132	5.0

Source: BBS, Op. cit, pp.202-203.

agricultural credit, Programme for extensive farm mechanisation as a device to agricultural development has not been materialised in Bangladesh. Farm mechanisation has taken place only to a very limited extent and its impact on overall agricultural production has been rather insignificant. The new seed-fertilizer - irrigation technology was introduced in different phases and in 1966 for the first time HYV seeds of rice, IR-8 for the winter Boro crop was introduced. In 1970 another variety called IR-20 was introduced and with this several other new varieties were developed and introduced. Yet per acre yield is low in Bangladesh compared to that in other Asian countries. A comparative statistics of agricultural production for some Asian countries is shown in Table 2.9.

Table 2.9

Some Comparative Statistics of Agricultural Production in Some Asian Countries

Countries	Per Capita Agri. Land Acre, 1972	Index of per capita food prod. 1972 (1961-65)=100	Index of Agri Prod. in 1990 (1979-81)=100	Yield per Acre 1973 Paddy (lbs.)	Yield per Acre 1979 Paddy (lbs.)
Bangladesh	0.40	77	128	1335	1724
India	1.09	97	145	1438	1596
Pakistan	5.87	112	154	2014	n.a.
Sri Lanka	0.74	92	102	1951	1789
Thailand	1.02	95	125	1615	1678

Source: BDS, Vol.III, July 1975, No.2, p.262; BBS, Statistical Pocket book, 1992; FAO, Production Yearbook, 1979, p.98, Statistical Yearbook 1973-74.

The Agricultural Sector in Bangladesh is composed of four distinct parts viz. (i) Crops, (ii) Forestry, (iii) Livestock and (iv) Fisheries. The percentage shares of agricultural components are presented in Table 2.10 which indicates the relative importance of various component parts.

Table 2.10

Percentage Share of Agricultural Components

Groups	1979/80	1983/84	1987/88	1990/91
Crops	75.0	76.7	78.4	78.9
Forestry	4.9	7.0	6.9	6.6
Livestock	13.1	9.9	7.4	7.3
Fisheries	7.0	6.4	7.3	7.2
TOTAL	100.0	100.0	100.0	100.0

Source: BBS, Statistical Yearbook 1984/85 & 1991/92

Note: 1979/80 and 1983/84 at current prices, 1987/88 and 1990/91 at constant (1984/85) prices.

Major share (about 80 percent) comes from crops. Paddy is the main crop of Bangladesh and is grown in 4 out of every 8 acres of the total cropped area.[12] The percentage share of value added by different crops in Bangladesh is shown in Table 2.11 which exposes cereals the main contributing crop. Cereals grown in Bangladesh include rice, wheat, maize, barley etc. of which rice is the most dominant crop. The three main crops of rice are Aman, Aus and Boro. Next to rice Jute is important not in term of its share in the total value added from all crops but in terms of its importance as the main export crop in raw as well as in manufactured forms. The other important crops are Tea, Sugarcane, different types of fruits, vegetables, spices, pulses etc.

Agricultural development is very much essential in Bangladesh to generate certain types of industries like repairs, services

Table 2.11

Percentage Share of Value Added by Different Crops

Crop	5 year average 1972-77	1976-77	1982-83	1987-88
Cereals	75.1	73.0	78.1	74.6
Beverages	1.9	2.6	2.1	2.0
Fibres	4.7	5.8	4.8	4.6
Fruits	4.7	4.5	5.0	5.5
Oilseeds	2.0	2.1	1.3	2.2
Pulses	1.0	1.0	1.0	2.6
Spices	2.6	2.6	1.5	2.3
Sugarcane	3.3	4.3	3.3	3.0
Vegetables	4.2	3.5	2.4	2.9
Other crops	0.5	0.6	0.5	0.3
TOTAL	100.0	100.0	100.0	100.0

Source: Haroun-Er-Rashid, Op.cit., p.67; BBS, Op.cit., pp.205-6 for 1982/83 data; BBS: Statistical Yearbook 1992.

and agro-processing industries based on domestic raw materials and also to generate employment of the excess agricultural labour force for the industrial sector.

2.5 Industry

The industrial sector, though relatively a minor contributor to GDP in Bangladesh, plays an important role in the economy. It accounted for 8.8 percent of the GDP and employed 7.0 percent of the total labour force in the large and medium manufacturing sector in 1989/90[13] excluding small and cottage industries which are seldom covered by the CMI reports. The importance of this sector can hardly be over emphasized in terms of supply of essential consumer goods and key inputs for mechanised agriculture. This sector accounted for about 80.0 percent of gross foreign exchange earnings in 1989/90[14]. The major industrial export items are ready-made garments, Jute, Yarn, Jute goods, Leather and Leather goods, Fertilizer, Paper, Newsprint, and handicrafts.

The industrial sector in Bangladesh is characterised by structural dualism. The lion's share of the total manufacturing value added originates from large and medium scale industries while the economy considerably depends on small and cottage industries for employment of surplus rural labour and supply of the most important non-food consumption goods like coarse cloth, processed food, earthen utensils, tobacco, furniture, tailoring, wood products, rubber and leather products etc. The cottage industries located mostly in the rural areas are family based enterprises, using negligible residential homes while the small enterprises are located both

in urban and rural areas. These industries are labour intensive and use almost entirely traditional technology with less skilled workers. The small and cottage industries employ above 80-85% of the total manufacturing labour force and contribute to about 40-45% of the value added (3.7% of GDP cames from small scale manufacturing industries and 4.1% from large scale manufacturing industries) in the manufacturing sector. The large scale industries are capital intensive with high labour productivity because of using modern techniques and skilled labour. Among the large scale manufacturing industries jute, textiles and cotton textiles have been historically the pioneering industries in Bangladesh both in terms of output and employment. Other important industries are sugar, tea, tobacco, vegetable, oil, paper, fertilizer, cement, steel, chemicals etc. To note here for the convenience of our discussion we will mostly classify all large and medium scale industries under twenty major industrial groups as in CMI reports. More details about the structure of manufacturing industry in Bangladesh will be discussed in the next chapter. We present here in Table 2.12 the composition and growth rates of the manufacturing sector in Bangladesh. The table shows that during 1976/77, 1981/82 and 1988/89 the value added of large and medium units has grown at a higher rate than the smaller units.

The overall industrial growth rate has been 3.4 per cent per annum during 1976/77-1981/82 and 3.8 percent per annum during

Table 2.12

Composition and Growth Rates in the Manufacturing Sector

Sub-sector/Industries	Composition % of Value added 1989-1990	Growth Rate		
		1973/74-1977/78	1976/77-1981/82	1980/81-1988/89
The Manufacturing Sector	100.0	-0.3	3.4	3.80
(a) Small Scale	41.77	2.9	3.0	1.4
(b) Large Scale	58.23	-0.9	4.7	5.9

Source: Composition calculated from figures of Statistical Yearbook 1992 growth rates taken from Rahman Atiq - Research Report No.41, p.47 for 1976/77-1981/82 figures; Ahmed, M.U. - Self Reliant Development and Industrialisation Strategy of Bangladesh - A critique, p.8, for 1973/74-1977/78 figures. Composition and growth rate for 1980/81-1988/89 taken from Quarterly Journal, BIDS, Vol.XIX, March-June 1991, p.30.

1980/81-1988-89. Data shows that during 1973/74-1977/78 the overall industrial growth rate was negative. The large scale industrial sector also experienced a negative growth rate during the period while the growth rate experienced by the small scale industry, was still positive. During 1976/77-1981/82 and 1980/81-1988/89, growth rate in the large scale industry has been observed to be higher than in the small scale sector. The reasons behind the negative growth rate during 1973/74-1977/78 were observed to be lack of administrative support, discriminatory investment policies, fiscal and financial incentives; and absence of entrepreneurial tradition along with the effects of the liberation war like shortage of foreign exchange to import raw

materials spare parts, loss of skilled labour and managerial capacity etc.

Bangladesh hardly followed any effective industrial development strategy covering both large, small and cottage industries ever since Pakistan period. Within the framework of the then Pakistan, Bangladesh followed the strategy of industrial development through state sponsored private entrepreneurship, particularly during the 1950's. The predominant character of industrialisation strategy during the sixties had been import substitution through establishing large and relatively capital intensive consumer goods industries. Small and cottage industries, though provided a labour intensive alternative for some important production items (such as cloth), were hardly encouraged in the government's scheme of import substituting industrialisation. As a result, textiles and a few non-essential consumer goods such as beverages and cigarettes were encouraged through heavy protection via import licensing system, Export Bonus Scheme, High tariff protection, tax rebates and financial concessions. The export bonus scheme heavily subsidised the export oriented industries, especially jute manufacturing industries in Bangladesh.[15] But the most noteworthy point is that no proper attempt was made to explore the full potentials of the small and cottage industries for output and employment expansion though their importance was emphasized in successive five year plans.

The large scale industrial sector, however, faced a number of problems like (a) inconsistency of factor intensities with internal factor endowments, (b) the establishment of factories not always based on comparative cost advantage and (c) under utilisation of capacity in most of the industries. The problems had their roots in the import licensing system, export bonus scheme, high tariff protection and other concessions enjoyed by these industries.

Since independence (1947), scarcity of foreign exchange and dependence on imports for many items of necessity led the government to emphasize import substituting industrialisation while the growth of Jute textile industries became limited by the demand in domestic and foreign markets.

After Liberation, as much as 80 percent[16] of the large scale industry sector in terms of fixed asset, was put under public control reducing the size of the private sector of the economy. However, since 1974 the scope of the private sector participation in industries began to be widened and that of the public sector reduced through gradual enhancement and subsequent elimination of investment ceilings and disinvestment programmes.[17]

The denationalization provisions and other measures for promoting private (including foreign) investment culminated in the announcement of the New Industrial Policy of 1982 (NIP). Accordingly, large-scale denationalization was carried out at

a rapid pace. The NIP '82 also attempted to introduce various 'liberalization' measures by waiving regulatory provisions pertaining to investment sanctioning, tilting from import substitution to export promotion, liberalizing import procedure, expanding incentives to foreign private investments. The Revised Industrial Policy of 1986 (RIP '86) and subsequent policy reforms were designed to strengthen these measures further. The latest industrial policy presented by the GOB in August 1991, designed to eliminate the use of investment schedules, has made it possible for industries to be set up within a ceiling of Tk.300 million without reference to the government. (Details on government's Industrial Location Policy will be discussed in the 4th Chapter.)

However, no comprehensive strategy for industrialization in the small and cottage industry sector was envisaged before SFYP. With a view to creating off-farm employment and income opportunities, promoting dispersal of industries and production and supply of basic need goods, industrial policy was directed towards development of medium, small and cottage industries of agro support and agro-based.

On the use of domestic resources, in the SFYP and TFYP. As a means to minimize trade gap and diversify industrial base much importance was attached to diversification of manufactured exports in lines where Bangladesh has comparative advantage.

2.6 Service Sector

Service sector, as a whole, is the most important sector of Bangladesh in terms of its contribution to GDP. This sector for the purpose of this study includes construction, transportation and communication, power, gas, water and sanitary services, trade services, housing services, public administration, banking and insurance services and professional and miscellaneous services contributing more than a half of the total GDP. This sector contributed 54.3 percent to GDP and provided 20.9 percent of the total employment in 1989.[18] The growing importance of this sector is evident from Table 2.5 indicating its increasing trend toward GDP.

In Table 2.13 absolute and percentage share of different components of service sector to GDP and employment and in Table 2.14 percentage share of different components of the sector have been presented indicating prominence of transportation and communication, housing and trade services and professional and miscellaneous services in terms of contribution to GDP. On the other hand Table 2.14 indicates that employment in the trade services is the highest. Employment in the Housing and public administration services together shows an increasing trend while that in the power, gas, water and sanitary services and professional and miscellaneous services show a declining trend. It is evident from Table 2.13 that the importance of the service sector in

terms of its contribution to GDP is continuously increasing though employment share of this sector is diminishing.

However, in the perspective of economic development of Bangladesh the role of service sector is no doubt important indicating a transitional move of the economy.

Table 2.13

Share of Service Sector to GDP and Employment

Service Sector	1983/84				1986				1989			
	Share to GDP		Employment		Share to GDP		Employment		Share to GDP		Employment	
	Taka (Mil.)	%	No. (000)	%	Taka (Mil)	%	No. (000)	%	Taka (Mil)	%	No. (000)	%
Construction	18095	5.2	321	1.1	28839	5.3	646	2.1	43110	5.8	662	1.3
Power, Gas, Water, Sanitary Services	1939	0.6	107	0.4	3545	0.7	38	0.1	8824	1.2	18	neg.
Transportation & Communication	26013	7.4	1209	4.2	61901	11.5	1321	4.3	75061	10.2	1278	2.5
Trade Services	28513	8.1	3271	11.5	45883	8.5	3832	12.5	61583	8.3	4130	8.2
Housing Services	24867	7.1	1089	3.8	40938	7.6	1208	4.0	66358	9.0	2391	4.8
Public Administration	13984	4.0			20867	3.9			32764	4.4		
Banking & Insurance	5152	1.5	178	0.6	10116	1.9	367	1.2	15110	2.1	238	0.5
Professional & Miscellaneous Services	31082	8.9	3250	12.0	59666	11.1	2563	8.3	98376	13.3	1795	3.6
	149645	42.8	9425	33.6	271805	50.5	9975	32.5	401186	54.3	10512	20.9

Sources: [illegible] for employment Bgdesh Statistical Yearbook 1984/85 and [illegible] for production Bgdesh.

Table 2.14

Percentage Share of Different Components of Service Sector to GDP and Employment

Components of Service Sector	1983/84		1986		1989	
	GDP	Employ-ment	GDP	Employ-ment	GDP	Employ-ment
Construction	12.1	3.4	10.6	6.5	10.8	6.3
Power, Gas, Water & Sanitary	1.3	1.1	1.3	0.4	2.2	0.2
Transportation & Communication	17.4	12.9	22.8	13.2	18.7	12.1
Trade Service	19.0	34.8	16.9	38.4	15.3	39.3
Housing Services	16.7		15.0		16.5	
Public Administration	9.3	11.5	7.7	12.1	8.1	22.8
Banking & Insurance	3.4	1.9	3.8	3.7	3.8	2.2
Professional & Misc. Services	20.8	34.4	21.9	25.7	24.6	17.1
	100.0	100.0	100.0	100.0	100.0	100.0

Source: BBS, LFS 1983/84, LFS 1989 for employment figures; Statistical Yearbook 1984/85 and 1992 for production figures.

Note: Employment figures for housing and public administration subsectors are not available.

2.7 Concluding Remarks

The salient features of the economy of Bangladesh emerging from the preceding discussion may be summed up as follows.

First, like all other developing countries, the economy of Bangladesh is agro-based with unfavourable man-land ratio and is characterised by increasing landlessness of rural households. The agriculture sector in Bangladesh is overwhelmingly a subsistence activity with low productivity which is covered by defective land tenure system, limitation and lack of the use of modern technology, lack of agricultural finance and natural calamities.

Secondly, about 109.8 million people (1991 Census) inhabit in a small area of Bangladesh making it world's most densely populated country. Her population is rising at a rapid rate aggravating the problem of unemployment and under employment. In order to minimize this problem the population growth need to be adjusted to resource availability.

Thirdly, the GDP structure and size of the country exposes a low resource base, inadequate development of resources and under utilization of the potentials in agriculture and industry. The structural change in GDP, is rather insignificant indicating a little change of the economy from agricultural to non-agricultural production, from primary to non-primary activities.

Fourthly, the Bangladesh Economy is characterised by lopsided growth in the manufacturing sector, logically the important component of GDP. Structural dualism is the main feature of this sector. A major portion of value added in manufacturing is contributed by the large scale industries while the economy is considerably dependent on small and cottage industries both in terms of employment and output. But the overall expansion in this sector has been far from satisfactory. More about the structure of the manufacturing industry will be discussed in the 3rd chapter. The striking feature identified here is that before the emergence of second five year plan, no comprehensive industrial development strategy was envisaged on the consideration of comparative advantages and resource endowments of the country and on the basis of existing socio-political structure. In the 1st plan allocation was small but their capital need for rehabilitation and growth was small too. Shortage of capital utilisation working capital and inadequate infrastructural support and lack of interactive subcontracting arrangement between the large medium and small industries did not allow for a full realisation of the potential in this field. While the small and cottage industries suffered from a capital shortage, the large and medium industries adopted more capital intensive technology encouraged by liberal credit and incentive package and accounted for an under-utilization of capital. However, effective ways were explored to develop the small and cottage

industries in the SFYP in which greatest emphasis had been given on the development of labour intensive small scale and cottage industries with a view to meeting basic needs of the rural people and creating wider employment opportunities. In the third five year plan priority has also been given to the small scale and cottage industries in view of the prospects for development at lesser investment creating larger employment and export potentials offered by these industries.

Fifthly, service sector of Bangladesh with different components appears with growing importance in terms of its share to GDP and faster development though share of employment in this sector is declining gradually. Yet, the changing pattern of this sector surely depicts a transitional trend of the Bangladesh economy.

Footnotes

1. World Development Report, 1992, p.218.
2. Statistical Pocket book 1992, p.88 & 218.
3. Op.cit.
4. Ibid, p.325.
5. World Development Report, 1992, World Bank, p.270.
6. BBS, Op. cit., p.320.
7. World Development Report 1992, p.222.
8. BBS, Op. cit., p.374.
9. Ibid., pp.202-203.
10. Yearbook of Agriculture & Statistics of Bangladesh 1987-88, p.267.
11. Ibid., p.210.
12. Faaland, Just and Parkinson, J.R.: Bangladesh the Test Case of Development, p.126.
13. BBS, Op.cit., pp.202-203.
14. BBS, Op.cit., p.204.
15. Pakistan Economic Journal, Vol.XIX, No.3, 1988-89.
16. Faaland, Just and Parkinson, J.R., Op.cit., p.170.
17. The BIDS, Volume VI, Autumn 1978, p.394.
18. BBS, Statistical Yearbook 1992 & LFS Report 1989.

CHAPTER 3

THE STRUCTURE OF MANUFACTURING INDUSTRIES SECTOR IN BANGLADESH

3.1 Introduction

The manufacturing sector is a minor sector of the Bangladesh Economy. It accounts for roughly 8.8 percent of GDP and absorb only about 7.5 percent[1] of the total labour force. The main factors explaining the smallness of the manufacturing sector are considered to be lack of capital, skill and education, undeveloped infrastructure and low effective demand for industrial goods. But this sector though small in size, can and should play a strong and expanding role in the process of economic development of Bangladesh. The sector is relatively small but important for import substitution, domestic availability of raw materials, the inherent stability of world demand for primary products such as raw jute, forward and backward linkages and employment of surplus labour from agriculture.

Bangladesh, the then East Pakistan, as it was known, was a primary producing region with little modern industry at the time of independence in 1947. There existed only a handful of large scale industrial units a few cotton textile mills, a few

sugar mills, one cement factory and a number of jute bailing presses. The first Industrial Policy statement of the Pakistan Government declared in April, 1948 had two basic objectives (i) to achieve industrialisation through private enterprise and (ii) to promote industrialisation through suitable and active Government intervention; which attracted Adamjee, one immigrant industrial family from West Pakistan to invest in jute manufacturing. And the process of industrial development in this region started by Adamjee for setting up three jute manufacturing units 1,000 looms each approved by the Pakistan Government by 1949. Following this more industrial units were established by a successful combination of Government Patronage and private initiative over the next two decades. The private investors were mostly West Pakistanis during the 1950's and the early 1960's. Of course, it should be noted here that East Pakistan Government developed 1st unit of Adamjee and largest cotton mill Maslin before the immigrants came in. So was the case with fertilizer and paper. However, by mid 1960's some Bengalis were made interested but they had mainly been engaged in small and medium scale industrial activities with small capital and limited managerial efficiency. The PIDC, Pakistan Industrial Development Corporation, established in 1950 and EPIDC, a part of PIDC as divided in 1962, assisted and contributed to the establishment of private enterprises and established industrial units in the public sector also. From being negligible in 1947, the

industrial base of Bangladesh reached a noticeable level by the end of the 1960's. Some statistics on the industrial sector in the pre-liberation period will be presented in the next section in Table 3.1.

With the above background of industrialisation in this region, the purpose of this chapter is to trace the structure of Manufacturing Sector in Bangladesh and to examine the changes in the structure of manufacturing sector since liberation. Section 3.2 illustrates the structure and nature of large and small scale industries. Section 3.3 evaluates structural changes in the large and medium scale industries. Size of manufacturing employment and its composition is analyzed in Section 3.4. Section 3.5 presents the concluding remarks.

