STRUCTURE OF
COTTON-MILL INDUSTRY OF INDIA

(A Study in the Size and Location of Industrial units in the Cotton-Mill Industry of India.)

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TO

THE SWEET MEMORY

OF MY

FATHER & MOTHER

PREFACE

This work is a study of the recent tendencies in the size and location of industrial units in the Cotton-Mill-Industry of India, and is the result of an investigation extending over a period of three years. The first year of my investigation was spent in visiting all the important cotton-manufacturing centres of India and in collecting the necessary information. The two years that followed were occupied in tabulating and classifying the data thus collected and in drawing inferences from them. This part of the work involved, besides a careful and cautious interpretation of facts, a systematic verification of the conclusions reached.

In the first part of this study an attempt has been made to examine the recent tendencies and developments in the size of industrial units in Bombay, Ahmedabad and the Rest of India. This study reveals three broad tendencies; first ,the relative spreading out of industrial units into larger dimensions, second the existence of 'typical or 'representative' sizes during each period, and, lastly, a regularity in the dispersion of size about the Average. This has been followed by a study of the causes that can account for the existence of these tendencies.

An enquiry has also been made into the relationship between size and efficiency, and actually some degree of positive correlation between these two variables was found. It is interesting to observe that the results obtained by the application of different methods show a remarkable degree of constancy and uniformity. This uniformity in all the observed tendencies constitutes a strong confirmation of the relationship between size and efficiency. Deductive proofs have also been supplied to explain the correlation between these two factors. Finally, an attempt has been made to find out the "optimum-size" of industrial units in the Cotton-Mill Industry of India.

The second part of this investigation deals with the problem of industrial location. Chapter VII gives a critical review of the various theories of industrial location and the modifications and adaptations suggested to render them more useful for practical application. Chapter VIII explains the nature and character of the present distribution and examines the relative advantages and disadvantages of different centres in regard to raw-materials, power and consumers' markets. Chapter IX reviews the recent tendencies in the intra-regional distribution of Cotton-Mill Industry in India. It examines whether these locational tendencies indicate the shifting of productive activity from regions of high to those of low labour costs and whether it is possible to find out the relative locational importance of different centres in the light of costs, productivity and profits The last Chapter contains some constructive suggestions for formulating a national policy of industrial location.

In the preparation of this work I have received invaluable help from Prof. K. L. Govil, and Prof. J. K. Mehta who have kindly gone through the MS. and offered valuable suggestions at all stages of the enquiry. I also wish to express my gratitude to Dr. John Matthai, B. Litt., (Oxon.), D.Sc. (London) and Dr. P.S. Lokanathan, M.A., D.Sc. (Econ.) (Lond.), for their encouragement and appreciation of this work. The stimulating suggestions that they offered from time to time have greatly increased the usefulness of this study. Lastly, I wish to thank my younger brother, R.M. Mehta, M.Sc. Tech. (Manchester) for his valued help and assistance.

M.M. Mehta

"A STUDY IN THE SIZE AND LOCATION OF INDUSTRIAL UNITS IN THE COTTON-MILL INDUSTRY OF INDIA"

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Chapter I

SIZE--THE PROBLEM OF STATISTICAL ANALYSIS

I

The question whether the individual units working in an industry are of the size which is most economical in working and conducive to the maximum of efficiency is of great practical significance. For, in the long run, the success of an individual unit depends upon the extent to which it has been able to reduce its cost of production per unit of output. In recent years with adoption of labour-saving devices, simplification and standardization of products, improvement in the skill and efficiency of workers and rapid developments in the means of communication and transport, the severity of competition has enormously increased. It is, therefore, doubtful whether in the long run the uneconomic and less efficient units can continue their independent existence. Thus from a purely competitive standpoint it is of vital importance that units are organized on the cheapest scale of output.

But the need for the study in size is much greater when viewed from the standpoints of national economy and industrial efficiency. The economic problem that confronts every nation is that of utilizing the scarce resources for achieving maximum national welfare. Thus viewed, the existence of uneconomic and inefficient units is a great drain on the available resources of a country. Their continuance means scanty profits to the entrepreneurs, low yield to investors and high prices to the general consumers. But more serious and distressing are the losses resulting from the frequent failures of ill-conceived and uneconomic ventures. Such failures, besides frittering away the limited economic resources,damp the enthusiasm of the investing public, cause temporary unemployment, and sometimes threaten the stability and smooth working of the industrial system. Hence in the larger interests of national economy and efficiency it is of paramount importance that individual units are organized on a scale that can ensure the most economical and efficient working.

But the question of most economic-size is one that needs extensive investigation—and careful analysis. Although it is generally believed that the larger the units the more economical they are in operation the subsequent growth of gigantic concerns and big combines makes one doubt if they are of the proper size and really not too big for economic management. Theoretically it is arguable that there is a limit beyond which further expansion would result in countervailing diseconomies and progressively increasing cost per unit. Thus has emerged the concept of "optimum-size" or the "most economical scale of output." It is stated that for each individual unit there is a certain size which, in the given conditions of technique and organizing ability, can secure the lowest average cost of production per unit. Firms smaller or larger than this optimum-size are not so economical in working nor conducive to maximum efficiency. Our investigations will reveal the fact that this concept of optimum-size is not only relative to time and place but is also relative to the environments in which the operations of each individual unit are conducted. Hence the optimum-size for each unit will vary according to the availability of the resources and the extent of co-ordinating ability. This fact is of great significance because the question of optimum or most economic-size is essentially relative in character and hence renders any generalization extremely difficult

It is on account of this difficulty of generalization that the recent controversies on size have mainly centred round the issue of "big business versus small business." Several of the statistical studies undertaken in the United States have established beyond doubt that the smaller units are technically inefficient,[1] the unit cost of production in small operating units is much greater,[2] and the mortality rate much higher than among the bigger units[3]. It is really very surprising that in spite of these adverse influences the smaller units have shown great tenacity in surviving. It has often been asked why, if bigger units enjoy the advantages of large-scale production, the smaller units exist side by side with bigger ones, and even compete succesfully with their larger contemporaries? Their continued existence has been ascribed to two basic factors, firstly, the existence of imperfect competition, and secondly in some cases the superior organizing capacity of smaller units, which in spite of some technical disadvantages may be able to derive some economies of detailed management and close supervision. A large number of smaller units exist because they either produce wide varieties of fine, light and artistic goods to meet the whims and fancies of different consumers, or mainly try to cater their local markets, which are accessible to the larger units only at a certain expense. It is interesting to

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1. R. N. Anthony: Effect of Size and Efficiency, in Harvard Business Review, Spring, 1942, P, 17.

2. J. M. Blair: The Relation between Size and Efficiency of Business, The Review of Economic Statistics, August, 1942.

3. W. L. Crum: Corporate Size and Earning Power. Harvard University Press, 1930, p. 8-9.

See also G. B. Wimsatt: Business Discontinuances, 1940-42. (A study in the relation between Mortality, Rate and Size of Firms), published in Survey of Current Business 1943, and E.A. Heilman: Mortality of Business Firms in Mineapolis, etc., University of Minnesota Press, 1938.

observe that a stream of smaller units come in on a wave of good trade, prosper for some time, and when adversity sets in, some of them collapse, some linger on in expectation of good times and some more energetic and striving ones continue to struggle to maintain their independent existence. But on the whole, it seems, and our own investigation and study amply indicate, that the future of smaller units is by no means very promising.

The protagonists of smaller units, on the other hand, claim that the mere expansion or enlargement of size and the gradual displacement of smaller units, cannot, in the conditions of our time, be regarded as an infallible index of technical progress and cost reduction. Indeed where larger units are in a position to acquire some price-leadership they always try, in the conditions so created, to secure for themselves a monopolistic or rather oligopolistic position, caring less for cost reduction or technical efficiency. While no doubt this may be a characteristic feature of those industries in which only a few firms exist or in which the degree of financial and administrative integration renders some form of combination more feasible, it is exceedingly rare in industries like the cotton-textiles, where the units are not only regionally scattered but in which ownership too is widely diffused. Hence so far as cotton-textile industry is concerned the question of market domination has but little significance.

Another ground on which the enlargement of size has been opposed is that of unwieldiness and the difficulty of economic management. It is said that after a certain size has been reached diseconomies may begin to arise because of the impossibility of perfect co-ordination and lack of close supervision and detailed management. But these diseconomies of management in spite of the importance attributed to them by some theoretical economists[1], seem to have only minor importance in practice[2]. Some statistical evidences too have been offered of lower profits among larger firms by Messrs H.B. Summers[3], W.A. Paton[4], R.C. Epstein[5] and the Federal Trade Commission (U.S.A.)[6], but further investigation and analysis show that their findings were of a general character and did not relate to any specific industry. Now until the profit-rate of different sizes of firms within the whole large-sized group is analysed industry by industry, it is rash to accept from the study of unanalysed group, that smaller units tend to be more profitable than the larger units. A comprehensive and searching enquiry undertaken by Prof. W.L. Crum[7] in this direction clearly suggests an unmistakable tendency for the rate of profit to increase with the increase in the size of the corporate enterprise. His study and analysis cover practically all the different classes of industries, and his results show a surprising degree of uniformity and constancy in all cases. Further, researches of Mr. J.M. Blair[8], R.N.

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1. Austin Robinson: The Structure of Competitive Industry.
Kemper Simpson: Big Business Efficiency and Fascism An Appraisal of the Large Corporations and their threat to Democracy. (New York, 1941).

2. Joseph Steindl: Small and Big Business—Economic Problem of the Size of Firms. P.11.

3. H. B. Summers: A Comparison of the Rates of Earnings of Large Scale and Small Scale Industry—Quarterly Journal of Economics, Vol.46 (1931-32), P. 465-479.

4. W.A. Paton: Corporate Profits as Shown by Audit Reports (New York, 1945).

5. Ralph C. Epstein: Industrial Profits in the United States (New York, 1906) op. cit. p. 350.

6. Relative Efficiency of Large, Medium-Sized and Small Business. (T.N.E.C. Monograph, No. 13) Federal Trade Commission, 1941.
"The results of total tests reveal that the largest companies made, on the whole a very poor showing...... on the average one-third of the companies had costs lower than that of the largest company."
(P.10,12).

7. W.L. Crum: Corporate Size and Earning Power. Cambridge, Massachusetts. 1939, P, 17.

8. J.M. Blair: The Relation between Size and Efficiency. The Review of Economic Statistics, Aug. 1942.

Anthony[1], and Joseph Steindl[2] suggest that as a general rule the larger units are more economical in working and conducive to greater efficiency than smaller units.

The accuracy of these central findings can be further tested by a review of the tendencies in the size of industrial units in different countries. Researches made in the United States of America[3], Canada[4] and to some extent in Great Britain[5] show that in all these countries the dominant tendency has been the gradual expansion and enlargement of the size of operating units. This tendency can be attributed largely to the desire on the part of the big-industrial units "to reduce overhead costs per unit of output by spreading the costs of management and of non-manufacturing operations over a larger volume of output."[6] Enlargment of size has thus been looked upon as one of the important means of securing the advantages of low manufacturing costs.

A study in the trends of changes in the size of industrial units, and a factual analysis of costs and profits in units of different sizes will furnish a very useful basis for judging whether the units working

1. R. N. Anthony: Effects of Size and Efficiency. Harvard Business Review. Spring. 1942, P.17.

2. Joseph Steindl: Small and Big Business—Economic Problem of Size of Firms. Published by the Institute of Statistics, Oxford 1945.

3. Gardiner C. Means: "Growth of Relative Importance of Large Corporations in American Life" Published in American Economic Review Vol. 27 (1931) P. 10-42.

4. V. W. Bladen: Size of the Establishments in Canadian and American Industry. Toronto University Studies—"Contribution to Canadian Economics" Vol. I P. 56-68.

5. Prof. S. J. Chapman and T. S. Ashton: Size of Business mainly in the Textile Industries, Journal of Royal Statistical Society, 1914, P. 472-480.

See also Committee of Industry and Trade Reports, Part I, Survey of Industries—"Scale of Business." P. 3-12,

Compton and Bott: British Industry—Its changing Structure during Peace and War. (London, 1941).

6. S. J. Kennedy: Profits and Losses in Textiles, (New York, 1936) P. 186

in an industry are of the size that can be considered economical in working and conducive to the maximum of efficiency.[1] Further, it will be interesting to examine whether the observed facts reveal the same trends and justify the same conclusions that theory has long supported. Such a study will not only be of great theoretical interest but also of considerable practical significance.

II

OBJECTIVES OF ANALYSIS

The primary object of our study is to examine the recent tendencies and developments in the size of industrial units in the Cotton-Mill Industry of India. If such a study reveals or suggests certain distinct tendencies, we shall advance adequate reasons to explain and account for their existence. Further we shall examine whether the character of distribution of sizes in the Cotton-Mill Industry of India shows the existence of certain typical-sizes, and if so what changes have taken place in the size of typical units during the last forty years. Moreover, we shall examine the nature and character of dispersion about the type, and explain, in the light of modern economic theory, the laws that govern such dimensional dispersions, and also indicate the extent to which they are applicable to the Cotton-Mill Industry of India.

Another object of our study is to find out by investigation and analysis whether there exists any relationship between size and efficiency. In other words, we have to see if an increase in the size or the scale of operation necessarily brings about greater

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1. P. Florence Sargent: Economic Research and Industrial Policy. Economic Journal, 1937. P. 186.

"To a certain degree mere description of the actual situation is a test of efficiency, since a given situation in sites or in sizes is the result of efficiency in survival from past policies; and efficiency is tested to a yet greater degree by the description of the trends of changes over a period of years."

Changes in U. S.A. and Mr. S. J. Kennedy in Profits and Losses in Textiles."

On the relationship between size and efficiency several interesting statistical studies have been undertaken in recent years. Among the most valuable contributions are: H. B. Summers' "A Comparison of the Rates of Earnings of Large Scale and Small Scale Industries,"[1] J. N. Blairs' "The Relation between Size and Efficiency"[2] T. N. E. C's Monograph on "The Relative Efficiency of Large, .Medium-sized and Small Business"[3]; R. N. Anthony's article on the "Effect of Size and Efficiency"[4] E. R. Walkers' study of "Size and Efficiency in New Zealand Industry"[5]; G. T. Jones' Study of the "Relation between Size and Efficiency of some Selected British and American Industries,[6] W. L. Crums' several interesting articles on the relationship between Size and Earnings published in the Harvard Business Review and his recently published but most remarkable and exhaustive treatise on "Corporate Profits and Earning Power."

On the theory of the size of firms much valuable work has been done by Mr. Austin Robinson in his admirably lucid and thought-stimulating book on "Structure of Competitive Industry" and in his article on "The Problem of Management and the Size of Firms"[7]; by Mrs. Joan Robinson in her "Economics of Imperfect Competition"; by Florence Sargent in his two thought-provoking articles, one on "The Problem of Management and the Size of Firms: A Reply,"[8] and another on "Economic Research

1. Quarterly Journal of Economic Statistics Vol. 46 (1931-32,) P.465-479.
2. The Review of Economic Statistics, August, 1942.
3. T. N. E. C.'s Monograph 13, published by Federal Trade Commission. (U. S. A.) 1941.
4. Harvard Business Review, Spring 1942. p.17.
5. The Economic Record, June, 1937.
6. Published by Cambridge University Press, 1933.
7. Economic Journal. Vol.44 (1934), P.242-257.
8. Economic Journal. Vol.44 (1934), P.723-729.

and Industrial Policy"[1] by Nicholas Kaldor in "The Equilibrium of Firms"[2]; by V. H. Hutt in "Co-ordination and Size of the Firms"[3] and other interesting works of E.P. Schmidt,[4] C.H. Allen[5] W.Benton,[6] Kemper Simpson[7], J. H. Cover and others[8] on Economics of Small and Big Businesses.

The writer has derived great inspiration and assistance from the works of the above authors, and much of the original contribution contained in this study is the result of the absorbingly interesting and stimulating researches undertaken in foreign countries.

IV

CONCEPT OF 'SIZE' AND 'INDUSTRIAL UNIT'

In the study of the size of industrial units we ought to start, if our thinking is to be clear, with some clearly defined concept of 'size' and 'industrial unit.' Although, in theoretical economics, 'size' connotes "the scale either of 'operation' or output, in practical discussion, it has been used in such a variety of sense that it has become very difficult for a layman to understand what it precisely implies. Even "economists have unfortunately not always been too clear as to whether they meant firm or plant when they were discussing scale of industry;

1. Economic Journal. Vol. 47 (1937). P.625.
2. Economic Journal. Vol.44 (1934).
3. The South African Journal of Economics, December, 1934.
4. E.P. Schmidt: Small Business, Its Place and Problems. (Washington. 1943).
5. C.H. Allen: Is Small Business Doomed? Outlook for Small Business and U.S. Free Enterprise. (New York, 1934).
6. W. Benton, and others: Small Business after the War (Chicago University, 1934).
7. Kemper Simpson: Big Business Efficiency and Fascism. An Appraisal of the Large Corporations and their Threat to Democracy. (New York, 1943).
8. T.N.E.C. Monogram. 17. Problems of Small Business by John H. Cover, Nathanael H. Engle, Earl D. Strong, Peter R. Nehemkis., Williams Saunders, 1941.

sometimes they really meant neither."[1] To cite an interesting example, the word "establishment" used in American Census of Manufacture has been interpreted in so many different ways that it is difficult to understand whether the term "establishment" refers to plant, firm or combination of firms. J.A. Hobson refers to the American establishment as a 'business' or a 'business unit,' Leroy-Beaulieu, on the other hand, identified establishment with 'plant;' and Seligman identified it with 'factory'."[2] Even the definition officially given by American Census authorities can hardly be said to clarify matters.[3]

It is, therefore, a prerequisite of any statistical approach that we should clearly define all terms involved in interpretation. We should clearly understand whether the term 'industrial unit' used in this study refers to a firm, plant or mill or group of mills under one management or ownership. While several possible definitions may be valid, the choice must necessarily depend upon the purpose in view. If the object of our study is to examine the advantage of large-scale production, it would be best to regard 'any plant or productive group which is confined within, and completely fills one factory or mill'[1] as an industrial unit. But if our object is to analyse not only the advantages of large-scale production, but also of large-scale organization, we should regard all the several factories, owned by a single employer and administered in respect of their financial and marketing policies by a central office, as constituting one industrial unit. For example, if an employer or a company owns two or more mills or factories, they should, from the financial and administrative points of view be regarded as one industrial unit.[2] Diffi-

1. P. Sargent Florence: Economic Research and Industrial Policy, Economic Journal, 1937, p. 630.

2. P. Sargent Florence: Statistical Method in Economics (London, 1929) p.149.

3. Ibid, p. 150.

culty will, however, arise when the units, though owned by different employers or companies, are managed by some common Managing Agency firms. For in that case it may by argued whether or not it may be more appropriate to define the whole group of mills, managed by the same Managing Agents as one industrial unit. While no doubt there seems to be some justification in this argument, expediency suggests and the character and arrangement of the statistical data demand that it would be better if we confine our view of industrial unit to a mill or group of mills under one ownership. "Ownership should, after all, be the more relevant criterion, for the losses (if any) are borne by the owners and the profits accrue to them. Further, each individual unit keeps separate its own book accounts; and although even some of the common costs are apportioned among them in some prescribed manner, the accounts relating to each are maintained separately and the profits and losses remain special to each firm."[1] Morever when two or more mills are under one ownership the figures of profits, productivity and costs of each mill are published not separately but jointly. Hence for studying the relationship between size on the one hand, and profits, productivity and costs on the other, the whole group of mills under one ownership will have to be treated as one single firm or industrial unit. For our study the term 'industrial unit' may, therefore, be defined as a " a plant or group of plants or any manufacturing or productive group, which is under one ownership, and which is situated in the same industrial centre or area."

MEASUREMENT OF SIZE

Another difficulty arises in the selection of some suitable standards by which size can be measured with reasonable accuracy. Although it is possible to suggest several methods for the measurement of size, the accuracy and adequacy of each method will depend upon the nature of the industry and the character of its output. In industries like Cement, Sugar or Coal where the type of product is quite uniform or homogeneous, the 'Volume of Output' or the "Total Tonning-Capacity" can serve as a suitable standard for the measurement of size, but in industries like the Cotton-textiles which produce wide varieties of goods, some producing fine, light and artistic wares, while others specializing in rough, coarse and standardized goods, the 'Volume of Output' may fail to reflect the differences in the size of the individual units. Again, in some industries, like Paper, Chemical, Iron and Steel or Glass, the type and character of technical equipment so materially vary from unit to unit, that mere enumeration of the number of plants cannot furnish a reliable criterion for the measurement of their productive capacities. Similarly, in some industries, the capital requirements of the individual units, and the methods of financing them, are so widely different that the figures of 'paid-up capital' or even of the "total capital invested" may be quite inadequate to provide a satisfactory basis for measurement of size. Thus in view of the wide disparities in type of products, capital costs, financial methods and the technical equipment, no single standard of measurement can serve the purpose of all industries. Hence the significance, utility and adequacy of each standard should be viewed only in relation to the nature of industry, under investigation, and the uniformity, homogeneity and accuracy of the data available.

SOME SELECTED STANDARDS OF MEASUREMENT IN THE COTTON-TEXTILE INDUSTRY

SPINDLES AND LOOMS AS INDEX OF SIZE

The most widely used method in the Cotton-textile Industry for the measurement of size is the "Number of Spindles and Looms Installed" in each individual unit. Of course, it is not a perfect measure since spindles may be ring, mule or doubling and looms may be ordinary, semi-automatic or automatic. Their productive significance will vary according to the degree of utilization and the differences in mechanical efficiency. Thus, as measure of size, the number of Spindles and Looms Installed suffer from two serious limitations, firstly, they measure nothing more than "potential productive capacity" of each unit, and, secondly, they ignore the effects of hours of work, the number of shifts worked in different units and at different centres, as well as the technological factors of suitability for specific yarn counts, extent of mechanization and obsolescence. But for these limitations and reservations they provide a sufficiently satisfactory basis for measurement of size. The types of plant and equipment used in cotton-manufacturing possess a certain degree of 'technical homogeneity' and are largely interchangeable[1] and hence intercomparable. Further as much of the output in cotton-textiles consists of mixture of different fabrics and as there exists considerable uniformity of processes in the industry, the differences in the character of technical equipment too are not very great. And, lastly, although there may be some differences in the hours and shifts of work and in the mechanical efficiency attained by each unit, they cannot materially influence the "measurement of productive capacity." Hence the "Number of Spindles and Looms Installed" can serve as a reasonably satisfactory standard of measurement.

Another standard so commonly used for the measurement of size is the "Number of Workers Employed" per establishment. Indeed, when comparisons are made between units producing similar type of goods and representing the same

1. Mule Spindles can be replaced by Ring Spindles and ordinary looms by automatic looms, and vice versa.

stage of technical development, this method can give fairly satisfactory results. But when there are vast differences in the technique of production and character of output, the results of such comparisons are likely to be misleading. For a unit employing less 'capitalistic and more labour-intensifying' methods of production will employ proportionately a larger number of workers than a unit depending on 'Labour Saving and capital-intensifying methods of Production.' Again, when the character of output shows significant variations, (some producing fine and artistic goods, others specializing in coarse or standardized wares) the proportion of labour employed in each unit may considerably vary. Differences may also arise on account of the variations in the standard of efficiency of workers in different centres. Thus as a standard of measurement it has several limitations.

Another measure of size is furnisheed by the data relating to 'Annual mill-consumption of Raw-Cotton.' Where the units are to a great degree self-sufficing and where the differences in the character of output are not very great, this criterion will, no doubt, furnish a very valuabl e method for measuring the size of the industrial units. But where the differences in the character of output are very considerable, and the structure of the industry ill-balanced (some units being predominantly spinning while others weaving in character) this standard will fail to afford a satisfactory measure of size. For, in such cases the annual consumption of raw-cotton will vary from unit to unit according to the average counts of yarn manufactured, the proportion of several grades of raw-cotton consumed, and the relation between the spinning and weaving sections. Thus as a measure of size this criterion has some limitations, and unless proper adjustment are made for each of these factors, the results may, to some extent, be misleading. One method of obviating these difficulties to some extent is to restrict its application to spinning mills or section only.

The amount of capital invested has also been suggested as one of the standards by which size can be measured. But accurate data regarding capitalization are very difficult to obtain. The figures of paid-up capital, although available, do not afford a satisfactory basis of measurement, for the methods of financing the industry may be widely different in different centres, and even within the same centre, between different units. In centres, where industrial capital is cheap and easily available, firms will prefer to borrow more than where it is scarce and difficult to obtain. Again, some firms prefer it as a matter of business policy to depend more on owned capital and less on borrowed capital. In certain respects, therefore, the total block value of each unit is a better and safer measure of size, but here too, the methods of valuation of capital invested in land and buildings, plant and machinery and other fixed assets, may be so different, as to make this method undependable. Moreover, the amount of capital invested in different units may vary on account of such factors as location, time of floatation or promotion, and the character of technical equipment used. Hence the amount of capital invested cannot be regarded as a very dependable measure of size.

Other measures have also been suggested for the measurement of size such as Volume of Output, Value of Output and the Amount of Power consumed per establishment. For measurement of actual capacities, the 'Volume of Output' method has certain comparative advantages, but it suffers from the defect that the totals of volume disguise differences in quality and grade, and so also significant differences in unit and total value. The 'Value of Output' method though it takes full cognisance of these differences in quality of output, is quite inadequate for measurement of physical capacities. Further, if comparisons are made over a period of time, changes in the Value of Output may obscure the changes in the size of industrial units. It is, therefore, not a satisfactory measure of size. The amount of electric energy used may also serve as a useful index of size, but sometimes the differences in the character of technical equipment and in the methods of conservation and transmission may be so great that the results of comparison may be quite misleading.

The foregoing analysis clearly reveals that the most dependable measure of size is the 'Number of Spindles and Looms Installed' per unit. The other measures which can serve some purpose are, the 'Number of Workers Employed' and the 'Quantity of Cotton-consumed' per unit. We shall, therefore, in the course of this investigation, make use of all these three measures, in the hope that the distortions attributable to any one of them, taken singly, may thus be offset. Further, if the application of all these measures reveals the dominance of the same tendencies and suggests the same inferences, our general conclusions will be amply verified and confirmed.

VI.

SOURCES OF STATISTICAL INFORMATION : A NOTE

A few words are called for in regard to the statistical information used in this study. The figures of (I) Number of Spindles, (II) Number of Looms, (III) Average Number of Workers Employed, and (IV) the Quantity of cotton-consumed have been collecte from the Annual Reports of the Bombay Millowners' Association for the respective years. The first Annual Mill Statement was issued in the year 1904, but the copy of that statement available at the Association's Office was so mutilated and the figures so illegible that the earliest figures that we could make use of were for the year

1905. The period selected for the study of trends in the size of industrial units is from 1905-44—a sufficiently long period to indicate the general tendencies and developments.

For the study of relationship between size and profits, the figures of profits, paid-up Capital, Gross Block and Net Block, Capital Debt or Surplus Fund., etc., have been compiled from (I) The Industrial Investor's Diary, (ii) The Investor's India Year Book, (iii) Manu Mehta's Bombay Stock Exchange Year Book, and (iv) other Periodicals, Reports and Reviews which give details of financial position of some selected mills. Unfortunately, the data relating to capitalization and profits are so vastly scattered and diffused that one has to spend several wearisome hours at the table before one can collect and compile the required information. There is no authentic publication like the "Statistics of Income" in U. S. A, which gives complete, systematic and reliable information about capitalization and profits.

The statistical information relating to Cost of production has been compiled from the published Profit and Loss Accounts and Balance Sheets of different companies. These published Accounts give details of the individual items of expenses such as raw-materials, wages, power and fuel, stores, repairs and renewals, interest, insurance, supervision expenses, selling expenses, depreciations and profits. This information, though very inadequate and fragmentary for detailed cost-calculation, can nevertheless provide some basis for reflection whether costs bear any relation to size.

CHAPTER II

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY

1905-44.

I

Our object in this Chapter is to make a realistic study of the changes that have taken place in the size of industrial units in the Cotton-Mill Industry of Bombay during the last forty years., viz., 1905-44, and see if they exhibit any definite trends in certain directions. In case they do, we shall proceed to explain and account for the existence of such tendencies, and show to what extent they could be attributed to well-defined economic laws. Further, if our analysis reveals the existence of 'representative' or 'typical' units in the Cotton-Mill Industry of Bombay, we shall see whether there have been any important changes in the size of such units during this period. We shall also analyse the conditions responsible for the existence of 'typical units.' Incidentally, if our analysis reveals a regular dispersion of magnitudes about the type, we shall explain, in the light of modern economic theory the laws that govern such dimensional dispersions, and indicate the extent to which they are applicable in the case of Bombay Cotton-Mill Industry.