3.2 Structure and Nature of Large and Small Scale Industries in Bangladesh

The manufacturing sector, it is already pointed out, is small in Bangladesh. This sector contributed Rs. 1672 million (7.2 percent) to GDP in 1969/70 at constant 1959/60 prices, compared to Tk.64506 million (8.8 percent) in 1989/90 at current market prices.[2] The contribution of the large scale industries was Rs.783 million (4.4 percent) and that of small manufacturing was Rs.888 million (2.8 percent) in 1969/79, the corresponding figures for 1989/90 having been Tk.37565 million (5.1 percent) and Tk.26941 million (3.7 percent). On the contrary, the manufacturing sector, at the time partition of

India in 1947, accounted for about 4 percent of GDP in Bangladesh, the then East Pakistan. The largest share by far was that of the cottage industries producing handloom textiles, salt, processed food, tobacco and beverages and wood products and second important share came from small scale industry units (employing less than 10 workers). Only about one half of a percent of GDP was accounted for by the handful of large and medium scale industrial enterprises mainly producing cotton textiles.[3] In the subsequent two decades a number of important changes took place in the structure of industrial production in the country. Two important changes were noted to be the rapid expansion of the production of jute and cotton textiles and the shift within manufacturing towards large scale production. By 1969/70 nearly three quarters of industrial production was in two sub-sectors; food, beverages and tobacco; and jute and cotton textiles. The latter accounted for 43 percent of the total.[4] This is shown in Table 3.1. The Jute textiles industry, by far the largest industry based on indigenous raw materials and producing mainly for export, had by 1970 an estimated capacity of 22,500 looms[5] starting from scratch and employing 47 percent of all workers employed in large scale manufacturing.[6]

The next biggest large scale industry is domestic consumption oriented cotton textiles based largely on imported raw materials. About 10 percent of this industry's share is produced by large and medium industries whereas about 90

Table 3.1

Value Added in Manufacturing in 1969/70

Industry Group	Percentage	Share
A. Large Scale Manufacturing		61.4
i) Food, beverage and tobacco	19.1	
ii) Jute and cotton textiles	27.2	
iii) Others	15.1	
B. Small Scale Manufacturing (including Cottage)		38.6
i) Food, beverage & tobacco (Bidi)	10.5	
ii) Jute and Cotton textiles	15.9	
iii) Others	12.2	
TOTAL		100.00

Source: World Bank, Bangladesh Development in a Rural Economy, 1974.

percent being produced by small and cottage industries.[7] In addition to jute and cotton textiles the production of sugar, tea, hides and skins, leather, paper and newsprint processed fish, wood manufactures and ceramics and urea fertiliser grew up slowly based on the domestic resources, by 1969-70. The Paper and the Newsprint industry grew in 1952 and 1954. The first fertilizer became operative in 1964. However, over 65 percent of all industrial production in the beginning of the 1970's was agro-based.[8] By this time a range of pharmaceutical and chemical products, iron and steel, ship building, oil refining, cement, cigarettes, edible oil and

fertiliser, assembling of car and motor cycle, batteries cables began to grow on the basis of imported raw materials and intermediate goods under protective tariff and other import restrictive policies.

However, in the subsequent two decades following partition in 1947, the manufacturing sector grew at over 6 percent per annum[9] and the share of value added in manufacturing sector in total GDP increased to 7.2 percent from 4.1 percent in 1949/50. Table 3.2 shows percentage contribution of large and small scale industries to GDP since 1949/50.

Table 3.2

Percentage of Large and Small Scale Industries to GDP since 1949/50 (At constant 1972/73 prices)

Industry	1949-50	69-70	75-76	79-80	82-83	87-88	89-90
Total	4.1	7.2	10.1	10.7	10.2	8.5	8.8
Large scale	0.6	4.4	5.6	6.1	5.7	4.8	5.1
Small scale	3.5	2.8	4.5	4.6	4.5	3.7	3.7

Source: World Bank Report for 1969/70 figures (at constant 1959/60 prices). BBS, Statistical Yearbook 1978, 1981/82, Statistical Pocket book 1983/84, 1991 for 87-88 figures (at current market prices) and 1992 for 89-90.

The percentage share of manufacturing sector to GDP declined immediately after liberation due to the severe shortage of foreign exchange to import raw materials, as well as physical disruptions caused during the war and the loss of managers, owners and West Pakistan market. The government of Bangladesh

estimates that industrial assets worth more than Tk.290 million were destroyed during the liberation war.[10] Apart from the effects of war, problems associated with the nationalisation programme in 1972, leading to radical change in the whole framework of industrial ownership, management and policy contributed to decline in the manufacturing sector. To these were further added the abolition of the Export Bonus Scheme and devaluation of domestic currency soon after Liberation affecting export oriented industries.

The national accounts show that a major portion of value added in manufacturing is contributed by the large scale industries while the economy is considerably dependent on small scale and cottage industries (Table 3.2). The annual compound growth rates of value added during the period from 1949/50 to 1959/60, 1959/60 to 1969/70, 1973/74 to 1983/84 and 1984/85 to 1989/90 have been projected in Table 3.3.

The notable feature that appears is the declining growth rate in the large scale and increasing growth rate in the small scale manufacturing sector upto 1983/84. The growth rate in the large scale sector during the period from 1949/50 to 1959/60 is remarkably high. This has been possible due to the fact that industrialisation in the large scale sector had its start in the post independence period i.e. after 1947. Upto this period the manufacturing sector was dominated by the small scale sector. The initial high rate of growth in the

Table 3.3

Annual Compound Growth Rate of Value Added in the Manufacturing Sector

	49/50-59/60	59/60-69/70	73/74-83/84	84/85-89/90
Manufacturing	6.3	6.4	9.0	4.0
Large scale	19.3	9.8	7.8	6.1
Small Scale	2.3	2.6	12.8	1.8

Growth rate computed from the following figures (in million Taka)

	1949/50	59/60	69/70	73/74	83/84	84/85	1989
Manufacturing	472	912	1696	3402	7875	28324	34780
Large scale	69	406	1041	2224	4390	15028	20254
Small scale	403	506	655	1178	3485	13296	14526

Note: Figures from 1949/50 to 1969/70 at 1959/60 factor cost, (World Bank Figures from 1973/74 to 1983/84 at 1972/73 Constant Prices), figures for 1984/85 and 1989/90 at 1980/81 constant prices, taken from BDS, Vol. XIX, March-June 1991, p.30.

large scale sector could not however, continue in the subsequent period. The post liberation period experiences lowest rate of growth, most probably due to war disturbances and frequent changes in the industrial policy of the post liberation government (discussed in the 2nd Chapter). Growth rate in the small scale industry sector falls to 1.8 percent during 1984/85 to 1989/90 from 12.8 percent during 1973/74-83/84. Large scale sector still experiences lower rate of growth than before.

The number of registered factories by major industrial groups in 1982/83 is 3300 as against 3130 in 1968/69.[11] The number of large and medium scale industries was 1276 in 1970/71 and increased to 2728 in 1981/82.[12] In 1987/88 the number of establishments increased to 4793 of which 167 are government owned units 4593 private owned and 33 are under joint-venture. Out of 4793 units 635 are in food, 2316 are in textile, 430 are in chemicals of which 5 are fertilizer industries contributing major part of the value added in chemicals.[13] In addition, there are a large number of small non-registered and cottage industries. Sufficient information about small and cottage industries are not available. The Bangladesh Small and Cottage Industries Corporation (BSCIC) earlier known as EPSIC (East Pakistan Small Industries Corporation) established in 1957, has the overall responsibility for promotion of small scale and cottage industries in the country and takes interest in generating data for policy and programme development purposes. A survey Report on Small-scale industries in 1978 reveals that 24005 small industries of 129 types in 1978 were in operation in Bangladesh. The largest number of units were in rice mills numbering 12242 which accounted for 51 percent of entire small units. Bakery 2167 (9% of total units) Flour mills 1315 (5.5%) Light Engineering Works 1120 (4.7%), Hosiery 732 (3%), Oil Mills 577 (2.4%) and the rest were other 123 types of industries. On the other hand, a summary statistics of cottage industries in Bangladesh made by BSCIC in 1980

reveals that at the end of 1980 there were 321745 cottage industrial units in Bangladesh.[14] The total number of persons engaged in cottage industries were 9, 16, 806 in 1980. The survey also reveals that with 45,223 units (14.06%) of total units, Tailoring industry tops the list followed by Bamboo and cane products industry with 42,169 units (13.11%) of total units, Salt producing units 28,073 (8.7%), Fish Net manufacturing units 19,599 (6.09%), Rice mill 17,285 (5.3%), Pottery 16,522 (5.15%) and wood products 13,420 (4.17%) respectively. Table 3.4 represents growth of small and cottage industries (in terms of number of production units and employment) in Bangladesh since 1961.

Table 3.4

Growth of Small Scale and Cottage Industries since 1961

Year	Small scale Industries		Cottage Industries (Excluding Handloom)	
	No. of Units	Employment in lakh	No. of Units	Employment in lakh
1961	16331	2.20	234934	6.75
1980	24005	3.30	321745	9.16
1985	28304	3.65	368064	10.50
1990	38104	3.87	403237	13.50

Source: BSCIC Annual Report 1984, 1985/86 and 1991, Employment figures for 1990 are approximate figures on the basis of 93% of new employment of 320338 in the cottage industries sector and the rest in the small scale sector.

The contribution of small and cottage industries however, is likely to be substantially underestimated by official statistics in Bangladesh. Moreover, because of the labour intensive character of these traditional enterprises, their share in employment is striking.

Available evidence suggests that they employed about 82.2 percent of the total industrial labour force in 1981/82[15] and more than 93% in 1987/88 (Table 3.11).[16]

The manufacturing sector in Bangladesh is dominated by consumer goods and intermediate goods industries. Table 3.5 exposes that more than fifty percent of value added comes from consumer goods industries while about fifty percent of employment is accounted for the intermediate goods industries.

Table 3.5

Structure of Large and Medium Scale Manufacturing Sector in Bangladesh by End Use (in percentage)

Industries	Value added				Employment			Fixed Asset		
	69/70	76/77	81/82	85/86	69/70	76/77	81/82	69/70	76/77	81/82
Consumer goods	59%	54%	52%	59%	43%	45%	43%	39%	35%	49%
Intermediate goods	35%	24%	36%	39%	52%	49%	51%	56%	52%	43%
Capital goods	6%	22%	12%	2%	5%	6%	6%	5%	13%	17%

Source: BBS, CMI 1969/70, 1976/77, 1981/82.

Note: Consumer goods, Intermediate goods and Capital goods industries are defined in Annexure-2 According to CMI 1962/63.

The decrease in value added by the consumer goods industries in 1976/77 and in 1981/82 is mainly due to fall in the share of textile industries to 7 percent in 1976/77 and to 9 percent in 1981/82 from about 23 percent in 1969/70. The increase in value added by capital goods industries in 1976/77 is mainly due to sharp increase in the share of Basic Metal Industries. During 1981/82, the same sector experienced lower value added due to decreased share in the Basic Metal Industries. The other notable feature is the increasing share of fixed assets in the capital goods industries and declining share of the same in the intermediate goods industries over the period from 1969/70 to 1981/82. However, value added figures for 1985/86 show a slight upward change in the share of consumer goods and intermediate goods whereas the share of capital goods experiences a sharp fall to 2% from 12% in 1981/82. This is indicative of the absence of any remarkable change in the structural composition of manufacturing value-added and negligible progress achieved in import substitution and overall slow progress towards the path of self sustained growth.

3.3 Structural Changes in Large and Medium Scale Industries in Bangladesh

With above information about manufacturing sector we now like to examine the structural changes in the large and medium scale industries in Bangladesh. Table 3.6 shows changes in

average size of establishment in major industries of Bangladesh over the period from 1969/70 to 1987/88.

Table 3.6

Change in Average Size of Establishments Over Time
Both in terms of Employment and Fixed Asset

Major Industries	Employment				Fixed Asset			
	69/70	76/77	81/82	87/88	69/70	76/77	81/82	87/88
Food Mfg.	104	99	85	88	1337	1841	3010	6250
Tobacco	232	231	217	281	2691	3674	3709	20686
Textile	304	369	229	134	2676	3674	3709	3460
Paper & Prod.	177	285	318	380	9369	29572	42580	85135
Leather & Prod.	29	26	22	49	130	233	973	7736
Chemical & Prod.	66	71	80	94	1327	3716	3778	33238
Non-metallic mineral	70	75	101	140	361	2327	3158	24210
Basic Metal Prod.	95	193	203	73	2501	12577	11173	4709
Metal Prod. & Ex-Machinery	33	38	38	37	132	209	1686	2968
Machinery, Ex-Electrical	41	36	64	53	180	965	11667	10643
Elec. Machinery	76	95	118	102	657	2669	16596	4636
Transport Equipment	128	206	139	95	885	3426	2905	3516

Source: BBS, Calculated from CMI 1969/70, 1976/77, 1981/82 and 1987/88.

The most striking feature is that the change by employment is not so remarkable while the change by fixed asset is remarkably noticeable. This is of course indicative of a change towards high capital intensiveness of the manufacturing sector as a whole. Though the main problem with the stock of fixed asset data is that these are book values written down at initial prices to which new investments (at current prices) are added from time to time and from which some notional

depreciation is deducted on an annual basis. Thus, the year ending capital stock data are not very meaningful entities. However, an idea of net addition to capital stock to different subsectors can be obtained from these figures.

In Table 3.7 an attempt has been made to show structural changes, though not in coherent pattern, in some large and medium scale industries. The table shows percentage changes in the share of value added by major industries contributing about 80% of the total manufacturing value added in some selected years.

Table 3.7

Changes in the Percentage Share of Value Added by Some Major Industries

Industries	69/70	72/73	74/75	76/77	81/82	87/88
Food Mfg.	14.8	7.8	10.8	10.9	12.5	11.0
Tobacco	1.3	19.8	25.8	13.2	2.4	9.8
Textile	44.4	44.9	38.7	32.1	38.9	33.9
Chemical	10.7	11.3	10.9	12.5	21.1	17.4
Basic Metal	2.4	4.4	4.4	17.3	8.9	2.9
All Machinery Ex-Electrical	1.4	0.8	0.6	0.8	1.7	0.9
Metal Prod. Ex-Machinery	0.9	2.2	1.2	5.4	1.9	1.4
Ready-made Garments					0.3	1.9

Source: BBS, CMI 1969/70, 72/73, 74/75, 76/77, 81/82 and 87/88.

The peculiarity observed is the falling share of value added by the textile, food, chemical, basic metal and other industries except tobacco and ready-made garments in 1987/88 compared to the year 1981/82. Textile industry is observed to contribute the highest of the manufacturing value added though with a falling trend. Other sectors experience ups and downs in the share of value added. Table 3.8 displays the trend growth rates[17] of selected industrial products during the period from 1975/76 to 1982/83 and 1981/82 to 1987/88.

The table exposes a considerable growth rate in the beverage, non-electrical machinery, basic metal and electrical goods sector except in a few item of them during 1975/76 to 1981/82. None of the components of the Textile industry has grown respectably, cotton cloth with minimum and jute sacking rather having negative growth rates. Shrimps and frog legs in Food industry faces a negative growth rate while other items have a fair growth rate during the same period. Growth rate further declines during 1982/83 to 1987/88 in food, beverage and textile industries except in a few item like shrimp & frog legs, country type liquor and other spirit etc. Basic metal industries experiences a negative growth rate. The position is better with paper, electric goods, transport equipments and ready-made garments industries.

Table 3.8
Trend Growth Rates of Selected Industrial Products
Over 1975/76-82/83 and 1983/84-87/88

Broad Industrial Category	Name of Products	Trend rate of Growth in %	
		75/76-82/83	82/83-87/88
Food Mfg.	Shrimps Frog legs	-15.59	25.96
	Sugar	6.95	0.07
	Molasses	7.38	0.36
	Tea	3.00	0.90
Beverage	Rectified Spirit	1.61	-4.51
	Other Spirit	10.61	12.65
	Foreign type liquor	17.47	-8.47
	Country type liquor	2.61	23.37
Tobacco	Cigarette	3.90	0.0
Textile	Cotton yarn	2.42	0.55
	Cotton cloth	0.47	0.53
	Jute Hessian	4.21	-0.74
	Jute sacking	-15.97	-1.10
	Carpet backing	0.45	-6.69
Paper	Writing paper	1.76	4.67
	Printing paper	7.78	13.15
	Packing paper	-1.38	11.49
	Newsprint	8.59	13.20
	Particle board	-9.63	33.50
Chemical	Fertilizer	5.57	25.40
	Sulphuric acid	-6.64	12.06
	Matches	8.33	2.29
Petroleum		1.88	2.47
Non-metallic	Cement	6.07	0.22
Product	Glass Sheet	7.71	3.55
Basic Metal	Iron & Steel	8.73	-2.61
Non-electric Machinery		43.16	7.49
Electric goods	Fan	13.42	5.61
	Radio	14.71	-14.39
	Bulb	10.40	11.06
	Tube light	-4.78	8.91
	Television	37.71	26.20
	Telephone set	8.95	6.72
Transport equipment		-7.00	8.49
Ready-made garments		n.a.	46.92

Source: BBS, Statistical Year Book 1984/85. CMI 1987/88

However, this significant inter-industry variation in rates of growth during the above period does not indicate significant change in the structure of manufacturing production on a large and medium scale in Bangladesh. The high growths during this period are often associated with quite small base in 1974/75. Statistical data rather indicates marginal structural change in large and medium scale manufacturing sector in Bangladesh.

3.4 Size of Manufacturing Employment and its Composition in Bangladesh

Information about employment in the manufacturing sector are available from different reports on population census and labour force survey. Table 3.9 shows employment in the manufacturing sector in different periods and growth rate during the period from 1961 to 1974, 1974 to 1983/84, and 1983/84 to 1989.

This table shows an incremental percentage change in employment from 4.8 percent in 1974 to 7.5 percent in 1983/84 and to 13.9 percent in 1989 of the total civilian labour force. It can be stated that the size of the manufacturing employment is still very small taking together large scale and small and cottage industry sectors. It is important to note here that about 96.8 percent of the manufacturing labour force is in the large scale, small scale and cottage industries in the private sector of which about 93.0 percent is accounted for by cottage industries alone. Employment figure in cottage

Table 3.9

Employment in the Manufacturing Sector

	1961	1974	1983/84	1989
Total civilian labour force (in Million)	16.8	21.4	27.9	50.1
Employment in Manufacturing (in thousand)	810	1026	2108	6975
Mfg. Employment in percentage of the total labour force	4.8	4.8	7.5	13.9
	1961-74	74-83/84	83/84-89	
Compound growth rate of mfg. employment	1.8	5.8	27.0	

Source: BBS, Preliminary labour force survey 1983/84, p.32, and LFS 1989.

industry sector differs from Table 3.4 because of difference in system of accounting by BBS & BSCIC. (Table 3.10).

The table shows that the bulk of employment in the industrial sector is in cottage industries. The public sector corporations employ only about 3.2% of the total industrial labour force while large and small scale private sector is very small and employ only about 4% of the manufacturing labour force. The fall of public sector employment from 13.7% in 1981/82 to 3.2% in 1987/88 is associated with the changes in industrial policy regimes i.e. due to large scale denationalization.

Table 3.10

Employment in the Manufacturing Sector

Sector	Employment		% of Share	
	82/82	87/88	81/82	87/88
Public Sector (in thousand)	310.2	223	13.7	3.2
Private Sector (in thousand)	1958.5	6976	86.3	96.8
(a) Large and Medium Scale units	93.2	489	4.1	3.8
(b) Small scale units	400.0	6487	17.6	93.0
(c) Cottage Units	1465.3		64.6	
	2268.7	7199.0	100.0	100.0

Source: World Bank for 1981/82 figures; BBS, Statistical Pocket book 1992 for 1987/88 figures.

Table 3.11 shows employment structure in some major industries as percentage of the total large scale industrial employment in some selected years and reveals some facts about percentage changes in the employment structure in this sector.

The noteworthy feature that follows is that the textile industry alone accounts for about 60 percent while textile, food and chemical together account for about 80 percent of the total large scale manufacturing employment. These three industries contribute 60 percent while the textile industry alone contribute more than one third of the total value added

Table 3.11

Manufacturing Employment by Some Major Industries and Changes Over Time

Industries	69/70	71/72	76/77	81/82	87/88
Food Mfg.	12.7	9.9	12.9	9.1	10.8
Tobacco	2.0	2.8	1.4	1.3	1.2
Textile	63.4	67.8	81.1	65.1	59.3
Chemical	7.6	6.3	7.7	7.3	7.8
Paper & its product	1.5	1.7	2.5	2.0	2.0
Basic Metal Metal Product Ex-Machinery	2.8	3.4	4.3	4.1	3.4
Machi.Ex-Electrical	1.2	1.1	1.0	1.7	1.3
Miscellaneous	8.8	7.0	9.1	9.3	14.2
	100.0	100.0	100.0	100.0	100.0

Source: BBS, CMI 1969/70, 1976/77, 1981/82 & 1987/88.

in the manufacturing sector (Table 3.8). The trend growth rates of employment by industries have been presented in Table 3.12.

During 1962-71 the growth of employment was basically concentrated in Tobacco, Textile, Electrical machinery, Furniture and Petroleum industries at a considerable rate while trend growth rates of employment were very low for Food and Beverage industries. Other industries experienced negative growth rates during the same period. The wood and cork industry which declined at a fast rate during 1962-71 registered the highest employment growth rate during 1973-82.

Table 3.12

Trend Growth Rate of Employment by Industries

Industry	Growth Rate		
	1962-71	1973-82	1982-88
Food	1.79	1.75	5.18
Beverage	1.51	2.79	3.03
Tobacco	18.56	1.72	0.45
Textile	6.31	1.83	0.70
Footwear	-3.83	-7.01	7.54
Wood & Cork	-26.79	37.23	-0.94
Furniture	9.81	9.85	3.87
Paper & Paper Product	-12.15	1.98	2.40
Printing & Publishing	-2.58	11.27	4.30
Leather Product	-1.35	-2.95	16.99
Chemicals	-0.84	0.99	12.67
Petroleum & Coal	5.94	16.86	2.02
Non metallic minerals	-7.79	2.14	-1.06
Basic Metal	-9.94	-1.31	11.02
Machinery Ex-Electrical	0.96	12.88	-2.52
Electrical Machinery	17.59	25.83	2.76
Transport equipment	-10.17	1:93	0.52

Source: Planning Commission - Selected Issues in Employment and Development Bangladesh, p.153, for 1962-71 and 1973-82 growth rate, for 1982-88 are calculated from employment figures supplied by CMI 1981/82 & 1987/88.

During this period all industries but Footwear, leather and leather products and basic metal industries experience positive growth rate in employment. During 1982-88 leather products, chemical and basic metal products experience higher

growth rate, where other industries experience lower and considerable growth rate with negative growth rate in wood and cork, non-metallic and machinery except electrical industries.

The growth rates in Table 3.12, however, do not show the number of additional employment created in the industrial sector. Table 3.13 attempts to show additional employment created in major industries in 1981/82 over 1969/70 and in 1987/88 over 1981/82.

The table shows that 66.7 percent of the additional employment in 1981/82 over 1969/70 is due to employment expansion in the Textile industries. Other important employment creating industries are chemical, food, basic metal, paper, electrical machinery, printing, metal products machinery and non-metallic products. In 1987/88 major employment generation took place in chemical industry followed by food, textile and basic metal. Other industries experience little change while machinery except electrical, non-metallic product and wood & cork experience negative change.

Table 3.13

Additional Employment Created in 1981/82 over 1969/70

(in hundred)

Industry	Employment in 1969/70	Addition to employment in 1981/82 over 1969/70	1981/82-87/88
Food Mfg.	263.51	153.26	147.55
Tobacco	41.88	21.07	1.74
Textile	1308.24	1669.82	127.08
Chemical	158.30	177.41	208.59
Paper & Paper Product	31.96	60.34	14.11
Basic Metal	20.91	74.77	83.51
All machinery Ex-Electrical	25.19	53.42	-11.19
Metal Product Ex-Machinery	38.61	57.97	
Transport equipment	30.81	13.61	1.41
Non-metallic Product	25.42	33.65	-1.96
Electrical machinery	13.71	57.57	12.66
Footwear	18.09	24.98	6.23
Printing	25.63	34.73	17.38
Wood & Cork	2.33	19.42	-1.20
Others	55.99	50.31	23.96
TOTAL	2060.58	2502.33	629.77

Source: BBS, CMI 1969/70, 1981/82 & 1987/88, Statistical Yearbook 1983/84.

In Table 3.14 an attempt is taken to show industrial statistics at a glance during the period from 1972/73 to 1987/88. The table is significant in showing a rising trend in number of establishment and employment but does not pose any

importance regarding incremental value of fixed asset and value added accounted at current prices.

Table 3.14

Industrial Statistics 1972/73 to 1987/88

(Value in million Taka in current price)

Period	No of reporting Establishment (Public & Private)	Value of Fixed asset	Employment all employees No.	Gross value added	Value added at factor cost
1972/73	1986	1955	182,092	1374	-
1973/74	1427	3654	307,404	3739	-
1974/75	2847	4640	370,097	4569	3431
1975/76	2216	5475	353,640	6240	4384
1976/77	2057	6526	347,385	6682	4403
1977/78	2728	7693	400,670	10263	6694
1978/79	2728	7693	400,670	10263	6694
1979/80	3006	8791	417,298	13061	9275
1980/81	3152	11509	438,044	14130	9579
1981/82	3356	13962	456,291	15711	10363
1982/83	3583	14467	448,951	18832	13380
1983/84	3740	22873	452,436	23068	16913
1984/85	3934	27170	468,606	23956	17245
1985/86	4473	30293	466,636	29567	20142
1986/87	4519	35520	478,696	31954	22404
1987/88	4793	36137	489,500	32549	23975

Note: Number of reporting establishments excludes factories unregistered with the CIF and non-response units.

3.5 Concluding Remarks

From the foregoing discussion on the structure of Bangladesh manufacturing sector the following conclusions may be drawn:

First, the manufacturing sector is dominated as per value added by the large and medium scale industries which contribute a lion's share to the total manufacturing value added. In 1989/90 this sub-sector accounted for 58.23 percent of industrial value added and 5.77 percent to GDP. Yet small scale industries play an important role in the economy of Bangladesh. 41.76 percent of manufacturing value added and 4.13 percent of GDP have been accounted for by this sector in 1989/90. Moreover, because of the labour intensive character of production in these enterprises, their share in employment is striking. About 90.0 percent of total manufacturing labour force is absorbed in the small and cottage industries sector. Thus, however, the manufacturing sector in Bangladesh is characterised by structural dichotomy.

Secondly, the textile (jute, cotton, garment, handloom) industry, by far appears to be the largest of all industrial sectors. It contributes more than one third of the manufacturing value added and absorbs about 60 percent of the total industrial labour force in the large and medium sector. Thus industrial development in Bangladesh has been highly concentrated around textile industry.

Thirdly, the manufacturing sector is dominated by consumer goods and intermediate goods industries in Bangladesh. Yet the change in the share of fixed assets by capital goods industries is remarkable.

Lastly, the manufacturing employment is observed to experience a high growth rate during the period of 1973 to 1982 against the period of 1962 to 1971. The period from 1982-88 also experiences moderate growth rate of employment in the manufacturing sector.

However, evidences on the absolute magnitude and relative share of the manufacturing sector in economy suggest that in the 1980s there has been little in the way of dynamic growth or structural change in the industrial sector.

Footnotes

1. Bangladesh Bureau of Statistics (BBS): Statistical Pocket book 1991.
2. BBS, Statistical Pocket book 1992, p.29.
3. World Bank, Bangladesh Development in a Rural Economy, September 1974, p.141.
4. Ibid., p.142.
5. World Bank, Op.cit.
6. Khan, A.R.: The Economy of Bangladesh, p.67.
7. Khan, A.R., Op.cit., p.70.
8. Alamgir M. Khan : Development Strategy for Bangladesh, p.33.
9. World Bank, Op.cit., p.141.
10. World Bank, Bangladesh Issues and prospects for Industrial Development, p.1.
11. Ahmed, Q.K., Op.cit., p.393.
12. World Bank, 1985.
13. BBS, CMI, 1987/88.
14. A Survey on Cottage Industries, 1981.
15. World Bank, Report on Trade and Industrial Policy 1985, p.72.
16. BBS, Statistical Pocket book, 1992.
17. $$\text{Trend growth rate} = \frac{\Sigma XY - \frac{\Sigma X \, \Sigma Y}{N}}{\Sigma X_1^2 - \left(\frac{\Sigma X}{N}\right)^2}$$

    Where $Y = \text{Log}_e \text{GDP}$

    $X = \text{Time}$

CHAPTER 4

THE LOCATION PATTERN OF MAJOR INDUSTRIES IN BANGLADESH

4.1 Introduction

The objective of the present chapter is to analyze the pattern of location of major industries in Bangladesh. For convenience of analysis the area under consideration has been divided into four infrastructural regions, namely (1) Dhaka, (2) Chittagong, (3) Khulna and (4) Rajshahi. The analysis is mainly devoted to highlighting the special geographic, economic and ecological features which might have influenced the pattern of spatial distribution of major industries in the four aforesaid regions. The data used in this chapter are secondary information available in the published sources of BBS. There will be another chapter based on primary information collected through field survey, designed to explore the proximate factors responsible for locational distribution of selected industries in Bangladesh.

Bangladesh is a land to have great homogeneity, geographically, linguistically, culturally, religion wise as well as ethnically.[1] Yet, regarding infrastructural (physical and social) facilities inequalities are observed among four aforesaid regions (Table 4.2).

Table 4.1

Indicators of National, Physical and Social Infrastructure

Year	Total Population (Million)	Total Metal & Unmetalled Road (km)	Availability of Road Per 10 thousand (km)	Total No. of Post Offices	No. of Post Offices per 10 thousand	Total No. of Telephone	Availability of Telephone per 10 thousand	Total No. of Banks (All Banks)	Availability of Bank facilities per 10 thousand	Total Railway (km)	Availability of Railway per 10 thousand (km)	Navigable waterways (km)	Availability of water way per 10 thousand (km)	Electricity Generation in Million (KWH)	Per capita electricity availability (KWH)	No. of Educational Institution Primary & Secondary	Educational Institution per ('000)
1982/83	93.5	n.a.	n.a.	7551	0.81	n.a.	n.a.	4719	0.50	2866	0.31	n.a.	n.a.	3432	36.70	51883	2.14
1983/84	95.5	7997	0.84	7590	0.79	n.a.	n.a.	4927	0.51	2871	0.30	8433	0.88	3967	41.54	52016	2.09
1984/85	97.5	9387	0.96	7624	0.78	151356	15.52	4993	0.51	2871	0.29	8433	0.86	4545	46.61	52237	2.05
1985/86	99.4	10374	1.04	7684	0.77	163959	16.49	5128	0.51	2818	0.28	8433	0.85	4800	48.29	52505	2.01
1986/87	101.5	11185	1.10	7735	0.76	174375	17.18	5344	0.52	2792	0.27	8433	0.83	5586	55.03	52975	1.97
1987/89	103.4	11815	1.14	7810	0.75	187650	18.15	5469	0.53	2792	0.27	8433	0.82	6541	63.26	53379	1.87
1988/89	105.5	12321	1.17	7882	0.75	192361	18.28	5614	0.53	2746	0.26	5968	0.57	7114	67.43	54969	1.89
1989/90	107.5	12960	1.20	7982	0.74	205500	19.12	5731	0.53	2746	0.25	5968	0.55	7732	71.92	55605	1.85
1990/91	109.8	13627	1.24	8132	0.74	223682	20.37	5960	0.54	2746	0.25	5896	0.54	8270	75.32	57877	1.89

Source: BBS. Statistical Yearbook 1992.
BANBEIS for statistics about school going children (Primary and Secondary together) within age group 6-15).

Note: Waterways = Seasonal + Perennial

Table 4.2

Regional Variation in Physical Resource, Social and Infrastructure and Productive Establishment and Manpower

	Dhaka		Chittagong		Khulna		Rajshahi	
	Absolute No.	% of total	Absolute No.	% of total	Absolute No.	% of total	Absolute No.	% of total
Total Population 1991 (in million)	33.59	30.50	28.81	26.22	20.80	18.93	26.66	24.27
Labour force 1989 LFS (in '000)	15364	30.27	12662	24.95	10363	20.42	12354	24.34
Cultivable land (in acre)	5864	24.23	6084	25.14	5763	23.81	6489	26.81
Crop intensity 1991	181.23	-	160.95	-	160.94	-	180.52	-
No. of Industrial units	2309	48.18	1066	22.28	173	3.61	1243	25.93
No. of Handloom	286	17.48	300	18.34	-	-	1050	64.18
Others Units	2023	64.08	768	24.33	173	5.48	193	6.11
No. of Industrial Employment	282205	53.87	133513	25.48	75668	14.44	32488	6.20
Gas Reserve (BCF) 1991	325	1.52	21029	98.48	-	-	-	-
Electricity generation (MW) 1989	1220	56.75	588	27.35	277	12.88	65	3.02
Educational institution (Primary + Secondary)	15247	26.34	15156	26.19	12904	22.29	14570	25.17
No. of Post Offices	1852	22.77	2252	27.69	2444	30.05	1584	19.48
No. of Telephone	129611	57.94	48620	21.74	26241	11.73	19210	8.59
Road (Metalled + unmetalled) (km)	3235.70	23.75	4250.54	31.19	3018.64	22.15	3122.12	22.91

Source: BBS, Statistical Yearbook, 1992; BPDB, Annual Report, 1991.

Note: Intensity of cropping = Total cropped area - net cropped area x 100
Cultivable land = Total area - (area not available for cultivation + Forest area).

Major infrastructural facilities like transportation network, telephone, electricity, natural gas etc. are mostly concentrated in Dhaka and Chittagong. The infrastructural

facilities are mostly absent in Northwestern region except in a few places of Bogra and Rajshahi district. At the time of independence (1947) the country started with poor infrastructural endowments and attained afterwards a little progress in this regard. In the light of existing infrastructural facilities our attempt is to focus on the location pattern of selected industries in Bangladesh.

The chapter begins with two tables exposing national parameter with respect to physical and social infrastructure and regional variation in physical resource, social and infrastructural and productive establishments and manpower.

Afterwards it has been divided into three sections. The second section attempts to examine the location pattern and geographic distribution of major industries in Bangladesh. In this section, we first analyze the pattern of distribution of industries in four regions of Bangladesh and then attempt to examine the degree of concentration and or extent of localization of major industries. The concluding observations are presented in the third section.

4.2 Location Pattern and Geographic Distribution of Major Industries in Bangladesh

4.2.1 The Pattern of Regional Distribution of Industries

The process of industrialisation in Bangladesh began in the late fifties and gathered momentum in the sixties. Whatever

the pace of industrial development achieved, available information reveal that there are essentially three main belts of industrial activity in Bangladesh (Annexure-I); one covers the region from Joydevpur in the north and Savar in the west to Narayangonj in the south east in Dhaka, with pronounced concentration at Tongi, Tejgaon, Demra and Narayangonj. Other consists in the region from Sitakunda in the North to Kalurghat in the South in Chittagong, with three key spots at Kalurghat, Patenga and Faujderhat. The last belt extends from Phultala of Khulna in the north to Khulna city area, with main pockets at Khalishpur Daulatpur and Atra-Gilatola. There are of course, some industrial units scattered in the rest of the country with a few smaller pockets depending on the types of industry in Sylhet, Pabna, Comilla, Barisal, Rajshahi, Jessore and Tangail. The overall growth of industries, however, is virtually centralised in three big cities of Dhaka, Chittagong and Khulna. The relative degree of industrialisation in different regions is shown in Table 4.3 on the basis of percentage share of various regions in total manufacturing value added and employment along with their share in total population and economically active population. Table 4.3 also shows concentration ratio[2] in different regions.

The distribution of industrial employment without regard to the distribution of economically active population does not give a clear idea of the degree of concentration of industries in a given region. A more meaningful index of industrial

Table 4.3

Regional Percentage Share of Establishments, Value Added, Total Population, Economically active Population and Manufacturing employment and Concentration Ratio in Different Region

Region	No. of Establishment (in %)	Value Added	Total Population	Economically Active Population	Manufacturing Employment	Concentration Ratio
Dhaka	48.18	42.36	30.57	30.27	53.87	1.8
Chittagong	22.28	37.29	26.22	24.95	25.48	1.0
Khulna	3.61	13.17	18.93	20.42	14.44	0.7
Rajshahi	25.93	7.18	24.27	24.34	6.20	0.3

Source: BBS, CMI 1987/88, Population Census 1991

concentration can be obtained by determining whether a region's share in the industrial employment is larger or smaller than its share in the total economically active population. This has been done by working out the "concentration ratio" as presented in the above table for the year 1987/88, which shows significantly highest concentration in Dhaka region followed by Chittagong, Khulna and Rajshahi region. Percentage share of manufacturing employment is the highest in Dhaka and is higher than the percentage share of the region's economically active population giving rise to highest concentration ratio in Dhaka (1.8) while percentage share of manufacturing employment is the lowest in Rajshahi and is lower than economically active population of the region giving rise to lowest concentration ratio in Rajshahi (0.3).

Concentration ratio is higher in Khulna than in Rajshahi whereas number of establishments is larger in Rajshahi (Table 4.2 and 5.3) indicating lower average employment per establishment in Rajshahi (i.e. majority of the establishments are small sized).

Important factors responsible for the differences in the distribution of industries among various regions are evident from Table 4.2 and now briefly discussed here.

The factors explaining the locational pattern of manufacturing industries in Bangladesh may be classified into four major heads: (i) natural and physical factors, (ii) human factors i.e. labour force, (iii) acquired advantages and comparative advantages, (iv) other agglomeration factors and (v) infrastructural advantages.

Eva Muller and Morgan, James N.[3] however classified locational factors under two groups: (a) Cost and demand factors and Non-pecuniary factors. Cost and demand factors are labour cost, proximity to markets, availability of skilled labour, availability of power and fuel, water supply and climate, the tax bill and proximity to materials, transportation cost, etc. The non-pecuniary factor is industrial climate defined by Muller and Morgan as attitudes of the state and community toward industry.[4]

i) Natural and Physical Factors:

The natural and physical factors include (a) suitable physiographic and climatic conditions of the area, (b) its access and nearness to rivers, sea ports, raw materials, and finally (c) availability of transport facilities.

(a) Bangladesh consists of a low flat and fertile land except the hilly regions in the north-east and south-east and some areas of high lands in the north and north-western part. The flat and fertile land along with sub-tropical monsoon climate is suitable for agricultural crops. Land in the north-western districts and some part of Jamalpur, Mymensingh and even of Dhaka is suitable for sugarcane production leading to the growth of sugar industries in these areas. Land and climatic conditions in Sylhet, Chittagong and some parts of Comilla are favourable for the production of tea leading to localisation of tea industry in these areas.

(b) Access to the open Ocean is a major natural advantage for Bangladesh, through which there is easy access to the Indian Ocean and to the major lanes of the international shipping. Two major sea-ports are in Chittagong and Mongla. Industries based on imported heavy material (steel industry in Chittagong), fish processing industries and export oriented industries are thereby mainly localised by the coastal areas. It is better to

note here that though Chittagong is older as a port but before 1947 main port import trade was done through Calcutta.

(c) Cheap and adequate supply of power and fuel is the most essential ingredient for large-scale industrial undertakings. Dhaka and its surrounding industrial areas always enjoy the advantage of having easy access to the sources of power by virtue of being the capital city with all metropolitan facilities. The greater part of the electricity generated in Bangladesh is based on the use of local natural gas and hydro-power. About 77.80 percent of total electricity generation is based on natural gas and 10.13 percent on Hydro-project at Kaptai in 1990/91.[5] The other electricity generating projects are Siddhirganj Thermal Power Station, Ashuganj Power Station etc. However, the biggest single source of energy for power generation is natural gas, mainly the Titas Gas field; and the other source being imported fuel like furnace oil, diesel, shell gas etc.

The generation of electricity in the eastern zone of the country based on local hydro-power and natural gas is cheaper than power generated in the Western zone from imported fuel. This is one of the important factors helping localisation of industries in this area. The generation and supply in electric power in the northern

region is based on the production of mainly Saidpur and Thakurgaon Thermal Power Station and mini hydraulic power plant of Bheramara. The absence of sufficient hydro-power and natural gas along with regular load shedding are important unfavourable factors that hindered industrial growth in this region. Table 4.2 shows that electricity generated in the northern region is only 3.02 percent of the total supply of electricity generation.

(d) Nearness to market and nearness to raw materials are two important locative factors. Though very often they have pulled in opposite directions so that the advantages of the one have outweighed those of the other. Normally, plants are established where a transportational advantage ensures access to a substantial local market and adjoining markets. An orientation to market may be based on a weight or bulk gained in the process of manufacturing or on higher freight costs of the finished products than on raw materials. Industries producing perishable goods are also market oriented. Major markets in Bangladesh centre around Dhaka, Chittagong and Khulna and hence market oriented industries like cotton textile, food, drinks, glass factory, service industries have grown up there. On the other hand, when the raw materials needed for the industry is heavy and bulky and/or the output compact and can be easily transported, it is advantageous that the production plant be established

near the source of supply of raw materials. For example, sugar, paper, cement and fertilizer industries.