At the outset it must be admitted that the task of measuring changes in the size of industrial units is by no means easy. Apart from the innumerable changes that have taken place in the operating technique, character of output and equipment, there have been imperceptible changes in the organization and structure of the Cotton Textile Industry during the last four decades. These changes tend to obscure and conceal the real tendencies in operation, making it difficult to judge their effects with any degree of precision and exactitude. This difficulty is further accentuated by the existence of financial and administrative integrations among the industrial units in the Cotton-Mill Industry of Bombay. "Where several mills are under the same management, the possibility of common services being rendered for the mills by a central organization, renders the size of the individual mill a matter of relatively smaller moment." It is, therefore, difficult to analyse correctly the effect of these developments on the size of industrial units, and more so to statistically measure and quantitatively determine the nature and extent of such changes.

Despite these reservations and limitations such a study would be helpful in two directions. Firstly, it would throw ample light on the changes that are taking place in the size of the industrial units, and, secondly, where such changes exhibit definite trends or tendencies, it would enable us to draw certain inferences and arrive at certain conclusions. If certain other factors such as the changing pattern of industrial organization or the structure of the industry or any other extraneous influence or influences, tend to counteract such trends or tendencies, we shall endeavour to detect them and study their influence on the size of the units separately.

DISINTEGRATION OF PROCESSES

For our present study, we have divided the Cotton-Mill Industry of Bombay into two Sections, Spinning and Weaving. The data about Finishing is so scanty, and so incomparable as to hardly justify any independent investigation or generalization. Firstly, we shall study the size of the Spinning and Weaving Sections separately and then attempt the "Method of Cumulative Measurement" for determining the size of a Combined Spinning and Weaving Unit and the quantitative relationship that exists between these two processes. This alternative has been forced upon us partly by scientific facts, partly by reason of constraint of circumstances and partly by the character and arrangement of the available Statistics.

I

SIZE OF SPINNING SECTION

The size of the Spinning Section can be measured either by the Number of Spindles Installed or by the Quantity of Cotton-Consumed. They are, of course, not perfect measures, since Spindles may be Ring or Mule or Doubling, and the Quantity of Cotton-Consumed may vary according to the counts of yarn spun and the proportion in which the several grades of cotton are mixed. As regards, spindles with which we shall deal first, it may be said that under the present circumstances it is not possible to quantitatively measure the productive capacity of each class of spindles separately and generalize about their quantitative relationship. Conversion of mule spindles into their equivalent ring-spindles is a task which will entail far more labour than our results would justify and, secondly, even if we are able to establish some quantitative relationship between the the two classes of spindles on some arbitrary basis it would be a very inexact one indeed. All that can be said is that Ring Spindles involve a higher degree of mechanization and signify a higher degree of productive capacity than the mule spindles[1], and

1. I. L. O. Report on World Textile Industry, 1937, P. 52.

there is an increasing tendency on the part of Textile Mills in Bombay to scrap their mule spindles and instal in their place ring spindles as the following Table will amply illustrate:

TABLE No. I.

CHANGE IN THE CHARACTER AND COMPOSTION OF SPINDLE ACTIVITY IN BOMBAY COTTON-MILL INDUSTRY—1905-44.

	Percentage Figures of Ring-Spindles Installed	Mule Spindles Installed
1905	55.45	44.55
1911	68.86	31.14
1921	76.73	21.27
1931	89.83	10.07
1941	94.92	5.08
1948	95.36	4.64

CHANGE IN THE SIZE OF SPINNING-SECTION

DISTRIBUTION OF GROUP-FREQUENCIES

The following Table gives the frequency distribution of industrial units according to the number of Spindles installed. The magnitude of the class-interval has been taken as 5,000 upto 60,000 spindles and thereafter 10,000. For a smaller magnitude the distribution would have been uneven, and a larger magnitude would have covered up the tendencies.

Table no. II.

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY—1905—'44.

FREQUENCY DISTRIBUTION OF SPINDLE-ACTIVITY

Spindles Installed.	1905	1911	1921	1931	1941	1944
0— 5,000	1	1	1	0	0	0
5,000—10,000	1	1	1	1	0	0
10,000—15,000	2	2	1	2	0	1
15,000—20,000	4	3	2	2	1	2
20,000—25,000	11	5	7	2	2	2
25,000—30,000	13	14	7	4	0	0
30,000—35,000	12	10	15	9	9	6
35,000—40,000	10	14	8	6	6	7
40,000—45,000	7	5	5	13	7	10
45,000—50,000	6	6	5	8	9	8
50,000—55,000	1	4	4	3	5	4
55,000—60,000	0	2	2	3	0	1
60,000—70,000	2	2	3	3	6	7
70,000—80,000	1	1	0	3	3	2
80,000—90,000	0	2	2	2	0	0
90,000—100,000	1	0	1	1	2	2
Above 1,00,000	1	2	4	4	2	2
Totals	73	74	68	66	52	54

An analysis

An analysis of this Table will show that in 1905 no fewer than 46 industrial units, out of the total of 73 engaged in spinning, had a spindle-equipment ranging from 20,000 to 40,000 spindles. Of these 46 industrial units 25 fell in the group of 25-35 thousand spindles. Only six of the 73 industrial units were equipped with more than 50 thousand spindles equipment or amalgamated themselves with larger and only two had a capacity of 80 thousand spindles each. The comparative absence of bigger units and the preponderance of the smaller units were two outstanding features of the earlier period.

Upto 1911 no significant change took place in the size of the industrial units except a marked decline in the 20-25 thousand group and a slight increase in the 35-40 thousand group. Most of the units, 38 out of the total of 74, fell in the class-interval of 25-40 thousand spindles. The number of industrial units having more than 50,000 spindles increased to 13, 4 of which had more than 80 thousand spindles. A regularity of dispersion though lop-sided, is observable on both the sides.

In 1921 we note the persistence of the same tendencies. There is a steep decline in the 25-30 thousand-group and an appreciable increase in the number of mills having more than 50,000 spindles. A few of the bigger mills expanded their spindle-equipment very considerably, 4 units having more than 1,00,000 spindles.

In 1931, we observe the continuous decline in the number of smaller units and a substantial increase in the number of larger units. No fewer than 21 industrial units out of the total of 66 in 1931 had a spindle-equipment ranging from 40,000 to 50,000 spindles. This also contained, as we shall see later, the 'representative' or 'typical unit' in 1931. Further, a greater regularity of dispersion is observable on both the sides than what existed in previous years.

In 1941 we note an unprecedented decline in the number of smaller units. Only 3 units, having less than 30 thousand spindles could, in spite of the protection granted to the industry, survive the vicissitudes of the post-depression period. The others either went into liquidation or increased their spindle-

(ii) The entire loss is confined to class-intervals having less than 40 thousand spindles. This inference suggests another reflection, namely, a spinning unit in Bombay, having less then 40,000 spindles is perhaps not (as our subsequent enquiry will show, is certainly not) conducive to maximum efficiency or economic working.

(iii) In spite of a remarkable decline in the number of industrial units between 1905-44, from 73 to 54, the number of frequencies in the 40-80 thousand class-intervals record a conspicuous increase from 17 in 1905 to 32 in 1944. This indicates a relative spreading out of industrial units into somewhat larger dimensions. The increase in the average-size of an industrial unit is attributable to various causes, which we shall analyse later.

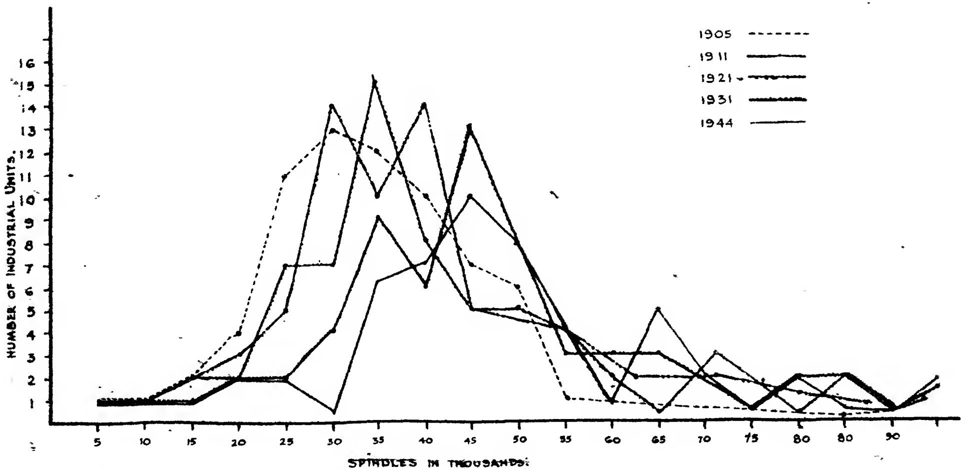
(iv) The class-interval of 60-70 thousand spindles has (and as the recent tendencies show) become more pronounced.

(v) There is a remarkable degree of regularity in size-dispersion.

The relative changes also indicate or reflect the same tendencies. Industrial Units having less than 40,000 spindles have declined in importance. Whereas $45_0/^0$ of the frequencies in 1905 fell in 0-30 thousand class-intervals, in 1944 the percentage share was only 9. There is a considerable increase in the share of each class-interval having more than 40 thousand spindles. One-third of the industrial units engaged in spinning in the City and the Island of Bombay have now a capacity ranging from 40-50 thousand spindles.

Now looking at the Graph No. 1 we shall be able to detect the same trends. In 1905 there existed, though indistinctly, one maximum having 20-30 thousand spindles. In 1911 two distinct maxima (fork-shaped) are clearly observable, one in the class-interval of 25-30 thousand spindles,

Fig. 1 Showing Trends in the Size of Industrial Units in Cotton-Mill Industry of Bombay. (Spinning Section).



and the other in the class-interval of 35-40 thousand spindles. In 1921, we observe the existence of one outstanding maximum in the 30-35 thousand class-interval. In 1931 again two maximum appear, one in 30-35 thousand group and the other in the 40-45 thousand group, the latter being more distinct and pronounced. In 1944 also we note the continuance of the same expansionist tendencies. The first maximum is observable in the 40-45 thousand class-interval and the other though less distinct in 60-70 thousand group.

On a close observance of the above generalization one begins to suspect that the data relate to two distinct classes of industrial units which were constantly expanding and enlarging their technical equipment by almost imperceptible stages. For example, one dominating size of 20-25 thousand spindles in 1905 passed into that of 25-30 thousand spindles in 1911 and into that of 30-35 thousand spindles in 1921. The same units expanded and passed into the size of 40-45 thousand spindles in 1948. All these maxima, therefore, disclose some 'secular' and 'ascending' trends; the same units passing from lower to upper class-intervals in a descending order and at regular intervals. Some of the units which show such 'secular' and 'ascending' trends, and which can fairly be included in this category are Crown, Moon, Hindoostan, Indian Mfg., Jam Mfg., New Kaiser-Hind, Swan, Western India, New Union and Madhowji. Another class of industrial units which formerly belonged to 30-50 thousand class-intervals, has now passed on to one of 60-70 thousand spindle-size. In this case as well we observe the same secular and ascending trends, the same industrial units passing from lower to upper class-intervals in an ascending order. The units which can be reckoned in this category are Khatau, Phoenix, Morarji, Sassoon, Swadeshi, Shree Niwas and Tata.

Two very important conclusions emerge out of this factual survey, first, that there is a tendency on the part of industrial units to grow out of their humble beginnings. They first start on a small-scale and then expand their physical and technical equipments as the financial resources permit and as the exigencies of the situation demand. The periods of rapid expansion generally coincide with periods of great industrial activity, and the periods of slow, intermittent, and irregular expansion with those of industrial inactivity and depression. In old industrialized centres, however, where the agglomerating causes, which initially favoured the growth of new industrial units, cease to operate, it is doubtful whether a firm can manage to start on a small scale and expand its physical and technical equipment by gradual stages. The impact of competition from large and well-organized units and the newly-established centres would be so severe that smaller units have except in periods of great industrial activity, hardly any chance of easy survival. Hence it is only during the periods of early growth of the industry that this characteristic feature is usually discernible. At later stages of the evolution of the industry this tendency is comparatively less marked.

The second important fact that emerges out of this factual survey is the existence of the 'typical' or 'representative' units in the Cotton-Mill Industry of Bombay. Of course, the size of typical or representative units varied from period to period but there was a distinct tendency on the part of industrial units to expand and grow up to that 'typical size.' The law governing the growth of the industrial units, is in some respects analogous to natural law. Just as the human form grows and reaches a certain stature, which we call 'typical' so also there is a tendency on the part of industrial units to grow to some typical-size or magnitude.

Concept of 'average,' 'representative' and 'typical' size

In theoretical economics there is a significant difference between 'Average-size' and 'Typical-size.' Whether the Average-size is more representative of the whole series or the Typical-size, it is difficult to say without minute examination of the available data. Typical is, of course, a better representative of the whole series when there exists a single well-defined 'modal-class' and a regularity of dispersion is observable on both the sides of the 'modal-class.' But where 'mode' is indistinct or indeterminate or where two distinct maxima appear, it is doubtful whether mode can truly represent the characteristics of the whole series. In that case 'median' will be a more typical average to represent 'typical-size' in the industry. Fortunately there is such a remarkable degree of regularity in size-dispersion that the mode and the 'median' tend to fall in the same class-interval and hardly exhibit any significant variation. The theoretical differences in these terminologies, have, therefore, hardly any practical bearing so far as this investigation is concerned. Of course, the tendency to cluster round the average makes 'median' more typical and representative of the whole series than the 'mode.' Further for measuring the degree of dispersion from the average, the median has a wider applicability than the Mode. So, considering the distribution of frequencies, characteristics and peculiarities of our observational data, we find that in our investigation, the Median would be more typical and representative of the size of industrial units than the Mode. We have put greater emphasis on this point for we want to bring to light the salient fact that the significant changes in the Average-Size denote significant changes in the size of typical units.

Changes in the average-size

The Table on the next page will exhibit the extent of changes that have taken place in the Average-Size of the Industrial Units engaged in spinning in Bombay from 1905-44. The changes in the Average-Size are also suggestive of the changes in the size of Typical-units.

TABLE NO. IV.

TRENDS IN THE AVERAGE-SIZE OF AN INDUSTRIAL UNIT IN COTTON-MILL INDUSTRY OF BOMBAY 1905—1944.

(SPINNING-SECTION.)

Years.	Group containing the Average-Size. (Spindles Installed)	Average No. of Spindles installed per industrial Unit. in thousands (Type of Average used 'Median.')
1905	30,000—35,000	32.1
1911	35,000—40,000	35.5
1921	35,000—40,000	35.3
1931	40,000—45,000	42.9
1941	45,000—50,000	45.8
1944	40,000—45,000	44.8

AN ANALYSIS:

On analysing the above Table one can make the following observations:

(i) The average-size of an industrial unit in Bombay has expanded from 32 thousand spindles to 45 thousand spindles between 1905 and 1944.

(ii) The expansion was the greatest during the period 1921-31.

(iii) During 1941-44 the average number of spindles installed per industrial unit recorded a slight decline, primarily because of the inability of the units to replace their worn out plants during the currency of the war.

(iv) There is some regularity in the change of class-intervals. In 1905, 30-35 thousand group contained the average-size, in 1911, the 35-40 thousand group, in 1931, the 40-45 thousand group and in 1941, the 45-50 thousand group contained the average-size. The 'ascending' tendency suggests that there was a regular but gradual expansion in the average-size of an industrial unit.

The expansion in the average-size of an industrial unit in Bombay can be ascribed to various causes. Firstly, with the expansion of the industry there was a natural desire on the part of the individual units to expand and extend their domain of influence over a wider area. Secondly, the units expanded with the object of increasing their competitive strength. Thirdly, the industrial concentration with its attended external and internal economies tended to encourage the growth of larger units. The motivation underlying this expansion was to spread out the "over-head costs" over a larger volume of output so as to bring about a substantial reduction in the total costs per unit of output. Fourthly, the movement towards 'specialization' help the expansion of the individual units, and lastly changes in the character and form of industrial organization such as the elemination of private and proprietary concerns, and the growing preponderance of Joint-Stock enterprises, placed in the hands of the individual units afford ample financial resources for further expansion.

DISPERSION OF SIZE ABOUT THE AVERAGE

Looking at the Graph—No. 2 we observe a remarkable degree of regularity in the dispersion of magnitudes about the average. Even in the Table No. II we shall observe that the frequencies in each class-interval are scattered on both the sides of the average quite regularly. This regularity denotes the tendency on the part of individual units to cluster round the Average. While attempting to reach that Average-Size many of the individual units may still be in a state of infancy and adolescence. And that probably accounts for the diversity in size and regularity in dispersion. The industry includes all units, some still infant, some matured and some over-grown. The small beginnings and the expanding stages in the industry account for the regularity in dispersion of magnitudes about the Average. The theoretical justification for the existence of such tendencies, we shall advance at some later stage. Here we shall only point out that in the Cotton-Mill Industry of Bombay, one will distinctly observe that there is a remarkable degree of regularity in the dispersion of magnitudes on both the sides of the Average-Size.

MEASURE OF DISPERSION

For determining the degree of variability of each item from the Average several methods can be employed depending upon the character and arrangement of the available statistics. The principal methods generally adopted are Mean Deviation, Standard Deviation and the Quartile Deviation. For the purpose of this enquiry we shall adopt Quartile Deviation or Semi-Interquartile Rangle and its Co-efficient as a Measure of Dispersion, for it has two distinct advantages over the Mean and the Standard Deviation. Firstly the Quartile Deviation will show the degree of variability both on the lower and the upper side of the Average-size separately and, secondly, this Measure of Dispersion is simple to comprehend and easy to compute.

The table on the next page will show the Quartile Deviation in the average spindleage installed and the Quartile Co-efficient of Dispersion. While the first will be an Absolute Measure of Dispersion, the second will show the relative degree of variability in the size of industrial units during the different periods.

TABLE No. V.

DISPERSION OF SIZE ABOUT THE AVERAGE

(SPINNING SECTION)

(In Thousands)

Year.	Lower Quartile Q. I.	Dispersion of Lower Quartile from the Average.	Upper Quartile Q. 3.	Dispersion of Q. 3. from the Average.	Quartile Deviation.	Co-efficient of Quartile Dispersion.
1905	24.8	—7.3	41.1	+ 9.0	8.15	.25
1911	27.4	—8.1	46.0	+10.5	9.3	.25
1921	28.8	—6.5	49.8	+14.5	10.5	.27
1931	33.2	—9.7	55.4	+12.5	11.1	.25
1941	36.1	—9.7	61.3	+15.5	12.6	.26
1944	37.0	—7.8	60.4	+15.6	11.7	.24

The following conclusions emerge from the observation of the above Table :

(i) The Measure of Dispersion is less on the lower side of the Average than on the upper-side of the Average. This means that the units on the lower side of the Average show a great tendency to cluster round the Average, than units on the upper-side. Whereas the smaller units are constantly struggling hard to reach the Average-size, the larger units grow out disproportionately. Once the unit has expanded it is difficult to effect contraction. While expansion, reduplication or supplementing of the technical equipment is easy, its corresponding deviation, shrinkage or contraction is not possible except at a serious loss. Even during periods of depression and industrial inactivity it is doubtful whether the larger units would to any great extent, effect a reduction in the productive capacity of their technical equipments or keep their plants idle. The degree of variability will, therefore, be greater on the upper side than on the lower-side of the Average. Secondly, the expansion on the upper-side is governed more by the capacity for management than by technical considerations, and as the capacity for management widely differs, it is natural for the degree of variability to be relatively greater on the upper-side than on the lower side of the Average. This is also clear from the above Table. Whereas the dispersion of Lower Quartile from the Average ranged from 6½ to 10 thousand spindles, dispersion of the Upper Quartile from the Average ranged from 9 to16 thousand spindles. The density of frequencies was,therefore, greater on the lower-side than on the upper-side of of the Average.

(ii) On the lower side of the Average, dispersion was the least in the year 1921 and the greatest in the year 1931. This is because in the year 1931, due to conditions created by boom and 'prosperity psychology' the incentive to expand and reach the Average-size was greater than in the year 1931, when such an incentive was completely lacking due to industrial inactivity and Depression. The Measure of Dispersion, on the lower side of the Average was, therefore, greatest in the year 1931 and the least in the year 1921.

(iii) On the upper-side of the Average dispersion was the least in the year 1905 and greatest in the year 1944, showing a continuous increase in the degree of variability on the upper-side of the Average, and confirming our conclusion that once the unit has expanded or increased its technical equipment it cannot, except at a serious loss, effect any contraction or reduction in its productive capacity. If a policy of 'restrictive output' is pursued, it entails additional interest and obsolescence charges.

(iv) Between 1905 and 1941 we observe a greater and greater degree of size-dispersion about the Average. In 1905 the Quartile Deviation or the Semi-Interquartile Range showed a dispersion of about 8 thousand spindles from the Average, in 1921, of about 10½ thousand spindles, and in the year 1941 it showed a dispersion of about 12½ thousand spindles from the Average. This, however, is not a peculiar feature of the Bombay-Cotton Mill Industry alone. There is a universal tendency on the part of individual units in any centre to show a greater tendency to cluster round the Average during the period of early growth than in the latter years when due to the operation of long-period forces they get ample opportunity to adjust their technical optimum to their financial and managerial optima. From this we can conclude that the Measure of size-dispersion or degree of variability in magnitudes will be relatively greater for old industrialized centres than for newly industrialized areas.

CHARACTERISTICS OF THE CHANGES IN SPINNING SECTION : CONCLUSION :

A careful study of these trends in the size of industrial units in Cotton-Mill Industry of Bombay reveals three important characteristics:

I. A preponderance of smaller units in the earlier period, and subsequently a gradual decline in the number of smaller units in each class-interval having less than 40 thousand spindles. These units were either scrapped, dismantled, enlarged or were amalgamated with the larger units. The periods of extinction or decadence coincided with periods of depression, industrial inactivity and intense internal and external competition.

II, A relative spreading out of units into some what larger dimensions with the object of bringing about a substantial reduction in the cost of production,

III. In case of Spinning, though the Average-size of the industrial unit has expanded during the last 40 years, the expansion has not been very considerable. That is partly because the Industry does not lend itself, on technical side, to a further division of processes, beyond what existed a hundred years ago, and partly because the changes that took place in the structure of the industry necessitated a more rapid expansion of the Weaving Section than the Spinning Section in the Bombay Cotton Industry.

II

WEAVING SECTION

CHANGES IN THE SIZE OF WEAVING SECTION

DISTRIBUTION OF GROUP FREQUENCIES

The following Table will give the frequency distribution of industrial units according to the number of looms Installed. The magnitude of the class-interval is 100 upto 1,400 Looms, and thereafter 200. For a smaller magnitude the distribution would have been uneven, while a larger magnitude would have covered up the tendencies and concealed the true characteristics of the changes in Group-Frequencies.

TABLE VI.

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY—1905-44

(Weaving Section)

FREQUENCY DISTRIBUTION OF LOOM ACTIVITY

Class-Interval (Looms Installed)	1905	1911	1921	1931	1941	1944
0— 100	0	0	0	0	0	0
100— 200	0	0	0	0	0	0
200— 300	1	2	1	0	0	0
300— 400	3	2	1	0	0	0
400— 500	3	2	2	3	3	3
500— 600	6	4	9	6	2	1
600— 700	4	7	6	4	2	2
700— 800	7	8	8	7	7	5
800— 900	0	2	6	6	5	6
900—1000	2	3	3	8	4	4
1,000—1,100	2	2	5	7	7	8
1,100—1,200	1	4	4	5	1	2
1,200—1,300	0	2	1	2	5	4
1,300—1,400	0	0	2	2	3	2
1,400—1,600	0	0	1	3	3	3
1,600—1,800	0	1	2	2	3	3
1,800—2,000	1	0	0	2	2	3
Above 2,000	2	3	5	6	4	4
Totals.	33	42	56	63	51	52

QUANTATIVE DETERMINATION OF THE ABSOLUTE AND RELATIVE CHANGES IN GROUP FREQUENCIES.

The following Table shows distinctly the extent of chnages that have taken place in the Size of weaving Section in the cotton-Mill Industry of Bombay during the last 40 years. The primary object of this Table is to make these changes more intelligible by showing distinctly the trends or directions in which such changes are taking place. Whereas the Absolute changes signify the increase or decrease in the number of frequencies in each class-interval, or the relative changes denote the changes in the percentage share of each class-interval in the total frequencies.

TABLE NO. VII

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY—1905-44

(*Weaving Section*)

RELATIVE AND ABSOLUTE CHANGES IN GROUP FRQUENCIEES

Looms Installed,	PREQUENCIES 1905-1944		Variations in Group Frequencies between 1905-1944.	Percentage share of each class-interval 1905-1944		Change in the percentage share of each class-interval
0— 100	0	0	0	0	0	0
100— 200	0	0	0	0	0	0
200— 300	1	0	—1	3.03	0	— 3.03
300— 400	3	2	—1	9.09	3.85	— 5.24
400— 500	3	3	0	9.09	5.77	— 3.32
500— 600	6	1	—5	18.18	1.92	—16.26
600— 700	4	2	—2	12.12	3.85	— 8.27
700— 800	7	5	—2	21.22	9.68	—11.60
800— 900	0	6	+6	0	11.54	+11.54
900—1,000	2	4	+2	6.06	7.69	+ 1.63
1,000—1,100	2	8	+6	6.06	15.38	+ 9.33
1,100—1,200	1	2	+1	3.03	3.85	+ .82
1,200—1,300	0	4	+4	0	7.69	+ 7.69
1,300—1,400	0	2	+2	0	3.85	+ 3.85
1,400—1,600	0	3	+3	0	5.77	+ 5.77
1,600—1,800	1	3	+2	3.03	5.77	+ 2.74
1,800—2,000	1	3	+2	3.03	5.77	+ 2.74
Above 2,000	2	4	+2	6.05	7.69	+ 1.63
Totals.	33	52	+19	100	100	

From these two Tables we observe that :

(i) The number of industrial units which had a Weaving Section increased from 33 in 1905 to 63 in 1931, and then declined to 52 in 1944. The first period marks the growth of 'self-sufficing' and 'balanced' Industrial units, and the second marks the extinction of certain uneconomic units in the Bombay Mill industry. This also reflects the changing character of the Cotton-Mill Industry from a predominatingly Spinning Industry to a Combined Spinning-Weaving Industry. The loss of China market in yarn was the most important factor that brought about this structural change—the change which was further accentuated by the conditions created by the last Great War.

(ii) The entire loss is confined to class-intervals having less than 800 looms. This suggests that an industrial unit in Bombay having less than 800 looms does not seem to be and our subsequent enquiry will show, is not, conducive to maximum efficiency or economical working.

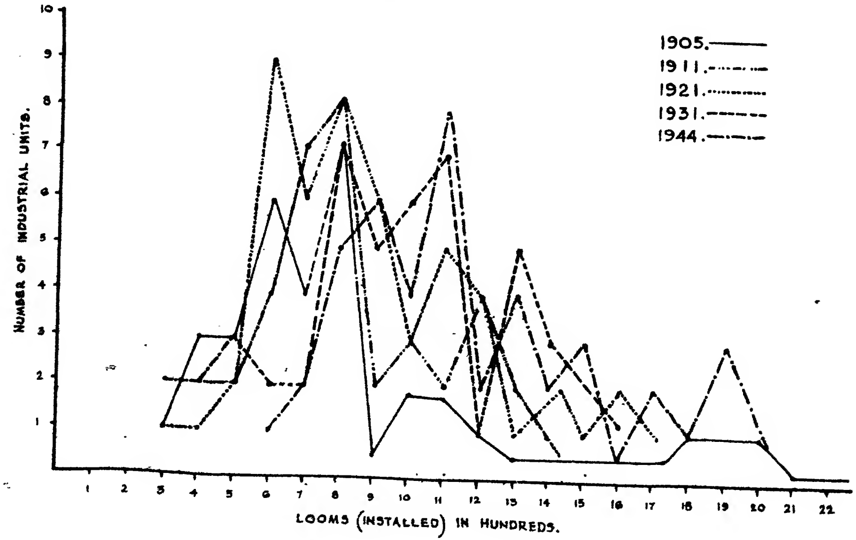
(iii) There is a relative spreading out of individual units into somewhat larger dimensions. Formerly in the year 1905, 24 out of 33 or about 73 per cent of industrial units had a loom-equipment ranging from 200 to 800 looms. In 1944, only 13 out of the total of 52 or 25 per cent of industrial units had less than 800 looms. This shows a comparative absence of bigger units and the preponderance of smaller units during the earlier period, and a relative absence of smaller units and the preponderance of bigger units, having more than 800 looms, in the later period. This expansionist movement can be attributed to two important factors, firstly, the tremendous stimulus provided by the last Great War, and, secondly, the desire to lower down productive costs by expansion and enlargement of size.