(e) Transportation facility very often happens to be the most important single determinant of the location of a manufacturing enterprise. Good circulatory system for procurement of raw materials and distribution of finished products is an essential pre-condition for industrial development of any particular area. Bangladesh, with a net work of road, railway and water way transport system, still lags behind well-developed transportation frame work every corner of the country. A few exception are the urban areas of Dhaka, Chittagong and Khulna facilitating industrial concentration in these areas. Water ways play the most vital role and provide the cheapest means of transport for the industrial and commercial development of the country, especially in the riverine areas of Dhaka, Chittagong and Khulna. In the non-riverine areas, especially in the northern region, the railways and roads are the major arteries of commerce and transportation. However, Table 4.1 and 4.2 present some statistics about national (time series) and regional availability of social and infrastructural facilities for a particular year. Evidences show that transportation facilities (road, water and railway) are not very remarkably available for industrial development of the country as a whole. It is evident from table 4.1 that availability of

road facility is only 1.24 km, railway facility is 0.25 km and waterway facility is 0.54 km per thousand of population in 1990/91 in Bangladesh which is surely far from requirements. Rajshahi with 22.91 percent of total metalled and unmetalled road availability lacs behind desired industrial development due to absence of other facilities, mainly electricity, natural gas and availability of skilled labour force.

ii) Human Factors

Human factors as one of the important determinant of the location of manufacturing industry relates to the availability of skilled entrepreneurial capacity and skilled industrial, managerial and operative manpower. The history of industrial growth of this country reveals that the earliest location of all the jute, cotton and specialised textile mills are accounted for partly but significantly by the availability of entrepreneurship in the respective areas, especially in the places of birth or residence of the entrepreneurs. In the sixties, the then Bangladesh experienced growth of Bengali industrialists through a system of sponsored capitalism supported by political patronization on the one hand, reinforced on the other by political opposition demanding parity in developmental allocations.[6] Concentration of private sector industries in the cities of Dhaka, Chittagong and Khulna is mostly the outcome of the migrant entrepreneurs

from India or rural Bangladesh (Noakhali in case of Khulna and Dhaka).

In the case of cottage industries like handloom and blacksmithy, where special skill is critically important, the availability of skilled labour becomes the predominant locational factor. Thus, the growth of handloom industry in Narsingdi, Serajgonj, Brahmanbaria, and Tangail are mainly the results of predominant availability of special hand weaving skill in these areas. However, the supply of unskilled labour in the industrial sector comes from villages as temporary migrants because of the pauperization process which makes villagers landless or jobless.[7]

iii) Acquired and Comparative Advantages

With the establishment of one or a few industries in a particular area of any reason or other, the area gradually developed a good transportation links with other areas providing apply of raw materials and marketing facilities. The area also accumulates certain more commercial advantages for itself like warehousing, storage, banking, insurance, professional services etc. These add to the superiority of the area over other potential rival and attract other entrepreneurs to set up industries in the area. This situation may be termed as industrial climate which might act as an important factor in determining location of manufacturing plants. The growth of industrial areas of Dhaka, Chittagong

and Khulna, for example is the outcome of such acquired climate. At the initial stage, it is assessed that some entrepreneurs were encouraged under government patronage to set up industries in these areas. Gradually other advantages like skilled manpower, power supply financial institutions, training institutes etc. cumulated and subsequently expansion of industries from a few metropolitan urban areas to adjoining areas took place. For example Industrial concentration at Narayangonj, Tejgaon, Tongi and Demra in Dhaka contain a pool of second generation skilled labour and special education institutions such as College of Textile Engineering and Technology, Bangladesh Institute of Leather Technology and Bangladesh Institute of Glass and Chemical all in Dhaka, geared to the needs of especially jute and cotton textile, leather and Glass and Ceramic industry to help the firms to reduce cost of training of their workers. Moreover, many enterprises producing tools and equipment for these industries have grown up in these areas. Thus location of an initiating industry has helped growth of industries supplying inputs (backward linkages) and rise of industries that utilize its products (forward linkage).

Thus, we observe an expansion of industrial area from Narayangonj to Polash, Savar, Gazipur, Tongi and Demra in Dhaka; from Kalurghat to North Kattali, Baushbaria, North Patenga and Fouzderhat in Chittagong; and from Khalishpur to

Daulatpur, Atra Guilatola and the adjoining areas in Khulna (Annexure I).

iv) Other Agglomeration Factors

Apart from factors described above, there are still other factors explaining distribution of industries in Bangladesh. These are (1) Internal economies of scale, (2) External economies of scale, (3) Government Policy etc.

Internal economies of scale large enough for some single firm often help creation of an industrial estate. For example the industrial estate of Adamjeenagar at Narayangonj was created by Adamjee Jute Mill, Aziznagar in Chittagong was created by Azizuddin Industries, Jamilnagar at Bogra was created by Jamil Soap Factory etc. In the following chapter we shall discuss about creation of BSCIC industrial estates.

External economies of scale available to industries of the same or unlike nature reduces costs in terms of transport cost, labour cost etc. as different industries have grown up in one place. These economies, in other words, may be better described as economies of urbanisation. The growth of industrial areas of Dhaka, Chittagong and Khulna is the result of this urbanisation.

The importance of government policy as locative factor cannot be over-emphasized. This we are going to discuss in the following chapter.

4.2.2 Degree of Concentration and Extent of Localisation of Industries in Bangladesh

The most useful measures of the locational distribution of industries are the co-efficient of localization[8] and location quotient.[9] These are indications of the extent to which on industry is, or not, distributed through out the country in a manner which corresponds to the geographic distribution of all the industries. In Bangladesh, the large scale industries, mainly, have tended to cluster in and around a few urban centres like Dhaka including Narayangonj and Chittagong (Table-4.3). According to CMI Report, 1987/88 more than 48% of industrial establishments contributing about 42% of total manufacturing value added are in Dhaka and about 22% establishments contributing about 37% of manufacturing value added are in Chittagong. Of 3.53% of total establishments contributing about 13% of value added in Khulna, jute, cotton, sugar, pulp and paper industries belong to large sector and of 25.93% of total establishments contributing only about 7% of manufacturing value added in Rajshahi region a few large industries are sugar, jute, cotton, paper and drugs & pharmaceuticals. Out of 1243 establishments in Rajshahi region (Table 4.1) handloom alone constitutes 1050 units in Serajgonj.[10] Small scale industries, however have tended to disperse all over the country in many small towns and sub-urban areas.

The co-efficient of localisation of some selected major industries in Bangladesh are provided in Table 4.4 which illustrates the extent of localisation of these industries.

Table 4.4

Co-efficient of Localisation of Some Selected Major Industries in Bangladesh

Sl. Code	Industries	Co-efficient
3123	Sugar	0.53
3141	Cigarette	0.21
3211	Cotton Textile	0.10
3213	Jute Textile	0.10
3214	Silk Synthetic Textile	0.14
3216	Handloom	0.40
3241	Leather (Tanning and finishing)	0.30
3411	Pulp and paper	0.48
3511	Drugs and Pharmaceuticals (Allopathic & Medicine)	0.14
3524	Fertilizer	0.38
3692	Cement Manufacturing	0.72
3711	Steel & Engineering	0.72
3713	Iron and Steel rerolling	0.17

Source: BBS, CMI 1987/88. Computed from figures given against particular industry against particular region. Methodology followed has been that used by P.S. Florence.

It shows that among the industries under consideration highest co-efficient of localisation are recorded by steel and cement manufacturing industries followed by Sugar, Paper,

Handloom, Fertilizer and leather industries in order. On the other hand, cotton and Jute, textile industries mark the lowest co-efficient of localisation being followed by silk and Synthetic, Drugs and pharmaceuticals (Allopathic and Medicine). Iron and steel rerolling and cigarette manufacturing industries in order. This indicates that these industries with low co-efficient of localisation tend to be highly dispersed unlike those industries with high co-efficient of localisation meaning their high concentration in particular places.

The co-efficient of localisation, however, is not a sufficient measure to indicate the degree of spatial concentration of industries in different regions. For this we need to compute a second index called "Location Quotient"[11] which we present in Table 4.5 for the above mentioned selected industries in different regions.

Location quotient shows the number of times an industry's concentration in a region is greater than (or less than) the overall concentration of industry there. For example, the table shows the highest concentration of handloom industry (more than ten times greater than other industries in the region) in Rajshahi followed by sugar, cotton textile, jute industry and drugs and pharmaceuticals. Jute textile appears with highest concentration in Chittagong followed by cotton textile. In Khulna region concentration is the highest in jute

Table 4.5

Location Quotient of Some Selected Large Industries in Different Region

	Dhaka	Chittagong	Khulna	Rajshahi
Sugar	0.03	-	0.43	7.23
Cigarette	0.02	0.01	0.04	0.04
Cotton Textile	0.26	0.53	0.72	3.60
Jute Textile	0.60	1.37	1.20	2.96
Silk & Synthetic Textile	0.02	0.11	0.01	0.31
Handloom	0.02	0.12	-	10.22
Leather (Tanning & Finishing)	0.03	0.01	0.00	-
Ready-made garments	0.13	-	0.02	-
Fertilizer	0.01	0.12	-	-
Pulp & Paper	0.00	0.11	0.21	0.49
Drugs & Pharm. (Allopathic & Medicine)	0.06	0.07	0.07	0.71
Cement	-	0.04	-	-
Steel & Engineering	-	0.11	-	-
Iron & Steel re-rolling	0.03	0.07	0.02	0.05

Source: BBS, CMI 1987/88.

textile followed by cotton textile and sugar industry. Figures for Dhaka region do not show much concentration in a particular industry. Yet jute textile appears with highest concentration here compared to other industries. The most interesting point to note here is that except steel and cement industries (among above industries) all other are more or less

dispersed to different region while the above two industries are entirely concentrated in Chittagong region.

4.3 Concluding Remarks

From the foregoing analysis it follows that the Dhaka conurbation is the main area of concentration of industrial and economic activities followed by Chittagong and Khulna, Rajshahi being the least developed area.

The locational factors responsible for the existing pattern of distribution of major industries in Bangladesh are its natural assets, available raw materials and cheap and skilled supply of labour. Moreover, the location of an initiating industry in developed regions has subsequently generated the growth of other industries supplying inputs and utilizing products. Thus there have sprung up many industries in those areas. The inter-industry linkages have a very important bearing upon locational choice and on the successful growth of manufacturing centres of Dhaka, Chittagong and Khulna.

Footnotes

1. Ahmad, Muzaffer - Labour Management Relation in Bangladesh - a study in participation, p.1.

2. Concentration Ratio = Percentage Share of a region in the total industrial employment divided by percentage share of the region in the total economically active population (Population above 10 years of age) in the corresponding area.

3. Eva Muller and Morgan, James N. - "Location Decisions of Manufacturers," University of Michigan, American Economic Association, May 1962, p.2.

4. Opcit., p.207.

5. BBS, Statistical Yearbook 1992.

6. Ahmad, Muzaffer, Ibid, p.13.

7. Ahmad, Muzaffer, Ibid, p.45.

8. Co-efficient of localization: it is the sum of the plus deviations (divided by 100) of the regional percentages of workers in the particular industry from the corresponding regional percentages of workers in all industry.
   P.S. Florence - Investment Location and Size of Plant, p.34.

9. Location quotient:

$$L.Q. = \frac{\text{Regional Percentage of workers in a particular industry}}{\text{Regional Percentage of Workers in all Industries}}$$

O.Malley - Irish Industry; Structure and Performance, p.3.

10. For our study we considered Serajgonj constituent part of Rajshahi region, though in CMI 1987/88 it is considered within Dhaka Division after the recent changes in administration arrangement of the Division and Districts.

11. O. Malley, Op.cit., p.3. Methodology followed that has been used by O. Malley.

CHAPTER 5

INDUSTRIAL LOCATION POLICY OF BANGLADESH

5.1 Introduction

The industrial background of Bangladesh had its origin during the Pakistan regime. In 1947, when Pakistan came into being Bangladesh, the then East Pakistan, possessed only a handful of modern industrial units, a few cotton Textile Mills (Dhakeswari, Laksmi Narayan Cotton Mill at Narayangonj, Mohini Cotton Mill at Kushtia, National Cotton Mill in Chittagong etc.) a few Sugar Mills (at Darshana, Setabgonj, Gopalpur), one cement factory at Chattak (Assam Bengal Cement Factory), a number of jute bailing presses located mainly at Narayangonj, Chittagong and a few tea processing industries in Sylhet.

At the time of independence (1947) the country also started with poor infrastructure and transportation system of problem with which the new Government had to come to terms. A basic requirement for industrial growth is the availability of infrastructure (power, water, transport, communication etc.) which, in most countries is operated by the public sector. The legacy of industrial backwardness and poor infrastructure of Bangladesh owes to the utter negligence and the colonial policy of the British Government. The piecemeal development

that took place during that era was concentrated mostly in West Pakistan.

In the years following independence, this area of Bangladesh, however, experienced increasing concentration of economic activities at selected locations and disparity in economic welfare among different regions of the country. The Government of Pakistan adopted a series of measures influencing the location of manufacturing establishments for promoting industrial and regional development in this country. Soon after the fall of Pakistan Government, the Government of Bangladesh announced its own industrial policy designed to promote regional development through several incentives and measures that have been adopted to encourage dispersal of industrial growth to less-developed areas.

This chapter attempts to highlight the industrial location policies of Bangladesh starting from the time of independence in 1947. The chapter has been divided into four sections. The second section is a review of industrial Location Policies in Bangladesh. Section 3 presents an over all assessment of industrial location policies and the concluding remarks are presented in the last section.

5.2 Review of Industrial Location Policies in Bangladesh

The industrial location policies in Bangladesh can be discussed in the light of industrial policies influencing

inter-regional distribution of industries and growth. The industrial policy in Bangladesh can be divided into two periods (a) the period beginning from 1948 January to 1971 during the Pakistan regime and (b) the period from 1972 to date.

(a) Industrial Policy During the Pakistan Regime

During 1948-58 there was no conscious policy of the then Government for the disposal of industries in Bangladesh. It is as late as in April 1959 when regional development issues acquired some significance and the then Government introduced Tax Holiday Scheme providing for tax holidays for the industries ranging from 2 to 8 years to 2-6 years. This revised scheme granted tax holiday of four years for the industries located in the cities of Dhaka, Narayangonj, Chittagong and Khulna and the areas within ten miles of the municipal limits of these cities. A tax holiday of six years was granted to the industrial units located in the rest of Bangladesh. Thus special attention was given to the economically backward areas. Still industrialists preferred urban centres like Dhaka, Chittagong and Khulna for industrial establishments, except of course where proximity to raw materials became an overriding consideration, as for example, the case is with sugar industries.

The most interesting point to note is that during Pakistan regime the government's direct investment in industry had

taken place through PIDC (Pakistan Industrial Development Corporation) as soon as it began functioning in 1952. PIDC established industries in Fenchugonj, Khulna, Narayangonj, Chandraghona, Chandpur etc. PIDC has been bifurcated in 1961.[1] The EPIDC established a good number of jute industries localised at Khulna, Dhaka, Narayangonj, Ghorashal, Serajgonj, Chandpur, Mymensingh, Kishorgonj, Kuliarchar, Panchagarh, Mobarakgonj, Norsingdi and Chittagong etc. The corporation also established some sugar mill, a newsprint mills and a hardboard factory at Khulna, a fertilizer factory at Fenchuganj, in 1968 etc. Almost all the big industries of the then East Pakistan owe their existence to the direct assistance of PIDC/EPIDC.

(b) Industrial Policy in Bangladesh

The emergence of Bangladesh in 1971 entailed a radical change in the pattern of industrial ownership and policy. The industrial base of the country, which was not very large to start with suffered a heavy set-back during the war of liberation. Development policies and programmes in the initial years after liberation, therefore, deliberately concentrated on repairs, rehabilitation and consolidation so as to restore health of the sector at pre-liberation level and also on some new investments such priority areas as would establish firm agro-industrial linkages through provision of essential agricultural inputs (i.e. fertilizer, tools and implements

etc.) and processing of agricultural output, reduce dependence on import of essential consumer goods and provide job-opportunities.

By virtue of the Nationalisation Order of 1972, the public sector owned the largest share of the country's industrial assets after liberation and the role of the private sector in the industrial development of the country was reduced to a minimum. However, the government came to recognize the necessity of the private sector in the interest of economic development and in 1974 additional incentives for private sector investment were given along with raising of investment ceiling from Tk. 2.5 million to Tk.30.00 million. Later on in view of higher investment cost, the ceiling was raised to the 100 million in 1975 and in 1978 however, the government decided to totally waive the ceiling for private sector investment.

The new investment policy announced in January 1973 under which the Industrial investment schedule was issued in August, 1973, had been reviewed in July 1974. The New Investment Policy set forth the following principles for dispersal of industries:

(1) With the development of basic infra-structure and service facilities, such as power, transport, communication and credit industries are to be dispersed all over the

country, particularly outside the industrially developed areas of Dhaka, Chittagong and Khulna.

(2) Particular emphasis needs to be given to labour intensive small and medium size, industries for creating employment opportunities and producing essential commodities within the country.

(3) With a view to encouraging industrial activities in industrially backward areas outside the industrial zones of Dhaka, Chittagong and Khulna certain monetary and fiscal incentives such as rebate of custom duty, deferred payment of 50 percent customs duty on machinery, etc. were granted and tax holiday was given for a period up to 7 years. Policies regarding "Pay as Your Earn Scheme", suppliers' credit, investment by overseas Bangladesh were to continue.

In 1976, however, the Government's decision to accelerate the process of disinvestment of a number of abandoned and taken over industries through public tender and also to return the takeover industries belonging to the Bangladeshis created a favourable climate to the private sector investment. In 1978 the policy package for attracting private investment was further improved and streamlined and the New Industrial Investment Policy of Government was announced on September 9, 1978. The process of a shift in policy and a lift towards the private sector continued and culminated in the NIP (New

Industrial Policy) announced in June, 1982.[2] The NIP '82 provided the setting for determined push towards privatization and it assigned the private sector the major role in industrial development and restricted the exclusive role of the public sector to a limited number of industrial activities. Accordingly, large-scale denationalization was carried out at rapid pace. The NIP '82 also attempted to introduce various "liberalization" measures by waiving regulatory provisions pertaining to investment sanctioning, tilting from import substitution to export promotion, expanding incentives to foreign private investments. The Revised Industrial Policy of 1986 (RIP '86) and subsequent policy reforms (1991) were designed to strengthen these measures further. In RIP '86 all industries except seven strategic industries of the reserve list were open for private investment.[3]

In view of geographical concentration of industrial activity around Dhaka with large industrial complex at Narayangonj, Demra, Tongi, Joydevpur, Ghorashal, Norsingdi and the Metropolitan cities of Chittagong and Khulna, the Government of Bangladesh in the "New Industrial Policy" assured to promote regional development through fiscal incentives and facilities. For the purpose of fiscal incentives the country has been divided into "developed" and "less developed" areas. The developed area consists of the Metropolitan cities of Dhaka, Chittagong and Khulna.

A variety of monetary and fiscal incentives are offered by the Government in the policies to attract entrepreneurs to establish industries in less developed areas. The major incentives and measures[4] are discussed below.

5.2.1 Fiscal Incentives

Concessionary rate of import duty: The rate of import duty on machinery and equipment for setting up new industries and for balancing modernisation, replacement and expansion of existing industries with sanctions of the competent sanctioning authorities will be -

i) For developed areas - 15% ad-valorem (no sales tax)

ii) For less developed area - 2.5% (no sales tax)

iii) For BSCIC Industrial Estate located in the developed areas - 2.5% (no sales tax).

iv) Export oriented industries (with commitment of 80% production) irrespective of location and industries using 70% or more local raw materials (called priority industry) will continue to be entitled to a concessionary rate of 2.5% duty.

v) For essential and selective industries there will be rebate of 25% in excise duty on the additional production if such manufacturing units produce more than 100% of their sanctioned capacity.

vi) Special fund will be created to subsidize costs of fuels by recognised industrial units in less developed areas by diverting profit from the gas sector.

5.2.2 Tax Holiday

i) Tax holiday is allowed for 5 years for developed areas, 7 years for less developed areas, 9 years for least developed areas and 12 years for special economic zone areas and will remain valid upto 1995.

ii) All enterprises in fish farming, poultry farming, duck farming, cattle farming, dairy farming and horticulture have been allowed tax holiday for a period of 10 years irrespective of location.

iii) An industrial undertaking seeking tax holiday and set up in a developed area is required to re-invest 30% of its profit in the industrial undertaking from which such profit has been derived or to invest the same in the purchase of bond issued by the Government. The percentage of re-investment will be 15% in respect of an industrial undertaking set up in a less developed area.

In addition the Industrial Policy 1991 includes that-

iv) An Exchange rate Fluctuation Absorption Scheme (EFAS) to be introduced to protect entrepreneurs from fluctuations of exchange rate of domestic currency with foreign currency.

v) The provision for Accelerated Depreciation Allowance upto 80% to 100% to be introduced.

5.2.3 Additional Incentives to Export Oriented Industries

i) Concessional interest rate in the case of pre-shipment and packing credits;

ii) Provision of 90% of requirement of working capital against irrevocable letter of credit by the commercial banks;

iii) Income tax rebate on export ranging from 30% to 100% of tax attributable to export sales;

iii) For export oriented industries and those located in less developed area, the rate of interest to be charged by the financing institutions will be one percent less than that charged for developed areas;

v) The facility under the Export Guarantee Scheme will be given more extensive to the export-oriented industries;

vi) To eliminate delays in duty drawback a National Import Duty Drawback Scheme (NIDDS) for exporters has been introduced;

vii) Export oriented industries are also allowed to operate under Bonded Warehouse System when duty free import of raw materials and export is allowed;

viii) A National Committee for Industrial Development (NCID) has been constituted for sanction of all foreign investment.

5.2.4 Export Processing Zone

Industrial Free Zone or Export Processing Zones have been used as an important instrument for the promotion and development of export oriented industries. These consist of customs free privileges and special incentives provided in scheduled zones having developed land, factory, building, water, electricity, telecommunication, transportation and other infrastructural facilities for the convenience of the operating firms accelerating the process of industrial development through attracting foreign investment for transfer of technology, expansion of employment opportunities and foreign exchange earnings.

In view of shortage of indigenous industrial raw materials but a large availability of cheap and trainable labour, low cost of energy and reasonably developed infrastructural facilities

(shipping facilities in Chittagong and air facilities in Dhaka), two EPZ, one at South Halishahar in Chittagong and another at Savar (Zirani) in Dhaka have been established.

5.2.5 Industrial Land

The industrial location policy of Bangladesh encouraged the development of industrial land with requisite infrastructural and utility facilities such as approach roads, electricity, gas, water, telecommunication etc. to make them available to entrepreneurs managed by the local development authorities, the Ministry of Works for quick implementation of the sanctioned projects. The industrial areas under different regions are presented in the following tables:

Table 5.1

Development of Industrial Lands by Region

Regions	Industrial Land
Dhaka	(1) Postagola, (2) Tongi, (3) Tejgaon, (4) Savar, (5) Hazaribag (only for tanning industry), (6) Shampur, (7) Mohammadpur (Mirpur and Mohammadpur area primarily meant for small and cottage industries).
Chittagong	(1) Kalurghat, (2) Fouzdarhat and (3) Nasirabad
Khulna	Khulna Industrial Area
Rajshahi	BSCIC Industrial Estates

Besides, Bangladesh Small and Cottage Industries Corporation (BSCIC) had 20 Industrial Estates by 1960s. For massive development of small and cottage industries BSCIC had undertaken more areas under industrial estates and by the end of 1990 the total possible industrial estates had been estimated to be 86. The region-wise location of the BSCIC Estates are given in table 5.2.

Table 5.2

Region-wise Location of BSCIC Industrial Estates

Region	Industrial Estates under BSCIC
Dhaka	Tongi, Mymensingh, Rajbari, Savar, Joydevpur, Kaliakair, Munshigonj, Manikgonj, Tangail, Narayangonj, etc.
Chittagong	Sholoshahar, Kalurghat, Fouzderhat, Comilla, Feni, Sylhet, Cox's Bazar, Bandarban, Patia, Khagrasari, Rangmati etc.
Rajshahi	Rajshahi, Rangpur, Dinajpur, Bogra and Pabna.
Khulna	Khulna, Jessore, Kushtia, Swarupkati and Barisal.

BSCIC however will set up a number of new Industrial Estates in the country, particularly at the Thana and Sub-Division level keeping in view the industrial potentials there. BSCIC will also develop one Industrial Estate at Savar and the other at Joydevpur. The present position of BSCIC industrial estates (upto 1991) is evident from Annexure I. It shows areas under development besides areas already developed. Available

evidence show that BSCIC industrial estates suffer from mainly following constraints:

(a) Selection of some inappropriate location lacking transport facilities for access to market and sources of raw material.

(b) Lack of entrepreneurship.

(c) Marketing problems.

(d) Lack of utilities (water, electricity etc.) in rural areas.

5.2.6 Industrial Financing

The industrial Location Policy of the Bangladesh Government needs to be well supported by financial institutions. Development Finance Institutions (DFIs) have played a major role in the development of entrepreneurship in Bangladesh since the 1950s. The Pakistan Industrial Finance Corporation (PIFCO) was set up in 1949 to extend loans to private entrepreneurs in setting up industries. The need to accelerate the pace of industrialization in Pakistan demanded access to foreign exchange financing. To this end in 1957 Pakistan Industrial Credit and Investment Corporation (PICIC) was set up. Industrial Development Bank of Pakistan (IDBP) was set up in 1961 with a view to widening the base of entrepreneurship and financing medium sized industries and took over the assets

and liabilities of PIFCO.[5] The post-liberation period between 1972-75 experienced DFI extending loans to public sector borrowers. After 1975, with the end of privatisation the World Bank and the Asian Development Bank extended sizeable credit lines to the private sector through the DFIs, the Bangladesh Shilpa Rin Sangstha (BSRS) and the Bangladesh Shilpa Bank (BSB) the successor organisation of IDBP. Investment Corporation of Bangladesh (ICB) to a limited extent, for equity investment and underwriting, bridge financing and the commercial banks for short term working capital funds. In addition to usual loan financing by BSB/BSRS upto 70% of the total cost of the project for less developed area and 60% for other area and upto 80% for projects of exceptional merit and viability. ICB underwriting facility is available for public limited companies upto 60% of the equity. This ensures upto about 88% financing for a large number of projects in the less developed areas. A National Committee for Industrial Development (NCID) has been constituted for sanction of all foreign investments.

Since the liberation of Bangladesh and particularly since 1975 the Development Finance Institution (DFI) in Bangladesh have made a significant contribution to the financing of industrial investment in Bangladesh. The two DFIs, BSB and BSRS have between them sanctioned Tk.7919 million as term financing as between 1971 to 1984.[6] These DFI loans have financed investment estimated at the 13213 million directed to 1132

investment projects of which 918 are new units and 214 are existing projects, for Balancing, Modernisation and Replacement of Equipment (BMRE). These investments are projected to create 72,281 new jobs. Around 95% of the new investments have been directed towards the private sector. The regional breakdown of investment by DFIs (Table 5.3) shows an inoptimal distribution of investment located in developed metropolitan areas with its concomitant infrastructural support. Which is surely noticable for the uneven industrial growth throughout the country. It is evident from the table that the two DFIs have sanctioned (44% of total investment) and 43% of total loan in 517 units in Dhaka constituting 45% of total sanctioned units creating 32124 (45% of the total job opportunities.

The regional concentration of industrial investment is further highlighted when all Chittagong area is added to the all Dhaka region. Together this area accounts for more than two third of the total number of units, investment, loans and employment.

Table 5.3

Area Wise Breakdown of DFI Investment & Loan during 1975-1984

(In million taka & number)

Area	No. of Units	Total Investment	Total Loan	Employment creation
Dhaka Metropolitan in %	256 (22.61)	2917.92 (22.08)	1618.42 (21.06)	14763 (20.42)
Dhaka (all region) in %	161 (23.06)	2919.98 (22.10)	1756.69 (22.86)	17361 (24.82)
Chittagong Metropolitan in %	81 (7.16)	1215.50 (9.20)	691.20 (9.00)	8163 (11.29)
Chittagong (all region) in %	179 (15.81)	2300.09 (17.41)	1313.42 (17.09)	11866 (16.42)
Khulna Metropolitan in %	27 (2.38)	261.59 (1.98)	163.61 (2.13)	1310 (1.81)
Khulna (all region) in %	145 (12.81)	1370.73 (10.37)	835.10 (10.87)	9243 (12.79)
Rajshahi in %	183 (16.17)	2226.59 (16.85)	1305.08 (16.99)	9575 (13.25)
Total in %	1132 (100)	13213.27 (100)	7683.52 (100)	72281 (100)

Source: Rehman Sobhan, Debt Default to the Development Finance Institutions, The Crisis of State sponsored Entrepreneurship in Bangladesh, University Press Limited. Table V-A, p.96.

5.3 An Overall Assessment of Industrial Location Policy

In the last section we discussed industrial location policy during Pakistan period and post liberation period. In the present section we attempt an overall evaluation of industrial location policy, which involves probing into the justification and rationale of these policies. It appears that these

fundamental issues have not been adequately sorted out by the policy makers. As a result, locational policies so far pursued have not been proved effective and regional disparities in industrial development have been marked in Bangladesh, as we have seen in Chapter 3 and 4.

From the analysis of the pattern of industrial location it is found that (i) the district of Dhaka with industrial complexes at Narayangonj, Demra, Tongi, Joydevpur, Ghorasal and Narsingdi is the leading industrial centre of Bangladesh, (ii) Dhaka is closely followed by the metropolitan areas of Chittagong and Khulna, (iii) with lion's share of the industrial growth going in 3 metropolitan areas, industrial growth in the other part of the country has suffered (Table 5.4).

The table shows regional distribution of industrial establishments in absolute number and percentage. It is interesting to note large number of industrial establishments in Rajshahi with minimum manufacturing value added (7.18%) and employment (6.20%) than in Khulna (Table 4.3). This is because of the fact that the number of handloom industry under textile group in Rajshahi (1050 units in Serajgonj) alone constitutes 64.18 percent of the total number of handloom industries (Table 4.2), while there is no single unit of the type in Khulna. On the other hand the shares of Khulna in manufacturing value added and employment are 13.17 and 14.44

Table 5.4

Regional Distribution of Industries by Major Group

Code (1997/1998)	Dhaka		Chittagong		Khulna		Rajshahi		Total	
	81/82	87/88	81/82	87/88	81/82	87/88	81/82	87/88	81/82	87/88
311-312 Food Mfg. Industry	148	195	248	306	21	53	73	81	491	635
313 Beverage Industry	3	3	2	2	1	1	x	x	6	6
314 Tobacco Industry	13	9	5	3	5	8	6	3	29	23
315 Animal food & by-products	x	x	x	2	x	1	x	x	x	3
321-322 Textile	782	813	162	383	27	33	327	1087	1298	2316
323 Wearing Apparels	19	81	3	2	x	1	x	x	22	84
324 Leather & its product	101	120	15	11	1	1	x	x	117	132
325 Footwear	6	5	x	x	x	x	x	x	6	5
326 Jute pressing & baling	11	12	x	1	6	7	4	3	21	23
331 Wood & wood product	16	23	7	6	1	3	x	x	24	32
332 Wooden furniture	9	7	3	5	3	4	1	2	16	18
341 Paper & paper product	20	19	7	7	1	1	1	1	29	28
342 Printing & Publishing	122	126	22	35	2	9	6	10	152	180
351 Drugs & Pharmaceuticals	127	111	35	39	15	13	17	23	194	186
352 Chemical industries	15	14	5	11	x	x	x	x	20	25
353 Other chemical industries	131	131	58	68	5	10	11	10	205	219
354-355 Petroleum refineries & Prod.	x	9	2	6	x	x	x	x	2	14
356 Rubber products	28	28	2	7	x	x	x	x	30	35
357 Plastic Products	36	38	2	4	2	1	x	x	40	43
361 Pottery & china ware	4	6	x	x	x	x	1	1	5	7
362 Glass products	35	28	2	3	x	1	x	x	37	32
369 Non-metallic products	10	14	6	6	x	1	x	x	16	21
371 Iron & Steel	32	40	12	15	3	4	x	1	47	60
372 Non-ferrous metal industries	x	x	x	2	x	x	x	x	x	2
381-382 Fabricated metal product	157	212	85	100	6	5	12	15	260	332
383 Machinery ex-electrics	88	98	16	15	16	10	1	2	121	125
384 Electrical machinery	40	70	16	7	3	3	1	2	60	82
385 Transport equipment	26	36	4	8	1	2	1	2	32	48
387 Photographic & opticals	6	6	x	x	x	x	x	x	6	6
393-394 Other mfg. industries	53	56	15	14	3	1	x	x	-	71
TOTAL	2038	2309	734	1068	122	173	462	1243	3356	4793
Percentage of total	60.72	48.18	21.87	22.28	3.64	3.61	13.76	25.93		

Source: CMI 1981/82 and 1987/88.

percent respectively. Out of 2309 establishments in Dhaka and 1068 establishments in Chittagong regions 286 and 300 are handloom units. However, large units are almost concentrated in Dhaka and Chittagong with Khulna in the third position.

The concentration of industries in the 3 metropolitan area of Bangladesh and the uneven distribution of industries throughout the country is due to unequal infrastructural development and defective Government Policies.

Let us discuss these in details:

(a) We know that the basic requirement for industrial growth is the supply of infrastructural facilities like power, water, transport, communications, etc. which are in most countries operated by the public sector. Infrastructural investment in Bangladesh has often been based on political judgement than on sound economic analysis. The faulty allocation of infrastructural investment has led to uneven infrastructural growth leading to distortions in the location of industries. The case of Jaipurhat Limestone Mine and Cement Complex is a case in point.[7] A sum of Tk. 36 cores has already been spent so far for the infrastructural development works but the project now in its almost 20th year with an on-going character is, yet not off the ground. New questions about its viability have been raised by certain quarters though its techno-

economic viability has firmly been established through a number of studies.

(b) The creation of Industrial Estates under BSCIC failed to attract even small entrepreneurs to set up industries in the northern region after liberation. Industries, rather established in the pre-liberation period in those estates, like Hosiery, light engineering workshops, small press, shoe factories, aluminium, ware-nail industries, food and allied industries, paper printing and publishing, etc. ceased to exist for multifarious reasons. The most important reasons are non-protection of their manufactured goods in the post liberation period, inadequate and haphazard arrangement of working capital, absence of proper compensation with the war-ravaged units, loss of entrepreneurs due to war, insufficient raw materials, etc. These industrial estates merely meant wastage of resources. The cases of example, are with the BSCIC industrial estates of Pabna and Rajshahi.

(c) Among other reasons the important one is that the private entrepreneurs are often interested to establish industries in urban areas with complete neglect to the social hazards and pollution and consequent adverse effect on surrounding environments. No significant remedial measures were taken to prevent concentration; rather further expansion of the metropolitan cities took

new moves helping disparities. Moreover, it is observed that certain regions and areas possess industrial potential but entrepreneurs do not invest there because of high risk and lack of government initiative.

(d) We can quote here some specific problems with industrial policy, that were communicated to me by the respondents in course of my survey related to the private industries.

i) Local industries are facing competition with foreign goods both in terms of quality and price.

ii) Regular load shedding hampers production to a great extent.

iii) Workers' unrest is responsible for lower production and sustaining loss.

iv) Industrial as well as import policy regarding import of raw materials is not liberal.

v) Liquidity crisis is a great problem. Want of working capital results in serious liquidity crisis.

These problems, however, can never be solved in our country without proper and sincere initiative and interference by the government.

Evidences show that the main reasons for the industrial stagnation in Bangladesh are lack of confidence in the stability of policies, bureaucratic sloth and poor

implementation of policies, labour code unfavourable to the employer, indiscipline among workers, high cost of electricity, high returns and low risk in trade and smuggling relative to manufacturing production, widespread corruption, political patronage and too many formalities and sanctions that the industrialists have to go through which take a long time, during which government officials have to be entertained.[8]

(d) The incentives for less developed areas mentioned in the industrial policy of Bangladesh are yet to attract entrepreneurs to establish industries in these areas. Entrepreneurs, rather become interested to set up industries in the less developed areas which are in close proximity to metropolitan cities to take advantage of the infrastructural facilities than to going for less developed areas in the northern region.

5.4 Concluding Remarks

From the foregoing discussion on Government policies and measures designed to locate industries in different regions of Bangladesh we conclude that (i) the industrial growth in Bangladesh has been concentrated in three metropolitan cities of Dhaka, Chittagong and Khulna, with Rajshahi being the least developed area, (ii) uneven infrastructural development is one of the important factors responsible for this inoptimal pattern of industrial growth, (iii) the government policy

influencing industrial location in different regions is plagued with numerous limitations. These failed to attract new entrepreneurs to set up industries, (iv) infrastructural investments along with incentives and subsidies, especially in the form of power, fuel and transport facilities are considered more effective measures for speedy industrialization in less developed areas.

Even to save and nourish the existing industries (specially in the private sector) government should carefully design the industrial as well as the import policies and do the following: (a) Domestic ill-fated industries must be saved by protection, (b) Private sector must be carefully considered and discussed before any announcement of benefit to the workers, (c) Regular power supply should be ensured, (d) More liberal policy for import of raw materials will have to be adopted, (e) Supply of sufficient working capital by nationalised banks must be ensured to solve liquidity problem.

However, to rectify the inoptimal pattern of industrial distribution in Bangladesh, the foremost question relates to evolving out the most feasible industrial policies. There is no denying the fact that the best policies are sure to be those which tackle the roots of the problem. In a developing country like ours industrial policy should be directed and formulated to pursue a rural oriented development strategy to enhance employment and purchasing power of the poorest

segments of the population. In our country (various studies opine that) export oriented industry such as garment should be encouraged with a definite programme to both modernize and organize the handloom sector to service the garment exporters. However, government should welcome more studies and surveys to assess industrial potentials of different areas of different regions. This might be considered as empirical base for initiating government policies and measures.

Footnotes

1. PIDC bifurcated into two parts EPIDC (East Pakistan Industrial Development Corporation and WPIDC (West Pakistan Industrial Development Corporation).

2. Ministry of Industries and Commerce (Industries Division) - New Industrial Policy, p.1.

3. The Third and Fourth Five Year Plan, Planning Commission, Ministry of Planning.

4. Department of Industries: Guide to Investment in Bangladesh.

5. Rehman Sobhan, Debt Default to the Development Finance Institutions. The Crisis of State Sponsored Entrepreneurship in Bangladesh, University Press Limited.

6. Rehman Sobhan, Ibid., p.69.

7. Dr. Mondol, A. Hye, "The location of Industries in Bangladesh", UNDP/UNCHS, Working paper No.6, Dhaka, March 1985, p.43.

8. G.S. Sahota, "Impact of policies", Evidence from a Survey of Industrial Leaders, HIID/ESEPP Working Paper No.19. Harvard Institute for International Development, Employment and Small Enterprise Policy Planning.

CHAPTER 6

LOCATION ANALYSIS AND LOCATION EQUATIONS OF SOME SELECTED INDUSTRIES IN BANGLADESH

6.1 Introduction

This chapter presents the location analysis and results of the regression equations of some selected industries in Bangladesh. The analysis is based on a transportation model which shows how the transportation inputs explain regional change in an industry's output. The transportation model used in this study is based on the idea of Harris, Curtis C. Jr. (University of Maryland) and Frank E. Hopkins (State University of New York) in "An Interregional Econometric Model of Agriculture, Mining, Manufacturing and Services."

This chapter comprises five sections. The second section consists of a general discussion on the transportation model that has been used and presents location equations, general or specific. The third section discusses the explanatory variable of the equation with data source and explains how they are estimated. The fourth section estimates the model and presents the results of empirical findings and the last presets conclusions.

6.2 The Transportation Model

An industrial plant locates in order to maximise profits. Given the location, a firm will produce the quantity that maximise profits. But since a firm has a choice in between different locations it will select the location where profit maximisation may be possible. Output of a firm is determined by the cost of production which includes (a) the cost of transporting raw materials from their sources of supply to the plant of manufacturing, (b) the actual cost of processing[1] at plant and (c) the cost of transporting the finished product to the market. Assuming that the cost of processing is, to a great extent, invariant to the location of the plant, transport costs may be main determining factors of output level of a plant or industry at a particular location.

Thus on the basis of relationship between production level and aforesaid factors output may be defined as a function of transport costs and symbolically expressed as follows:

$$Q_{ij} = f(TI_{ij}, TQ_{ij})$$

where Q_{ij} = Output of industry i in region j.

TI_{ij} = Marginal cost of obtaining input to the industry i in region j.

TQ_{ij} = Marginal cost of transporting output of the ith industry from region j.

There might be some other factors influencing production of the plant or industry called agglomeration variables, viz., value of land, total output of the industry in the region,

etc. which are also considered for the purpose of capturing the effects of externalities.

Most industries do not manufacture their own raw materials but purchase them instead from other industries. The output of one industry becomes the input of another industry. Thus a direct interdependence exists among industries. An industry's output is either used as intermediate goods or as final product for consumption. An industry's location might be influenced by the growth of suppliers of inputs (forward linkages) and/or by the rise of industries that utilize its products (backward linkages). Thus output of an industry at a particular location is a function of transport inputs, value of land, output of the industry, major supplying and purchasing sectors.

There might be other social and ecological factors like social cost, water, environmental pollution, entrepreneurial efficiency, social benefit, etc. which influence location. But these factors have not been considered in this study mainly (a) because these factors are not quantitatively observable and (b) because our main study of location is related to the transportation model.

The study of the geographic location of industries as a business decision was originally developed by Weber and improved upon by many, notably Hoover, Losch, Isard, Greenhut and Cooper. We view our study as an application of Isard's

analysis treating transportation services as an input in the productive process.

Our model may not be free from limitations. The series of variables used in the original location equation prevalent in the large geographic area are not used in this study mainly for two reasons: (i) within a limited geographic area all the variables are not necessary, for example, wage rate to explain regional change of output by industry has been dropped in this study on the understanding that within a limited geographic area wage rate by industry, both in the public and private sectors, hardly differs; and (ii) lack of availability of statistical data.

However, in this study it is hypothesized that the regional change in output by industry can be explained by the regional variation in the independent variables discussed in the third section of this chapter. With this view in mind, we used the following regression equation in order to show the influence of various explanatory variables on the change of an industry's output in a particular location. To note here value of output has been used instead of output level as dependent variable in the equation and thus the equation becomes:

$$\Delta Q_{ij} = Q+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+\beta_5 x_5+\beta_6 x_6$$

Where Q = constant

β = coefficient

$x_1 = TI_{ij}$ = Marginal cost of obtaining input to the industry i in region j.