FREQUENCY DISTRIBUTION—A GRAPHICAL REPRESENTATION :

Now looking at the Graph on opposite pag we observe the existence of the same tendencies. I 1905 there existed two distinct maxima, one in th class-interval of 500 to 600 looms and the other i the class-interval of 700 to 800 looms, the first bein more pronounced. In 1911 we observe the disap pearance of the 500-600 maximum and the emergenc of one distinct maximum in the class-interval c 600-800 looms. In 1921, we observe three maxim in descending order, one in 500-600 class-interva and the other two in 700-800 and 1000-110 class-intervals, respectively. Similarly in 1931 thre maxima appeared; in 700-800, 900-1100 and 1200-130 class-intervals, respectively, the first two being mor pronounced. In 1944 we observe one distinct maxi mum in 1000-1100 class-interval and on both the sides of the maxima, regularity in size-disper sion though lopsided is distinctly observable.

On a close observance of this factual analysis w shall find that the data relate to two distinguishabl classes of industrial units which were constantl enlarging and expanding their technical equipment For example, one dominating size of 500-600 loom in 1905 passed into the size of 600-700 looms in 191 and into 700-800 looms in 1931. The same unit expanded and passed into the size of 800-900 loom in 1944. All these maxima, therefore, disclose som secular and ascending trends, the same units passing from lower to upper class-intervals in an ascending order. Some of the units which show such ascend ing trends and which may fairly be included in thi category are : Finlay, Hirjee, Phoenix, Khatau Bradbury, Elphinstone and Madhowji. Anothe class of industrial units which formerly belonge to 700-800 class-interval has now passed into th class-interval of 1000-1100 looms. Here also w

FIG: 2. SHOWING SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY-(WEAVING SECTION) 1905-44.



From the above Table we can make the following observations :—

(i) The Average-size of the Weaving Section in Bombay has expanded from 700 looms in 1905 to about 1000 looms in 1944. The class-intervals containing the Average-size have also changed.

(ii) The expansion was the greatest during 1911-21.

(iii) No material change has taken place in the size of the Weaving Section during 1941-44.

The rapid expansion of the Weaving Section during 1911-21 can be attributed to two causes, firstly, the tremendous stimulus provided by the last Great War and, secondly, the loss of China-market in yarn. The only way of consuming the large surplus quantities of yarn was to develop the Weaving Section of the industry. Thus between 1911-21 the Weaving Section developed faster than the Spinning Section.

Dispersion of size about the average

Looking at the Graph on page 46 we shall observe that there is a considerable degree of regularity in the dispersion of magnitudes about the type. Even in the Table VIII we shall observe that the frequencies on both the sides of the Average are distributed quite regularly. This shows that the laws governing the dimensional dispersions have equal validity or applicability so far as Weaving Section of Bombay Cotton Industry is concerned.

Measure of Dispersion

The Table on the next page will show the extent of size-dispersion in the Weaving Section of the Cotton-Mill Industry of Bombay. The Measure of Dispersion used is Quartile Deviation and its Coefficient of Dispersion. While the first is an absolute Measure of Dispersion the secend shows the relative degree of variability in size-dispersions during different periods.

TABLE NO. IX

DISPERSION OF SIZE ABOUT THE AVERAGE.
(LOOMS INSTALLED '00 OMITTED)

Year	Lower Quartile Q1	Dispersion of Q1 from the Average	Upper Quartile Q3	Dispersion of Q3 from the Average	Quartile Deviation	Co-efficient of Quartile Dispersio
1905	5.3	—1.7	9.8	+2.8	2.25	·39
1911	6.1	—1.5	11.1	+3.5	2.50	·29
1921	6.2	—3.0	11.4	+2.2	2.60	·30
1931	7.4	—2.4	13.0	+3.2	2.80	·28
1941	7.9	—2.5	14.0	+3.6	3.05	·28
1944	8.0	—2.4	14.5	+4.1	3.25	·28

Here also we shall observe that the Measure of Dispersion is less on the lower-side of the Average than on the upper. Whereas the dispersion of the lower Quartile from the Average ranged from 150 to 300 looms, dispersion of upper Quartile from the Average ranged from 200 to 400 looms. The density of frequencies was, therefore, higher on the lower-side of the Average than on the upper.

Secondly, we shall observe that between 1905 and 1944 there has been an increasing degree of variability or size-dispersion about the Average. In 1905 the Quartile Deviation or Semi-Interquartile Range showed a dispersion of about 225 looms from the Average, in 1921 of about 260 looms and in the year 1944 it showed a dispersion of about 325 looms from the Average. This increasing variability or size-dispersion from the Average is a characteristic feature of an old-established industry in which some of the units are still growing, some have reached maturity and some are over-grown.

Characteristics of the changes in group frequencies: Conclusions:

Changes that enveloped the Weaving Section of the Cotton Industry were in certain respects analogous, both in character and behaviour, to the changes that took place in the Spinning Section of the Industry. There was, in the earlier period, a preponderance of the smaller units, and a comparative absence of bigger units. In subsequent years we witness the tendency to gradual elimination and extinction of small-sized units and a relative spreading out of individual units into somewhat larger dimensions. The characteristics of the changes in Weaving Section differed from the characteristics of the changes in the Spinning Section, in only two ways. Firstly, we shall observe that during the earlier period it was the expansion of Spinning that brought about an expansion in Weaving. In later years, it was the expansion of Weaving Section that brought about an expansion in the Spinning Section rather than the reverse.[1] Secondly, the tempo of expansion is higher in case of Weaving than in case of Spinning. Taking 1905 to be the base year, the number of looms installed per industrial unit in 1944 showed an increase of about 50 per cent as against a 40 per cent increase in the number of spindles installed. This rapid expansion in Weaving Section can be attributed to two factors, firstly, the changing character of the Bombay Cotton Industry from a predominantly Spinning to a Combined Spinning-Weaving type and secondly, the changes in the character of output, particularly the diversification of production, which necessitated a higher proportion of loomage to spindleage.

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1. Indian Tariff Board Report on Cotton-Textile Industry, 1927—

III

QUANTITATIVE DETERMINATION OF THE SIZE OF COMBINED SPINNING-WEAVING UNITS

Although our analysis reveals the nature, extent and character of changes in the size of Spinning and Weaving Sections of the Industry separately, it has failed to establish any quantitative relationship between these two productive processes. For this purpose the method of "Cumulative Measurement" is to be preferred. It will, on the one hand, determine the size of Combined Spinning-Weaving Units and on the other generalize the relationship which the two processes, namely, Spinning and Weaving, bear.

In studying the size of Combined Spinning-Weaving Units we are handicapped by the existence of several complicated factors. Firstly, the unbalanced structure of the Cotton-Mill Industry, particularly during the earlier period, makes it difficult to generalize in respect of the proportion of spindleage to loomage in an industrial unit. Some of the units manufacture yarn not only for weaving, but also for sale. Others may partly manufacture and partly purchase their requirements in the open market. This 'unbalanced structure' or 'lack of self-sufficiency' prevents us from generalizing about the ratio which spindleage bears to loomage in any individual unit. Secondly, differences in the character of output and the degree of specialization demand different proportions of spindleage and loomage in any individual unit. Secondly, differences in the character of output and the degree of specialization demand different proportions of spindleage and loomage, for example spinning high counts of yarn and weaving of finer varieties of cloth demand a slightly higher proportion of spindleage to loomage than in the manufacture of inferior varieties of cloth. Thirdly, secular comparisons are rendered invalid by the changes that have occurred in the character of output and the degree of specialization. Such a change tends to alter the quantitative relationship between the two productive processes and thus conceal the true characteristics of the changes in the size of Combined Spinning-Weaving units.

But despite these limitations and reservations the "Method of Cumulative Measurement" will show, to some extent the nature and extent of changes in the size of such units. In the following four Tables we shall make an attempt to measure and study the size of Combined Spinning-Weaving Units. Inter-comparison and analysis will show the Magnitude of the change that has occurred in the size of such Units during the last three decades. The figures of 1905 have been deliberately ignored for the structure of the industry was so unbalanced as to hardly justify any comparison.

QUANTITATIVE MEASUREMENT OF COMBINED SPINNING-WEAVING UNITS IN BOMBAY 1911

LOOMS \ SPINDLES (IN '000s)	10	20	30	40	50	60	70	70 Above	Total
ABOVE 1750	—	—	—	—	—	—	—	3	**3**
1500–1750	—	—	—	—	—	1	—	—	1
1250–1500	—	—	—	—	—	**2**	—	—	2
1000–1250	—	—	—	1	**3**	2	—	—	6
750–1000	—	1	4	**4**	—	—	1	—	10
500–750	—	—	**5**	8	1	—	—	—	14
250–500	—	**2**	2	—	1	—	—	—	5
0–250	—	—	—	1	—	—	—	—	1
Total	—	3	11	14	5	5	1	3	**42**

SPINDLES (IN '000s)

QUANTITATIVE MEASUREMENT OF COMBINED SPINNING-WEAVING UNITS IN BOMBAY 1921

LOOMS	10	20	30	40	50	60	70	80	90	100	ABOVE	TOTAL
ABOVE	—	—	—	—	—	—	—	—	—	1	4	5
2500	—	—	—	—	—	—	—	—	—	—	—	—
2250	—	—	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	—	—	—	—	—	—	—
1750	—	—	—	1	—	1	1	—	—	—	—	3
1500	—	—	—	—	—	1	1	—	—	—	—	2
1250	—	—	—	2	4	2	1	—	1	—	—	10
1000	—	—	3	7	2	—	—	—	—	—	—	12
750	—	1	10	5	2	1	—	—	1	—	—	20
500	1	1	—	1	—	1	—	—	—	—	—	4
250	—	—	—	—	—	—	—	—	—	—	—	—
0 / TOTAL	1	2	13	16	8	6	3	—	2	1	4	56

SPINDLES

(IN '000s)

QUANTITATIVE MEASUREMENT OF COMBINED SPINNING-WEAVING UNITS IN BOMBAY 1931

LOOMS												
ABOVE	—	—	—	—	—	—	—	—	—	—	4	4
2500	—	—	—	—	—	—	—	1	—	—	—	1
2250	—	—	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	2	1	—	—	—	—	3
1750	—	—	—	—	—	—	1	1	—	—	—	2
1500	—	—	—	1	1	2	1	—	—	—	—	5
1250	—	—	—	—	9	1	—	—	1	1	—	12
1000	—	—	1	10	5	—	—	1	—	—	—	17
750	—	1	4	5	3	1	—	—	—	—	—	14
500	—	2	—	—	1	—	—	—	—	—	—	3
250	—	—	—	—	—	—	—	—	—	—	—	—
0	—	3	5	16	19	6	3	3	1	1	4	61
TOTAL	10	20	30	40	50	60	70	80	90	100	ABOVE	TOTAL

SPINDLES
(IN '000s)

QUANTITATIVE MEASUREMENT OF COMBINED SPINNING-WEAVING UNITS IN BOMBAY

(IN 1944)

LOOMS	10	20	30	40	50	60	70	80	90	100	Above	Total
Above 2500	—	—	—	—	—	—	—	—	—	1	2	3
2250–2500	—	—	—	—	—	—	—	—	—	—	—	—
2000–2250	—	—	—	—	—	—	1	—	—	—	—	1
1750–2000	—	—	—	—	—	—	2	—	—	1	—	3
1500–1750	—	—	—	—	—	3	—	—	—	—	—	3
1250–1500	—	—	—	1	2	3	—	—	—	—	—	7
1000–1250	—	—	—	3	5	1	1	2	—	—	—	12
750–1000	—	—	1	7	6	—	—	—	—	—	—	14
500–750	—	—	1	2	1	—	—	—	—	—	—	4
250–500	—	3	—	1	1	—	—	—	—	—	—	5
0–250	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	3	2	14	15	7	5	2	—	2	2	52

SPINDLES
(IN '000s)

Looking at these figures, one is at once struck by the regularity in distribution and arrangement of the statistical data. The fact that all the maximum points are not scattered but cluster about a diagonal line shows that a tendency is operating, though indistinctly, in the earlier period and more marked in later years, for spindles and looms to combine within a certain range of ratios. The ratio of 40 spindles to one loom is becoming more and more pronounced though it will, in individual cases, vary according to the degree of specialization and the character of output. Production of finer varieties will involve a higher proportion of spindleage to loomage than production of inferior varieties.

This regularity in the arrangement and distribution of figures suggests another reflection, namely, that the movement towards specialization, has not made any appreciable progress during the last 40 years. Most of the units still operate on quite a wide range of counts and weave many varieties of cloth to meet the diverse requirements of the Indian market. The Average ratio between spindleage and loomage in each individual unit, therefore, exhibits a narrow range of variation. This feature one would hardly observe in case of Lancashire Industry where each individual unit specialize in the production of particular counts of yarn and particular varieties of cloth. The proportion of spindleage to loomage, therefore, widely varies from unit to unit according to the character of output and degree of specialization. It varies, in Lancashire, from 30 to 80 spindles per loom.[1]

A careful study of these four Tables reveals the existence of typical-sizes during each period. In 1911 there existed two typical sizes, one containing 500-750 looms and the other 20-40 thousand spindles. Upto 1921 no substantial change took place in the

1, Skinners' Directory of World Cotton Industry, 1944.

size of the typical units except a slight expansion in the size of the Weaving Section. A typical Spinning-Weaving Unit in 1921 contained 500-1000 looms and 20-40 thousand spindles. By 1931 the size of typical units considerably expanded from 500-750 looms to 750-1250 looms and from 20 to 40 thousand spindles. These expansionist tendencies persisted and in 1944 we find a typical Spinning-Weaving Unit of the size of 1000-1500 looms and 40 to 60 thousand spindles alongside the more or less equally prominent size of 750-1000 looms and 30 to 50 thousand spindles.

III

NUMBER OF INDUSTRIAL WORKERS

Another Standard of Measurement, so commonly adopted to determine the size of industrial units, is the Number of Industrial Workers employed. This is of course not a very satisfactory Standard of Measurement since the Number of Workers employed in an industrial unit depends upon numerous factors such as the character of output, degree of mechanization, application of labour-saving devices, efficiency of the workers and the efficiency of management. But despite these limitations, it is interesting to note that the nature and extent of changes which this criterion shows are in several respects analogous to those revealed by our two previous criteria, namely, Spindles and Looms. That is because the level of labour efficiency attained in any industry and the degree of machanization do not show significant variations from unit to unit in the same industrial centre. There may be slight variations not so vast as to cover up or conceal the real tendencies.

DISTRIBUTION OF GROUP-FREQUENCIES

The two Tables on the next page will show the nature and extent of the changes in the size of industrial units classified according to the Average

Number of Industrial Workers employed. The first Table will show the frequency distribution of industrial units according to the number of workers employed, and the second will show the absolute and relative changes in the number of frequencies in each class interval. The magnitude of the class-interval is 200 upto 2000 workers and thereafter 400. A smaller magnitude would have rendered generalization difficult and the Table too would have been unwieldy for presentation.

TABLE NO. XIV

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL

INDUSTRY OF BOMBAY—1905-44.

FREQUENCY DISTRIBUTION OF INDUSTRIAL WORKERS

Industrial Workers.	1905	1911	1921	1931	1944
0— 200	1	2	2	..	..
200— 400	1	2	1	1	1
400— 600	8	3	2	1	..
600— 800	7	6	..	1	..
800—1,000	16	6	4	3	..
1,000—1,200	9	17	9	5	4
1,200—1,400	14	7	6	6	2
1,400—1,600	5	2	9	13	6
1,600—1,800	..	9	5	6	10
1,800—2,000	2	7	5	3	7
2,000—2,400	6	2	11	9	6
2,400—2,800	1	4	4	5	6
2,800—3,200	1	1	1	3	3
3,200—3,600	..	1	2	2	2
3,600—4,000	..	1	2	2	2
Above 4,000	2	1	5	3	5
Totals.	73	71	68	63	54

Table XV

Trends in the size of industrial units Cotton-mill industry of Bombay-1905-44.

Absolute and relative changes in group frequencies

Average No. of Hands employed daily. Class-Interval	Number of Frequencies 1905	1944	Variations in Group Frequencies —or	Percentage share of each Class Interval 1905	1944	Variation in percentage share of each Class Interval —or
0— 200	1	..	— 1	1.37	..	— 1.37
200— 400	1	1	..	1.37	1.85	.48
400— 600	8	..	— 8	10.96	..	—10.96
600— 800	7	..	— 7	9.60	..	— 9.60
800—1,000	16	..	—16	21.91	..	—21.91
1,000—1,200	9	4	— 5	12.32	7.40	— 4.92
1,200—1,400	14	2	—12	19.19	3.70	—15.49
1,400—1,600	5	6	+ 1	6.85	11.11	+ 4.26
1,600—1,800	..	10	+10	..	18.51	+ 18.51
1,800—2,000	2	7	+ 5	2.74	13.01	+ 11.27
2,000—2,400	6	6	..	·8.21	11.11	+ 2.90
2,400—2,800	1	6	+ 5	1.37	11.11	+ 9.74
2,800—3.200	1	3	+ 2	1.37	5.55	+ 2.18
3,200—3,600	..	2	+ 2	..	3.70	+ 3.70
3,600—4,000	..	2	+ 2	..	3.70	+ 3.70
Above 4,000	2	5	+ 3	2.74	9.25	+ 6.51
Totals.	73	54	—19	100.00	100.00	

Quantitative determination of the absolute and relative changes in group frequencies.

An analysis:

A perusal of these two Tables will show a remarkable decline in the number of smaller units. In 1905 no fewer than 56 industrial units, out of the total of 73, employed less than 1400 workers. Of these

56 units, as many as 33, employed on an average less than 1000 workers. In 1944 we observe that only 7 industrial units out of the total of 54, employed less than 1400 workers, and only one, the off-spring of the World-War II employed less than 1000 workers. This will show the magnitude of the change that has taken place in the size of the industrial units between 1905-44

The relative changes also exhibit the same tendencies. More than 75 per cent of the industrial units in 1905 employed on an average less than 1400 workers as against 12 per cent in 1944.

Another fact that we observe from this analysis is the decline in the number of industrial units from 73 in 1905 to 54 in 1944. The entire loss is confined to class-intervals having less than 1400 workers.

The conclusions that emerge out of this analysis are mainly two, firstly, the decline in the number of smaller units and, secondly, the relative spreading out of units into somewhat larger dimensions.

Graphical representation

Now looking at the Graph on the opposite page, we shall at once note the existence of typical units during each period. In 1911 there were two maxima, one in the class-interval of 800-1000 workers and the other in the class-interval of 1200-1400 workers. In 1911 we observe the existence of one outstanding maximum in the class-interval of 1000-1200 workers. By 1931 this maximum passed into the class-interval of 1400-1600 workers and became even more distinct and pronounced, with greater regularity of dispersion on both the sides of the maximum than what is observed in previous years. In 1944 only one maximum appeared in the class-intervals of 1400-1800 workers and regularity in size-dispersion is observable only on the right-hand side of this maximum.

Our analysis suggests the existence of the same ascending tendencies, as we have seen in the case of spindles and looms, viz., the same class of industrial units passing from lower to upper class-intervals regularly and in an ascending order. For example, the 800-1000 maximum of 1905 passed into 1000-1200 maximum in 1911, and into 14-16 hundred maximum in 1931. The expansionist tendencies continued and in 1944, 1400-1600 class-interval contained one outstanding maximum.

Changes in the average-size.

One important inference that we can draw from this factual survey is the relative spreading out of industrial units into somewhat larger dimensions. Measurement of the Average-Size will give us an idea of the nature and extent of such a change.

Table No. XVI

Trends in the average-size of an industrial unit in cotton-mill industry of Bombay 1905-44.

Distribution of industrial workers

Year	Class containing the Average-Size.	Average No. of Workers employed per Industrial Unit. (Type of Average used Median)
		('00 omitted)
1905	1,000—1,200	10.9
1911	1,200—1,400	12.0
1921	1,600—1,800	16.0
1931	1,800—2,000	16.7
1941	1,800—2,000	18.8
1944	1,800—2,000	19.3

An analysis:

On analysing the above Table we observe that the Average-Size of the Industrial Unit has considerably expanded during the last 40 years. In 1905, 1000-1200 class-interval contained the Average-Size. In 1944 it was 1800-2000 class-interval that contained the Average. This shows the magnitude of the change, that has taken place during the last four decades. The Average number of workers employed per industrial unit has practically doubled between 1905-44.

The increase in the number of workers per industrial unit was the greatest during 1911-21 partly due to the expansion of the industry during the last Great War and partly due to double-shift working. It was least during 1921-31 partly because of the "efficiency measures" taken to reduce the number of industrial workers employed in each individual unit and partly because of the conditions created by the Great Depression when units did not operate to their full capacity.

During 1944 the average number of workers employed per industrial unit increased due to double and treble shifts of work and to the full utilization of the plants. But the increase in the number of Industrial workers per industrial unit during this war has not been as great as in the last Great War, firstly, because the average number of spindles and looms per industrial unit did not show any material increase and, secondly, because of the remarkable expansion in the size of the Weaving Section during the last Great War, which necessitated the employment of far more labour than expansion of Spinning would have entailed.

Dispersion of size about the average

The Table on the next page will show the dispersion of size about the Average. The Measure of

Dispersion used is Quartile Deviation and the Co-efficient of Quartile Dispersion. While the first shows the Absolute Measure of Dispersion the second shows the relative degree of variability in size-dispersion during different periods.

TABLE NO. XVII

DISPERSION OF THE SIZE ABOUT THE AVERAGE

Year	Lower Quart-ile Q1	Disper-sion of Q1 from the Av-erage	Upper Quartile Q3	Dispersion of Q3 from the Average	Quartile Devia-tion	Co-effi-cient of Quartile Disper-sion
			('oo omitted)			
1905	8.2	—2.7	13.9	+3.0	2.85	.25
1911	9.7	—2.3	18.0	+6.0	4.15	.30
1921	11.8	—4.8	23.2	+6.6	5.70	.33
1931	13.7	—3.0	24.0	+7.3	5.15	.28
1944	16.2	—3.1	27.5	+8.2	5.65	.26

We can draw the following inferences from the above Table.

(i) A tendency for increased size-dispersion is clearly observable. Dispersion was least in the year 1905 and greatest in the year 1944. Whereas the Quartile Deviation in the 1905 was only 285 from the Average, it was 4.15 in 1911, 5.15 in 1931, and in 1944 the Quartile Deviation was 5.65 from the Average. This shows an increased tendency for size-dispersion.

(ii) The Measure of Dispersion is less on the lower side of the Average than on the upper side. Whereas the deviation of the lower Quartile from the Average ranged from 230 workers to 480 workers, the deviation of the Upper Quartile from the Average ranged from 300 to 820 workers. That shows that the tendency to cluster round the Average is more marked in the lower class-intervals than in the upper class-intervals.

Now looking at the Graph we shall observe the same tendencies. On the lower side of the Average the graph lines reach the peak very rapidly and on the upper side of the Average they descend very gradually and regularly. This shows that the Measure of Dispersion is greater on the lower side of the Average than on the upper.

Characteristics of the changes in group Frequencies:

If we measure the size of industrial units by the number of workers employed we shall see that though the nature of changes exhibit the same characteristic tendencies of expansion and elimination of small and uneconomic units, the magnitude of the changes show considerable variations. The increase in the Average number of workers per industrial unit has been far greater than expansion in either spindleage or loomage would suggest. This disproportionate increase in the number of industrial workers per industrial unit is largely attributable to three important factors. Firstly, it reflects the influence of double and treble shifts of work. Secondly, the increase in the number of workers denotes the cumulative influence of expansion in spinning and weaving. Thirdly, the changing structure of the industry from a predominantly spinning to spinning-weaving type has necessitated the employment of much larger labour force. As a general rule, expansion of weaving entails, in comparison to the expansion of spinning, a relatively greater increase in the number of hands employed. That is because a single worker can look after a much larger number of spindles than looms.

V

Quantity of cotton-consumed

Another method of measuring the size of industrial units is to classify them according to the Total Quantity of Cotton consumed during the year. But this Standard of Measurement is far from perfect. Consumption of raw cotton in an industrial unit depends upon many variable factors, such as the average counts of yarn manufactured, the proportion in which the several grades of cotton are mixed and the relations between spinning and weaving in an industrial unit. Unless proper adjustments can be made for each of these factors, variations in the Quantity of Cotton consumed, from unit to unit, may be misinterpreted as significant variations in the size of industrial units. Utmost caution should, therefore, be exercised while analysing the observational data, and every conclusion should be viewed in the light of the above reservations.

In spite of these limitations, it is interesting to note, that the results disclosed and the inferences drawn manifest, to a great extent, the existence of the same tendencies in the size of industrial unit as exhibited by the application of other standards of measurements, namely, spindles, looms and the workers employed.

Frequency distribution

In the two Tables on the next page we shall show the nature and extent of changes in the size of industrial units judged by the Total Quantity of Cotton consumed during the year. The first Table will show the frequency distribution of industrial units classified according to the Quantity of Cotton consumed, and the second Table will show the absolute and relative changes in Group Frequencies. The magnitude of the class-interval has been taken as 1,000 candies upto 10,000 and thereafter 2,000 upto 20,000 candies. For a smaller magnitude the frequencies would have been so few and so uneven as to render any generalization difficult, and a larger magnitude would have covered up the tendencies.

TABLE NO. XIX

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY—1905-44.

FREQUENCY DISTRIBUTION OF THE TOTAL QUANTITY OF COTTON CONSUMED DURING THE YEAR

Cotton-consumed during the year (in candies of 784 lbs.)	1905	1911	1921	1931	1944
0— 1,000	1	3	1	..	..
1,000— 2,000	3	2	1	1	1
2,000— 3,000	1	8	4	5	..
3,000— 4,000	12	7	9	6	..
4,000— 5,000	10	6	10	10	1
5,000— 6,000	9	9	7	12	3
6,000— 7,000	8	2	8	5	4
7,000— 8,000	7	5	4	4	4
8,000— 9,000	7	6	4	4	..
9,000—10,000	5	2	3	3	6
10,000—12,000	3	6	6	4	11
12,000—14,000	2	5	1	2	7
14,000—16,000	..	..	3	1	4
16,000—18,000	1	..	..	..	4
18,000—20,000	2	..	1	..	3
20,000—24,000	1	2	2	..	1
Above 24,000	1	1	2	2	5
Totals.	73	64	67	59	54

TABLE XX

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY—1905-44

ABSOLUTE AND RELATIVE CHANGES IN GROUP FREQUENCIES

Cotton-consumed during the Year (in candies of 784 lbs.)	Frequencies 1905	Frequencies 1944	Variations in Group Frequencies —or	Percentage share of each class Interval. 1905	Percentage share of each class Interval. 1944	Variations in the percentage share of each Class Interval —or
0— 1,000	1	..	— 1	1.37	..	— 1.37
1,000— 2,000	3	1	— 2	4.11	1.85	— 2.26
2,000— 3,000	1	..	— 1	1.37	..	— 1.37
3,000— 4,000	12	..	—12	16.43	..	—16.43
4,000— 5,000	10	1	— 9	13.70	1.85	—11.85
5,000— 6,000	9	3	— 6	12.32	5.56	— 6.76
6,000— 7,000	8	4	— 4	10.95	7.40	— 3.55
7,000— 8,000	7	4	— 3	9.60	7.40	— 2.20
8,000— 9,030	7	..	— 7	9.60	..	— 9.60
9,000—10,000	5	6	+ 1	6.85	11.10	+ 4.25
10,000—12,000	3	11	+ 8	4.11	20.37	+16.26
12,000—14,000	2	7	+ 5	2.74	13.00	+10.26
14,000—16,000	..	4	+ 4	..	7.40	+ 7.40
16,000—18,000	1	4	+ 3	1.37	7.40	+ 6.03
18,000—20,000	2	3	+ 1	2.74	5.56	+ 2.82
20,000—24,000	1	1	..	1.37	1.85	+ .48
24,000 & above	1	5	+ 4	1.37	9.26	+ 7.89
Totals.	73	54	—19	1000.00	100.00	

These two Tables give us an idea of the magnitude of the change that has taken place in the size of industrial units, measured by the Quantity of Cotton consumed annually. Upto 1931 there were no material changes in the distribution of group-frequencies except that during periods of industrial prosperity the lower class-intervals recorded a slight decline and during periods of depression and industrial inactivity a slight increase. But no material changes took place in the distribution of Group-frequencies either in the upper or the lower class-intervals.

In 1944, a year of unrivalled war-prosperity, the number of frequencies in the upper class-intervals have shown a remarkable increase. The capacity to consume increased quantities of raw-cotton is largely attributable to double and treble shifts of work and to the fuller operation of plants.

Graphical representation

The Graph opposite this page will confirm our general conclusions. Between 1905-31 the cotton-consuming capacity of the industrial units did not show any substantial variations. Most of the industrial units consumed cotton ranging from 3000 to 6000 candies of 784 lbs. The maxima points during the depression periods show a slight contraction in size, while the maxima points during the periods of industrial activity show a slight expansion. In 1944 there was a considerable spreading out of industrial units into larger dimensions. None of the industrial units except one consumed less than 4000 candies of cotton. This war-time expansion, as we have already noticed, is due to the double and treble shifts of work and to the operation of plants to maximum capacity.