$x_2 = TQ_{ij}$ = Marginal cost of transporting output of the ith industry from region j.

x_3 = a representation of a major supplying sector.

x_4 = a representation of a major purchasing sector

x_5 = value of land.

x_6 = output of industry i in region j.

The model that we use assumes that the regional change in an industry's value of output is a function of the marginal cost of obtaining each input and distributing output and of agglomeration variables. Parameters in the equations are to be estimated with regional data as observations. It is to be noted here that the estimated equations in our study are not designed to predict the optimum location of an industry, rather to measure influences of transportation costs along with other explanatory variables on changes of an industry's value of output in a particular region.

6.3 The Explanatory Variables

6.3.1 Transportation inputs

The transportation variables are given top preference in the equation because of their prominence in location theory and

our concern is in testing the importance of transport costs in location decision following Isard as mentioned earlier. The transportation variables are the marginal costs of transporting an additional unit of input or output either into or out of a plant or industry in a region. We estimated the marginal transport cost[2] from total transport cost of a firm. Total transport cost for obtaining inputs and distributing output to major markets through different modes of transport like rail, road and water includes handling, clearing, forwarding, demurrage and other charges together. The coefficient as given in table 6.2 show the change in the value of output for the change in the transportation rate. The change in output is negative as the cost for transportation rate increases. This supports the hypothesis that the change in location of each plant or industry would be inversely related both to the marginal cost of transporting its product to the market and input to the plant. For example, table 6.2 reports that in case of Dhaka region with the increase in marginal cost of transporting inputs to the jute industry output decreased by 1.4859 (equation 6.2.a); in case of Chittagong region with an increase in marginal cost of transporting output to market, output decreases by 5.6945 (equation 6.2.b). The combined regression result shows a decrease in output by 0.3872 in response to an increase in marginal cost of transporting input and a decrease in output

by 0.7278 in response to an increase in marginal cost of transporting output (equation 6.2.d).

For testing importance of transportation cost, both linear (OLS) and non-linear (log linear) estimations have been done in case of jute industry with combined statistics (equation 6.2.d and 6.2.e) and cable industry (equation 6.2.g) with a single plant in Chittagong region. Transportation costs are, however, observed to be significant at the different probability level. The coefficients of TI are significant at 10 percent level in equation (6.2.d), at one percent level in equations (6.2.e) and (6.2.g). The coefficient of TQ is significant at 5 percent level in equation (6.2.d). They suggest the importance of transportation cost in locational analysis of jute and cable industry.

6.3.2 Agglomeration variables

Since the marginal cost variable does not account for external economies or diseconomies, agglomeration variables are entered in the model. The variables that are used to present the agglomeration effects of a particular industry include value of industrial land, output of major supplying sector, a representation of major purchasing sector and regional output by industry.

Value of land: Location decisions are sometimes influenced by value of industrial land. Land use theory of Industry location

was first developed by Von Thunen[3] in a study of agricultural land use around an urban centre. The theory has been improved by Losch, Alonso[4] etc. Land use theory is concerned with industry location within a metropolitan region but here we are concerned with interregional location. Land prices would be expected to vary by regions because of the amount of urbanisation of the region, i.e. the amount of competition for land. A firm located in an urban area may find the cost of additional land to facilitate expansion prohibitive. Firms seeking to build new plants or expand old ones will, ceteris paribus, be attracted to areas with low land values. In interregional locational decision land value might be more important determinant. Thus we include land prices as a variable in our model.

Of course, in many cases high value of industrial land is outweighed by other favourable factors in location decision or in other words, lower value of industrial land might be outweighed by higher costs of other location factors. As for example, the case for two Re-rolling plants, one at Iswardi, Pabna, (Al-Hajj Re-rolling Mill), may be cited here. Table 6.1 makes comparative cost study between the two Re-rolling plants from which relative profitability can easily be assessed. Essential raw materials like ship scraps, M.S. Billet, MS plate are obtained from Chittagong Still Mill and Scraps from old ships. Yet, relative differences in costs for procuring raw materials and marketing products along with cost of

processing which mainly includes fuel cost, give an explanation why the Re-rolling plant in Pabna stops production in the face of continuous loss though industrial land is comparatively cheap there. One important point to note here is that major market for its product is Dhaka based and furnace oil is used as major fuel in place of natural gas in the northern plant leading to higher processing cost[5] in spite of fuel subsidy.

Table 6.1 : Comparative cost study between two Re-rolling Plants, one at Ishwardi (Pabna) and the other in Dhaka

	Al-Hajj Re-rolling Mill, Ishwardi (Pabna)	Al-Amin Re-rolling Mill, Dhaka
Transport cost for procuring raw materials	Tk.1,000 per ton	Tk.300 per ton
Transport cost for marketing product	Tk.1,000 per ton	Tk.100 per ton
Cost of processing	Tk.1,200 per ton	Tk.350 per ton
Average value of land (industrial) per acre (approximately)	Tk.10 lacs	Tk.30 lacs

However, value of land is one of many considerations determining location. In our equations we have considered average value of urban, high and low industrial land. The coefficients of the variable, value of land, in equations (6.2.a), (6.2.b), (6.2.d), (6.2.e) and (6.2.g) are

significant. Some of them are significant at 1 percent probability level and some are significant at 5 percent level. This suggests that value of land is an important locational factor for manufacturing industries in Bangladesh.

Regional output by industry: The location equation includes the level of regional output by industry[8] to measure the possible external economies of being located near other firms in the same industry. It is very natural that while certain industries established at a particular location many other industries of the same nature localise there to derive the benefit of external economies and enjoy facilities related to overall development of the locality.

The coefficient of this variable is found significant in equations (6.2.a) and (6.2.b) at 5 percent probability level and in equation (6.2.d) and (6.2.e) at 1 percent level. Casual empiricism suggests that many jute plants were located within the same area to avail of external economies available due to concentration of industries.

Major supplying and purchasing sectors: Furthermore, the regional change in output might be related to the change in the supply of major raw materials and to the volume of major demand for its product. An industry's output might increase if supply of major raw material increases due to some reason or other. Simultaneously, regional industrial output might increase in order to respond to higher demand for its product

provided unutilized resources are available. On this consideration we include major supplying sector and major demand sector in our equations. Total supply of the major raw material to a particular industry in a region at a particular period of time is considered as major supplying sector whereas major demand includes purchase by the major sector. In location equations representing jute and cable industry major supplying sector has been dropped for non availability of statistical data. Major purchasing sector has been retained, which includes export demand for jute industry and local demand for cable industry. Major supplying sector is included in location equations for Sugar industry because Sugar industry in some particular areas of Bangladesh is mainly based on the supply of major raw material i.e. sugar cane. The coefficients of these variables do not seem to be significant except that of major supplying sector being significant at 1 percent probability level in case of Sugar industry, which is essentially a raw-material based industry.

Density of Population: This is a locational factor more popularly influencing service industries like Hotel, Restaurants, Medical and Educational Institutions etc. Population density is very highly correlated with the value of land. Therefore, in location equations in case of jute and cable industry density of population is rejected because of multicollinearity and the variable value of land is included. In case of sugar industry where supply of major raw material

is the important locational factor, density of population instead of value of land enters the equation, though empirical findings show that the coefficient of this variable is not significant.

However, the explanatory variables discussed above are used in the location equation to explain regional change in the value of output by industry. The results of the regression equations are presented in Table 6.2 in the fourth section.

6.3.3 Data Source

In estimating location equations linear and log linear regression methods have been used. Primarily we selected several variables following Harris. But for limitation of availability of statistical data and in view of our country we had to abandon many of them. We selected variables after running stepwise regression and retained them in the estimated equation either when they have been found to be statistically significant or contributing to total explanatory power as is seem from the increase in the value of the coefficient of determination (R^2). Once the variables are selected none of them was terminated when a variable became insignificant.

The location equations have been estimated using the data available from individual firms and Bangladesh Bureau of Statistics. We resort to time series data for the period from

1975-76 to 1985-86 supplied by firms, CMI reports and statistical year-books.

6.4 Empirical Findings

The results of the estimated regression equations explaining regional variation in the change in value of output by the regional variation in the independent variables like transportation costs, value of land, major purchasing and supplying sectors and total regional output by industry, are presented below in Table 6.2.

In Table 6.2, equations (6.2.a), (6.2.b), (6.2.c), (6.2.d) and (6.2.e) are estimations of regression equations for jute industry, equations (6.2.f) and (6.2.g) are estimations for cable industry and the rest for sugar industry.

Table 6.2 : Equations explaining correlation between change in output (value) and transport costs along with other explanatory variables by different regions (t ratios are in the parentheses)

		R^2	DW
	Jute Industry: Linear Regression Results: OLS Estimation		
6.2.a	Dhaka Region: $\Delta Q_{ij} = -5713.9198 - 1.4659TI - 0.0855TQ - 14.0186VL + 91.0209MB + 0.5688Q_{ij}$ (-0.349) (-4.870)* (0.339) (-4.714)* (0.602) (2.669)†	0.92	2.87 d=4-2.87=1.13 d_L=0.124 d_u=2.892
6.2.b	Chittagong: $\Delta Q_{ij} = -3292.2005 - 0.1825TI - 5.8945TQ - 8.3559VL + 28.7475MB + 1.0048Q_{ij}$ (0.046) (-1.174) (2.277‡ (-2.903† (0.039) (3.289†	0.78	1.71 d_L=0.124 d_u=2.892
6.2.c	Khulna : $\Delta Q_{ij} = 5669.0274 - 5.0586TI - 2.1050TQ - 9.5441VL - 91.8193MB + 0.6209Q_{ij}$ (0.162) (-0.535) (-0.149) (-0.687) (-0.247) (2.039)	0.69	1.10 d_L=0.150 d_u=2.690
6.2.d	Combined Regression Using Dummy Variables: $\Delta Q_{ij} = 18329.0774 + 4826.0491D_1 + 44.2476D_2 - 0.3872TI - 0.7278TQ$ (-1.402) (2.124† (0.028) (-1.927‡ (-2.644† $- 6.2209VL + 158.7577MB + 0.5492Q_{ij}$ (-3.580)* (1.187) (4.024)*	0.60	2.00 d_L=0.794 d_u=1.788
6.2.e	Log Linear Regression Result Log $\Delta Q_{ij} = 2.7040 + 2.1142D_1 - 0.3991D_2 - 0.0040TI - 0.0056TQ - 0.0031VL + 0.0409MB + 0.0001Q_{ij}$ (2.329)† (-0.707) (-3.774)* (-1.239) (-3.203)* (0.903) (3.329)*	0.63	2.20 d=4-2.20=1.80 d_L=0.72 d_u=1.66
6.2.f	Eastern Cables Chittagong, Linear Regression Result: $\Delta Q_{ij} = 66.8023 - 429.2889TI + 0.0739MB - 0.0142VL$ (0.322) (-0.360) (0.925) (-0.084)	0.16	1.89
6.2.g	Log-Linear Regression Result Log $\Delta Q_{ij} = 2.2790 - 22.7949TI + 0.0001MB + 0.0017VL$ (3.371) (-6.054)* (0.271) (2.817)†	0.90	2.68
	Sugar Industry		
6.2.h	Rajshahi Region: $\Delta Q_{ij} = 282201.00 - 0.24TI + 198.82DEN + 0.03RM$ (1.22) (-0.04) (+1.06) (0.50)	0.33	1.97
6.2.i	Khulna Region: $\Delta Q_{ij} = 211207.16 - 10.81TI + 189.60DEN + 0.07RM$ (2.37) (-1.52) (2.23) (1.57)	0.50	1.73
6.2.j	Dhaka Region: $\Delta Q_{ij} = 37413.70 - 4.93TI + 18.20DEN + 0.01RM$ (1.03) (-0.92) (0.91) (0.11)	0.33	1.91
6.2.k	Combined Regression Using Dummy Variables: $\Delta Q_{ij} = 48717.11 - 17811.82D_1 - 5530.93D_2 - 0.54TI + 14.71DEN + 0.02RM$ (1.12) (-1.93) (-0.16) (-0.17) (0.38) (0.92)*	0.20	1.85

The decision rules are: (a) Reject the null hypothesis if $d < d_L$
(b) Do not reject the hypothesis if $d > d_u$
(c) The test is inconclusive if $d_L < d < d_u$

* = 1 percent level of significance
† = 5 percent level of significance
‡ = 10 percent level of significance.

6.4.1 Jute Industry

Jute textile is the largest industry of Bangladesh concentrating in and around Dhaka, Chittagong and Khulna. The major raw materials used in this industry are raw jute, jute batching oil and other direct materials. The major products are Hessian, Sacks, Carpet etc. Foreign demand constitutes the major market for jute products.

Jute grows almost all over Bangladesh and is carried to the plants by different modes of transport like rail, road and waterways. The regression results show that the coefficients of TI and VL are significant at 1 percent probability level and the coefficient of Q_{ij} is significant at 5 percent level in equation (6.2.a). This suggests that in Dhaka region the variation in the change of value of output in Jute industry is significantly influenced by the change in marginal cost of input procurement cost, in the value of industrial land and total output by industry. The coefficient of TQ is significant at 10 percent level and coefficients of VL and Q_{ij} are significant at 5 percent level in equation (6.2.b). This suggests that in Chittagong region the variation in the change of value of output in jute industry is significantly influenced by product marketing cost, value of land and output by industry.

Combined regression results using dummy variables both under linear and log-linear estimations also express significance of

TI, VL and Q_{13} though at different percentage levels. Dummy variables D_1 for Khulna region and D_2 for Chittagong region were introduced in the combined regression equation mainly for finding missing data for the regions. None of the regression coefficients of the explanatory variables for Khulna region appear to be significant in equation (6.2.d) but the coefficients of D_1, a dummy variable for Khulna region are found significant at 5 percent level in both the equations (6.2.d) and (6.2.e) under linear and log-linear estimations. This, of course, suggests the significant influence of some missing data for Khulna region. Durbin Watson test in all cases suggests that the hypothesis is either inconclusive or there is no auto-correlation among error/disturbance terms.

6.4.2 Cable Industry

The Eastern Cables in Chittagong is the single large integrate unit of cable industry in Bangladesh. The major raw materials used in this industry are copper, D.O.P., Aluminium, Stabilizer, Chalk Powder, P.V.C Resin etc. of which copper, aluminium, D.O.P., Resin are imported raw materials. Local demand constitutes the major market for the product of cable industry. The major purchasers are Bangladesh Power Development Board and Rural Power Development Board, Domestic enterprises and traders.

The regression result under OLS estimation in equation (6.2.f) does not show significance of coefficient of any variable. The

coefficient of determination (R^2) also is as low as 0.16. R^2 increases to 90 under log-linear estimation and the coefficient of TI is found significant at 1 percent probability level and that of VL is found significant at 5 percent probability level equation (6.2.g). This suggests that the change in value of output of the cable industry is influenced by the change in transportation cost for procuring raw materials. The purchasers of the product have to incur transportation cost for marketing the product. Hence TQ does not enter the location equation.

As the industry with single plant is established in Chittagong, the port city to avail the benefit of proximity to raw materials the value of land (VL) here is of little importance. Because the question of regional variation of value of output does not arise here, the variable (VL) looses its significance.

6.4.3 Sugar Industry

Sugar cane is a minor crop in Bangladesh accounting for 3.3% of value added in the agricultural sector in 1983/84. Sugar industries are agro-based centrifugal processing industries and are established in concentrated sugarcane cultivation areas mainly Rajshahi, Rangpur, Dinajpur, Kushtia, Jessore, Faridpur and Pabna. Sugarcane is a crop that needs to be marketed quickly after harvest. Transportation is most important as the sugarcane content gets lost overtime. It is

observed that 5.3% of its content is lost within 24 hours of harvesting the cane, 19% within 48 hours and after 48 hours it is generally uneconomic to crush the cane[7]. Sugar Mills traditionally carry out their own cane production activities and purchase cane from within a specified zone. Cane is purchased at Mill gate and also at purchasing centres away from the Mill areas. These purchasing centres are located either at road head or at rail head to cover areas around the centres. Initially from the field cane is normally carried in Bullock carts and in case of large farms by mechanised vehicles; e.g. Trucks.

We tried to use statistical data from BSFIC[8] and calculated input transportation cost from the difference of price at Mill gate and price in the field. However, the transport cost involved in obtaining sugarcane to the plants is very negligible. The most important explanatory variable is major supplying sector i.e. regional production of sugarcane on which consideration Sugar Mills are established and localised in the sugarcane producing areas.

The regression results of location equations, equations (6.2.h), (6.2.i) and (6.2.j) do not show significance of coefficient of any variable. The significance of the coefficient of RM in the combined regression equation (6.2.k) at 1 percent level suggests that the main locational factor

for sugar industry in our country is the supply of major raw material, i.e. sugarcane.

In support of our finding we tried to measure Weberian Material Index (MI)[8] for sugar industry at different locations in Table 6.3. MI for sugar industry at different locations is found to be far greater than I. This is evident from the fact that availability and proximity to raw materials is the major consideration that contributed localisation of sugar industries within or near the sugarcane producing areas.

Table 6.3 : Material Index for Sugar Industries at Different Locations

Locations	MI
Rajshahi	10.52
North Bengal	9.48
Rangpur	5.87
Thakurgaon	12.01
Joypurhat	10.33
Kushtia	12.16
Jilbangla	10.86
Shampur	10.92
Panchgarh	10.81

Source: BSFIC

6.5 Concluding Remarks

From the foregoing quantitative analysis of locational factors of selected manufacturing industries of Bangladesh through transportation model it follows that transportation costs have negative and significant influence on the regional variation of changes in the value of output by industry. The transportation costs are found important along with other explanatory variables like value of land, total industrial output suggesting that these variables also have important influence on localisation of industries in Bangladesh. Other variables though do not appear significant but with expected sign are kept in the equation. The introduction of the dummy variable D_1 in the combined regression equation for Khulna region to explain some missing data and its significance indicates the importance of some unexplained data/variable for the region.

To note here again the estimating location equations are not designed to predict the optimum location of a plant or industry but to explain influences of transportation costs and other agglomeration variables on location of above selected industries. The results of this study are very encouraging. The model explains a sizeable proportion of the regional variance in the change in output for jute industry. The importance of the transportation variable is particularly encouraging.

However, if a good number of manufacturing industries, during our survey, could provide us with required statistical data and information in time, suitable to our programme, a more comprehensive understanding of the problem would have been possible.

Footnotes

1. Cost of processing includes material cost, fuel/oil and electricity costs, labour costs, etc.

2. Marginal transport costs are estimated by dividing the change in total transport cost by the change in total output i.e. $\Delta TI_{ij}/\Delta Q_{ij}$ or $\Delta TQ_{ij}/\Delta Q_{ij}$.
   Where, ΔTI_{ij} = change in total input procurement cost of industry i in region j.
   ΔTQ_{ij} = change in total output marketing cost of industry i in region j.
   ΔQ_{ij} = change in total output of industry i in region j.

3. Johaun Heinrich Von Thunen - Der Insoliete staat in Beziehung auf Landwirts - chaft and Nationalokonomies (Brded. S-Chumacher-Zarchlin, 1975).

4. Alonso W., Location and Land Use Theory, Cambridge, Harvard University Press, 1965.

5. Cost of processing here mainly includes fuel cost. It is observed that it requires 1000 cft of gas as fuel consumption per as fuel consumption per ton (at Pabna) costing taka 4.70 per ltr. times higher than fuel cost per ton in Dhaka.

6. Regional output by industry means value of total product by industry in a particular region against different years.

7. Ahmad, Muzaffer: A fact finding report on production prices and markets in Bangladesh Sugarcane. Institute of Business Administration, University of Dhaka, 1984.

8. BSFIC = Bangladesh Sugar and Food Industries Corporation.

9. M.I = Material Index is equal to weight of the raw materials divided by weight of the final product. If MI > 1, the industry is located near the availability of raw material, if MI < 1, it is located near the market place and if MI = 1, it is located anywhere between the two.

CHAPTER 7

OPTIMUM LOCATION ANALYSIS: A CASE OF JUTE INDUSTRY

7.1 Introduction

In the previous chapter we tried to show significance of transport cost taking some major industries of Bangladesh into consideration in the light of change in output as dependent variable and input transport costs, product marketing cost, value of land, along with other agglomeration variables as independent variables.

In this chapter we like to examine whether the domestic jute transportation system (from jute growing area to jute mills) is optimal with respect to the location of jute industry in Bangladesh using Transportation Model (TM). The model used here is essentially a simplified version of Cooper's (1971) Transportation Location problem[1] as explained in Literature Review in Chapter 1, is described in Chapter 7. The chapter is organised as follows: Section 2 describes data source and methodology. Empirical results are presented and analysed in Section 3 and the chapter ends with a concluding remarks in Section 4.