Change in the average-size

The Table on the next page will show the magnitude of the changes that have occurred in the size of the industrial units as measured by the Total Quantity of Cotton-consumed during the year:—

TABLE No. XXI

TRENDS IN THE AVERAGE-SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF BOMBAY

1905-44.

AVERAGE QUANTITY OF COTTON-CONSUMED IN CANDIES OF 784 LBS.

Year	Class containing the Average-size	Average Quantity of Cotton consumed per industrial unit.
		('000 omitted)
1905	6,000— 7,000	6.1
1911	5,000— 6,000	5.7
1921	6,000— 7,000	6.3
1931	5,000— 6,000	5.7
1941	9,000—10,000	6.6
1944	10,000—12,000	11.5

Between 1905-31 the average Quantity of Cotton-consumed in each industrial unit did not exhibit any material variation except that during period of depression and industrial inactivity, viz., 1911 and 1931, the average Quantity of Cotton-consumed per industrial unit was less than during periods of great industrial activity, viz., 1905 and 1931. The average Quantity of Cotton-consumed per industrial unit in these years ranged from 5700 candies to 6300 candies,—a remarkably insignificant variation. In 1944, we observe, that the average

Quantity of Cotton-consumed in an industrial unit has practically doubled. The fact that the average number of spindles and looms in an industrial unit did not increase and the Quantity of Cotton-consumed nearly doubled, shows that the units were working double or treble-shifts and operating their plants to full capacity.

Dispersion of size above the average

The following Table shows the extent of size-dispersion as measured by the Total Quantity of cotton-consumed during the year. The Measure of Dispersion is Quartile Deviation and its Co-officient of Dispersion.

Table No. XXII

Dispersion of size about the average

(Cotton-Consumed–'000 omitted)

Year	Lower Quartile Q1	Dispersion of Q1 from the Average	Upper Quartile Q3	Dispersion of Q3 from the Average	Quartile Deviation	Co-efficient of Quartile Dispersion
1905	4.2	—1.9	8.6	+2.5	2.20	,39
1911	3.5	—2.2	9.4	+3.7	2.95	,46
1921	4.2	—2.1	10.0	+3.7	2.90	,41
1931	4.3	—1.4	8.5	+2.8	2.10	,33
1944	9.1	—2.4	16.1	+4.6	3.50	,28

Here also we shall observe that the Measure of Dispersion is less on the lower side of the Average than on the upper side. From this we can infer that the density of frequency, distribution and the tendency to cluster round the average is more marked in the lower class-intervals than in the upper ones. A relative scatteredness is observable on the upper side of the Average. Whereas the deviation of the Lower Quartile from the Average ranged from 1400 to 2400 candies of cotton, the deviation of the upper Quartile from the Average ranged from 2500-4600 candies of cotton. The Measure of Dispersion was therefore much greater on the upper side of the Average than on the lower side.

VI

Standards of measurement

A comparative study

Whichever Standard of Measurement we may employ, our investigation reveals the dominance of the same tendencies of expansion and growth and climination of small and uneconomic units. Only the extent and magnitude of the change diverge when each of these criteria is separately applied. For example, if size is to be measured by the Number of Industrial Workers employed or Total Quantity of Cotton consumed per industrial unit, the magnitude of the change would be far greater than that revealed by the application of two other criteria, viz., spindles and looms. It is, there fore, essential to analyse these signficant variations, and if possible to account for them, so that amidst the apparent diversity some underlying unity may be perceived and our general conclusions verified and confirmed.

In the following two Tables we shall undertake a comparative study of the changes that have occurred in the Average Number of Spindles and Looms Installed, Workers Employed, and Quantity of Cotton consumed per industrial unit during different periods.

Table XXIII

Cumulative changes in the average-size of an industrial unit in bombay—1905-44.

(Type of average 'median').

Absolute measurement

Year	Average Number of Spindles Installed.	Average Number of Looms Installed.	Average Number of workers employed.	Average Quantity of Cotton consumed in candies of 784 lbs.
1905	32,083	700	1,089	6,125
1911	35,536	756	1,200	5,722
1921	35,313	917	1,660	6,250
1931	42,885	975	1,667	5,666
1941	45,833	1,043	1,880	9,643
1944	44,750	1,044	1,929	11,545

Table XXIV

Cumulative changes in the average-size of an Industrial unit in bombay—1905-44.

Relative measurement

(Base year—1905).

Year	Percentage changes in Spindles Installed.	Percentage changes in Looms Installed.	Percentage changes in workers employed.	Percentage changes in Cotton-consumed.
1905	100	100	100	100
1911	111	108	110	93
1921	110	131	153	102
1931	134	139	153	92
1941	143	149	172	157
1944	140	149	177	188

Very interesting information emerges from the analysis of our observational data. The various factors, namely, the Average Number of Spindles and Looms Installed, the Average Number of Workers employed and the Average Quantity of Cotton-consumed, have responded with varying degree of sensitivity to the changes in organization and structure of the Industry. Taking 1905 and 1944, though the average number of Spindles and Looms per industrial unit have increased by about 40 and 49 per cent respectively, the average number of workers employed and the Average Quantity of Cotton-consumed have recorded an increase of 77 and 88 per cent respectively. It would be our purpose here to explain and account for these significant variations and to show why a particular factor responded with varying degrees of sensitivity to the changes that occurred in the industry during the different periods.

First we take up the Number of Spindles Installed. Between 1905-21 the average number of spindles installed per industrial unit did not show any material increase. The reasons that can be attributed for the slow expansion of the Spinning Section during this period are mainly two; firstly the loss of yarn market in China and, secondly, the changing structure of the Cotton-Mill Industry of Bombay from a predominantly Spinning to a Combined Spinning-Weaving Industry. The urge for self-sufficiency was so great that the funds that flowed into the Industry after 1911, were all diverted towards the expansion of the Weaving Section. After 1921 there was some progress in the expansion of the Spinning Section but by no means very considerable. Between 1905 and 1944 the Average number of spindles installed in an industrial unit increased by only about 40 per cent.

Compared with the Average Number of Spindles the Average Number of Looms per Industrial

Unit shows a greater increase. Between 1905 and 1944 whereas the Average Number of Spindles per industrial unit increased by about 40 per cent, the Average Number of Looms increased by about 50 per cent. Unlike Spinning, the greatest expansion in Weaving occurred between 1911-21, when partly due to the exigencies of the War and partly due to the complete dwindling of the yarn market in China, the need for the development of the Weaving Section was most imperatively felt. Another striking fact that we shall observe (if we look at the Graph) is that between 1931 and 1941 the expansion of the Weaving Section has kept pace with the expansion of the Spinning Section. It suggests that with the growth of 'self-sufficing' and 'balanced' units in the Cotton Industry of Bombay a greater degree of uniformity is observable in the expansion of these Sections as we see in the case of Ahmedabad Industry.

It is striking to note that the increase in the Average Number of Workers per industrial unit has been far greater than either the expansion of Spinning or Weaving would suggest. If we compare the figures of 1905 and 1944, we shall find that though the Average Number of Spindles and Looms Installed have increased by about 40 and 50 per cent respectively, the increase in the Average Number of Workers employed per industrial unit has been about 77 per cent. From this one should not infer that the efficiency of labour on the whole is declining. While accounting for this rapid increase one should not overlook the fact that the greater increase in the Number of Industrial Workers is the cumulative effect of the expansion of both Spinning and Weaving. The increase is also, due, though to a small extent, to the double and treble shifts of work and to the shortening of working hours as a result of various Factory Legislations. It is interesting to note that the increase in the Number of Workers was greatest during 1911-21, mainly due to the rapid expansion of the Weaving Section, which requires a comparatively larger labour force than the expansion of the Spinning Section. Between 1921 and 1931, the Number of Spindles and Looms and the Number of Workers per industrial unit did not increase. That was partly because of the introduction of various "Efficiency Measures" and "Rationalization Schemes" to remove redundant hands and partly because of the great idle-capacity in the Textile Mills on account of an unprecedented depression and the prolonged strikes.

The changes in the Average Quantity of Cotton-consumed per industrial unit present some striking contrasts. Between 1905 and 1931, though the Average Number of Spindles, Looms and Workers employed per industrial unit increased, the Quantity of Cotton-consumed recorded some decline. At first this may look paradoxical, but a close observance would suggest some plausible explanation. The period from 1905 to 1921 was characterized by a remarkable expansion of the Weaving Section in the Bombay Cotton Industry almost to complete neglect of the Spinning Section. Now, expansion of weaving and the consequent increase in the Number of Workers employed do not entail any extra-consumption of Cotton. The yarn which was formerly produced for sale in the yarn market began to be utilized in the Weaving Section. The expansion of weaving and the increase in the number workers, therefore, did not bring about any increase in the Total Quantity of cotton-consumed per industrial unit. Secondly, it must be borne in mind that 1911 and 1931 were years of Depression, and a considerable portion of the productive capacity was lying idle. Hence the Total Quantity of Cotton-consumed per industrial unit in these years recorded a slight decline. And lastly the Cotton Mill Industry of Bombay gradually took to production of finer counts of yarn and finer varieties of cloth, which require proportionately lesser quantity of raw cotton than production of coarser goods. The result was that the increase in consumption of cotton was not proportionate to the increase in production of yarn and piecegoods. During the present War (1939-45) the Average Quantity of Cotton-consumed per industrial unit shows a remarkable increase. It partly reflects the influence of double and treble shifts of work and partly of the operation of plants to full-capacity.

VII

General conclusions and Explanations

The general facts that we have been able to discover and establish in our investigation are :

(i) There have been important changes in the size of industrial units in the Cotton-Mill Industry of Bombay during the last forty years ;

(ii) There existed during each period one or more than one 'typical' or 'representative' types of industrial unit in the Industry ;

(iii) There was some regularity in size-dispersion on both sides of the 'typical' units, though it was lop-sided; and

(iv) There existed in the Industry, during different periods, units of widely varied sizes, output and equipment.

Now, in this part of our investigation, we shall advance adequate explanations for the facts established. It would be our object to find :—

(i) Why there occurred important changes in the size of industrial units ?

(ii) Why there existed 'representative' or 'typical' units in the Cotton-Mill Industry of Bombay ?

(iii) Why there was a regularity in the dispersion of size about the Average, and lastly,

(iv) Why there existed at particular times industrial units of diverse sizes, types and magnitudes?

It is also essential that the conclusions drawn by the application of modern statistical methods should in all cases be verified by such other direct or indirect information that may be available, and that these developments should so far as possible be viewed in the light of modern economic theory and technique. This will furnish us with some additional tests by which we can measure the validity of our conclusions.

Firstly, we shall explain and account for the changes in the size of industrial units in the Cotton-Mill Industry of Bombay. We have noted that during the earlier period of our investigation there was a preponderance of smaller-units, and subsequently a relative spreading out of industrial units into somewhat larger dimensions. This, of course, is not a peculiar feature of Bombay only. Such tendencies, we shall observe in practically all the important industrial centres. It is the characteristic feature of every industry that units invariably grow out of their humble beginning. Obviously, there must be, during an early period, a greater dominance of small size than in the later stages of the development of the industry. Secondly, the immunity from internal and external competition, during the earlier period, tended to make the individual units in Bombay typically small. The impact of competition from foreign and up-country mills was not at all severe, and the markets both at home and abroad were sufficiently large to absorb the whole output. Thus sheltered the smaller units could manage to survive the competitive struggle. Thirdly, the prevalence of the private and proprietary form of industrial organization, during the earlier period militated against any expansionist movement.[1] The powers of private and proprietary concerns to raise funds are limited. Lastly, a prolonged depression commencing from 1906 and lasting upto 1911 discouraged any tendency for expansion and enlargement of size. The cumulative effect of the operation of all these factors was that during the earlier period the number of smaller units in the Cotton-Mill Industry of Bombay was comparatively larger than in subsequent years.

But with the lapse of time, the earlier influence which tended to counteract the effect of small-size gradually withered away. The last Great War gave a tremendous stimulus to the Cotton Industry of India. Under the abnormal conditions created by the War the industry made surprisingly rapid strides. With the expansion of industry, the individual units too expanded. The motivation underlying this expansion was the natural desire on the part of industrial units to make more profits by increasing the output. Combined with this the dwindling of export market in yarn left no alternative for the Bombay mills except to develop the Weaving Section of the Industry. The expansion of the Weaving Section during the war was, therefore, phenomenal. The causes, that led to the expansion of the Industry during this period were wholly incidental to the war and to the progressive loss of the yarn-market in China.

The need for expansion was most acutely felt after the last Great War, and particularly after 1924, when competition from up-country mills and Japan became increasingly severe. Now in a competitive struggle the power of an industrial unit to survive depends, to a great extent, upon its ability to lower the productive costs. So far as the prime

1. Subsequently when an expansionist movement began, the private and proprietary concerns had to be converted into Joint Companies, See Tariff Board Report on Cotton Textile Industry, 1927, p. 78.

costs were concerned the up-country mills were decidedly at a greater advantage than mills situated in Bombay. It was only through a substantial reduction in "overhead costs" resulting either from increased output or economy in production, that there was any possibility for the Bombay mills to face effectively the impact of internal and external competition. The individual units. therefore, expanded. It is striking to note that in spite of an unprecedented depression characterized by falling prices and accumulating stocks the Average size in Bombay expanded from 35.3 thousand spindles in 1921 to about 42.9 thousand spindles in 1931—an increase of about 22 per cent. The movement towards the increase in size was mainly due to the desire "to reduce overhead costs per unit of output by spreading the costs of management and of non-manufacturing operations over a larger volume of output."

This generation seems to warrant one very important conclusion, namely, that the conditions which necessitated changes in the size of industrial units in recent years are wholly different from those that necessitated changes in the earlier period. In recent years the individual units have expanded as a sequence to the growing intensity of the competitive struggle. The units have expanded with the object of reducing overhead costs and effecting economies in production. But the motivation underlying this expansionist movement during the earlier period was quite different. The individual units expanded, not primarily with the object of reducing costs, but because of the natural desire on the part of the individual units to expand with the expansion in industry. In the earlier period, the 'profit motive' was the dominating feature of the expansionist movement and in the later period it was the 'competitive motive.'

As regards the existence of a 'typical-size,' it may be said that "in every industry there is usually to be found sometimes one, and sometimes more than one size to which a firm has apparently tended to grow". The existence of typical units in any industry is partly the result of the pull of various productive factors and partly the result of the operation of the law of evolution. There is hardly any justification to think that in an industry a typical size exists because under given sets of conditions that particular size has been regarded as one conducive to maximum efficiency and economical working. Were it so, one would have seen in each industry and during each period 'typical units' representing the most economical scale of production in the industry. But this is hardly the case. During the early period of the growth of an industry one will distinctly observe that the typical units are small in size, not because that scale of production is considered to be most economical but because the financial resources and organizing ability set a limit to further expansion. It is, therefore, wrong to think that the 'typical-size' in an industry represents the most economical scale of production, or that it exists because each unit is constantly struggling to adopt the best scale of output.

How then is the existence of typical units to be explained? If we critically examine our observational data we shall find some plausible explanation. The industrial units during the early period of the evolution of the industry have clustered round a size which we may call the "minimum economical scale of production." This was precisely the typical-size' of the early period. The same industrial units passed into units of larger dimensions, and became the 'typical units' of the later period. This is what our analysis reveals. In the Cotton-Mill Industry of Bombay most of the industrial units commenced work with a capacity ranging from 20 to 30 thousand spindles. This was precisely the size of the 'typical' units in the last quarter of the 19th century. Since then, the size of typical units has continuously expanded and in 1911 there existed a typical unit of the size of 25-30 thousand spindles, in 1921 of 30-35 thousand spindles, in 1931 of 40-45 thousand spindles and in 1941, there existed a typical unit of the size of 45-50 thousand spindles. If the same expansionist tendencies continue it is not difficult to forecast that within the next decade or so the typical units in Bombay would be of a size ranging from 50 to 60 thousand spindles.

Another fact that emerges out of our foregoing analysis is the regularity in the dispersion of size about the Average. How is this regularity to be explained? Is this regularity only sporadic, or is it the result of the operation of certain well-defined economic laws? In an industry the dispersion of size or magnitudes can be attributed to the differences in the ages of the individual units. There are some units which are still in the infant stage, some that are still growing and some that have reached maturity or are over-grown and outlived their usefulness. Not only this, the pace of growth and expansion also exhibits a remarkable degree of regularity. In times of industrial prosperity and boom each individual unit endeavours to expand and in times of industrial inactivity and stagnation, the incentive for such expansion is generally less marked. Obviously, in an industry where the individual units make their beginnings at certain definite periods (generally during periods of rising prices, and growing demand), and keep pace in all the stages of expansion and development, a certain degree of regularity in size-dispersion is inevitable. This regularity will be greater in an industry where technical considerations set a limit to the degree of expansion and the stages of development and growth. For example, there are some industries in which installation or addition of a new plant would prove profitable only if the unit were twice as large. That is because in such cases the technical plant is incapable of further sub-division and the economies arising from it can only be retained if the additional plant operates to its full capacity. Regularity ir the stages of growth and development therefore, accounts for the regularity in size-dispersion.

Lastly, we shall have to explain and account for the existence of industrial units of diverse sizes, types and magnitudes in an industrial centre. If in an industry at any particular time there exists a size, which in the prevailing conditions of technique and organizing ability, can be regarded as most conducive to economical working, why do not all units cluster round this size and why do they show significant variations ? It is because the financial and managerial forces working in an industry tend to produce, not a fixed size, as the technical optimum does, but various sizes corresponding to the various degrees of human capacity and organizing ability. Thus in an industry, if the financial, managerial, marketing and entrepreneurial optima show significant variations from unit to unit "the interaction of these determinants, instead of securing one optimum firm will often have the effect of bringing about a number of optima at various stages of the evolution of the industry."[1] That is why in practice the individual units continue to exist and even prosper on widely different scales of output and equipment. Diversity in size is, therefore, the result of the divergent pulls of various productive factors.

Secondly, diversity in dimensions and magnitudes can be ascribed to the differences in the ages of the individual units. The industry comprises of units, which have been started at different periods and

1. Dr. P.S. Lokanathan: Industrial Organization in India, (London, 1934).

under widely varied conditions. Naturally the differences in the stages of development and growth must account for the differences in the size of industrial units.

Thirdly, the diversity in size is due to the differences in the type of goods produced. Where the types of goods produced are of widely varied character, shape and design, and work entailed demands unremitting supervision of details, the complex task of management will impose a limit on the size of the individual unit. Obviously, under such circumstances the individual units would be small in size. But when the type of goods manufactured are such that 'standardization' and mass production methods can be easily introduced the units organized would invariably be on a large scale. That is because in the latter case the task of management will not involve such searching supervision of minute details. Accordingly we see in practice that the units producing fine, light and fanciful goods are invariably organized on a small-scale and those producing coarse or standardized goods on a large scale. The differences in the character of goods produced also account for the differences in the size of industrial units.

Lastly, the diversity in size is the result of the differences in the operating technique. There may be some units which may try to get a high profit per unit on a larger output. Obviously the units in the first case would be smaller in size and in the second larger in size. Combined with this, the existence of different forms of business organizations, namely, private, proprietary and Joint-Stock, also encourage diversity in size. The greater the possibility of diverse forms, the greater the possibility of variations in size.

The survey in the size of industrial units in the Cotton-Mill Industry of Bombay has made at least one thing quite certain and almost indisputable, namely that the *size of an industrial unit is determined appreciably by law and not wholly by chance.* Chance may operate, but only to the extent of modifying the results which an unimpeded operation of the determining forces may have brought about. But sooner or later the forces working in an industry will tend to counteract such influences, and make the determination of size more a matter of law than of chance.

CHAPTER III

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF AHMEDABAD 1905-44

Next to Bombay Ahmedabad occupies the most important position in the Cotton-Mill Industry of India. It had, in 1944, no less than one-fifth of the total number of Cotton Mills working in India and it supplied more than one-sixth of cloth and one-eighth of the yarn produced by the Cotton-Mill Industry of the country. But the real importance of the Cotton-Mill Industry of Ahmedabad lies not so much in its share in the total production, as in its growing competitive strength and its unbroken prosperity even during periods of depression and industrial stagnation. During the last three decades the Industry has made surprisingly rapid strides, having weathered many a storm and having emerged safely from many crises. The industry stands today as a formidable rival and a powerful competitor to the Cotton-Mill industry of Bombay. It is, therefore, essential to undertake a study of the size of industrial units in Ahmedabad, and the influence it has exerted on the efficiency of the industry.

PECULIAR CHARACTERISTICS OF INDUSTRIAL ORGANIZATION IN AHMEDABAD AND THEIR INFLUENCE ON SIZE

While studying the size of industrial units in an industrial centre, one should take into consideration the varying influences of different factors that directly or indirectly affect size. For the disadvantages arising from small size are sometimes counter-balanced or neutralized by the peculiar character of industrial organization or such other factors as location, shifts of work, and the immunity from internal and external competition. In such cases the interaction of the diverse tendencies or a rare consilience of favourable and unfavourable influences tend to conceal the effect of size on the efficiency of the industry, and thus render the generalizations less conclusive, if not invalid. It is, therefore, essential that all those factors which directly or indirectly affect size should be studied in detail, and their influence on size carefully examined.

From several points of view the Cotton-Mill Industry of Ahmedabad reveals certain distinctive and characteristic features, both in its organization and evolution. One outstanding feature is the peculiarly local character of its organization. The industry during its initial and formative years grew up in the hope of taking advantage of large supplies of raw-cotton and the large consuming market in and around Ahmedabad. The abundance of capital and labour and the inherent business aptitude and sagacity of the shrewd and foresighted Bania community of Gujrat fulfilled the rest of the conditions for the rapid development of the Cotton Industry in Ahmedabad. Now, an industry built up on the local supply of capital, labour and organizing ability, and started with the object of catering the local markets must necessarily be composed of industrial units which are small in size, independent in ownership and manned and managed entirely by local talents. The peculiarly local character of its organization is, therefore, responsible for the dominance of small-sized units in the Cotton-Mill Industry of Ahmedabad.

Another factor that has considerably influenced the size of industrial units in Ahmedabad is the widely differing methods of promotion and finance prevalent in the industry. "The industrial units have been organized on lines, more or less resembling the private limited liability type, and not on the lines of public joint-stock companies, according to which the Bombay Mills are floated and financed."[1] The result is, that though the units are formally joint-stock in origin, are in reality largely proprietary in character. The money is invariably subscribed by the promoters and their few friends, and those who have large financial stake in the concerns constitute themselves as managing agents. The public hardly subscribes to the shares of the mill-company and comes in mainly as depositor of funds with the Managing Agents. Now such a method of promotion and finance must obviously set a limit to the size of the individual units. At least the beginnings have to be small, and for further expansion and growth they have to depend on the financial resources of their Managing Agents. Thus the considerations of finance and the methods of organizing the industry have considerably influenced the size of industrial units in Ahmedabad.

The degree of financial and administrative integrations in an industry also affect the size of the industrial units. Where several units are under one ownership, control or management, the possibility of common services being rendered by a central organization may set off some of the disadvantages arising from small size. This is what one will see in case of Ahmedabad Cotton Industry in particular. Though most of the industrial units are managed and financed by separate Managing Agency firms, the practice of inter-locking directorates has evolved a type of industrial

1. Dr. P. S. Lokanathan in his most illuminating and exhaustive treatise on "Industrial Organization in India" has given a vivid picture of the different methods of promotion and finance followed in Ahmedabad. P. 31-32, 95-96, 220-21, 301-3.

organization in which the control of several units is virtually vested in the hands of a few persons belonging to one family. It may appear that each unit is being managed by a separate Managing Agency firm but in reality the same persons, under different names, and with few outsiders, control, manage and administer the whole affairs. Thus, under the prevailing form of industrial organization in Ahmedabad it has become much easier for the Managing Agents to coalesce together and take concerted action in respect of collective purchase of raw-materials, stores, machinery and selling of finished goods. The following Table will reveal that less than eighteen prominent families of Ahmedabad control and manage more than four-fifths of the total number of industrial units, situated in that centre :

TABLE XXV

The financial and managerial integrations of industrial units in cotton-mill industry of Ahmedabad

1. Sheth Kasturbhai Lal Bhai group:

Control, Manage & Finance.

1. Arvind Mills
2. Arun Mills
3. Asoka Mills
4. New Cotton Mills
5. Nutan Mills
6. Raipur Mills
7. Saraspur Mills

2. Sheth Chamanal G. Parekh's group:

1. Aryodaya Spinning Mills
2. Aryodaya Ginning Mills
3. Bharatkhand Cotton Mills
4. Bharat Suryodaya Cotton Mills.
5. City Mills

6. Girdhardas Mills
7. Rajnagar Mills

3. SHETH SAKARLAL BALABHAI'S GROUP:

1. Ajit Mills
2. Rohit Mills
3. Sarangpur Cotton Mills
4. Silver Cotton Mills

4. SHETH MOTILAL HIRABHAI'S GROUP:

1. Ahmedabad Saranpur Mills
2. Bihari Mills
3. Kaiseri-Hind Mills
4. Motilal H. Mills
5. Vikram Mills

5. SHETH LALBHAI TRICUMLAL'S GROUP:

1, Maneckchowk Mills
2. New Maneckchowk Mills
3. Lalbhai Mills

6. SHETH AMBALAL SARABHAI'S GROUP:

1. Calico Mills
2. Jubilee Mills

7. SHETH HARIDAS AGHARATLAL'S GROUP:

1. Vijaya Mills
2. Manaklal Mills

8. SHETH GOVINDDAS MANEKLAL'S GROUP:

1. Harivallabh Mills
2. Shrinagar Mills

9. SHETH RATILAL NATHLAL'S GROUP:

1. Commercial Mills
2. New Commercial Mills
3. New National Mills

10. SHETH JAYANTILAL AMRITLAL'S GROUP:

1. Laxmi Cotton Mills (Now in Liquidation)
2. Ananta Mills

11. SHETH JIVANLAL GIRDHARLAL'S GROUP:
    1. Bharatkhand Textile Mills
    2. New Textile Mills
    3. New Standard Mills

12. SHETH MANGHALDAS JEYSINGHBHAI'S GROUP:
    1. Jehangir Vakil Mills
    2. Rustom Jehangir Vakil Mills

13. SHETH MARSDEN'S GROUP:
    1. Marsden Mills
    2. Monogram Mills

14. SHETH KHUSHALDAS BANKER'S GROUP:
    1. Himabhai Mills
    2. Patel Mills
    3. Waste Cotton Mills (Now in Liquidation).

15. SHETH NAGRI'S GROUP:
    1. National Mills
    2. Nagri Mills

16. SHETH MUNSHAW'S GROUP:
    1. Ramkrishna Mills
    2. Vivekanand Mills
    3. Ahmedabad Cotton Mills
    4. Laxmi Weaving Mills (Now in Liquidation).

17. SHETH PALANPURWALA'S GROUP:
    1. Industrial Mills
    2. Kalyan Mills

18. SHETH MANSUKHBHAI'S GROUP:
    1. Gujarat Spinning Mills
    2. Gujarat Ginning Mills

The importance of such integrations should not be ignored while examining the effect of size on the efficiency of the industry. "Without any formal combination or amalgamation and without losing their independent legal and functional existence, these various units, under one centralized control are able to realize some of the economies, if not of large-scale production, of large-scale organization."[1] Such financial, managerial and marketing integrations, therefore, tend to counteract or at least mitigate some of the disadvantages arising from small-size. How far this factor has retarded a rapid expansion and enlargement of size in Ahmedabad, it is difficult to say with any degree of precision and exactitude. But it is an undoubted fact that the need for expansion of size has not been so acutely felt in Ahmedabad as in other important industrial centres, like Bombay.

Another striking development in the Cotton-Mill Industry of Ahmedabad has been the gradual transformation of a predominantly spinning industry into a combined spinning-weaving Industry. Within a short period of two decades, viz., 1911-31, the number of purely spinning units has declined from 17 in 1911 to 6 in 1931. Most of these units have either gone into liquidation or have installed their own weaving sheds. Much worse has been the fate of purely weaving units. Between 1931 and 1935, no less than 6 Weaving units were scrapped, dismantled or otherwise went into liquidation. It reflects that under the growing intensity of the competitive struggle, it has become increasingly difficult for the purely Spinning and Weaving units to continue their independent existence.

The following Table will show the extent of transformation that has taken place in the structure of the Cotton-Industry of Ahmedabad during the last forty years:

1. Dr. P. S. Lokanathan: Industrial Organization of India.

TABLE XXVI

CHANGES IN THE STRUCTURE OF THE COTTON-MILL INDUSTRY OF AHMEDABAD 1905-44.

Year	Purely Spinning Units.	Purely Weaving Units.	Combined Spg. Wvg. Units.	Total Number of Industrial Units.
1905	15	3	13	31
1911	17	7	95	49
1921	10	7	34	51
1931	6	6	58	70
1944	5	Nil	61	66

We thus see that the type of industrial organization and the changing structure of the Cotton-Mill Industry have influenced the size of industrial units in ways, rather difficult to define, but of which the importance cannot be ignored. A study which seeks to analyse and examine the changes in the size of industrial units must take into consideration the varying influences of all those factors which have directly or indirectly affected the size of a unit and its competitive structure. The is because while attempting to explain and account for these developments, one cannot overlook or ignore those peculiar characteristics of industrial organization which formally initiated and motivated these changes.

DISINTEGRATION OF PROCESSES

For a study of size, the Cotton-Mill Industry of Ahmedabad can be divided into two Sections, viz., Spinning and Weaving.. As regards Finishing, the statistical data available is both scanty and incomparable and do not make any generalization possible. We shall first measure the size of Spinning and then attempt the "Method of Cumulative Measurement" for quantitative determination of the size of Combined Spinning Weaving Units.

II

Size of spinning section

While measuring the changes in the size of Spinning Section in Ahmedabad we are not faced with those technological difficulties, that confronted us in case of the Bombay Cotton Industry. The character and composition of spindle activity in Ahmedabad reveal a remarkable degree of uniformity and homogeneity which render it possible to measure the Size of industrial units with greater accuracy. In case of Bombay, the prevalence of both the types of Spindles namely, Ringh and Mule, and the differences in their productive capacities, have made it difficult to find out any common denominator which can measure size and render inter-comparisons possible. Further, the changes in the character and composition of spindle-activity in Ahmedabad during the last 40 years have not been so great as to conceal, distort or modify the true characteristics of the changes in the size of the industrial units. The following Table will show the extent of changes in the character and composition of spindle-activity both in Bombay and Ahmedabad :

TABLE XXVII

CHANGES IN THE CHARACTER AND COMPOSITION OF SPINDLE-ACTIVITY BOMBAY AND AHMEDABAD—1905-44.

Year	BOMBAY Percentage Mule Spindles Installed	BOMBAY Figures of Ring Spindles Installed.	AHMEDABAD Percentage Mule Spindles Installed	AHMEDABAD Figures of Ring Spindles Installed.
1905	44.55	55.45	15.19	84.09
1911	31.14	68.36	7.52	92.48
1921	21.27	79.73	3.62	96.38
1931	10.07	89.83	.41	99.59
1941	5.08	94.92	Nil	100.00
1944	5.08	94.92	Nil	100.00

While comparing the Size of Industrial Units in Bombay and Ahmedabad important reservations bearing on the character and composition of Spindle-activity in these two centres must be clearly borne in mind. Though the productive capacities of different classes of spindles differ with regard to type, make, and counts of yarns on which they operate, it has been generally recognized that "the ring spindles involve a higher degree of mechanization and signify a higher degree of productive capacity." As such an industrial unit, which is fully equipped with ring spindles will invariably represent a higher degree of productive capacity when compared to an industrial unit equipped with equal number of mule spindles. Since in this investigation we have not taken into consideration these technological differences and the variations in the productive capacity of different types of spindles, the industrial units in Ahmedabad, where the use of ring-spindles is universal, will remain at a discount whenever a comparison is effected between the size of industrial units in Bombay and Ahmedabad.

Changes in the size of spinning-section
Distribution of group-frequencies

The following Table gives the frequency disdtribution of industrial units in Ahmedabad according to the number of Spindles Installed. The magnitude of the class-interval has been taken to be 5,000 spindles, and thereafter 10,000 spindles, For a smaller magnitude the distribution would have been uneven, and larger magnitude would .have covered up tendencies.

Table XXVIII

Trends in the size of industrial units in cotton-Mill industry of Ahmedabad—1905-44.

Frequency distribution of spindle-activity

Class-Interval (Spindles Installed)	1935	1911	1921	1931	1941	1944
0— 5,000	..	..	..	..	1	1
5,000— 10,000	..	2	3	6	1	1
10,000— 15,000	10	8	12	15	5	5
15,000— 20,000	8	16	8	13	14	14
20,000— 25,000	2	5	9	9	14	13
25,000— 30,000	4	2	3	10	10	12
30,000— 35,000	1	4	1	3	12	11
35,000— 40,000	..	3	2	2	1	1
40,000— 45,000	1	..	1	1	3	3
45,000— 50,000	..	..	..	1	..	..
50,000— 55,000	..	..	..	1	3	3
55,000— 60,000	..	..	..	..	1	1
60,000— 70,000	..	1	1	2	..	..
70,000— 80,000	..	1	1	1	..	..
80,000— 90,000	..	..	..	..	..	..
90,000—1,00,000	..	..	..	..	..	..
Abobe 1,00,000	..	..	..	..	1	1
Totals.	28	42	44	65	66	66

An analysis

An analysis of the above Table will reveal that in 1905 no fewer than 18 industrial units out of the total of 28, engaged in Spinning, had a spindle-equipment ranging from 10 to 20 thousand spindles. Of these 21 industrial units, 10 fell in the class-interval of 10 to 15 thousand spindles and 8 in the class-interval of 1 5 to 20 thousand spindles. Only one industrial unit had a capacity of more than 40,000 spindles. The comparative absence of bigger and the preponderance of smaller units were the two distinctive features of the earlier period.

In 1911 we observe the emergence of two smaller units, having a capacity of less than 20,000 spindles. There was also a remarkable increase in 15-20 thousand group, the number of frequencies having doubled. Another striking feature in the emergence of two bigger units, one in 60-70 aud the other in 70-80 thousand class-interval. The number of frequencies in the 26-30 and 35-40 thousand groups also recorded a slight decline.

In 1921 we note a remarkable decline in the number of industrial units having less than 20 thousand spindles. The entire loss was confined to class-intervals having 10-20 thousand spindles. There was also a relative spreading out of industrial units into somewhat larger dimensions, the number of industrial units in 25-30 thousand group having increased from 2 in 1911 to 9 in 1921.

In 1931, we observe the continuance of the same expansionist tendencies. The number of frequencies in the 20-25 thousand class-interval increased from 8 to 13, and in the 30-35 thousand class-interval from 3 to 10. The 10-15 and 15-20 thousand groups also recorded some increase.

From 1931 to 1944 hardly any significant change occurred in the Size of Industrial Units in Ahmedabad. Though expansionist tendencies continued the progress made was remarkably slow and intermittent.

QUANTITATIVE DETERMINATION OF THE ABSOLUTE AND RELATIVE CHANGES IN GROUP-FREQUENCIES

The Table on the next page will show distinctly the nature and extent of changes that have taken place in the size of the Spinning Section in Ahmedabad during the last forty years. The principal object of this Table is to make these changes more intelligible. Whereas the Absolute changes signify the increase or decrease in the number of frequencies in each class-interval, the relative changes denote the changes in the percentage share of each class-interval. The former gives a correct analysis, the latter a right perspective to judge the significance and extent of these changes.

TABLE XXIX

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF AHMEDABAD

1905—44.

(Spinning Section)

ABSOLUTE AND RELATIVE CHANGES IN GROUP-FREQUENCIES

Class Interval (Spindles Installed)	Frequencies. 1905	1944	Variations in Group Frequencies -or-	Percentage Share of each class interval. 1905	1944	Variation in the percentage of each class-interval. -or-
0 — 5,000	..	1	+ 1	..	1.52	+ 1.52
5,000 — 10,000	..	1	+ 1	..	1.52	+ 1.52
10,000 — 15,000	10	5	— 5	35.71	7.58	— 23.13
15,000 — 20,000	8	14	+ 6	28.58	21.20	— 7.38
20,000 — 25,000	2	13	+ 11	7.14	19.69	+ 12.55
25,000 — 30,000	2	12	+ 10	7.14	18.17	+ 11.03
30,000 — 35,000	4	11	+ 7	14.29	16.66	+ 2.37
35,000 — 40,000	1	1	..	3.57	1.52	— 2.05
40,000 — 45,000	..	3	+ 3	..	4.45	+ 4.55
45,000 — 50,000	1	..	— 1	3.57	..	— 3.57
50,000 — 55,000	..	3	+ 3	..	4.55	+ 4.55
55,000 — 60,000	..	1	+ 1	..	1.52	+ 1.52
60,000 — 70,000	..	..	..	..	..	..
70,000 — 80,000	..	..	..	..	..	..
80,000 — 90,000	..	..	..	..	..	..
90,000 — 1,00,000	..	..	..	..	..	..
1,00,000 and Above	..	1	+ 1	..	1.52	+ 1.52
Totals.	28	66	24	100.00	100.00	

AN ANALYSIS:

The foregoing Table shows:

(i) that in Ahmedabad the number of industrial units engaged in Spinning have increased from 28 in 1905 to 66 in 1944. The increase has been the greatest in the 20-30 thousand spindle-size.

(ii) that the entire loss is confined to the class-interval having 10-15 thousand spindles. This suggests that a Spinning Unit in Ahmedabad having less than 15,000 Spindles seems to be, and our subsequent enquiry will reveal, is not conducive to maximum efficiency or economical working, and

(iii) that there has also been a relative spreading out of industrial units into somewhat larger dimensions.

The relative changes also indicate or exhibit the same dominating tendencies. Industrial units having less than 20 thousand spindles have declined in importance. Whereas in 1905 more than 60 per cent of the frequencies fell in 0-20,000 class-intervals, in 1944, the percentage share was only about 30. There is considerable increase in the share of each class-interval having more than 20 thousand spindles, except that of 45-50 housand spindles,-size which show a slight decline. More than three-fourths of the industrial units in Ahmedabad now fall within the class-intervals of 15 to 35 thousand spindles.

The Graph on the opposite page will show the changes in the size of the 'typical units' during the last forty years. In 1905 there existed a typical unit of the size of 10 to 15 thousand spindles. The units continued to expand and by 1911 passed into the size of 15-20 thousand spindles. This maximum also appeared in 1921 but became less pronounced. In 1931 and 1944 we observe a gradual disappearance of any outstanding maximum Units, having a capacity ranging from 15 to 35 thousand spindles, which have now become most frequent and typical in the Cotton-Mill Industry of Ahmedabad.

CHANGES IN THE AVERAGE-SIZE

Changes in the Average-size will reveal the extent of changes that have taken place in the industries as a whole, irrespective of the changes in the size of any individual unit. As such they render it much easier to generalize the trends or directions in which these changes are taking place. The following Table will show the extent of changes that have occurred in the Average-size of the industrial units engaged in Spinning in Ahmedabad from 1905-44.

TABLE XXX

TRENDS IN THE AVERAGE-SIZE OF INDUSTRIAL UNITS IN COTTON-MILL INDUSTRY OF AHEMEDABAD-1905-44.

(Spinning Section)

Year	Class containing the Average-size (Spindles Installed)	Average No. of spindles Installed per Industrial Unit (Type of Average Median)
		('000 omitted)
1905	15,000-20,000	17.8
1911	15,000-20,000	18.6
1921	20,000-25,000	22.8
1931	20,000-25,000	23.8
1941	20,000-25,000	24.8
1944	20,000-25,000	24.8

The principal points that emerge from the above Table may by summarized as follows:

(i) The Average-size of an industrial unit in Ahmedabad has increased from about 18 thousand spindles to about 25 thousand spindles between 1905 and 1944.

(ii) The expansion was the greatest during the period 1911-21.

(iii) After 1921 the expansion of the Average size was remarkably slow. It suggests that either the need for expansion has not been so acutely felt in Ahmedabad, or the peculiar structure of industrial organization has tended to retard any expansionist movement.

During the earlier period the expansion in the size of individual units in Ahmedabad can mainly be attributed to two causes, firstly, with the expansion of the industry and enlargement of the market, there was a natural desire on the part of the individual units to expand and extend their domain of influence and, secondly, the abnormal conditions created by the last Great War (1914-18) allured the industrialists to expand their productive capacity with a view to reap fabulous profits and distribute abnormal dividends.

DISPERSION OF SIZE ABOUT THE AVERAGE

In order to find how far the changes in the Average Size are representative of the changes in the whole industry we must examine the nature and character of size-dispersion. The Table on the next page will show the Quartile Deviation in the Average Spindleage Installed and the Quartile Co-efficient of Dispersion in the Cotton-Mill Industry of Ahmedabad.

TABLE XXXI

DISPERSION OF SIZE ABOUT THE AVERAGE

Year	Lower Quartile Ql	Dispersion of the Lower Quartilefrom the Average.	Upper Qnartile Q3	Dispersion of the Upper Quartile from the Average	Quartile Deviation. Co-efficient of Quartile Deviation
1905	13.6	—4.2	29.4	+11.6	7.90
1911	15.2	—3.4	28.1	+ 9.5	6.45
1921	17.2	—5.6	29.3	+ 6.5	6.05
1931	17.8	—6.0	32.3	+ 8.5	7.25
1941	18.5	—6.0	32.2	+ 7.7	6.85
1944	18.5	—6.3	31.9	+ 7.1	6.70

Following conclusions can be drawn from a study of the above Tabe:

(i) The Measure of Dispersion is less on the lower side of the Average than on the upper-side of it. This reflects that in the Cotton-Mill Industry of Ahmedabad the 'clustery tendency' is more marked among smaller units than among bigger ones. This is because smaller units always strived to reach the Average-size while the bigger units once they had expanded their productive capacity, had hardly any incentive to curtail or contract their productive capacity. In Ahmedabad the Measure of Dispersion is greater on the upper side also because certain technical considerations have set a limit to the degree of expansion and the stages of development and growth. For example, the installation of an additional plant proved profitable only, if the size of the industrial unit was twice as large. Obviously in such cases the Measure of Dispersion was greater on the upper-side of the Average than on the lower-side.

(ii) From 1911 to 1944 we observe that the tendency for size-dispersion on the lower-side of the Average is continually increasing. This greater and greater degree of variability can be attributed to the fact that during the earlier period the tendency on the part of the industrial units to cluster round the average was more marked than during the later years, when the operation of long-term forces provided ample time and opportunity to the individual units to adjust their scale of output to their managerial and financial resources.

(iii) On the upper side of the Average we observe a continuous decline in size-dispersion. It reflects that the tendency on the part of bigger units to deviate from the Average is gradually becoming less pronounced and less marked. It is because the type of industrial organization prevailing in Ahmedabad and the character of goods produced have invariably set a limit for further expansion of productive capacity. The tendency on the part of industrial units to grow beyond a certain size is less marked in Ahmedabad than in Bombay.

CHARACTERISTICS OF THE CHANGE IN SPINNING SECTION : CONCLUSION

A critical review of these trends in the size of industrial units in Ahmedabad will clearly reveal a few characteristic features. Most of the industrial units in Ahmedabad have been started with a spindle-equipment ranging from 10 to 15 thousand spindles. "Beginning with modest capital investments and small easily handled and commercially profitable manufacturing plants, in almost all cases the different mill companies gradually but progressively increased in size and capacity."[1] Our Graph clearly reveals that in 1905 there existed a typical unit having a capacity ranging from 10 to 15 thou-

1, Shorab K. Khan: Ahmedabad—"The Bolton of the East." The Indian Textile Journal (Jubilee Number) 1940, P. 171.

sand spindles. These units gradually increased and expanded their productive capacity and passed into the size of 15-20 and 20-25 thousand spindles. This shows that in Ahmedabad too, the tendency on the part of individual units to grow out of their humble beginnings is as universal as it is in the case of Bombay.

Only in one important respect do we find that the changes in the size of Spinning Section in the Cotton-Mill Industry of Ahmedabad show some divergence when compared with the changes in the size of industrial units in Bombay. Changes in Ahmedabad have been the result of normal expansion and growth. They have, therefore, been slow, gradual and uninterrupted. In Bombay the changes in the size of industrial units followed the course of changes in the structure of the Cotton Industry. Units expanded when the impact of competition was most severe. The motivation underlying this form of expansion was to reduce overhead costs by an increase in output. That is why expansion was greatest during 1921-31, a period of intense foreign competition, industrial strife and unprecedented depression. This reflects one very important conclusion, namely, that whereas in Ahmedabad the expansion in size was mainly the result of the desire on the part of individual units to earn more profits, in Bombay it was the result of the intense internal and external competition which necessitated the fortification of defence fronts by a substantial reduction in "overhead costs" per unit of output.

III

WEAVING SECTION

CHANGES IN THE SIZE OF WEAVING SECTION DISTRIBUTION OF GROUP-FREQUENCIES

The following Table shows the frequency distribution of industrial units according to the number of looms installed. The magnitude of the class-interval has been taken as 100 looms.

TABLE XXXII.

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN AHMEDABAD—1905-44.

—FREQUENCY DISTRIBUTION OF LOOM ACTIVITY—

Class Interval. (Looms Installed).	1905	1911	1921	1931	1941	1944
0— 100	1	..	..	2	1	..
100— 200	..	3	1	..	..	..
200— 300	2	8	5	4	..	..
300— 400	6	6	9	10	5	4
400— 500	2	2	6	14	16	16
500— 600	2	7	6	6	9	10
600— 700	1	2	7	10	9	8
700— 800	..	..	1	5	7	7
800— 900	..	..	1	5	3	4
900—1,000	2	..	..	3	3	3
1,000—1,100	..	2	..	1	3	1
1,100—1,200	..	..	3	1	1	2
1,200—1,300	..	..	..	1	2	2
1,300—1,400	..	1	..	..	3	2
1,400—1,500	..	..	..	..	..	1
1,500—1,600	..	..	..	1	..	..
Above 1,600	..	1	2	2	1	1
Totals.	16	32	41	65	63	61

Quantitative determination of the absolute and Relative changes in group-frequencies

The following Table shows the nature and extent of changes that have taken place in the size of the Weaving Section in the Cotton-Mill Industry of Ahmedabad. The purpose of this Table is to show distinctly and in a more intelligible way the trends or directions in which such changes are taking place.

Table No. XXXIII.

Trends in the size of industrial units in cotton-mill industry of Ahmedabad—1905-44. (Weaving-section)

Absolute and relative changes in group frequencies

Class Interval (Spindles Installed)	1905	1944	Variations in Group-Frequencies —or+ 1935-44	Percentage share of each class interval in total 1905	1944	Variations in the percentage share of each class interval 1905-44 —or+
0— 100	1	..	— 1	6.25	..	— 6.25
100— 200	..	..	..	..	..	..
200— 300	2	..	— 2	12.50	..	—12.50
300— 400	6	4	— 2	37.50	6.56	—30.94
400— 500	2	16	+14	12.50	26.22	+13.72
500— 600	2	10	+ 8	12.50	16.39	+ 3.89
600— 700	1	8	+ 7	6.25	13.11	+ 6.86
700— 800	..	7	+ 7	..	11.48	+11.48
800— 900	..	4	+ 4	..	6.56	+ 6.56
900—1,000	2	3	+ 1	12.50	4.92	— 8.58
1,000—1,100	..	1	+ 1	..	1.64	+ 1.64
1,100—1,200	..	2	+ 2	..	3.28	+ 3.28
1,200—1,300	..	2	+ 2	..	3.28	+ 3.28
1,300—1,400	..	2	+ 2	..	3.28	+ 3.28
1,400—1,500	..	1	+ 1	..	1.64	+ 1.64
1,500—1,600	..	..	..	..	..	+ ..
Above 1,600	..	1	+ 1	..	1.64	+ 1.64
Totals.	16	61	45	100.00	100.00	

A critical analysis of these two Tables will enable us to make the following observations:

(i) There has been a striking increase in the number of industrial units engaged in Weaving during the last forty years. In 1905 only 16 units in Ahmedabad had their weaving sheds, the rest were purely Spinning units. By 1944 no fewer than 61 industrial units had installed their weaving sheds. This reveals a remarkable transformation that has taken place in the structure of the Cotton-Mill Industry in Ahmedabad between 1905 and 1944.

(ii) There has been a considerable decline in the number of smaller units. In 1911 no fewer than 17 units, engaged in weaving, fell in the class-interval having less than 400 looms; by 1944 only 4 units survived which had a weaving capacity of less than 400 looms. The rest of the industrial units either expanded their weaving capacity or went into liquidation. The entire loss is, therefore, confined to class-intervals having less than 400 looms. This suggests one important fact, namely, that an industrial unit in Ahmedabad, having less than 400 looms does not seem to be, and our subsequent enquiry will show is not, conducive to maximum efficiency or economical working.

(iii) There is a relative spreading out of industrial units into somewhat larger dimensions. In 1905 more than half of the industrial units in Ahmedabad which were engaged in weaving had a weaving capacity of less than 400 looms. In 1944, we observe, that only 4 units remained in those class-intervals. The rest of them expanded their productive capacity and passed into units of larger dimensions. Table No. XXXIII clearly reveals that the number of frequencies in all the class-intervals, having more than 400 looms have appreciably increased.

The relative changes in Group-Frequencies also indicate the dominance of the same tendencies, namely, a comparative decline in the number of smaller units and a growing preponderance of bigger ones.

Frequency distribution: a graphical Representation

The nature and character of frequency distribution reveal one very important fact, namely, the existence during different periods, of one or more than one typical sizes in the Cotton-Mill Industry of Ahmedabad. The Graph on the opposite page will show these tendencies quite distinctly. In 1905 there existed one outstanding maximum in the class-interval of 300-400 looms. In 1911 also there existed one outstanding maximum, though less distinct and less pronounced. In 1921 two mixima are clearly observable, one in the class-interval of 300-400 looms and the other in the class-interval of 500-700 looms. In 1931 also we observe two outstanding maxima, one in the class-interval of 400-500 looms and the other in the class-interval of 600-700 looms the first being more pronounced. In 1944 we observe one very outstanding maximum in the class-interval of 400 to 500 looms which today, is the most prevalent and dominating size in the Cotton-Mill Industry of Ahmedabad.

Changes in the average-size

The Table on the next page shows the extent of changes that have taken place in the Average-size of the Weaving Section in the Cotton-Mill Industry of Ahmedabad :

TABLE XXXIV

Trends in the average-size of industrial units in the cotton-mill industry of Ahmedabad. 1905—44.

(Weaving section)

Year	Class containing the Average-size	Average Number of Looms Installed. (Type of Average Used 'Median') ('oo omitted)
1905	300—400	3.9
1911	300—400	3.9
1921	500—600	5.0
1931	500—600	5.5
1941	600—700	6.1
1944	600—700	6.1

AN ANALYSIS :

An analysis of the above Table shows that the Average size of the Weaving Section in Ahmedabad has expanded from 390 looms to about 610 looms between 1905-44. During the earlier period, viz., 1905-11, however there, was no expansion because the Depression commenced in 1906 and lasted right upto 1910 hit hard the Cotton Industry and freezed all initiative for expansion. No less than 6 industrial units failed during this period. Between 1911-21 there was a remarkable expansion of Weaving Section, firstly, because of the stimulus provided by the last Great War (1914-18) and, secondly because of the loss of yarn-market in China which left no alternative except to develop the Weaving section of the Industry. After 1921 the Weaving Section has slowly but progressively expanded in size and capacity. Only during the present War, due to the difficulty of getting imported machinery, there has been hardly any expansion in the size of the Weaving Section.

DISPERSION OF SIZE ABOUT THE AVERAGE

The following Table shows the extent of size-dispersion in the Weaving Section of the Cotton-Mill Industry of Ahmedabad. The measure of Dispersion used is Quartile Deviation and its Co-efficient of Dispersion.

TABLE NO. XXXV

DISPERSION OF SIZE ABOUT THE AVERAGE

Year	Lower Quartile Q1	Dispersion of the Lower Quartile from the Average	Upper Quartile Q3	Dispersion of the Upper Quartile from the Average.	Quartile Devia-tion	Co-efficient of Quartile Devia-tion
1905	3.2	— .7	5.9	+2.0	1.35	.30
1911	2.7	—1.2	5.8	+1.9	1.55	.37
1921	3.5	—1.5	6.6	+1.6	1.55	.31
1931	4.0	—1.5	7.7	+2.2	1.85	.32
1941	4.6	—1.5	8.8	+2.2	1.85	.29
1944	4.7	—1.4	8.4	+2.3	1.85	.29

Here also we observe that the Measure of Dispersion is less on the lower side of the Average than on the upper-side. Whereas the dispersion of the Lower Quartile from the Average ranged from 70 to 150 looms, dispersion of Upper Quartile from the Average ranged from 160 to 230 looms. This shows that the tendency to cluster round the Average is more marked among the smaller units than among the bigger ones. In the former case, the units, constantly strive to reach the Average size, in the latter the units grow out disproportionately. Once the unit has expanded it becomes difficult for it to contract, curtail or scrap its productive capacity.

Size dispersion will, therefore, be greater on the lower side of the Average than on the upper.

Secondly, we observe that between 1905 and 1944 there has been a greater and greater variability or size-dispersion from the Average. In 1905 the Quartile Deviation or the Semi-Interquartile Range showed a dispersion of about 135 looms from the Average, in 1921 of about 155 and in the year 1944 it showed a dispersion of about 185 looms from the Average. This increasing variability or size-dispersion from the Average shows that production is being organized on widely different scales of output and equipment.

CHARACTERISTICS OF THE CHANGES IN WEAVING SECTION : CONCLUSION

A critical review of these trends will show that the changes in the size of industrial units in Ahmedabad reveal three characteristic features. Firstly, there was a preponderance of small sized units during the early period of evolution of the industry. Even in 1911 we observe that nearly half the number of industrial units had a weaving capacity of less than 400 looms. The small units managed to survive partly because of the immunity from cut-throat competition of foreign and inland mills, and partly because of the prosperous yarn trade with China which to some degree compensated for the less profitability of the Weaving Section.

Secondly, there was a slow but progressive expansion in the size of the individual units. The factors that led to this expansionist movement were mainly two, firstly, the natural inclination on the part of the industrial units to increase their profits by enlarging the scale of output and, secondly, the need, created by the growth of competition to reduce overhead costs per unit of output by spreading the costs of management and non-manufacturing operations over a large volume of output.

Thirdly, the tempo of expansion is higher in case of the Weaving than in case of Spinning. Taking 1905 to be the base year, the number of looms installed per industrial unit showed in 1944 an increase of 56% as against a 40 per cent increase in the number of spindles installed. These differences in the tempo of development reflect partly the changing character of the Ahmedabad Cotton Industry from a predominantly Spinning to a Combined Spinning-Weaving type, and partly the changes in the character of output, particularly the diversification of production which necessitate a higher proportion of loomage to spindleage.

IV

Quantitative determination of the size of combined spinning-weaving units in Ahmedabad

While measuring the size of Combined Spinning-Weaving Units in Ahmedabad we are handicapped by the existence of the same complicated factors that confronted us in the case of the Bombay Cotton Industry. Firstly, the unbalanced structure of the Cotton-Mill Industry in Ahmedabad, particularly during the earlier period, renders it difficult to generalize about the proportion of spindleage to loomage in an industrial unit. Some of the industrial units manufacture yarn not only for weaving but also for sale while others partly manufacture and partly purchase their yarn requirements from the open market. This 'unbalanced structure' or the lack of self-sufficiency on the part of individual units, prevents us from generalizing about the relation which spindleage bears to loomage, Secondly, the variations in the character of output and the degree of specialization and diversification demand different proportions of spindleage to loomage; for example the spinning of high counts of yarn and the weaving of finer varieties of cloth will require a relatively higher proportion of spindleage to loomage than the manufacture of inferior varieties of cloth. Lastly, the changes in character of output over a certain period tends to alter the quantitative relationship between spindleage and loomage and thus conceal or distort the true characteristics of the changes in the size of Combined Spinning-Weaving Units.

But despite these limitations and reservation, an attempt has been made in the following four Tables to measure and study the changes in size of Combined Spinning-Weaving Units in the Cotton-Mill Industry of Ahmedabad during the last three decades. The figures of 1905 have been deliberately ignored, for, the structure of the Industry was so unbalanced that the proportion of spindleage to loomage hardly exhibited any uniformity which could have justified comparison.

QUANTITATIVE MEASUREMENT OF COMBINED SPG-WVG UNITS IN AHMEDABAD 1911.

LOOMS	10	20	30	40	Above	Total
ABOVE 1750	—	—	—	—	1	1
1500	—	—	—	—	—	—
1250	—	—	—	—	1	1
1000	—	—	—	2	—	2
750	—	—	—	—	—	—
500	—	2	1	4	—	7
250	—	9	2	—	—	11
0	1	1	1	—	—	3
Total	1	12	4	6	2	25

SPINDLES
(IN '000s).