7.2 Data Source and Methodology

The main sources of data for our estimation are yearbook of Agricultural Statistics of Bangladesh 1987 and Bangladesh Jute Mills Corporation (BJMC). Area wise annual production figures are taken from Agricultural Statistical Yearbook, BBS, and Mill wise requirements for raw jute are taken from BJMC.

Commonly jute mills require three types of raw jute namely White, Tossa and Mesta for the products produced by them. The products are mainly Carpet Backing Cloth (CBC), Hessian, Sacking, Carpet, Mat, Tape etc., requiring White, Tossa and Mesta in different proportion. It was difficult to get data on production figures for White and Tossa (two kinds of raw jute) separately. Therefore, we considered White and Tossa together as a single commodity requirement by mills. As production figures for Mesta were available, the requirement for Mesta by mills is considered separately. The two sample mills under consideration are Latif Bawany in Dhaka and Amin Jute Mill in Chittagong. Data on distances from sources of product to destinations are taken from map of Bangladesh and transport rates for road and water network have been collected from different transport agencies.

7.2.1 Methodology

We attempt to find the minimum transport cost between the given sources of raw jute and the fixed and known set of

destinations. The problem has been formulated as multi commodity (White & Tossa, and Mesta) Transportation Model (TM). Since amount of supply of raw jute is always more than the amount demanded, the TM turned out to a unbalanced transportation problem. Therefore, for convenience the problem was solved as Linear Program (LP) problem using LINDO (an optimization package).[2] The analysis was done at IBA Computer Centre, D.U.

We have considered 22 sources of raw jute and 2 jute mills (as mentioned earlier). It would have been better if we could get separate statistical data about area wise production figures of White and Tossa as could stand for capacity or requirement constraints. In this case the size of our problem would have been (22 x 6). As we have considered White and Tossa a single commodity, the requirements of raw jute by each mill are classified under White and Mesta. Hence the size of the formulation problem becomes (22 x 4). The most important point to note here is that though we have taken two mills into consideration, two types of raw jute as two separate requirements by each mill are considered as two separate destinations. That is why the number of destinations becomes 4 while the number of sources are 22. Therefore, transportation problem for our purpose takes the following form:

$$\min \sum_{i=1}^{22} \sum_{j=1}^{4} C_{ij} X_{ij}$$

$$\text{subject to} \sum_{j=1}^{4} X_{ij} \leq C_i$$

$$\sum_{i=1}^{22} X_{ij} \geq R_j$$

$$X_{ij} \geq 0$$

where,

X_{ij} = Raw jute to be shipped from source i to destination j.

C_i = Amount of supply to product at source i.

R_j = Amount of demand for product at destination j.

i = Number of sources.

j = Number of destinations.

Considering our data the above formulation of the problem can be expanded as follows:

Min cost= 4.35 (X_{1wl} + X_{1ml}) + 3.29 (X_{1wa} + X_{1ma}) +
3.21 (X_{2wl} + X_{2ml}) + 2.45 (X_{2wa} + X_{2ma}) +
4.17 (X_{3wl} + X_{3ml}) + 3.57 (X_{3wa} + X_{3ma}) +
3.59 (X_{4wl} + X_{4ml}) + 2.73 (X_{4wa} + X_{4ma}) +
7.07 (X_{5wl} + X_{5ml}) + 3.58 (X_{5wa} + X_{5ma}) +
5.59 (X_{6wl} + X_{6ml}) + 3.41 (X_{6wa} + X_{6ma}) +
3.57 (X_{7wl} + X_{7ml}) + 2.59 (X_{7wa} + X_{7ma}) +
3.29 (X_{8wl} + X_{8ml}) + 2.41 (X_{8wa} + X_{8ma}) +
4.65 (X_{9wl} + X_{9ml}) + 2.91 (X_{9wa} + X_{9ma}) +
5.09 (X_{10wl} + X_{10ml}) + 3.47 (X_{10wa} + X_{10ma}) +
4.29 (X_{11wl} + X_{11ml}) + 2.50 (X_{11wa} + X_{11ma}) +
4.71 (X_{12wl} + X_{12ml}) + 2.83 (X_{12wa} + X_{12ma}) +

$$4.80\ (X_{13wl} + X_{13ml}) + 4.39\ (X_{13wa} + X_{13ma}) +$$
$$5.71\ (X_{14wl} + X_{14ml}) + 2.80\ (X_{14wa} + X_{14ma}) +$$
$$7.60\ (X_{15wl} + X_{15ml}) + 3.45\ (X_{15wa} + X_{15ma}) +$$
$$5.71\ (X_{16wl} + X_{16ml}) + 3.16\ (X_{16wa} + X_{16ma}) +$$
$$8.33\ (X_{17wl} + X_{17ml}) + 2.78\ (X_{17wa} + X_{17ma}) +$$
$$13.33\ (X_{18wl} + X_{18ml}) + 2.73\ (X_{18wa} + X_{18ma}) +$$
$$7.69\ (X_{19wl} + X_{19ml}) + 6.80\ (X_{19wa} + X_{19ma}) +$$
$$5.07\ (X_{20wl} + X_{20ml}) + 3.15\ (X_{20wa} + X_{20ma}) +$$
$$7.84\ (X_{21wl} + X_{21ml}) + 3.03\ (X_{21wa} + X_{21ma}) +$$
$$9.23\ (X_{22wl} + X_{22ml}) + 2.18\ (X_{22wa} + X_{22ma}) +$$

Subject to,

$$X_{1wl} + X_{1wa} \leq 10,000$$
$$X_{1ml} + X_{1ma} \leq 1$$
$$X_{2wl} + X_{2wa} \leq 5,000$$
$$X_{2ml} + X_{2ma} \leq 1$$
$$X_{3wl} + X_{3wa} \leq 72,000$$
$$X_{3ml} + X_{3ma} \leq 642$$
$$X_{4wl} + X_{4wa} \leq 73,000$$
$$X_{4ml} + X_{4ma} \leq 642$$
$$X_{5wl} + X_{5wa} \leq 25,145$$
$$X_{5ml} + X_{5ma} \leq 147$$
$$X_{6wl} + X_{6wa} \leq 13,500$$
$$X_{6ml} + X_{6ma} \leq 41$$
$$X_{7wl} + X_{7wa} \leq 13,710$$
$$X_{7ml} + X_{7ma} \leq 40$$
$$X_{8wl} + X_{8wa} \leq 14,261$$
$$X_{8ml} + X_{8ma} \leq 13$$
$$X_{9wl} + X_{9wa} \leq 39,000$$
$$X_{9ml} + X_{9ma} \leq 2$$
$$X_{10wl} + X_{10wa} \leq 39,070$$
$$X_{10ml} + X_{10ma} \leq 2$$
$$X_{11wl} + X_{11wa} \leq 400$$
$$X_{11ml} + X_{11ma} \leq 200$$
$$X_{12wl} + X_{12wa} \leq 200$$
$$X_{12ml} + X_{12ma} \leq 1$$

$X_{13wl} + X_{13wa} \leq 31,059$

$X_{13ml} + X_{13ma} \leq 61$

$X_{14wl} + X_{14wa} \leq 54,305$

$X_{14ml} + X_{14ma} \leq 421$

$X_{15wl} + X_{15wa} \leq 12,500$

$X_{15ml} + X_{15ma} \leq 1$

$X_{16wl} + X_{16wa} \leq 12,493$

$X_{16ml} + X_{16ma} \leq 1$

$X_{17wl} + X_{17wa} \leq 500$

$X_{17ml} + X_{17ma} \leq 10$

$X_{18wl} + X_{18wa} \leq 1,000$

$X_{18ml} + X_{18ma} \leq 100$

$X_{19wl} + X_{19wa} \leq 33,163$

$X_{19ml} + X_{19ma} \leq 11$

$X_{20wl} + X_{20wa} \leq 200$

$X_{20ml} + X_{20ma} \leq 20$

$X_{21wl} + X_{21wa} \leq 38,463$

$X_{21ml} + X_{21ma} \leq 247$

$X_{22wl} + X_{22wa} \leq 56,085$

$X_{22ml} + X_{22ma} \leq 608$

$X_{1wl} + X_{2wl} + X_{3wl} + X_{4wl} + X_{5wl} + X_{6wl} + X_{7wl} + X_{8wl} + X_{9wl} + X_{10wl} + X_{11wl} + X_{12wl} + X_{13wl} + X_{14wl} + X_{15wl} + X_{16wl} + X_{17wl} + X_{18wl} + X_{19wl} + X_{20wl} + X_{21wl} + X_{22wl} \geq 6717.80$

$X_{1ml} + X_{2ml} + X_{3ml} + X_{4ml} + X_{5ml} + X_{6ml} + X_{7ml} + X_{8ml} + X_{9ml} + X_{10ml} + X_{11ml} + X_{12ml} + X_{13ml} + X_{14ml} + X_{15ml} + X_{16ml} + X_{17ml} + X_{18ml} + X_{19ml} + X_{20ml} + X_{21ml} + X_{22ml} \geq 124.00$

$X_{1wa} + X_{2wa} + X_{3wa} + X_{4wa} + X_{5wa} + X_{6wa} + X_{7wa} + X_{8wa} + X_{9wa} + X_{10wa} + X_{11wa} + X_{12wa} + X_{13wa} + X_{14wa} + X_{15wa} + X_{16wa} + X_{17wa} + X_{18wa} + X_{19wa} + X_{20wa} + X_{21wa} + X_{22wa} \geq 3179.80$

$X_{1ma} + X_{2ma} + X_{3ma} + X_{4ma} + X_{5ma} + X_{6ma} + X_{7ma} + X_{8ma} + X_{9ma} + X_{10ma} + X_{11ma} + X_{12ma} + X_{13ma} + X_{14ma} + X_{15ma} + X_{16ma} + X_{17ma} + X_{18ma} + X_{19ma} + X_{20ma} + X_{21ma} +$

$X_{22ma} \geq 105.90$

X_{1wl} ..... $X_{22wl} \geq 0$

X_{1ml} ..... $X_{22ml} \geq 0$

X_{1wa} ..... $X_{22wa} \geq 0$

X_{1ma} ..... $X_{22ma} \geq 0$

Where,

W stands for White

m stands for Mesta

l stands for Latif Bawany Jute Mill

a stands for Amin Jute Mill

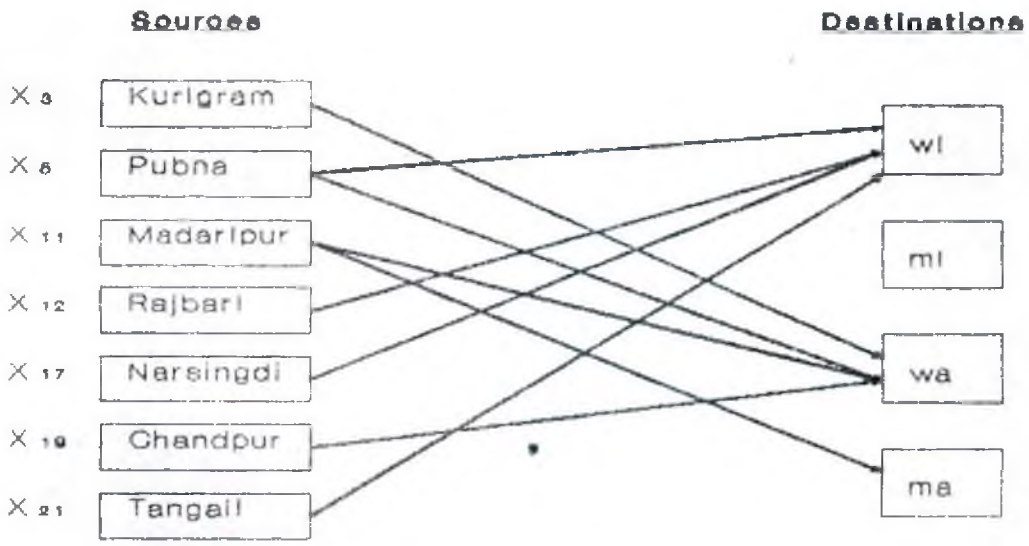
The problem has 48 constraints and 22 variables. It took 8 simplex iteration for LINDO to solve the problem.

The formulating cost minimization function we had to exclude purchase of raw jute at Mill gate by each mill, since the transport costs involved in these cases were not possible to calculate.

7.3 Results and Analysis

The management of the mill purchase raw jute from different sources, and then vary from year to year. Ignoring such variation our study considered the movement of raw jute from sources to destination for the year 1990-91. For the particular year Latif Bawany and Amin Jute Mills are purchasing raw jute of different kinds from 7 different regions. This can be shown more conveniently using flow diagram:

Present Pattern of flow:



Therefore,

Cost = $X_{3wa} + X_{5wl} + X_{5wa} + X_{11wa} + X_{11ma} + X_{12wl} + X_{17wl} + X_{19wa} + X_{21wl}$

= 1500 x 1725 + 700 x 2880 + 1000 x 278.10 + 800 x 2506 + 800 x 106 + 400 x 1617.40 + 300 x 1685.60 + 1000 x 405.70 + 400 x 535

= 8743540

We solved the same problem as TM. It took 8 simplex iteration for LINDO to solve the problem.

The output are as follows:

X_{21} = 5,000

X_{22} = 1

X_{42} = 70

X_{72} = 40

X_{81} = 1717

X_{82} = 13

X_{223} = 3179

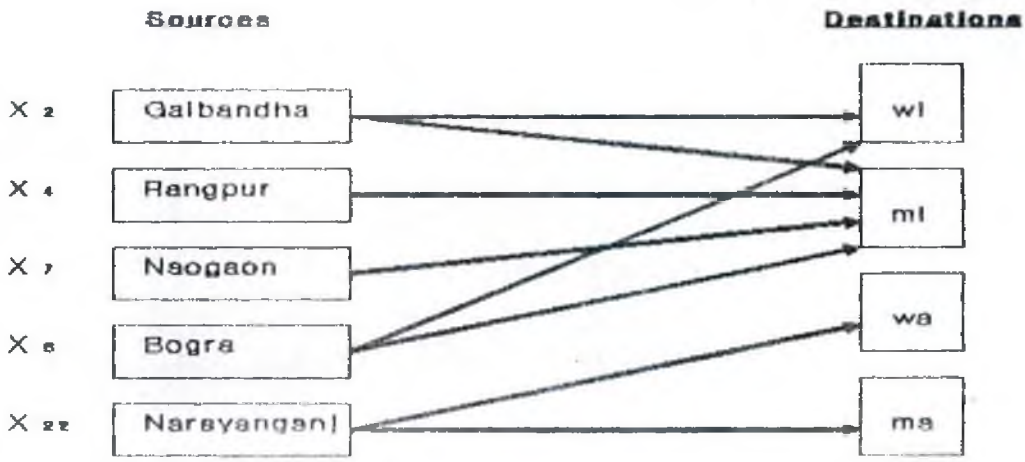
X_{224} = 106

Therefore, the total cost becomes:

Cost = 5000 x 3.21 x 187 + 2.45 x 1 x 367 + 2.73 x 70 x 403 + 2.59 x 40 x 348 + 3.29 x 1717 x 152 + 2.41 x 13 x 332 + 2.18 x 3179 x 193 + 2.18 x 106 x 193

= 5366485.07

The optimal pattern of flow diagram is shown below:



It is important to note here that for simplification we have plotted only those sources which are in concern and avoided others.

A comparison between the present and optimal pattern of flow of product from sources to destinations shows that transport cost minimization has been possible in the second case. In this case the number of sources supplying raw jute to destinations is 5 incurring lower transport cost by 61.38% than before.

7.4 Conclusions

The present study attempted to solve and formulate a simple transportation problem following a version of Cooper's transportation location problem.

The model has been used for a problem related with jute industry in Bangladesh with small data base. We have considered only 2 mills and 22 sources of raw jute for a single year.

It is possible to solve much larger problem of similar nature. More extensive work can be done related to any industry in our country on the basis of above transportation location problem.

In this study our objective was to show how Operations Research can handle locational problem. The finding showed cost-effectiveness of the method. A comparison between the present pattern of flow of raw materials from sources to destinations and the optimal pattern of flow of the same shows that the present location of the mill does not follow optimal cost-benefit approach as such. From this limited observation it is possible to hypothesis that either the procurement program needs to the changed or the mill could be relocated to obtain minimal cost subject to the assumption of Ceteris Paribus i.e. that other factors affecting location has no impact in this regard.

Footnotes

1. Cooper, Leon - "Transportation Location Problem," Sourhtern Methodist University, Dallas, Texas (Received January 8, 1971).

2. LINDO - an acronym for Linear Interactive Discrete Optimizer, an interactive computing package for solving LP model on a computer. The main purpose of LINDO is to allow a user to quickly input an LP formulation, solve it, assess the correctness or appropriateness of the formulation based on the solution and then quickly make monitor modifications to the formulation and repeat the process.

CHAPTER 8

SUMMARY AND CONCLUSIONS

This chapter attempts to summarise the major findings of the present study and draw important conclusions for making policy suggestions. Section 8.1 presents summary of major finding and conclusions and suggestions for further research are presented in section 8.2.

8.1 Summary of Major Findings

The main purpose of the study has been to analyze the influences of transport cost on the patterns of locational and regional distribution of selected manufacturing industries in Bangladesh. The period covered has been sufficiently long, extending from the period of the birth of Pakistan to the late eighties, during which the physical and social infrastructure of Bangladesh grew almost in direct proportion to the growth of the economy. The major findings of the study include the following:

Bangladesh with an agrarian base, experienced little change in its feature during the period covered by our study (Chapter 2). The agricultural sector contributes the lion's share to GDP (36%) while the manufacturing sector contributes only 8.8% of total GDP, the large industry sector contributing 5.7% and

small scale and cottage industry sector contributing 4.5% (Table 3.2). Besides having a narrow industrial base, the manufacturing industries sector also suffers from structural dichotomy. For example, the large scale manufacturing sector contributes to 61.4% the small sector contributes to 38.6% of total manufacturing value added (Table 3.1). In turn, the small scale and cottage industry sector because of its labour intensive character, provides employment to about 82.2% of the total manufacturing labour force (Table 3.11) and is thus no less important in our economy which suffers from an acute problem of unemployment and underemployment.

In so far as the regional distribution of industries is concerned, there exists significant concentration in the spatial distribution of industries. The Dhaka conurbation is the main area of concentration of industrial and economic activities followed by Chittagong and Khulna with Rajshahi being the least industrialised area. It has been shown in Table 4.3 of the study that Dhaka with 30.57% of total population and 32.27% of economically active population provides 53.87% of manufacturing employment with the highest concentration ratio of 1.8. Dhaka is followed by Chittagong with concentration ratio 1.0, Khulna with concentration ratio 0.7 and then Rajshahi with lowest concentration ratio 0.3. The regional imbalance in the growth of manufacturing sector emerges clearly from the table.

The locational factors contributing to the existing pattern of distribution of industries in Bangladesh are mainly its natural assets, availability of raw materials, cheap and skilled supply of labour and adequate supply of power and fuel (Chapter 4). Moreover, sometimes, the location of an initiating industry in developed region has subsequently generated the growth of other industries. For example, the development of jute industry in the areas, especially in Dhaka, to a greater extent, is related to the growth of jute bailing industries in the pre-partition days in and around Dhaka (Chapter 6).

Further, an uneven infrastructural development also seems to have been one of the important factors responsible for the inoptimal pattern of industrial growth in Bangladesh. The industrial history of Bangladesh reveals the fact that the establishment of a few industries in and around Dhaka before Pakistani regime helped infrastructural development in this area which in turn was followed by localisation of industries in post-independent Bangladesh. The infrastructural development of Chittagong and Khulna as two big port cities invited several entrepreneurs to establish industries in these areas to avail of external economies created due to localisation and development of the areas.

The government policy influencing industrial location in different regions is plagued with numerous limitations which

failed to attract new entrepreneurs to set up industries in the least developed areas. Infrastructural investments along with incentives and subsidies, especially in the form of power, fuel and transport facilities are considered more effective measures for speedy industrialisation in less developed areas. This involves (a) regional planning and (b) measures designed to attract industrial plants. In addition, the government may invest directly in fixed capital by building factories and developing new industrial estates in order to attract entrepreneurs in specific locations. Transportation facilities along with sufficient fuel subsidy, sometimes, alone are sufficient to do this. There are some examples where some plants in the northern region have been bound to shut down production for high transportation costs and fuel cost in spite of fuel subsidy. As examples, the case of Al-Hajj Rerolling Plant in Ishwardi (Pabna) may be cited here (Chapter 6).