QUANTITATIVE MEASUREMENT OF COMBINED SPG-WVG UNITS IN AHMEDABAD 1921

LOOMS	10	20	30	40	50	60	70	80	Total
1750	—	—	—	—	—	—	—	1	1
1500	—	—	—	—	—	—	1	—	1
1250	—	—	—	—	—	—	—	—	—
1000	—	—	—	—	3	—	—	—	3
750	—	1	—	1	—	—	—	—	1
500	—	—	10	3	—	—	—	—	13
250	—	10	4	—	—	—	—	—	14
0	1	—	—	—	—	—	—	—	1
Total	1	10	13	4	3	—	1	1	34

SPINDLES
(IN '000s)

QUANTITATIVE MEASUREMENT OF COMBINED SPG-WVG UNITS IN AHMEDABAD 1931

LOOMS	10	20	30	40	50	60	70	80	
	—	—	—	—	—	—	—	**1**	1
1750	—	—	—	—	—	—	**2**	—	2
1500	—	—	—	—	1	**1**	—	—	2
1250	—	—	—	—	**1**	—	—	—	1
1000	—	—	—	**8**	1	—	—	—	9
750	—	2	**14**	4	—	—	—	—	20
500	2	**15**	7	—	—	—	—	—	24
250	—	—	—	—	—	—	—	—	—
0									
Total	2	17	21	12	3	1	2	1	**51**

SPINDLES
(IN '000s)

QUANTITATIVE MEASUREMENT OF COMBINED SPG-WVG UNITS IN AHMEDABAD (1944)

LOOMS	10	20	30	40	50	60	Above	Total
Above 1500	—	—	—	—	—	—	1	1
1250	—	—	—	1	1	2	—	4
1000	—	—	1	—	1	2	—	4
750	—	1	2	8	—	—	—	11
500	—	3	14	4	—	—	—	21
250	—	13	7	—	—	—	—	20
0	—	—	—	—	—	—	—	—
Total	—	17	24	13	2	4	1	61

SPINDLES
(IN '000s)

Looking at these figures one is again struck by the regularity in distribution and arrangement of the statistical data. The fact that all maxima are not scattered but cluster about a diagonal line shows that in Ahmedabad also as in the case of Bombay, a tendency is operating, though less distinctly in the earlier period and more marked in the later years, for spindles and looms to combine within a certain range of ratio. The ratio of 40 spindles to one loom is becoming more and more pronounced though it will, in individual cases, vary according to the variations in the character of output, degree of specialization and the type of machinery used.

A study and analysis of these three Tables reveal the existence of one or more than one typical-sizes during each period. In 1911 there existed in Ahmedabad a dominant type of industrial unit containing 250 500 looms and 10 20 thousand spindles. In 1921 this size continued to exist, but there emerged another typical size having a range of 500-750 looms and 20 30 thousand spindles. The expansionist tendencies continued, and in 1931 one more typical size having a range of 759-1000 looms and 33-40 thousand spindles came into existence. It is striking to note that after 1931 no material change has taken place in the size of the Combined Spinning-Weaving Units in Ahmedabad, except a slight decline in the smaller group. The three 'typical-size' still continue to dominate the Cotton-Mill Industry of Ahmedabad.

A study in the nature and character of frequency distribution in Bombay and Ahmedabad will show that the "diagonal tendencies" are more marked and more pronounced in the case of Ahmedabad than in that of Bombay. Whereas more than two industrial units in Ahmedabad kept closely to the ratio of 40 spindles to one loom, in Bombay only 21 out of 52 units kept closely to this ratio. This reflects that either the structure of industry in Bombay is less balanced than that of Ahmedabad or that the variations in character of output and degree of specialization are so great that they demand different proportion of spindleage to loomage from unit to unit. However, the differences in the ratio of spindles to looms in these two centres denote partly the differences in the structure of the industry and partly the variations in the character of output and equipment.

V

REASONS FOR THE DIFFERENCES IN THE SIZE OF INDUSTRIAL UNITS IN BOMBAY AND AHMEDABAD

A comparative study of the size of industrial units in Bombay and Ahmedabad will reveal that, judged by any standard of measurement, the industrial units in Bombay are bigger than those in Ahmedabad. The following Table shows the nature and extent of these differences.

TABLE. XXXIX

AVERAGE-SIZE OF INDUSTRIAL UNITS IN BOMBAY AND AHMEDABAD

1944.

	No. of Spindles Installed. ('000 omitted)	No. of Looms Installed. ('00 omitted)	No. of workers employed. ('00 omitted.)	Candies of Cotton consumed ('000 omitted)
Bombay	44.8	10.4	19.3	11.5
Ahmedabad	24.8	6.1	10.6	4.6

The difference in the size of industrial units in Bombay and Ahmedabad can be ascribed to various factors such as location, structure of industrial organization and the variations in the character of output and equipment. How far and in what ways these factors explain and account for these differences we shall presently study.

The most important reason for the differences between units in Bombay and Ahmedabad, lies in the peculiar circumstances and environments in which the industry in these two places developed. In Bombay, from the very beginning, the industry was organized for an export trade in yarn, which for a long time remained a dominating feature of the industry. Now, an industry built up with the object of capturing the foreign market had to be organized on a fairly large scale. Moreover, the super-abundance of wealth which poured into the slender coffers of Bombay citizens during the American Civil War (1861-64) stimulated wilder enterprises in all directions. It is significant to observe that all the 15 new units that came into existence during this short spell of five years (1870-75) were, on the average, equipped with a capacity of more than 30,000 spindles. Thus we see that from the very start the industrial units in Bombay were organized on a fairly large-scale. In Ahmedabad on the other hand, the units were started primarily to take advantage of the large supplies of raw-cotton and the large consuming markets in and around Ahmedabad. The persons, who pioneered the industry were small capitalists with modest resources but great organizing ability. Now, an industry which depends on the local supply of capital, labour and organizing ability and which was started with the object of catering to the needs of local markets must necessarily be organized on a small-scale. The essentially local character of its organization is thus responsible for the domination of small-sized units in the Cotton-Mill Industry of Ahmedabad.

Another reason for the differences in the size of industrial units in Bombay and Ahmedabad is to be found in the widely differing methods of promotion and finance prevalent in these centres. Although in form most of the industrial units in Ahmedabad are joint-stock in origin, in reality they are largely proprietary in character. In Bombay, on the other hand, the units are not only Joint-Stock in name, but also in all their essential features. Now, the units organized on lines more or less resembling the private limited liability type, must necessarily be smaller in size than those organized on lines of Joint-Stock Companies. Thus, in Ahmedabad, considerations of finance and organizing ability have set a limit to the size of individual units. In Bombay, on the contrary, the greater activity on the Stock Exchange and the ampler resources of the Managing Agents have always encouraged the formation of larger units. The differences in the methods of promotion and finance, therefore, account for the differences in the size of industrial units in these two centres.

Differences in the character of output also account for the differences in the size of industrial units in Bombay and Ahmedabad. In Ahmedabad the type of goods produced are of widely varied character, shape, texture and design. Hence the complicated task of management has imposed a limit on the size of the individual unit. In Bombay, on the other hand, the degree of specialization and the type of goods manufactured have favoured the introduction of standardization and mass production methods. The units organized have, therefore, been invariably large. The lesser concentration of Bombay in the production of 'quality goods' and the greater care of management and organization in Ahmedabad also explain the difference in the scales of organization in these two centres.

Differences in the size of industrial units can also be attributable to the differences in the ages of the industry. The Bombay Industry being an old-established industry has afforded ample scope to the individual units for expansion and growth. In Ahmedabad most of the industrial units, 35 out of 66, were started after 1905, and as such many of them are still in their growing stages. It is, however, possible for the Average Unit in Ahmedabad to become larger as time passes.

Last, but not the least important reason for the differences in the scales of organization in Bombay and Ahmedabad lies in the competitive structure of the industry. Bombay being a port and an important junction of railways had always to face the severe competition both from inland and foreign mills. Ahmedabad being an inland centre and nearer to the sources of raw-material and consuming markets, was not affected to the same extent as Bombay. Naturally the need for reduction of "over-head" costs by expansion and enlargement of size was not so acutely felt in Ahmedabad as in Bombay. The industrial units in Bombay, therefore, expanded more rapidly than those in Ahmedabad, particularly during 1921-31, when the impact of internal and external competition was most severe.

VI

Conclusion

The study of the size of industrial units in the Cotton-Mill Industry of Ahmedabad clearly reveals that although there have been important changes in the size of industrial units in Ahmedabad, they have not been as far-reaching in character and significance as those in the Cotton-Mill Industry of Bombay. Changes have invariably followed the course of normal expansion and gradual development. The individual units are slowly but progressively expanding in size, and it is possible for the average unit to become larger as time passes. This policy of slow and cautious expansion has, however, been a great blessing in disguise, for it has, on the one hand, prevented the floatation of gigantic and ambitious ventures, too big to be efficiently managed, and on the other, led to the methodical consolidation and systematic stabilization of Ahmedabad's premier industry.

CHAPTER IV

TRENDS IN THE SIZE OF INDUSTRIAL UNITS IN REST OF INDIA 1905-44

I

While measuring the size of industrial units in other parts of the country one is confronted with numerous difficulties that render the task of generalization extremely hazardous. Not only are units scattered over a vast area, the number of units at each industrial centre or region is so small that any attempt at generalization about the trends or directions in which changes are taking place will be vitiated by the existence of many divergent tendencies. It is striking to note that in none of the industrial centres in the rest of India, except at Cawnpore and Coimbatore, does the number of industrial units engaged in Cotton-textiles exceed ten. With such a small number of observations it would be difficult to make any generalization, and even if any generalization is attempted, the inferences drawn would undoubtedly be less conclusive if not unreliable and misleading. Thus the study of size in Rest of India is handicapped by the uneven distribution of industrial activity in Cotton-textiles.

In another respect, too, the study of size in other centres of India presents some distinctive features. Where units are situated in the same industrial centre or area, the same set of conditions governs the changes in the size of individual units. For example, any alteration in the transport relationship between the centres of production and sources of raw-materials on the one hand and the consuming markets on the other, or a change in the distribution of other productive factors will invariably affect not one but all the industrial units located in that centre. But where units are scattered over a vast area the regional differences will be so great that the true characteristics of the changes in size will be blurred by the interaction of diverse tendencies. For example, if an attempt is made to study the changes in size of industrial units in the United Provinces we shall at once discover that there exist in the industry two distinct tendencies. Whereas in Cawnpore the individual units are slowly but progressively expanding in size and capacity, in other centres of the industry, viz., Agra, Hathras, Mordabad and Benares, hardly any significant change has occurred in the size of the individual units. That is because the sets of conditions governing the changes in size are different at different places. Were all the industrial units located at the same centre or area, the same set of conditions would have affected all the units. Hence in a study of size in other centres of India, the 'locational factor' becomes an important determinant of size. A study which seeks to analyse the changes in size must therefore examine the varying influences of this factor at each centre.

Running parallel to the differences in the character of localization are the difference in the evolution, organization and the structure of the industry at different centres. The methods by which the industry has been built up and the conditions under which it has developed in different centres show significant variations. A study of the methods by which the industry has developed in Cawnpore and in Ahmedabad, will reveal that factors other than location can also account for the differences in the scales of output and the method of organization. The widely differing methods of promotion, finance and management prevalent at each centre not only influence size but also govern the course of future changes. The forces that determine size are, therefore, various and do not act always in the same direction. The result is that there can exist in an industry, at any particular time, as many diverse tendencies as there are centres of industrial production.

Thus we see that from several points of view the character of industrial organization and the structure of the industry in each province have rendered the task of generalization extremely difficult. Had the conditions governing size been more uniform and exhibited greater regularity it would have been much easier to diagnose certain trends, draw certain inferences and establish certain conclusions. But since these conditions are quite conspicuous by their absence the observational data have to be judged in the light of the peculiar character of industry in each centre. In case an attempt is made to generalize the results of our investigation, the individual characteristics of each centre will have to be rigidly borne in mind, and their influence on size examined. Greater emphasis has been laid on this aspect of the problem because the factual data are so scanty and the frequencies so few and scattered, that if the individual characteristics are not taken into consideration our observations would undoubtedly be less accurate and more arbitrary.

II

SIZE OF INDUSTRIAL UNITS IN BOMBAY PRESIDENCY

While studying the sizes of industrial units in the Bombay Presidency it is essential to classify the industrial units into two broad divisions, those located in the British India and those located in Indian States. Such a classification is of great practical significance for it not only reveals the striking differences that exist between the size of industrial units in these two regions, but also exhibit the tendency for the industry to migrate, firstly, from British

India to Indian States and, secondly, from regions of higher to those of lower labour costs. How far and in what ways the locational shift has affected the size of industrial units will form the subject-matter of our subsequent enquiry. Here, we need only say that the tendency for the shifting of productive activity from British India to Indian States has, in recent years, become much pronounced. The following table will testify to this conclusion:

TABLE XL

TRENDS IN THE DISTRIBUTION OF INDUSTRIAL UNITS IN THE REST OF BOMBAY PRESIDENCY

1905-44

	NUMBER OF INDUSTRIAL UNITS IN		
Year.	British India.	Indian States.	Total.
1905	16	5	21
1911	24	10	34
1921	22	13	35
1931	35	22	57
1941	27	32	59
1944	28	38	66
Increase or Decrease between 1905-44 — or +	+12	+33	+45

In this investigation we shall study the size of Spinning, Weaving and Combined Spinning-Weaving Units separately.

SIZE OF SPINNING UNITS

The following table gives the frequency distribution of Spinning Units according to the number of spindles installed. The magnitude of the class-interval is 5,000 Spindles.

TABLE XLI.

TRENDS IN THE SPINNING UNITS IN THE REST OF BOMBAY PRESIDENCY

1905-44

Spindles Installed.	BRITISH INDIA. 1905	1944	Change in size between 1905-44 — or	INDIAN STATES. 1905	1444	Change in size between 1905-44 — or
0— 5,000	1	..	—1	..	4	+4
5,000—10,000	...	1	+1	..	2	+2
10,000—15,000	1	2	+1	..	1	+1
15,000—20,000	2	..	—2	..	2	+2
20,000—25,000	..	..	..	..	..	..
25,000—30,000	..	..	..	..	..	..
Above 30,000	4	1	—3	..	..	..
Totals	8	4	—4	..	9	+9

A study of the size of purely Spinning Units in the Rest of Bombay Presidency reveals several characteristic features. In 1905 all the 8 Spinning Units were located in British India. Of these 8 units 4 were equipped with more than 30 thousand spindles, the Gokak Mills having about 70,000 spindles and the two units in Sholapur having 42,000 and 45,000 thousand spindles respectively. Of the remaining 4 units. 2 fell in the class-interval of 15-20 thousand spindles and one in 0-5 and 10-15 thousand spindle-size each. This shows that there existed in 1905 spinning units of varied sizes and magnitudes, the smaller units mainly catering the local demand and the larger ones depending on the prosperous yarn-markets abroad, which for a considerable time remained a dominating feature of the Indian Spinning Industry.

By 1944, however, significant transformation took place in the size and structure of the industry. The number of purely spinning units in British India declined from 8 in 1905 to 4 in 1944. Of the four bigger units that existed in 1905, three took to weaving and installed their own weaving sheds. The remaining one still exists and has a capacity of about 75,000 spindles. Of the four smaller units that existed in 1905, one was dismantled and scrapped, and the remaining three changed hands and were reconstructed as Combined-Weaving units. A few other spinning units were floated between 1905 and 1944, but most of them, after a short languishing existence went into liquidation. At present only three spinning units are working, two at Barsi and one at Budhagaon (M. S. M. Rly.). None of these units is equipped with more than 13,000 spindles.

The industrial units located in Indian States are even smaller in size than those located in British India. It is significant to observe that of nine spinning units working in Indian States in 1944, 4 had a capacity of less than 5,000 spindles. Of these 4 two are located in Baroda State and the remaining two at Miraj and Bhor State respectively. None of the remaining five units is equipped with more than 20,000 spindles.

Thus we see that the purely Spinning Units do not occupy any significant place in the Cotton Mill Industry of Bombay Presidency. In all 13 spinning units are working and they are typically small in size and mainly cater to the local market of the handloom weavers. Being situated in the heart of the cotton-growing area, and sheltered behind the strong state barriers, many of them could manage to lead a languishing existence. But it is extremely doubtful that with the growing intensity of the competitive struggle they have any prospective future before them.

SIZE OF WEAVING UNITS

Purely Weaving Units, too, do not have any place of significance in the Cotton-Mill Industry of Bombay. In all 5 Weaving Units were working in 1944, of which two were situated in Bhiwandi, and the remaining three in Jamnagar, Ichalkaranji and Tikerkewadi. All the last three units were equipped with less than 100 looms. The two units located at Bhiwandi were comparatively bigger in size, one of them having 125 looms and the other 250 looms. Most of these units cater to the local needs and operate on fine, light and fanciful fabrics which do not come into direct competition with mill-made products.

SIZE OF COMBINED SPINNING-WEAVING UNITS

It is the Combined Spinning-Weaving Units that are important. Of the 63 units working in 1944, 47 belonged to this Group. This reflects that the purely Spinning and Weaving Units have declined in importance and there is a growing tendency for spinning and weaving to be combined together and carried on as one independent enterprise. The development is particularly striking when contrasted with that of the Lancashire Industry where the practice of carrying on spinning and weaving separately is still dominant.

One important factor that needs to be considered here is the "locational variation in size." If an attempt is made to study the size of industrial units in each centre separately one will be struck by the discovery of the existence of important regional differences in the size of industrial units at each centre. For, if a comparison is made between the size of industrial units in Sholapur and that of the units situated in Baroda, Broach or Jalagaon, one will at once find that at each centre units tend to be of a distinctive size and magnitude. This tendency to adopt a certain scale of output may either be the result of the pull of various productive factors which determine an "optimum-size" for each centre, or may be ascribed to the fact, that once an industrial unit is started on a certain scale of output in any centre the subsequent units tend to adopt the same scale of output and equipment. But whatever may be the reason for the characteristic pattern of size at each centre, it cannot be denied that there exist important regional differences in the size of industrial units in an industry. This factor has great significance, for if the differences in any centre are considerable, the units in that centre must be separately classified, and the variations in size examined.

In the Table on the next page an attempt has been made to study the size of Combined Spinning-Weaving Units in the Rest of Bombay Presidency. The magnitude of the class-interval has been taken as 10,000 Spindles and 250 Looms.

TABLE XLII

SIZE OF COMBINED SPINNING AND WEAVING UNITS IN REST OF BOMBAY PRESIDENCY

1944.

(Spinning Section)

	BRITISH INDIA.			INDIAN STATES.			
Spindles Installed.	Sholapur.	Rest of British India.	Total	Baroda	Rest of the States.	Total	Total in Bombay Presidency.
0-10,000	..	1	1	..	4	4	5
10,000-20,000	..	4	4	7	7	14	18
20,000-30,000	1	6	7	6	2	8	15
30,000-40,000	..	..	..	1	1	2	2
40,000-50,000	2	3	5	..	..	..	5
50,000-60,000	1	..	1	..	..	..	1
Above 60,000	1	..	1	..	..	..	1
Total	5	14	19	14	14	28	47

(Weaving Section)

Looms Installed.							
0-250	..	1	1	..	5	5	6
250-500	..	5	5	8	6	14	19
500-750	1	5	6	5	3	8	14
750-1,000	..	1	1	1	..	1	2
1,000-1,250	1	2	3	..	..	..	3
1,250-1,500	2	..	2	..	..	..	2
Above-1,500	1	..	1	..	..	..	1
Totals.	5	14	19	14	14	28	47

A study of the above Table reveals that out of the 47 Spinning-Weaving Units working in the Rest of Bombay Presidency, 19 are located in British India and 28 in Indian States. The units in Sholapur are the biggest in size, none of them except one, having less than 40,000 spindles and 1,000 looms. Units in Indian States are somewhat smaller in size than those located in British India. Whereas in British India the largest number of frequencies fell in the class-interval of 20 to 30 thousand spindles, in Indian States it was 10-20 thousand class-interval that contained the dominant-size. It is a significant fact to observe that none of the industrial units in Indian States has more than 32 thousand spindles and 750 looms. In Baroda of course there are two distinguishing classes of industrial units, one having 10-20 thousand spindles and 250-500 looms, and the other having 20-30 thousand spindles and 500-750 looms. In other States the units are typically small in size, the 10-20 thousand group predominating.

It is interesting to observe that in the Rest of Bombay Presidency as well a tendency is operating for spindles and looms to combine within a certain range of ratios. The ratio of 40 spindles to one loom is distinctly observable.

In the following Table an attempt has been made to quantitatively measure the size of a Combined Spinning-Weaving Unit in the Rest of Bombay Presidency:—

Table No. XLIII

QUANTITATIVE DETERMINATION OF THE SIZE OF COMBINED SPINNING-WEAVING UNITS IN THE REST OF BOMBAY PRESIDENCY—1905-44.

Looms \ Spindles in '000s.	0–10	10–20	20–30	30–40	40–50
Above 1000	..	..	..		**2**
750–1000	—	—	—	—	—
500–750	—	1	**11**	2	—
250–500	1	**15**	3	—	—
0–250	**5**	2	—	—	—

The Table on the last page clearly reveals the existence of typical units in the Cotton-Mill Industry of Bombay Presidency. Two typical-sizes are easily distinguishable, one having 10 or 20 thousand spindles and 250 to 500 looms and the other having 20 to 30 thousand spindles and 500 to 750 looms. In the rest of the class-intervals the frequencies are very unevenly distributed.

III

SIZE OF INDUSTRIAL UNITS IN THE UNITED PROVINCES

The size of industrial units in the United Provinces has been influenced by two important factors, namely, location and the structure of the Cotton-Mill Industry. Almost all the important industrial units are located in Cawnpore. They are exceptionally large in size and account for more than 90 per cent of the cloth produced by the Cotton-

Mill Industry of the Province. The other units, which are mostly Spinning, are scattered over the Western Districts of the United Provinces, mainly in Agra, Aligarh and Moradabad. They are typically small in size, and mainly cater to the local demand of the hand-loom weavers. But for their proximity to local supplies of raw-cotton and the consuming markets, it would have been difficult for these smaller units to survive the periods of depression and industrial inactivity.

Of the 27 industrial units, working in the United Provinces in 1944, 9 were purely Spinning Units, 3 Weaving Units and the remaining 15 were Combined Spinning-Weaving type. We shall study their size separately and where possible analyse the trends or directions in which changes have occurred.

Size of Spinning Units

The following Table gives the frequency distribution of Spinning units according to the number of Spindles Installed :

Table No. XLIV

TRENDS IN THE SIZE OF SPINNING UNITS IN THE COTTON-MILL INDUSTRY OF THE UNITED PROVINCES.

1905—44.

—FREQUENCY DISTRIBUTION OF SPINDLES ACTIVITY—

Spindles Installed.	1905	1911	1921	1931	1941	1944	Change between 1905-44 —or +
0—10,000	..	1	2	1	..	2	+2
10,000—20,000	2	5	3	3	6	6	+4
20,000—30,000	..	1	2	1	1	..	..
30,000—40,000	..	1	..	..	..	..	..
Above 40,000	..	..	1	1	1	1	+1
Totals.	2	8	8	6	8	9	+7

The above Table reveals that hardly any material change has occurred in the size of the spinning units during the last forty years. The size of 10-20 thousand spindles still continues to be a typical-size for the spinning units in the United Provinces. Only one Spinning unit in Agra had about 50,000 spindles. The rest of the frequencies fell in the class-intervals having a range of 0 to 20 thousand spindles.

These small spinning units have always had a precarious existence. Most of them have often changed hands, and were several times reorganized and reconstructed. It is interesting to note that one unit at Hathras has changed hands about half a dozen times. [1]

SIZE OF WEAVING UNITS

Purely Weaving Units hardly occupy any place of significance in the Cotton-Mill Industry of the United Provinces. There were in all 3 Weaving Units working in the year 1944, all of which had less than 100 looms, and employed on an average less than 100 workers. They were located at Agra, Mirzapur and Allahabad.

SIZE OF COMBINED SPINNING-WEAVING UNITS

It is the Combined Spinning-Weaving Units that occupy a position of real importance in the Cotton-Mill Industry of the United Provinces. Although the number of such units is only 15 they produce in aggregate, more than 90 per cent of the yarn and piecegoods manufactured by the Mill-Industry of the Province. Of the 15 Spinning-Weaving Units working in 1944, 11 were located in Cawnpore alone which, next to Bombay and Ahmedabad, is the biggest centre of the cotton-mill industry of India.

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1. It refers to the present Bijli Mills (formerly Tulsidas Tejpal Mills Ltd.)

Since the industrial units located in Cawnpore are very much larger in size than those located in other centres of the Province, it is essential that their size be studied separately.

The following Table will show the changes that have occurred in the size of Combined Spinning-Weaving Units in the Cotton-Mill Industry of Cawnpore during the last 40 years :

Table No. XLV

TRENDS IN THE SIZE OF COMBINED SPINNING-WEAVING UNITS IN THE COTTON-MILL INDUSTRY OF CAWNPORE.

1905-44.

(SPINNING SECTION)

Spindles Installed.	1905	1911	1921	1931	1941	1944	Change between 1905-44.
0— 20,000	..	..	..	..	1	1	+1
20,000— 40,000	..	1	..	2	3	4	+4
40,000— 60,000	2	1	1	3	2	2	..
60,000— 80,000	2	2	2	1	2	2	..
80,000—100,000	..	..	..	1	2	1	+1
Above—1,00,000	..	..	1	1	..	1	+1
Totals ..	4	4	4	8	10	11	+7

(WEAVING SECTION)

LOOMS INSTALLED.							
0— 500	..	..	..	1	1	2	+2
500—1,000	3	3	1	3	3	3	..
1,000—1,500	1	1	1	2	4	4	+3
1,500—2,000	..	..	2	2	2	2	+2
2,000—2,500	..	..	..	..	..	1	+1
Above—2,500	..	..	..	..	..	..	..
Totals.	4	4	4	8	10	11	+8

The above Table reveals that all the industrial units that came into existence during the earlier periods were organized on a fairly large scale. They were started by rich and experienced European merchants or employees who conceived industrial organization on somewhat bold and larger lines. The ample financial resources, the proximity of the sources of raw-materials and consuming markets and the abundant supply of cheap and skilled labour, appraised them of the vast potentialities for the development of the textile industry in so promising a centre as Cawnpore. The conditions, were therefore, very congenial for the beginnings to be made on a fairly large-scale. It is significant to note that none of the industrial units working in 1905 had less than 40,000 spindles and 500 looms. They were Elgin, Muir, Cawnpore Cotton, and Victoria Mills—all owned and managed by European firms or directors. It was only after 1921 that a few enterprising Indian industrialists with modest resources but great organizing ability came in the field. They mostly belonged to the trading class of Indian merchants who had vast business experience but little technical training. The units organized by them were somewhat smaller in size, most of them having 20 to 40 thousand spindles and 500 to 1,000 looms. Thus in Cawnpore two classes of industrial units are clearly distinguishable ; those units that came into the field before 1911 were organized on a fairly large-scale and those that came into existence subsequently began work on a moderate scale with moderate equipments. It is, however, expected that these units too will become larger as time passes.

In no other centres except Bombay, are the units in Cotton-Mill Industry organized on such a large-scale as in Cawnpore. In 1944 5 units, out of the total of 11, were equipped with more than 50,000 spindles and 1,000 looms. One of them, viz., Swadeshi Cotton

Co., Ltd., had a capacity of over a lakh of spindles and 2,000 looms. Undoubtedly, some of the units in Cawnpore such as Muir, Elgin, Cawnpore Cotton and the New Victoria are the most well-known and best organized units in the Cotton-Mill Industry of India.

The other Spinning-Weaving Units working outside Cawnpore are not of much importance. Of the 4 units that were working in 1944, one was located at Benares, one at Lucknow, one at Hathras and one in Rampur State. The size of these units varied within a small range, viz. from 17,000 to 23,000 spindles and 300 to 500 looms.

IV

Size of Industrial Units in the Cotton-Mill Industry of Bengal

The most striking feature of the development of the Cotton-Mill Industry in Bengal is the remarkable transformation of a purely Spinning Industry into a Combined Spinning-Weaving type. Within a period of less than four decades the number of Combined Spinning-Weaving Units has increased from 1 in 1905 to 17 in 1944, while the number of purely Spinning Units has declined from 9 in 1905 to 4 in 1944. The extent of such transformation will be evident from the table on the next page:

Table XLVI

TRENDS IN THE STRUCTURE OF THE COTTON-MILL INDUSTRY IN BENGAL.

Year.	Purely Spinning Units.	Purely Weaving Units.	Combined Spg. Wvg. Units.	Total.
1905	9	..	1	10
1911	6	1	3	10
1921	5	2	3	10
1931	4	3	6	13
1941	3	8	15	26
1944	4	7	17	28
Change between 1905-44—or+	—5	+7	+16	+18

The transformation of a purely Spinning Industry into a Combined Spinning-Weaving Industry had an important effect on the size of the individual units. The Spinning Units that were started during the earlier period were organized on fairly large scale; 4 out of 9 units working in 1905 had a capacity of over 60,000 spindles. But when the profitable yarn market in China gradually declined and the competition from Japan became increasingly severe, the spinning units had no alternative but to curtail their productive capacity or instal their own Weaving sheds. Many of the units, therefore, resorted to contraction of size by scrapping a certain portion of their spinning machinery. The units that adopted this course were Bowreah, Dunbar, Bengal Cotton (now known as Kesoram Cotton Mills), and the Goosery Cotton Mills (now known as Radha Krishna Cotton Mill No. 1). Many of these also took to Weaving and installed their own weaving sheds. The result is that today the number of purely Spinning units in Bengal has considerably declined, and even those that exist are very much smaller in size compared to those that were working during the last quarter of the 19th century and early twenties. The following table indicates the nature and extent of changes that have occurred in the size of the Spinning units in the Cotton-Mill Industry of Bengal during the last four decades:

Table No. XLVII

TRENDS IN THE SIZE OF SPINNING UNITS IN THE COTTON-MILL INDUSTRY OF BENGAL.
1905-44.

FREQUENCY DISTRIBUTION OF SPINDLE ACTIVITY.

Spindles Installed.	1905	1911	1921	1931	1941	1944	Change between 1905-44 —or+
0— 15,000	1	1	1	1	2	3	+2
15,000 — 30,000	2	2	1	1	1	1	—1
30,000 — 45,000	2	1	1	..	..	..	—2
45,000 — 60,000	..	..	1	1	..	..	..
60,000 — 80,000	2	1	1	1	..	..	—2
80,000 —1,00,000	2	1	..	..	..	..	—2
Totals.	9	6	5	4	3	4	—5

Two important conclusions emerge from the above Table, firstly, the number of Spinning units in the Cotton-Mill Industry of Bengal has declined from 9 in 1905 to 4 in 1944, and secondly, the entire loss is confined to class-intervals having more than 30,000 spindles. Most of the industrial units belonging to upper class-intervals have either installed their own Weaving Section or scrapped their spindle-equipment. Of the 4 Spinning units working at present, 2 are equipped with less than 3,000 spindles and the remaining two have about 12,000 and 24,000 spindles respectively.

SIZE OF WEAVING UNITS IN BENGAL

In no other Province of India is the number of purely Weaving Units larger than in the case of Bengal. About one-fourth of the total number of industrial units located in Bengal are purely weaving units. Most of these units came into existence between 1931 and 1941.

Of the 7 Weaving Units that were working in 1944, 2 fell in the class-interval of 0 to 100 looms, 4 in the class-interval of 100 to 200 looms and the remaining one fell in the class interval of 300-400 looms. It is indeed a remarkable feature of the Cotton Industry of Bengal that whereas in the earlier period weaving units were quite conspicuous by their absence and the spinning units dominated the whole field in recent years a reverse tendency is operating. Whereas the number of purely spinning units is gradually but progressively declining, the number of weaving units has shown a remarkable increase, particularly after 1931. In number the latter have already outstripped the former.

SIZE OF COMBINED SPINNING-WEAVING UNITS IN BENGAL

The Table on the next page shows the nature and character of changes that have occurred in the size of Combined Spinning-Weaving units during the last 40 years:

Table No. XLVIII

TRENDS IN THE SIZE OF COMBINED SPINNING-WEAVING UNITS IN COTTON-MILL INDUSTRY OF BENGAL 1905—44.

(SPINNING SECTION)

Spindles Installed.	1905	1911	1921	1931	1941	1944	Change between 1905—44 — or +
0 — 15,000	..	..	..	2	6	8	+8
15,000 — 30,000	1	..	..	1	1	1	..
30,000 — 45,000	..	1	2	3	6	6	+6
45,000 — 60,000	..	..	..	..	2	2	+2
60,000 — 80,000	..	1	..	1	..	..	..
80,000—1,00,000	..	1	1	..	..	..	..
Total	1	3	3	6	15	17	+16
Looms installed.			(WEAVING SECTION)				
0 — 250	1	1	..	..	3	5	+4
250 — 500	..	..	1	4	4	4	+4
500 — 750	..	1	..	..	4	4	+2
750 — 1,000	..	1	..	..	4	4	+4
1,000 — 1,500	..	..	1	..	1	1	+1
1,500 — 2,000	..	..	..	1	1	1	+1
Total	1	3	3	6	15	17	+16

The number of Spinning-Weaving units in Bengal has increased from 1 in 1905 to 17 in 1944. The most spectacular increase has been during 1931-41, when no less than 9 new units made their appearance. Most of the new entrants were typically small in size. They were equipped with less than 10,000 spindles and 300 looms. Some of the units that belonged to this class were Luxminarayan Cotton Mills, Dacca Cotton Mills, Sri Durga Cotton Mills, Chittaranjan Cotton Mills and Banga Shree Cotton Mills. They were mostly started by small Bengali industrialists, who possessed moderate financial resources but considerable organizing capacity. While such have been the developments as regards the smaller units, some of the older units have considerably expanded in size and capacity. For example, the Dhakeshwari Cotton-Mills Ltd. has increased its spindle-equipment from 21,000 to 50,000 spindles, and the Mohini Mill Ltd. from 14,000 to 35,000 spindles. The result is that in the Cotton Mill Industry of Bengal there can be distinguished two typical sizes existing in the industry, one having a capacity ranging from 0 to 15,000 spindles, and 0 to 500 looms, and the other having a capacity ranging from 30 to 45 thousand spindles and 500 to 1,000 looms. To the latter class of industrial units belong those old well-established concerns which have emerged successful from many a catastrophic crises and depressions.

V

Size of Industrial Units in Madras

The Cotton-Mill Industry of Madras reveals certain striking features both in regard to the evolution and structure of the Industry. Upto 1931 the number of Industrial Units working in Madras was not very large, but the period following it has witnessed a remarkable expansion of the Spinning Industry. Between 1931-35, no less than 31 new concerns were floated in Madras Presidency. Paradoxical as it may appear, it was during a period of unprecedented depression that the Spinning Industry in Madras rapidly developed. The foremost reason that can explain the apparent anomaly is the establishment of the Pykara Hydro-electricity Works in 1932 which gave a tremendous impetus to the development of the Spinning Industry in centres like Coimbatore, Singanallur and Peelamedu. Of course, there were other reasons too for the development of the Spinning Industry during this period but they were mainly created by slump conditions. The unprecedented fall in the prices of raw-cotton and triple unemployment of men, money and material induced certain industrialists to take to the new and unexplored field of industrialization. Thus we see that the period of rapid development of the Cotton-Mill Industry in Madras coincided with the period of the terrible slump that set in 1929. The conditions under which the industry developed in Madras were, therefore, entirely different from those under which the industry developed in other centres of the country.

In another aspect too, the Cotton-Mill Industry in Madras reveals only distinctive feature. Where as all over India a tendency is operating for the gradual elimination and extinction of purely Spinning units, in Madras the movement for the establishment of Spinning Mills has made surprisingly rapid strides. The figures on the next page will show the extent of transformation that has taken place in the structure of the Cotton-Mill Industry in Madras :

Table No. XLIX

TRENDS IN THE STRUCTURE OF COTTON-MILL INDUSTRY OF MADRAS.

1905-44.

Year.	Purely Spinning Units.	Purely Weaving Units.	Combined Spg. Wvg. Units.	Total.
1905	9	..	2	11
1911	9	1	3	13
1921	6	1	5	13
1931	13	3	5	21
1941	41	6	11	58
1944	42	4	12	58

The Cotton-Mill Industry of Madras which upto 1921 was a Combined Spinning-Weaving Industry has now become a predominantly Spinning Industry. Of the 58 industrial units working in 1944, 42 were purely Spinning units, 4 weaving and the remaining 12 were Combined Spinning-Weaving Units. This transformation is a particularly striking feature when contrasted with the developments that have taken place in the structure of industry in other centres of India. This factor had, however, an important effect on the size of industrial units in Madras for a Spinning Mill tends to be much smaller in size than a Combined Spinning Weaving Unit.

Size of Spinning Units in Madras

The Table below shows the changes that have occurred in the Cotton-Mill Industry of Madras during the last 40 years :

Table No. L

TRENDS IN THE SIZE OF SPINNING UNITS IN COTTON-MILL INDUSTRY OF MADRAS—1905-44.

Spindles Installed.	No. of spinning units in 1905	1944	Change between 1905 and 1944
0— 10,000	..	11	+11
10,000— 20,000	5	20	+15
20,000— 30,000	1	7	+6
30,000— 40,000	2	2	..
40,000— 50,000	1	1	..
Above 50,000	..	1	+1

In 1905 the number of purely Spinning units was very small and the distribution of frequencies, too quite uneven. Of the 9 units working 5 fell in the class-interval of 10 to 20 thousand spindles, and the remaining 4 were unevenly distributed in class-intervals having a range of 20 to 50 thousand spindles. It is, however, significant to observe that none of the spinning units working in 1905 was equipped with less than 10,000 spindles.

The 1944 figures reveal some important changes in the size of the spinning units. One remarkable feature is the emergence of 11 new units having a size of less than 10,000 spindles. Of these 11 units six were located in the Coimbatore District, 3 in Godavery District and the remaining two in Salem District. The number of frequencies in the 10 to 20 and 20 to 30 thousand class-intervals has also recorded an appreciable increase. Only 4 spinning units in Madras, viz., Madura, Meenakshi, Radhakrishna and Lakshmi are now equipped with more than 30,000 spindles. The Madura Mills Co. Ltd., is of course a giant concern, with four spinning mills, having in aggregate, a capacity of over four and half lakh spindles.

But with a few exceptions, the Spinning Industry of Madras is primarily dominated by small-sized units. They are mostly located in the heart of the cotton-growing districts served by hydro-electricity projects. Being nearer to the sources of raw-materials, power and consuming markets, the units, though small in size have fared better than those situated in other parts of the country.

SIZE OF WEAVING UNITS

Of the 4 weaving units working in Madras in 1944 two were located in North Malabar one in Ramnad District, and in Tinnevelly District. Both the units at Malabar had about 300 looms, while the remaining two at Ramnad and Tinnevelly had about 100 looms each.

SIZE OF COMBINED SPINNING-WEAVING UNITS IN MADRAS

The number of Combined Spinning-Weaving units working in Madras is not very large. Of the 12 units working in 1944—5 were located in Coimbatore two in Madras, two in Madura and the remaining three in Tinnevelly, Salem and Cochin State. All the five units working in Coimbatore had more than 25,000 spindles, three of them, viz., Dhanalakshmi, Vasanta and Cambodia fell in the class-interval of 25 to 30 thousand spindles and the remaining two, viz. Kaleeswarar and Cambodia had 42 and 45 thousand spindles respectively. The weaving section of these units is quite undeveloped, none of them except one having more than 300 looms. This undeveloped and 'unbalanced structure' of the industry suggests that even the Combined Spinning-Weaving units are predominantly spinning in character. In Madras, although the number of industrial units working is only two, they are comparatively bigger in size than those situated in other centres of the Province. The Madras United Spinning and Weaving Co., Ltd., had about 40 thousand spindles and the Buckingham and Carnatic Co., Ltd., which is one of the biggest spinning-weaving unit in the country, had over a lakh of spindles and 2,750 looms. Both the units situated in Tinnevelly and Salem District had about 25,000 spindles. The two units located in Madura are of course small in size, one of them having 15 thousand spindles and the other, viz., Sri Kothandram Mills, having only 4,000 spindles and 82 looms.

Thus we see that the Combined Spinning-Weaving Units in Madras reveal two important characteristic features. Firstly, they are bigger in size than the purely spinning units and, secondly, they are 'unbalanced' in structure. The weaving section is still undeveloped. The result is that most of the combined spinning-weaving units in Madras are predominantly spinning in character. The yarn manufactured is partly utilized in the weaving section but mainly sold off in the open market.

VI

SIZE OF INDUSTRIAL UNITS IN OTHER CENTRES OF INDIA

In no other centre of India are the number of industrial units so large as to allow any generalization in respect of size. Our approach will, therefore, be less general and more of an individualistic and descriptive character.

SIZE OF INDUSTRIAL UNITS IN CENTRAL PROVINCES AND BERAR

The Cotton-Mill Industry of C. P. and Berar is composed of industrial units of different sizes and magnitudes. But, in main, three classes can be easily distinguished:—the small sized units, the medium sized units, and the bigger units. Among the small sized units can be included the Vidharbha Mills and the Savatram Ramprasad Mills, both of which had less than 14 thousand spindles and 350 looms. The medium-size units included the Berar Manufacturing Co., the R. S. Reekchand Gopaldas Mohota Mills, the Burhanpur Tapti Mills, the Bengal-Nagpur Mills and the Rai Bahadur Bansilal Abirchand Spinning Weaving Mills, all of which were equipped with 20 to 32 thousand spindles and 350 to 650 looms. There were only two large-sized units, both of which were located in Nagpur--one was the Model Mills, which had about 52 thousand spindles and 950 looms and the other, the Central India Spinning Weaving and Manufacturing Co. (more popularly known as Empress Mills) which had over a lakh of spindles and about 2000 looms.

SIZE OF INDUSTRIAL UNITS IN CENTRAL INDIA

Of the 15 units working in Central India in 1944, 7 were located in Indore, 4 in Gwalior State and the remaining three in Ratlam, Dewas Junior and the Bhopal State. At each centre the units were of different sizes and magnitudes. In Indore four units were of the size of 15 to 30 thousand spindles and 350 to 750 looms, two were of the size of 30 to 45 thousand spindles and 1,000 to 1,500 looms. Of the units working in Gwalior State three were equipped with 15 to 30 thousand spindles and two with 38 and 50 thousand spindles respectively. The units in other States of Central India were somewhat smaller in size, none of them having more than 16 thousand spindles and 450 looms. Taking all these figures together we find that no less that 7 units out of 15, were of the size of 15 to 20 thousand spindles.

SIZE OF INDUSTRIAL UNITS IN RAJPUTANA

Of the 7 industrial units working in Rajputana in 1944, 3 were located in Beawar, and one in Bhilwara, Kishengarh, Pali Marwar), and Bijainagar. All the three units in Beawar, viz., Mahalakshmi, Krishna and Edward had a capacity ranging from 13,000 to 19,000 spindles and 350 to 650 looms. The units located in Bhilwara was the smallest in size, having only 8000 spindles and 250 looms. The two other units, viz., Maharaja Shree Umaid Mills at Pali and the Maharaja Kishengarh Mills at Kishengarh were equipped with 17 and 28 thousand spindles and 392 and 414 looms, respectively. Thus we see that the units in Rajputana were typically small in size, all falling within the range of 8 to 28 thousand spindles and 250 to 650 looms.

SIZE OF INDUSTRIAL UNITS IN HYDERABAD

In 1944, 6 units were working in Hyderabad of which two were located in Elchigudda (Secunderabad) and one each in Aurangabad, Warrangal, Gulbarga and Nanded. The units situated in Gulbarga and Nanded were somewhat bigger in size, the Mahaboob Mills had about 28 thousand spindles and 598 looms and the Osmanshahi Mills had about 25 thousand spindles and 619 looms. All the other units in Hyderabad were equipped with a capacity ranging from 13 to 20 thousand spindles and 240 to 440 looms,

SIZE OF INDUSTRIAL UNITS IN MYSORE

Of the 8 industrial units working in Mysore in 1944, 3 were purely weaving units, 1 spinning unit and the remaining four were of Combined Spinning-Weaving type. All the three weaving units were, as is generally the case, very small in size. They were equipped with 63, 166 and 200 looms respectively. The one spinning unit, viz., the Davangere Cotton Mills had about 12,000 spindles. Out of the 4 spinning-weaving units, three were situated in Bangalore city and one at Siddalingalpur. The unit at Siddalingalpur had about 25,000 spindles and 250 looms. The remaining three units in Bangalore city were of fairly large-size, the Minerva Mills was equipped with 34 thousand spindles and 480 looms, the Mysore Spinning and Manufacturing Mills with 50 thousand spindles and 520 looms, and the Bangalore Woollen, Cotton and Silk Mills was equipped with 42 thousand spindles. and 1150 looms, of which 51 were blanket looms.

SIZE OF INDUSTRIAL UNITS IN PUNJAB AND DELHI

In all 7 units were working in Punjab in 1944, of which 2 were located in Lahore, 2 in Bhiwani, one in Lyallpur, one in Okara and one in Amritsar. Of the two units situated in Lahore, one, viz., Punjab Textile Mills Ltd. was a purely spinning unit with 5,000 spindles and the other, viz., Mela Ram Cotton-Mills was a combined Spinning Weaving unit with 16,000 spindles and 150 looms. The two units located in Bhiwani were also very small in size, one had 8,000 spindles and 225 looms and the other 12,000 spindles and about 280 looms. The latter was converted into a Technological Institute of Textiles. One unit in Okara, viz., the Sutlej Cotton Mills, was equipped with 20,460 spindles and 844 looms. The biggest unit in Punjab, was of course the Lyallpur Cotton Mills (branch of Delhi Cloth and General

Mills Co. Ltd.) which had about 32 thousand spindles and 1,000 looms.

Of the 4 units working in Delhi in 1944, one was a purely weaving unit and the remaining three were of Combined Spinning-Weaving type, all of them being of different sizes and magnitudes. The Lakhmi Chand Jaipuria Mills (formerly known as Mahabir Spinning and Weaving Mills) had about 10,000 spindles and 170 looms, the Birla Cotton Spinning and Weaving Mills had about 30,000 spindles and 860 looms and the Delhi Cloth and General Mills, which is one of the best and the most well-known concerns in Northern India, was equipped with 70,800 spindles and 1,830 looms.

Chapter V

SIZE AND EFFICIENCY—AN ATTEMPTED CORRELATION

The object of this Chapter is to see if there exists any relationship between size and efficiency. In other words, does an increase in size or the scale of operation necessarily bring about greater efficiency? For unless this aspect of the problem is minutely examined, the posing of the issue that size is an important factor in the efficiency of the industry has hardly any practical significance. Unfortunately, however, although general knowledge suggests and the law of Increasing Returns states that in almost all the manufacturing industries the increase in the scale of output generally leads to increased economies of production and distribution, in practice the existence of many limitations, partly physical but mainly technological, renders the task of establishing any relationship between size and efficiency extremely difficult.

At the outset, one has to bear in mind the extremely intricate nature of the work involved and the risk in drawing hasty inferences. The factors of production are so numerous, variable, and complex that it is difficult to weigh the effect of each individual factor on the total efficiency of an individual unit. Whether efficiency is the result of the enlarged-size of the productive plant or the result of myriads of heterogeneous factors too complex and too closely interwoven to be singled out, it is difficult to state without a minute examination of statistical data based on well recognized principles of cost-accounting. But such information has not been fully accessible even to the Tariff Board. Not only are millowners extremely reluctant to disclose any information, they have also in many instances ingeniously concealed or manipulated the available information in their published Balance Sheets. The writer spent about a year's time in Bombay and Ahmedabad and other centres of the industry to collect information relating to Working Capital, Total Gross and Net Block, Total Working Expenses (including expenses on such individual items as raw-materials, wages, power and fuel, stores, repairs and renewals, interest, insurance and supervision expenses) of firms of varying scales of output. Although the results obtained have not been commensurate with the labour expended, the information collected has undoubtedly been of great value in studying the relationship between size and efficiency. However, it must be admitted that the paucity of statistical information and the extreme variability and complexity of statistical data have prevented a more thorough and searching survey of this important but exceedingly intricate problem.

Another difficulty has arisen with regard to inter-comparison of the costing data. The units are situated in different industrial centres and derive differential advantages in respect of locational economics. 'The distances of mills from the centres of cotton-cultivation and from the coalfields, the varying rates of wages, and conditions of labour in different parts of the country, the differences in climatic conditions, the marked divergences as regards the character and accessibility of the principal markets and other differences arising from the local environment of the industry' are so great that the costing data, available for comparison will not be truly homogeneous. Even if we confine our enquiry to industrial units situated in the same centre or area and deriving the same benefits in respect of location, there will still remain significant differences in the character of technical equipment and type of goods manufactured. These differences are so considerable and variable that the question is frequently asked whether in the absence of the uniform conditions prevailing in the industry, does any satisfactory basis exist for the inter-comparison of the costing-data.' While, no doubt, the cumulative effect of these variations may be considerable, the observational data, if sufficiently large would tend to counteract some of the divergent tendencies. Further, the resultant findings will have greater validity and wider applicability if comparisons are made between "Groups" rather than between individual units. Group comparisons will eliminate distortions and irregularities of individual items, and thus afford a better and more uniform basis for intercomparison. Thus it should be borne in mind that to the extent our findings have any validity, that validity is confined only in so far as they reflect the existing relationship between size and efficiency. No attempt is, however, made to compute the cost of production of different industrial units. For that purpose a much-detailed information is needed.

The existence of financial and administrative integrations in the industry also tends to distort the relationship between size and efficiency. Where several units are controlled, managed or administered by a central organization some of the disadvantages arising from small-size can be easily offset by increased economies in other directions, such as collective purchase of raw-cotton, stores, machinery, spare parts and selling of finished goods and by-products through a common marketing organization. The result is that although the units may be small in size they can, through such financial and administrative integrations, realize some of the economics if not of large scale production, at least of large scale organization. If the object of our analysis is to establish a correlation between size and efficiency, all such forms of expansion and combinations must be thoroughly examined and their influence on efficiency studied. But the statistical data at our disposal do not permit such a treatment. Further, the economics derived from such integrations can neither be quantitatively measured nor arbitrarily separated. Though of course the cumulative effects of these limitations are bound to be considerable they cannot be too great to vitiate our general conclusions. The striking regularity in the relationship between size and efficiency, as shown in this analysis, clearly indicates that the limitations, serious though they may be, do not prevent our analysis from having great significance.

IS EFFICIENCY QUANTITATIVELY MEASURABLE ?

While studying the relationship between size and efficiency one more intricate question arises—namely, whether efficiency of an industrial unit can be quantitatively measured, and if so what should be the standard of measurement which can be applied with reasonable accuracy ? While it may be generally accepted that the absolute measurement of efficiency is neither feasible nor practicable, the relative efficiency of different units can be measured with reasonable accuracy. The word 'efficiency' as it is commonly understood, is a relative term, and we characterize a particular unit 'efficient' or 'inefficient' not absolutely but in relation to some other units. It, therefore, presupposes some existing standards of valuations. Viewed in that perspective, we believe, such efficiency can be quantitatively measured, if not with scientific exactitude at least with reasonable accuracy.

STANDARDS OF MEASUREMENT

The serious difficulty, therefore, arises, mainly in the choice of selecting some suitable standards. The suitability of any unit of measurement will depend much upon the significance we attach to the word 'efficiency'. If industrial efficiency consists as Mr. Robinson has viewed it in trying to do with eight men what we have hitherto been doing with ten men 'labour productivity per worker,' or to put in a more scientific term .'labour productivity per man hour (P.M.H.)' may be regarded as a satisfactory criterion for measuring industrial efficiency. If, however, the term 'efficiency' is used in a more comprehensive sense, meaning a "measure of securing the greatest results at least cost," 'Cost of Production per Unit of Output' can be regarded as a most satisfactory and reliable standard of efficiency. An industrialist will, however, view 'efficiency' from some different perspective. His aim is to produce goods with as much profit as can be obtained in the prevalent circumstances and from that standpoint his success will be judged by his "earning" capacity. Rate of profit can, therefore, also be one of the standards of measuring efficiency. If, however, the word "efficiency" is to be used in its widest sense, it will connote higher standard of living for the worker, lower prices for the consumers, and greater returns to the investors. But since in practice these objects are often in conflict with each other, we cannot think of one common standard of efficiency which can be applicable to all. This limitation prevents the use of 'efficiency' in its widest sense.

Thus we see that the standards of measuring efficiency will vary according to the purpose in view. Since the object of our study is to establish a correlation between size and efficiency, each of these standards will have some significance in measuring and explaining the degree of relationship between these two variables. Moreover, we know, that none of the several methods by which 'efficiency' can be measured is in itself entirely adequate. If all these criteria are used there is every possibility that the distortions, attributable to any one criterion taken singly, can be easily offset. Further, if the application of all of these standards, reveals the dominance of the same tendencies, our general conclusions, namely, that size is correlated to efficiency, will be amply verified and confirmed.

We have, therefore, applied all the following standards of measurement for comparing the industrial efficiency of different units:

(i) "Earning" or "Profit-making capacity" of different units.

(ii) Spindle, Loom and Labour Productivity:

(a) Output of yarn per spindle per day or per man hour;

(b) Output of woven goods per loom per day or per man hour, and,

(c) Output per worker per day or per man hour.

(iii) Average cost of Production. The lower the average-cost, the greater is the industrial efficiency.

RATE OF PROFIT AS AN INDEX OF EFFICIENCY

Before examining the issue whether the rate of profit is in any way correlated to size, it is essential to find out how far the rate of profit is truly indicative of the efficiency of the industry. While no doubt, gains or losses are the chief criteria by which we judge the success or failure of an enterprise they can by no means be regarded as the sole or even the most important determinant of the efficiency of the industry. Profits are the results of a variety of factors, and since efficiency is only one of them, it will not be wholly correct to establish any correlation between rate of profits earned and the standards of efficiency attained by different units. The rate of profit as an index of the efficiency will, therefore, have to be judged in the light of several qualifications and reservations. Firstly, the rate of profit may vary, even in the same centre, from unit to unit according to the differences in their capital-structure, particularly the relationship between the "owned" and "borrowed" capital; secondly, the rate of profit may vary as a result of the variations in the amount of capital invested; and thirdly the variations in the rate of profit may be caused by the operation of cyclical influences. All these factors tend to show that causes, other than efficiency, may also explain and account for the variations of profit rates. Hence the rate of profit as an index of efficiency, has its own limitations.

MEASUREMENT OF PROFIT-RATE

But apart from these limitations, there exists the fundamental difficulty of finding a suitable standard in relation to which profits may be correctly measured. Should profits be expressed in terms of paid-up Capital, Capital and Funds, Working Capital, Gross Block or Net Block or even in terms of Total Turnover? Unfortunately, "the interpretation of statistics of industrial profits per unit of capital is so difficult and hazardous, and subject to so many qualifications and reservations, that it seems impossible to find any firm ground on which to base definite conclusions."[1] One method that is invariably employed is to express profit as a percentage of the ordinary share capital since equity-holders are the real owners and risk bearers of the industry. As a measure of efficiency, this method can hardly claim any scientific justification, for the ordinary share capital represents but a fraction of

1. Factors in Industrial and Commercial Efficiency—Balfour Committee on Industry and Trade

the total invested capital on which profits have been really earned. The total Capital and Funds invested in the industry too suffer from the same defects. In addition there are other disturbing factors, namely, differences in the treatment of specific and general reserves and difficulties in knowing at what points the provision for depreciation begins to take the shape of concealed reserves or hidden profits.[1] The Total Effective Capital is, of course, a somewhat satisfactory criterion since it takes into consideration both the owned and the borrowed capital invested in the industry. For similar reasons the Gross Block and the Net Block are better measures of earning capacity but since the methods of valuation of the capital invested in land, buildings and machinery vary, the figures do not have the same significances in respect of each unit.

But despite these limitations and reservations, if all these measures reveal the same tendencies and warrant the same conclusions, a sufficiently satisfactory basis exists to infer that the variations in the profit-rate are closely associated with the variations in size

SIZE AND RATE OF DIVIDEND: A CORRELATION

Firstly, let us study whether there exists any correlation between the size of the industrial unit and rate of return on shareholders' equity. In other words do the rates of dividend progressively increase with the increase in the size of industrial units?

At the outset, it must be emphasized that the rate of dividend as a measure of earning capacity has several limitations. Firstly, the dividends distri-

1. R. C. Epstein: Industrial Profits in the United States. National Bureau of Economic Research (New York, 1934).

buted to the shareholders generally represent only the fraction of the total profits earned; secondly the methods of allocating profits as between reserves and dividends, vary so greatly that the dividends do not have the same significance in respect of each unit, and, thirdly, there may exist such marked differences in the capital structure of different units (some being content with less of owned capital and more with borrowed capital) as to render the task of comparison extremely difficult. Sometimes profits of 'non-manufacturing' character may also be included for distribution of dividends.

But these reservations, important though they may be, cannot materially influence the validity of our main generalizations, since the units of all sizes are equally affected by them. Further, if our analysis covers a fairly long period and if comparisons are made between groups rather than between individual items, many of the individual irregularities can be easily eliminated. The dividend-rates, over a long period are fairly indicative of the profit trends in the industry.[1]

VARIATION OF RATE WITH SIZE

The practical difficulties arise in correlating size with rate of dividend. Firstly, if a long period is selected for our analysis, it would be difficult to confine the units to particular class-interval since many of them may have expanded in size and changed their class-intervals. Secondly, the regional differences in size and rate may be so considerable that the average struck may conceal the true character of the relationship between these variables. For example, a unit of 80,000 spindles may not be considered too big for economic working in Bombay but it is extremely doubtful whether the same scale of

1. M. H. Gopal: **Trends in Industrial Profits—A Factual Analysis** (Sankhya, 1943).

operation can be regarded as 'economical' for centres like Coimbatore, Ahmedabad, or Broach where the financial, managerial or marketing considerations may favour the growth of moderate-sized units. In such cases, the operation of divergent tendencies at two centres may obscure the true character of the relationship between size and rate of dividend. This difficulty can, however, be overcome if we confine the scope of our study to units, situated in the same centres or area. This course will also provide more uniform conditions for intercomparison.