The major problem, however, lies with the industrial policy of the government which failed to attract new entrepreneurs in the field of industrialisation. The basic problem is that the industrial policy is prepared by the technocrats on the basis of superficial information and not on the basis of any comprehensive survey of the situation prevailing in the country. The formation of "Sick Industries Rehabilitation Cell" on the 15th of June, 1991 proves this sufficiently. This cell is set up by the Ministry of Industry consisting of

experts and industrialists of the country with a view to identifying the factors behind decline of production and sickness of as many as ten sectors like jute, textile, engineering, tannery, services, food, misc. etc. under which about 2500 applications have been submitted to the cell. It may be noted here, for information, that currently 50 percent of Bangladesh's formal sector industry is estimated to be "Sick," when industrial sickness is defined by less than 30% capacity utilization. From the empirical observation and analysis of available data by the cell out of 17 causes identified, the major problems are related to (i) Unplanned sanction without proper sectoral survey, (ii) Lack of coordination among the related bodies, (iii) Inefficient banking management, (iv) Free import of foreign goods and smuggling, (v) Undesirable political influence and (vi) to some extent, inexperience of new generation entrepreneurs. These problems almost coincide with our findings of major loopholes of the industrial policy summed up under following:

(a) The policy with regard to selection of industrial site/location is determined more on the basis of political considerations and preferences as opposed to actual potentials and requirement of different regions.

(b) Lack of co-ordination among different concerned agencies like Ministry of industry, finance and Ministry of planning leads to faulty sanction giving rise to

unplanned growth of industries. For example, in the Water Sector while the Ministry of Planning closes further sanction of loan in building cargo vessels, the BKB and other commercial banks extended further financial assistance to the sector in complete disregard to the procurement of information about vessels and cargo potentials prevailing in the country, ultimately pushing the whole sector to be sick.

Besides, in the most vital sectors the financial assistance was extended not in pursuance of proper survey nor were these located near the industry. The haphazard allocation in view of impractical appraisal reports caused serious set back. For example, in the textile sector the absence of looms in required number, related twisting plants, printing plants, sufficient working capital, protection against import of cotton yarn and garment fabrics is highly responsible for a great set back.

(c) The concessions or rebates for less developed areas as mentioned in the policy (discussed in Chapter 5) are hardly implemented. As evidence, the case with Ahmed Textile Mill (as communicated by the owner), newly set up at Bolta, Rupganj may be cited here. The entrepreneur of the plant set up under EXIM credit, a project of Sonali Bank, had to pay 10% duty on machineries at Benapole

border whereas in the sanction document the duty was fixed at 2.5%. There are, however, a good number of such discouraging examples in case of other existing industries also.

In the light of the above discussion on the problems and limitations of the industrial location policy of Bangladesh, the following policy recommendations may be made for creating congenial atmosphere in the field of industrialisation both to safeguard the existing industries and attract new entrepreneurs for setting up new industries:

(a) While framing an industrial policy a comprehensive survey is required for assessment of true and actual requirements of industries in our country to avoid excess and unnecessary allocation of resources.

(b) A pragmatic industrial policy must invite opinions from the experts and industrialists associated with different industries in order to make proper and valuable use of their experiences.

(c) The policy makers should take into consideration the experiences applied in other countries with similar socio-economic background. Of particular relevance may be the experiences of India, Sri Lanka, Thailand, Pakistan, South Korea and Taiwan.

(d) The policy should make provisions to prevent inflow of products from other countries to encourage domestic

products. In other words, the policy protection should be adopted by the government in order to save local industries facing competition with foreign goods both in terms of quality and price.

(e) For attaining industrialisation the industrial as well as import policy of essential items and raw materials should be liberal and carefully recommended.

(f) The concerned financial institutions should impose reasonable and simple rate of interest and formulate easy terms for recovery of loan from the entrepreneurs.

(g) Necessary amendments of banking laws (Black laws like article 34, the enforcement of this infringes fundamental right without giving any chance to the entrepreneur to challenge acquisition of his property) are required.

(h) The commercial banks should provide adequate working capital to solve liquidity crisis in the private sector also.

(i) More emphasis should be given to small and medium scale labour - intensive industries, especially agro-based, in view of the practical economic conditions prevailing in our country for mainly two reasons: (i) to create new employment opportunity and (ii) to exploit untapped indigenous raw materials. For example Fruit processing industries may be developed in Dinajpur and greater Rajshahi making optimum use of mango. Similarly, such

industries may be developed in Chittagong, Sylhet and Mymensingh for making use of Pine-apples and in Barisal and Khulna for making proper utilisation of coconut.

Another vital point emerged while exchanging views with the owners of private enterprises that government has to be aware of the financial condition of the private entrepreneurs before any announcement of benefit to the workers.

The quantitative analysis done through the use of the transportation model in Chapter 6 of the study represents an attempt to measure transportation cost as a determining factor of industrial location in Bangladesh. Transportation very often happens to be the single most important determinant of the location of a plant. But in actual practice this has not been the case in Bangladesh. Least transport cost consideration is not the only determining factor here. In the case of industries involving very high transport cost both for procurement of raw materials and for transhipment of finished products, it is quite natural that transportation would become one of the key determinants of the localisation of these industries. This is the case with heavy capital goods industries. Ours is a country where industrial growth, whatever the rate may be, took place mainly in the field of intermediate and consumption goods items, except a few cases of medium scale production of light capital goods and a single

plant at Joydevpur producing capital goods (Joydevpur Machine and Tools Factory).

In spite of data deficiencies, we tried to make a quantitative analysis of transportation model taking into consideration the cases of Jute, Cable and Sugar industries in the sixth chapter; What we observed is that transportation cost alone does not seem to play much important role here. The results of both linear and log-linear estimation of location equation (Chapter 6) suggest that transportation costs along with other variables like value of land, major purchasing sector and regional industrial output are significant.

Following Harries Curtis C. Jrand Frank E. Hopkins, we tried to examine the hypothesis that regional change in the value of output of a plant or industry is a function of transportation costs along with other agglomeration variables (illustrated in chapter 6). The least-squares regression routine was set up to preserve the theoretical order of variables entering the equation but was not terminated when a variable became insignificant. For alternative specification log-linear estimation is attempted with combined equation in case of jute industry and cable industry.

The results, as presented in Table 6.2, show the significance of the coefficient of TI (Marginal cost of transporting input) in equations 6.2(a), 6.2(d) and 6.2(g) at 1 percent level and in equation 6.2(d) at 10 percent level. This suggests that the

change in the value of output of jute and cable industry is affected by TI. That is the change in the value of output decreases as TI increases. For example, in case of jute industry in Dhaka region change in the value of output decreases by 1.4859 with an increase of marginal unit of cost of transporting input. The coefficient of TQ (marginal cost of transporting output to major market) is significant in equation 6.2(b) at 10 percent level and in equation 6.2(d) at 5 percent level explaining how the change in the value of output is affected by the change in TQ. The coefficients of VL (value of land) and Qij (industrial output by region) also are observed significant at different levels of percentage in all equations except 6.2(c) and 6.2(f). Two dummy variables, D_1 for Khulna region and D_2 for Chittagong region were introduced in the combined equation for jute industry to examine influence of some other factors. Both linear and log-linear estimations (equation (6.2(d)) and (6.2(e)) express significance of the coefficient of D_1 at 5 percent level explaining importance of some other factor for Khulna region while those for Dhaka and Chittagong are similar. Durbin Watson test for all equations prove the hypothesis either inconclusive or existence of no auto-correlation among the variables (Table 6.2).

Turning to the case of Sugar Industry, the coefficients of all variables are observed to be insignificant except in equation 6.2(k) the coefficient of a single variable RM (supply of

major raw material) is found to be significant at one percent level. Our study intends to confirm that the availability of major raw material is the only important consideration for localisation of Sugar Industry in the respective areas. To arrive at this conclusion we further made an attempt to measure Weberian Material Index (MI) (illustrated in chapter 6) for different sugar industries at different locations (table 6.3). In support of our finding that all the sugar mills are established in the areas supplying sugar cane to the adjacent mill, MI in all cases is far greater than I satisfying locational condition of all raw material based industries. Besides, one notable point is that sugar cane content get lost by 5.3% within 24 hours, by 19% within 48 hours and it is almost uneconomic to crush the cane after 48 hours (chapter 6). The study, however justifies location of sugar industry in Bangladesh though failed to establish significance of transportation costs as basic locational factor. We express our regret and limitation in this regard. This might so happen due to our inability in measuring marginal transportation costs for sugar industries for non-availability of actual statistical data.

While conducting field survey, some more examples of raw material based industry drew our attention. We could not follow quantitative approach to prove and measure the locational factor of such industry. But corroborated by facts and personal interviews our finding is that the emergence and

growth of fertilizer industry at different locations is the most remarkable example of such nature while owes to the consecutive discovery of gas fields in various adjacent locations. Gas is the major raw material used in this industry. All the Urea producing Fertilizer factories were set up along a route convenient in terms of distance and transportation from the gas fields. This also explains the total absence of any fertilizer factory either in Rajshahi or in Khulna division since no arrangement existed for transporting gas across the river Jamuna either in condensate form or by pipe line. On the other hand, the TSP Fertilizer factory had to be located in the port city of Chittagong primarily due to the consideration of easy import of raw materials.

The Optimum Location Analysis in case of jute industry has been made in Chapter 7. On the basis of simplified version of Cooper's transportation location problem we attempted to examine whether the domestic jute transportation system (from jute growing area to jute mills) is optimal with respect to the location of jute industry in Bangladesh. A comparison between the present pattern of flow of raw materials from sources to destinations and the optimal pattern of flow of the same shows that present location of the mills do not follow optimal cost benefit approach as such. It may be opined from the limited observation that either the procurement programme needs to be changed or the mills could be relocated to obtain

minimal cost subject to the assumption that other factors affecting location have no impact in this regard.

Though ours is a limited observation, it is possible to solve much larger problem of similar nature and more extensive work can be done related to any industry in our country on the basis of transportation location problem.

8.2 Conclusions and Suggestion for Further Research

To repeat, the foregoing review of the major findings of the study leads to the conclusion that the important economic factors like transportation costs, value of land, major purchasing and major supplying sectors, regional industrial output seem to have influence on the localisation of industries in many cases in Bangladesh, yet the importance of social and political factors cannot be denied. In many cases industrial location has not been based entirely on any rational economic consideration. Poor growth of infrastructural facilities resulted in almost total absence of industrialisation in less developed or backward areas of Bangladesh in spite of various incentives provided in the form of tax concessions, more liberal credit, etc. offered by the government. It appears that the gain due to fiscal and other concessions is overly outweighed by the loss due to absence of infrastructural facilities, frequent load shedding and in many cases absence of sufficient fuel subsidy.

At the present level of economic and industrial development of Bangladesh there is need for carrying out comprehensive industrial feasibility studies for selecting new industrial location. A comparative study should be made in order to determine a least-cost location and promote balanced regional industrial development aiming at accelerating overall economic growth and generating adequate employment opportunities. With this end an important area for further research may be identified as the need for a social cost benefit analysis including studies of economies and diseconomies of concentration and dispersion of industrialisation with commercial and social profitability of different industrial sites having high resource potentials in order to make optimum location decision.

In fact, in a developing country like Bangladesh for long-term industrial development regional objective should be given preference along with national objective. Conflicting viewpoints should be reconciled, more and more government investment should take place for providing transportation and infrastructural facilities in order to attract private enterprises at different industrial areas and alleviate regional disparities.

GEOGRAPHICAL DISTRIBUTION OF INDUSTRIAL ESTATE IN BANGLADESH

ANNEXURE 2

Industrial establishments are classified into consumer goods, intermediate goods and capital goods industries, according to CMI 1962-63, in accordance with the value of the largest single product. This criterion is a subjective one and is likely to give fluctuating numbers under the different groups of industries over time. A more objective criterion such as "primary product ratio" can be used to classify industrial establishments into industrial group primary product ratio measure the extent to which establishments classified in an industry specialise in making "products or product group" regarded as primary to the industry i.e., the value of shipments (value of production) of primary product of establishments in the industry is expressed as ratio of the total shipments (value of production) of all products made by these establishments. For proper classification, the value of this ratio should be 80% or more for assigning on establishments to a particular industry group.

According to CMI 1962/63, East Pakistan Bureau of Statistics, the lists of consumer goods, intermediate goods and capital goods industries are given below:

Consumer Goods Industries:

1. Sugar Manufacturing
2. Edible Oil
3. Tea Manufacturing

4. Food Manufacturing (NEC)
5. Tobacco Manufacturing
6. Flower Milling
7. Distillery
8. Dall Milling
9. Rice Milling
10. Bakery
11. Confectionary
12. Canning and preservation of fruits
13. Matches
14. Printing and Publishing of Newspaper
15. Soap
16. Cotton Textile (Mill made)
17. Coconut Oil Processing
18. Silk and Art Silk
19. Narrow Fabrics
20. Foot wear
21. Ready-made Garments
22. Pen and Pencil
23. Ice
24. Umbrella making
25. Perfumery and Hair oil
26. Medicinal and Pharmaceutical
27. Handloom
28. Wooden Furniture
29. Printing and Publishing book

30. Knitting (Hosiery)
31. Plastic Industry
32. Carpet and Rugs
33. Glass & Glass Products
34. Musical Instrument

Intermediate Goods:

1. Jute Textiles
2. Rubber Products
3. Saw Milling
4. Cotton Ginning
5. Manufacture of Fertilizer
6. Paints and Colours
7. Disinfectants and Insecticides
8. Leather Polishes
9. Jute Pressing
10. Paper and Paper Board
11. Miscellaneous Chemicals
12. Optical Goods
13. Dyeing, Bleaching and Finishing of Textiles
14. Oxygen
15. Aluminium
16. Tin cans and Tin ware
17. Electricity and Gas
18. Tanning and Leather Finishing
19. Leather Products other than Foot Wear.

Capital Goods:

1. Cement
2. Metal Barrels and Drums
3. Concrete Gypsum and other plaster products
4. Miscellaneous Fabricated Products
5. Electrical Appliances
6. Shipbuilding and Repairing
7. Structural Clay products
8. Non-Propelled Vehicles
9. Safe, Vaults and Trunks
10. Other Metal Industry
11. Propelled Vehicles
12. Type Foundry and Block making
13. Iron and Steel
14. Other miscellaneous Industries

ANNEXURE 3

Questionnaire for Intensive Survey

1. Name of the Respondent: _____

   Address: _____

   _____

2. Particulars of the Plant:

   2.1 Output

Year	Output in terms of Quantity	Output in terms of value
1975		
1976		
1977		
1978		
1979		
1980		
1981		
1982		
1983		
1984		
1985		

2.2 Input Cost

(a) Fixed Cost

Year	Cost of Land	Depreciation	Cost of Machineries	Total Cost
1975				
1976				
1977				
1978				
1979				
1980				
1981				
1982				
1983				
1984				
1985				

(b) Variable Cost

Year	Raw Materials	Fuel/Oil Electricity	Labour Cost		Total
			Skilled	Unskilled	
1975					
1976					
1977					
1978					
1979					
1980					
1981					
1982					
1983					
1984					
1985					

2.3 Types of Raw Materials Used

1.

2.

3.

2.4 Transport cost of obtaining input (i) from major supplying sources

Year	Source I	Source II	Source III
1975			
1976			
1977			
1978			
1979			
1980			
1981			
1982			
1983			
1984			
1985			

2.5 Transport cost of obtaining input (ii) from major supplying source

Year	Source I	Source II	Source III
1975			
1976			
1977			
1978			
1979			
1980			
1981			
1982			
1983			
1984			
1985			

2.6 By which modes the inputs are carried to the production unit?

Year	Source I	Source II	Source III
1975			
1976			
1977			
1978			
1979			
1980			
1981			
1982			
1983			
1984			
1985			

2.7 Transport cost of shipping output to the major purchasing sectors.

Year	Rail	Road	Water	Other	Total
1975					
1976					
1977					
1978					
1979					
1980					
1981					
1982					
1983					
1984					
1985					

2.8 Output purchased by major sectors (Quantity and value)

Year	Sector I		Sector II		Sector III	
	Qnt.	Value	Qnt.	Value	Qnt.	Value
1975						
1976						
1977						
1978						
1979						
1980						
1981						
1982						
1983						
1984						
1985						

2.9 Value of Capital Stock

Year	Value
1975	
1976	
1977	
1978	
1979	
1980	
1981	
1982	
1983	
1984	
1985	

3. Changes in the technique of production, if any, during the period from 1975-1985

4. Please comment on Industrial Policy of the Government and other related problems, if any.

THANK YOU

BIBLIOGRAPHY

Books:

Ahmad, Muzaffer : Labour Management Relation in Bangladesh - A Study in Participation.

Akhtar, S.M. : Economics of Pakistan.

Alonso, William : Location and Land Use: toward a general theory of land, rent. Cambridge, Harvard University Press, 1965.

Cooper, Leon : Transportation Location Problem. Dallas, Texas, Southern Methodist University (Received January 18, 1971).

Lorch, August : "The Economics of Location." New Haven, Yale University Press, 1954.

Faaland, Just & Parkinson Jr. : Bangladesh, The Test Case of Development.

Florence, P.S. : Investment Location and Size of Plants.

Greenhut, Melvin : Plant Location in Theory and Practices. Chapel Hill N.C., University of North Carolina Press, 1956.

Haroun-Er-Rashid : An Economic Geography of Bangladesh.

Harris, Curtis C., Jr. & Hopkins, Frank E. : An Interregional Econometric Model of Agriculture, Mining, Manufacturing and Services.

Hoover, Edgar M. : The Location of Economic Activity. New York, McGraw-Hill, 1964.

Hye, Mondol A. (Dr.) : "The Location of Industries in Bangladesh." UNDP/UNCHS Working Paper Nol.6, Dhaka, March 1985.

Isard, Walter : Location and Space Economy. Cambridge, The MIT Press, 1956.

Khan, A.R. : The Economy of Bangladesh.

Khan, Alamgir M. : Development Strategy for Bangladesh.

Malley, O. : Irish Industry; Structure and Performance.

Miller, E. Willard : A Geography of Manufacturing.

Palander, Tord : Location Theory, 1935.

Sekhar, A. Uday : Industrial Location Policy: The Indian Experience. World Bank Staff Working Paper No.620.

Sharma, Tulshiram : Location of Industries in India.

Sobhan, Rehman : Debt Default to the Development Finance Institution, The crisis of State Sponsored Entrepreneurship in Bangladesh. University Press Limited.

Thunen, Johaner Heinrich Von : Der Insoliete Staat in Beziehung auf Landwirts - chaft and National Okonomies (Brded S. Chumacher-Zarrchl in 1975).

Journal:

Ahmad, Muzaffer : "A fact finding report on production prices and markets in Bangladesh Sugarcane." Institute of Business Administration, University of Dhaka, 1984.

Ahmed, M.U. : Self Reliant Development and Industrialisation Strategy of Bangladesh - A critique.

Ahmed, Q.K. : The Manufacturing Sector of Bangladesh, BIDS, 1978.

American Economic Review, 1980.

Bangladesh Jute Mills Corporation, Annual Report 1982/83.

BBS : Preliminary Labour Force Survey 1983/84, 1989.

BBS : Statistical Yearbook 1983/84, 1984/85, 1985/86, 1992.

BBS : Statistical Pocket book 1988/89, 1990, 1992.

BBS : Population Census 1981

BBS : CMI Report 1969/70, 1972/73, 1974/75, 1976/77, 1981/82, 1982/83, 1987/88.

BSCIC : Annual Reports 1981 to 1992.

BSCIC : A Survey on Cottage Industries 1981.

BSCIC : A Profile, June 1984.

BSCIC : A Survey on Small Scale Industries in Bangladesh, 1978.

Cooper, Leon : "Solutions of Generalized Locational Equilibrium Models," Journal of Regional Science, Vol.7, Summer, 1967.

East Pakistan Bureau of Statistics 1962/63.

Greenhut, Melvin L. : "Integrating the Leading Theories of Plant Location." Southern Economic Journal, 1952.

Guide to investment in Bangladesh, Department of Industries.

Harris, Chauncy D. : "The Market as a Factor in the Localization of Industry in United States." Annual of the Association of American Geographers, 1954.

Hobson, A.C. : "The Great Industrial Belt." Economic Journal, September 1951.

Indian Economic Review 1980

Kalona, George & Morgan, James N. : "The Quantitative Study of Factors Determining Business Decisions." Quarterly Journal of Economics, February 1952.

Muller, Eva & Morgan, James N. : "Location Decisions of Manufacturers." University of Michigan, American Economic Association, May 1962.

New Industrial Policy - Ministry of Industries & Commerce.

Pakistan Economic Journal, 1968/69.

Planning Commission - Selected Issues in Employment and Development of Bangladesh

Planning Commission, Ministry of Planning - Third & Fourth Five Year Plans of Bangladesh.

Rahman, Atiq : BDS Research Report No.41.

Sahota, G.S. : Impact of Industrial Policy in Bangladesh, BDS, Vol.XIX, March-June, 1991.

Simon, Herbert A. : "Theories of Decision Making in Economics." American Economic Review, June 1959.

Sobhan, Rehman : An Industrial Strategy for Industrial Policy: Redirecting the Industrial Development of Bangladesh in the 1990s. BDS, Vol.XIX, March-June 1991.

The Economic Journal, 1951.

World Bank : Bangladesh Issues and Prospects for Industrial

World Bank : Report on Trade and Industrial Policy, 1985.

World Bank : Bangladesh Development in a Rural Economy. September, 1974.

World Bank : World Development Report, 1992.