SIZE AND RATE OF DIVIDEND IN AHMEDABAD

We have, for the purpose of this study, selected the Cotton-Mill Industry of Ahmedabad for several reasons. The conditions prevailing in Ahmedabad are more uniform and homogeneous for intercomparison than in any other centre of the industry. Almost all the Cotton Textile Mills in Ahmedabad are equipped with ring spindles and are more or less self-sufficing in character. The methods of promotion, finance and management too do not differ very considerably, for nearly all the units are owned, manned and managed by local talents. Moreover, the units in Ahmedabad have followed a more stable, uniform and consistent policy in respect of distribution of dividends than units in other centres of the industry. The result is that the dividend trends are fairly regular for the study of the relationship between size and rate of dividend. Lastly Ahmedabad Mills are more representative of the Indian Cotton Industry than either the mills in Bombay or in up-country centres.

A fourteen-years period, viz., 1929-42 has been selected for this study and the dividend figures of all the units, working in Ahmedabad during this period, have been minutely examined in the Table on the next page. The period selected is a fairly long one, and includes periods of industrial depression, recovery, recession and war-time prosperity.

In one respect our analysis has some special significance, namely, that the results have been based on the observation of all the frequencies. It need hardly be emphasized that in all such enquiries neither the method of 'random sampling' nor the method of 'deliberate or purposive selection' can give us as precise and accurate results as those based on the study of all the observational data. No doubt the difficulty of getting all the factual data is supreme but the results based on them will undoubtedly be more conclusive and less arbitrary. To that extent this analysis has some special significance.

The Table on the next page will reveal the extent of relationship that exists between the rate of dividend and the size of industrial units in the Cotton-Mill Industry of Ahmedabad.

Table No. LII

VARIATION IN SIZE AND RATE OF DIVIDEND IN COTTON-MILL INDUSTRY OF AHMEDABAD.

1929-42.

Spindles Installed.	Total Number of industrial units in each Group.	Average for the Years 1929-42.
GROUP I		
Less than 15,000	8	4.80
GROUP II		
15,000 and less than 30,000	36	8.33
GROUP III		
30,000 and less than 45,000	14	15.94
GROUP IV		
45,000 and less than 60,000	4	27.45
GROUP V		
Over 60,000	1	24.40
Total.	63	

AN ANALYSIS :

It is evidently clear from the above Table that the rate of dividend progressively increases as size increases till a point is reached when the rate of return begins to decline, and further expansion becomes less profitable. Both the Tables and the Graph distinctly reveal that the rate of return has increased, with almost surprising regularity, upto 60,000 spindle-size after which it has begun to decline though very gradually. This suggests that upto a certain point, there exists an unmistakable tendency for the rate of return to advance as size increases.

The rate of dividend as a measure of earning capacity has, of course, several limitations both as regards its denominator as well as its numerator. The ordinary Capital on which the rate of dividend is calculated is only a fraction of the total Capital invested in the industry. So also the dividends distributed to the shareholders represent only a part of the total profits earned by the industry. Hence the correlation between size and rate of dividend can only be regarded as roughly indicative of correlation between size and earning capacity.

SIZE AND RATE OF PROFIT : A CORRELATION

"Profits" rather than "Dividends" should, therefore, be regarded as the real measure of earning capacity. Difficulty will, however, arise in regard to the meaning and measurement of profit-rates. For the purpose of this study 'profits' may be defined as "total disposable surplus after meeting the cost of production." Depreciation, however, we have regarded as a charge on profit and not on production, since the position and practice in respect of this item vary so greatly from unit to unit that it would not have been possible to accord this item a general treatment. As regards the measurement of profit they may be expressed as a ratio of :

CAPITAL AND FUNDS ;
TOTAL WORKING CAPITAL ;
GROSS BLOCK ; OR
NET BLOCK.

Although as a measure of earning capacity each one of them has some limitations, they can roughly indicate the relative earning capacity of different units.

In this study we shall examine "To what extent are the variations in profit-rates associated with the variations in size ?"

VARIATION IN SIZE AND RATE OF PROFIT

(On Capital and Funds)

The following Table will show how far the rate of profit (on Capital and Funds) is correlated to the size of the industrial unit:—

Table LIII

VARIATION IN SIZE AND RATE OF PROFIT

(On Capital and Funds)

IN COTTON-MILL INDUSTRY OF AHMEDABAD

Spindles Installed.	Total No. of Spg. Wvg. Units working.	Total No. of cases examin-ed.	percentage of profit to Capital and funds. 1938	1939
GROUP I.				
Less than 15,000	4	3	·98	1·30
GROUP II				
15,000 but less than 30,000	40	40	4·33	4·30
GROUP III				
30,000 but less than 48,000	13	13	5·53	4·65
GROUP IV				
45,000 but less than 60,000	3	3	13·00	11·42
GROUP V				
Above 60,000	1	1	10·88	10·55

The same striking conclusions emerge from the observation of the Table on the last page. The rate of profit increases—though less regularly, as size increases upto the 60,000 spindle-size, after which it records a slight decline. The Graph distinctly reveals this unmistakable tendency. The curve rises generally with increase in size, the rise being slow for passage from smallest to moderate-sized classes, and remarkably steep for passage from moderate to lower-upper class-interval. The rate of dividend and the rate of profit on Capital and Fund exhibit the same characteristic tendencies, namely, that the rate of return progressively increases as size increases, till a limit is reached when further expansion becomes less profitable and rate of return begins to decline. But since our observations in the highest class-interval are based on the study of one frequency only, the conclusions need to be further verified and confirmed.

In one important respect our main generalizations diverge when rates of profits are expressed in terms of total working Capital, Gross Block or Net Block. In all these cases, the progression of rate with size is continuous, and no tendency is discernible for the rate of return to decline at any stage of output. This digression or apparent inconsistency should not, however, be misinterpreted to mean that the measures applied to compute the relative earning capacity of different units give widely divergent results. If we minutely examine the available data we might possibly discover some plausible reason for this significant variation. Our results in the highest class-interval are based on the observation of only one frequency, the peculiar character of which will explain why the rate of dividend and the rate of profit on Capital and Funds show some "declining tendency" in the highest class-interval, and why the rates of profit, when expressed in terms of Total Working Capital, Gross Block and Net Block do not manifest such tendency. The Calico Mills which falls in the highest class-interval is dependent more on owned and accumulated capital than on borrowed capital and this accounts for a comparatively lower percentage-rate when profits are expressed in terms of Capital and Fund, and for a comparatively higher percentage rate, when profits are expressed in terms of Total Working Capital, Gross Block or Net Block.

Size and Rate of Profit on "Effective" Capital

"Effective" Capital includes both the owned and borrowed Capital and as such roughly represents the total capital invested in the industry. Profits when expressed as percentage of Effective Capital, will, therefore, serve as a more reliable and dependable measure of earning capacity than either the rate of dividend or rate of profit on Capital and Funds invested in the industry.

The following Table will show whether the rate of profit on effective capital is in any way correlated to the size of the industrial units:

Table LIV

VARIATION IN SIZE AND RATE OF PROFIT (on Effective Capital) IN COTTON-MILL INDUSTRY OF AHMEDABAD.

Spindles installed	Total No. of Spg. Wvg. units. working.	Total No. of cases examined.	PERCENTAGE OF PROFIT ON EFFECTIVE CAPITAL. 1938	1939
Group I				
Less than 15,000	4	3	.23	.43
Group II				
15,000 but less than 30,000	40	40	1.96	2.13
Group III				
30,000 but less than 45,000	13	13	5.58	4.65
Group IV				
45,000 but less than 60,000	3	3	7.43	7.29
Group V				
Above 60,000	1	1	8.09	7.60

The above Table suggests the same unmistakable tendency for the rate of profit to increase with the increase in the size of the individual unit. The rate of return increases slowly but regularly as we pass from smallest to moderate-sized units, and thereafter we observe a sudden steep advance, followed by a very slow rather negligible increase. However, the tendency for the rate to increase with size is distinctly clear, and this suggests some degree of positive correlation between size and rate of profit on "Effective" capital.

Variation in size and rate of profit
(On Gross Block)

The following table will show to what extent is the size of the industrial unit correlated to the rate of profit when expressed as a percentage of Gross Block:—

Table LV
Variation in size and rate of profit
(on Gross Block)
In cotton-mill industry of Ahmedabad.

Spindles Installed	Total No. of Spg. Wvg. Units working.	Total No. of cases examined.	Percentage of profit on gross block. 1938	1939
Group I Less than 15,000	4	3	.35	.63
Group II 15,000 but less than 30,000	40	40	2.98	3.26
Group III 30,000 but less than 45,000	13	13	4.67	4.00
Group IV 45,000 but less than 60,000	3	3	10.92	10.86
Group V Above 60,000	1	1	11.53	11.52

Strikingly similar conclusions emerge from the observation of the above Table. The rate of profit rises persistently as size increases—the rise being fairly regular when we pass from smallest to moderate-sized units, and more pronounced when we pass from moderate-sized to large-sized units. For the uppermost class-interval, the rate of profit does not show any material increase. It follows from the above analysis that the rate of profit on Effective Capital and the rate of profit on Gross Block reveal strikingly similar tendencies. In both the cases the profit curves move in exactly the same direction and follow just the same course of variations.

VARIATION IN SIZE AND RATE OF RROFIT
(On Net Block)

The rate of profit on Net Block also suggests that there exists some degree of positive correlation between size and earning capacity. The following Table shows the extent of such relationship:

Table LVI
VARIATION IN SIZE AND RATE OF PROFIT
(on Net Block)
IN COTTON-MILL INDUSTRY OF AHMEDABAD.

Spindle Installed	Total No. of Spg. Wvg. Units working.	Total No. of cases examined.	PERCENTAGE OF PROFIT ON GROSS BLOCK. 1938	1939
Group I				
Less than 15,000	4	3	.43	.81
Group II				
15,000 but less than 30,000	40	40	4.80	5.27
Group III				
30,000 but less than 45,000	13	13	10.14	8.41
Group IV				
45,000 but less than 60,000	3	3	16.54	17.95
Group V				
Above 60,000	I	1	26.26	29.43

Here also we shall observe that the rate of profit increases as we pass to the right—that is, pass upwards on the scale of size. The smallest-size earns the lowest profits, and the largest-size the highest. In between them the rate rises as size increases, the rise being greatest for units falling in the upper class-intervals. Thus the rate of profit on Net Block also confirms the unmistakable tendency for the rate of profit to rise as size increases.

The foregoing analysis has brought to light a remarkably apparent correlation between rate of profit and size of industrial units. The larger the size, the higher is the rate of return on the average and this relation holds with surprising constancy in practically all the isolated tests we have applied in course of this study. The remarkable regularity in all the observed tendencies undoubtedly reflect that the progression of rate with size is unmistakable. From this, no inference should, however, be drawn that all smaller units suffer alike or all larger units are practically well-off. If we minutely examine our observational data, we might at once discover that some smaller units like Himabhai, Bhalakia, Nutan or Vikram are doing remarkably well compared to some of their larger contemporaries like Aryodaya Ginning and Manufacturing, Rajnagar, or Aryodaya Spinning Mills Ltd. But this will necessarily imply, as a corollary, that other units in those class intervals are either faring much worse or are doing much better than what the averages of these respective class-interval really show. This aspect of the problem we shall deal at length in our next Chapter. Here we need only point out that our results are only indicative of the general tendencies, and if some of the units show different state of affairs they must be regarded as exceptions rather than the general rule.

III

Spindle, loom, and labour productivity

Other measures so commonly employed for evaluating the relative efficiency of different units are:

(i) Spindle Productivity, which may be measured by output of yarn per spindle per day or per man hour;

(ii) Loom Productivity which may be measured by woven goods per loom per day or per man-hour; and

(iii) Labour productivity, which may be measured by total output per man per hour (P. M. H.).

While no doubt, theoretically, these methods are fairly satisfactory for measuring the relative efficiency of different units, in practice a number of important limitations render their general application exceedingly difficult. For certain obvious reasons, the exact spindle, loom and labour productivity cannot be calculated with mathematical exactitude or scientific accuracy. Even if such computations were possible, it may still be questioned whether the statistical data of different units are truly homogeneous for inter-comparison. The type of goods produced by different units show wide variations in respect of dimensions, texture, design, finish and quality. The result is that the differences in 'productivity,' as measured by physical volume of output may only reflect the differences in the character of goods produced to different units. Again, the equipment of mills shows such a vast range of variation both in the character of the machinery employed and in capacity and actual output that it is difficult to find any satisfactory basis for evaluating the relative efficiency of different units. For example, the output per spindle will always be greater in a mill equipped with ring spindles than in a mill equipped with equal number of mule spindles, although the latter may be more efficient.[1] Thus the output per spindle or per loom will vary not only because of the differences in the standards of efficiency obtained by each but also because of the significant differences in the character and composition of spindle or loom-activity in each unit. Lastly, for any comparison, we shall have to start on the postulation that the conditions of work in different units do not show significant variations, that the units under comparison derive the same benefit in respect of location and that the hours of work and the composition of labour force are the same in all the units. All these assumptions are, of course, too far-reaching character, and the generalizations based on them may even be regarded as untenable.

With these limitations and reservations, it is, nevertheless, possible to bring together some observational data on the spindle, loom and labour productivity in different units, and to examine if there exists any relationship between size and industrial productivity. In other words, does output per spindle, per loom, or per worker tend to increase as size increases?

MEASUREMENT OF SPINDLE, LOOM, AND LABOUR PRODUCTIVITY

Two different methods are generally followed for measuring and comparing the spindle, loom and labour productivity of different units—one based on the volume of output per head and the other on

1. The reference for either of these spindles will be determined by the character of goods produced. The mule spindles are generally used for producing high grades of yarn by processes in which labour skills count heavily, and ring spindles for producing low or medium grades of yarn by a highly mechanized technique, although, to a considerable extent, both may be used for similar manufacturing purposes. From this point of view, mule spindles present a lower and ring spindles a higher degree of mechanization. The World Textile Industry, 1937, P. 50,

the value of output per head. The choice for either of these methods will depend upon the nature and character of the industry. In industries like, Cement or Coal where the output data can be reduced to homogeneity, the "volume of output" method is generally preferred. But in industries like Cotton or Wool where the types of goods produced are of widely varied character, such a method can hardly be accepted as a satisfactory basis for comparing the loom or labour productivity in different units. Physical output per loom or per worker will definitely be lower in a unit, which operates on fine, light and fanciful fabrics than in a mill which specializes in the production of coarse or standardized goods, Physical output per loom or per worker, therefore, cannot be regarded as a satisfactory basis for comparing the productivity of different units unless such comparisons are confined to particular counts of yarn and selected varieties of cloth. The only alternative method which can, therefore, be applied for comparing the relative efficiency of different units is the value of output method, which eliminates the difference in the character of output, and thus renders possible the inter-comparison of the costing data.

The method adopted for estimating the spindle, loom and labour productivity is as follows. The figures of "Production per Spindle" and "Production per Loom" have been worked out by dividing the "Total Amount of Production" by Total Number of working Spindles and working Looms on the basis of '40 Spindles-1 Loom.' The figures thus arrived at have been further divided by the Actual Number of Days worked. This gives the figures of "Production per spindle per day" and "Production per loom per day." Similarly the amount of goods produced have been divided by the "Average Number of Hands employed" and the "Number of Days worked". This gives us the figures of "Output per

Worker per Day."[1] The results of this study have been presented in Table LVII.

It must be emphasized here that this method of calculating spindle, loom and labour productivity is neither perfect nor claims any scientific accuracy. Nevertheless results are presented here for their suggestiveness and are valid only in so far as they reflect some degree of relationship between size and spindles, loom and labour productivity.

TABLE LVII

VARIATION IN SIZE AND SPINDLE, LOOM AND LABOUR PRODUCTIVITY

Size.	Production per Spindle.	Production per Loom.	Production per Worker.
	Rs.	Rs.	Rs.
GROUP I.			
Less than 15,000 Spindles.	39	1566	1768
GROUP II.			
15,000 but less than 30,000 Spindles.	46	1878	2139
GROUP III.			
30,000 but less than 45,000 Spindles.	48	1907	2222
GROUP IV.			
45,000 but less than 60,000 Spindles.	53	2100	2523
GROUP V.			
Above 60,000 Spindles.	80	3183	3190

1. We are unable to give figures of per-man hour because of the lack of necessary data.

The table roughly indicates the tendency for spindles, loom and labour productivity to increase with the increase in the size of the industrial units. The most striking feature is that all the three, spindle, loom and labour curves exhibit the same parallelist tendencies. All the three curves rise very rapid as we pass from small to moderate-sized units, and then slowly but progressively as we pass from moderate to large-sized units. Even in the highest class-interval the "advancing" tendencies continue. This reflects that there exists some degree of positive correlation between size on the one hand, and spindles, loom and labour productivity on the other.

But "increased productivity" does not necessarily mean "increased efficiency". If expenses incurred increase more in proportion to the "increased productivity" it may even mean a positive decline in industrial efficiency. Hence the question of increase or decrease in 'industrial productivity' should always be considered in relation to "costs". The greater the margin of difference between "production" and "costs" the greater is the industrial efficiency. This margin of difference should, therefore, be regarded as a real measure of "spindle, loom and labour efficiency." Such efficiency can be measured by the following formula:

$$a - b = c, \text{ when}$$

'a' represents Output per spindle or per loom per day

'b' represents Expenses per spindle or per loom per day and

'c' represents Profit or "Measure of Efficiency."

This method of measuring spindle or loom efficiency will give more correct and precise result than obtained by the "Measurement of Productivity" alone. The Table shows the results of such a study:

Table LVII

SPINDLE, LOOM AND LABOUR PRODUCTIVITY IN COTTON-MILL INDUSTRY OF AHMEDABAD 1939.

	Production per Spindle.	Production per Loom.	Production per worker.
GROUP I.	Rs.	Rs.	Rs.
0-15,000 spindles.			
Bharat Suryodaya	44	1778	1974
Kalyan	39	1543	1577
Patel	34	1378	1754
Average.	39	1566	1768
GROUP II.			
15,000 to 30,000 spindles.			
Bhalakia	43	1725	2124
Bihari	55	2197	2640
Shrinagar	44	1775	2217
Harivallabhdas	60	2399	2769
Shri Vivekananda	39	1577	1883
Rustom	64	2554	2585
Silver Cotton	36	1456	1674
Waste Cotton	34	1370	1641
Ananta	38	2336	2729
Motilal	40	1603	1637
Ahmedabad Cotton	32	1286	1714
Nagri	64	2554	2885
Bacherdas	34	1340	1645
Ahmedabad Industrial	25	1056	1193
Ahmedabad Kaisar-Hind.	40	1588	1945
Himabhai	58	2336	2871
Rajpur	59	2376	3003
Ahmedabad New textile	46	1841	1971
Vikram	51	2025	2367
Commercial	37	1495	1636

	Production per Spindle.	Production per Loom.	Production per worker.
	Rs.	Rs.	Rs.
New Manakchowk	53	2100	2229
Raipur	63	2539	3518
Gujrat Cotton	38	1505	1636
Jahangir Vakil	34	1366	1578
Lalbhai	64	2549	2782
Average.	46	1878	2193
GROUP III.			
30,000 to 45,000 spindles.			
Aryodaya Gng. & Mfg.	38	1516	1885
Bharatkhand Textile	39	1566	1845
Saraspur	36	1443	1890
Asoka	63	2539	3367
Aruna	66	2647	3299
Rajnagar	37	1486	1802
Ambica	63	2712	2726
Jubilee	81	3225	3068
Manaklal	33	1330	1593
Ahmedabad Advance	31	1251	1515
Manekchowk	32	1261	1445
Average.	48	1907	2222
GROUP IV			
45,000 to 60,000 spindles.			
Aryodaya Spg.	39	1540	1385
Sarangpur	51	2043	2381
Arvind	68	2717	3804
Average.	53	2100	2523
GROUP V.			
Above 60,000 spindles.			
Calico	80	3183	3190

Here too, we observe the same characteristic tendencies. The "Margin of profit" widens progressively as size increases. Profits per spindle or per loom are the lowest for units falling in the smallest class-interval, and highest for those, falling in the largest class-interval. These tendencies suggest that the "Measure of Efficiency" increases as size increases.

IV

COST OF PRODUCTION

The most reliable and dependable measure for comparing the efficiency of different units is the cost of production per unit of output. The lower the cost per unit of output, the greater is the efficiency attained by the industrial unit. Costs, in a competitive economy can, therefore, be characterized as a 'barometer' by which we can measure and compare the relative efficiency of different units.

Our object in examining the cost of production of different units is to find out whether there exists any correlation between cost of production and size of the industrial units. In other words do costs vary with the variations in the scales of output? If costs of production per unit of output tend to decline progressively as size increases, we can safely infer that there exists some degree of negative correlation between size and costs, if on the other hand costs do not vary with the variations in the scale of output, no such relationship exists.

It need hardly be emphasized that the difficulties of obtaining and verifying costs of different units are infinitely great. Costs are always regarded as a 'trade secret' to which an outsider can hardly have any access. Even the Tariff Board, in spite of its written undertakings that neither the identity of the mills nor the cost statements supplied by them would be disclosed in their published reports, was unable to obtain all the information, it needed. Hence all the information that can be publicly had for cost-comparisons is that compiled in the published Profit and Loss Accounts of different companies. This information, although incomplete and fragmentary for detailed cost-calculation, can nevertheless provide some basis for reflection whether costs bear any relation to size. But unfortunately even this information is not easily available. The firms, as a general rule, are reluctant to send the copies of their Published Profit and Loss Accounts and Balance Sheets to persons other than their bonafide shareholders. Of the 40 firms of Bombay to whom the writer approached for a copy of the published Profit and Loss Account and Balance Sheet for the year 1939, only 23 complied with his request. The rest had not even the courtesy to acknowledge his repeated reminders. Under such circumstances it is difficult to undertake a more comprehensive and searching survey than the one we have attempted here.

Another difficulty arises with regard to the inter-comparison of the cost of production of different units. Not only are units situated in different localities but are also working under widely varied conditions. Even if we confine our study to units situated in the same centre of area, there still remain differences in the character of output and type of equipment, used. In view of these limitations it may well be questioned whether there exists any satisfactory basis for inter-comparison? While no doubt the cumulative effect of these limitations may be considerable, they cannot materially influence the validity of our general conclusions. Since our observations are based on the "average" results of several units, individual irregularities or distortions, if any, will be easily brushed off. In this study, at least, the interaction of diverse tendencies will render the averages typically representative of the general conditions. These differences, important though they be, cannot materially affect the validity of our main generalizations.

COSTS PER UNIT OF OUTPUT VS. AVERAGE COST OF PRODUCTION

Another difficulty of a strikingly similar character arises while examining the cost-structure of different units. The question whether for comparative purposes, costs should be expressed as "per unit of output" or as "percentage of the Value of Goods Produced" is difficult to answer without examining the nature of the industry and the character of industrial output. No doubt, where the type of product is homogeneous in character and easily comparable, costs per unit of output will form a satisfactory basis for measuring the relative efficiency of different units. But where there exists important qualitative differences in the character of output, such as variation in shape, quality or design, "costs of production per unit of output" will fail to throw any light on the comparative cost-structure of different units. For example, in the Cotton-Mill Industry, a unit operating on yarn of less than 20 counts and producing cloth of coarse varieties, capable of standardized production, will necessarily have lower cost of production per unit of output than an industrial unit operating on finer counts of yarn and producing goods of light, fine and fanciful varieties. In such cases cost of production per unit of output will vary with the variation in the character of output. Hence, the method of expressing costs as "per unit of output," cannot provide a satisfactory basis for cost-comparison unless comparisons are confined to particular counts of yarn or selected varieties of cloth. The only method, therefore, that can be applied for comparing the cost of production of different units is by expressing costs as "percentage of the value of goods produced."

METHOD OF COST-CALCULATION

The method adopted by us for evaluating the Cost of Production of different units bear close resemblance to those adopted by:

(i) Prof. Colin Clark in his study on Textile Production Costs in Britain and Japan: A Detailed Analysis."[1]

(ii) International Labour Office in their Report on "The World Textile Industry—Economic and Social Problems."[2]

(iii) U.S.A. Cabinet Committee in their "Report to the President on the differences in the Cost of Production of Cotton-Cloth in the United States and other competing countries;"[3] and by

(iv) The C. P. Textile Labour Enquiry Committee in their 1941 Report. The Form which they used for cost-calculation is reproduced in Appendix I.

In all these cases the costs of component items like raw-cotton, wages, stores, fuel and power, etc., have been expressed either as "percentage of the value of Goods Produced' or as 'Percentage of Total Turnover.' The expression of component costs as percentage of total costs or turnover renders the cost of production of different units intercomparable and thus affords a satisfactory basis for measuring the relative efficiency of different units.

SIZE AND COST OF PRODUCTION—AN ATTEMPTED CORRELATION

For the purpose of this study we have confined the scope of our analysis to the Cotton-Mill Industry of Ahmedabad. The results are based on the examination of the cost of production of nearly all the units, working in the year 1938. We present the result of our study in Tables LIX and LX, which show to what extent are the costs of production correlated to size of industrial units:

1. Manchester Guardian Commercial, 2nd October, 1936.
2. See Report on the World Textile Industry—Economic and Social Problems Vol. I p. 204.
3. Report on the differences in the Cost of Production of Cotton-Cloth, published by Superintendent of Documents, Washington.

Table

VARIATION IN SIZE AND COST OF PRODUCTION

	Cotton Consumed.	Wages.	Stores.	Fuel.	Interest.	Repairs.	Other Expenses.	Total Average Costs.
GROUP I.								
Less than 15,000 Spindles ..	45.1	26.1	12.2	5.6	5.7	1.1	5.5	100.3
GROUP II.								
15,000 but less than 30,000 Spindles.	44.5	28.5	10.9	5.6	3.0	1.4	5.2	99.0
GROUP III.								
30,000 but less than 45,000 .. Spindles.	44.9	28.0	8.9	5.3	2.0	1.4	6.3	96.7
GROUP IV.								
45,000 but less than 60,000 .. Spindles.	42.6	26.8	10.7	4.5	1.3	1.2	4.6	91.0
GROUP V.								
Above 60,000 Spindles ..	40.2	24.7	8.7	4.2	1.0	1.3	4.9	85.0

The most striking fact which emerges from the observation of the above Tables is the continuous decline in the cost of production with the increase in the scale of output. Costs are highest for units falling in the smallest class-interval and lowest for units in the largest class-interval. This suggests an unmistakable tendency for cost to decline as size increases. The decline in costs is slow as we pass from smallest to moderate-sized units and thereafter increases somewhat more speedily as we pass from smallest to moderate-sized units and thereafter increases somewhat more speedily as we pass from moderate to large-sized units. The three large and most efficient units of Ahmedabad, viz., Calico, Arvind and Ambica have the lowest Average Cost of production.

Strikingly similar tendencies are observable in the case of the Bombay Industry—as well. Costs progressively decline as the size of the industrial units increases. The larger units like Bombay Dying, Century, Kohinoor, Swadeshi, Tata, Khatau, Phoenix are somewhat more economical in working than units like New Sun, Ruby, Hirjee, Podar, New Union, Bradbury, Elphinstone, Kamla or Gold Mohur. Unfortunately no information could be obtained for these smaller units. However, the fact that most of them were working at loss before the war (1939-45) began, is a sufficient indication that they were uneconomical in working. This point we have dealt at length in our next Chapter. Here we need only point out that the percentage costs of production in smaller units is relatively higher than in larger units.

SIZE AND COSTS—A CORRELATION

The observed tendencies in Bombay and Ahmedabad clearly reflect that there exists some degree of negative correlation between size and costs. As size increases the cost of production per unit of output progressively decline. This suggests that as a general rule larger units are more economical in working than smaller units, although there may be cases where some of the smaller units may be doing fairly well as compared to some of their larger contemporaries. But this would necessarily imply that other units falling in those class-intervals are doing much worse than what the 'averages' of those class-intervals really represent. Our conclusions should, therefore, be viewed only as an indicative of the general tendencies. The mere fact that some of the smaller units can manage to be prosperous without enlarging their scale of output does not, in any way, invalidate our main conclusion that "increase in size generally leads to increased efficiency."

V

GENERAL CONCLUSIONS AND EXPLANATIONS

The foregoing analysis has made it explicitly clear that there exists some degree of positive correlation between size and efficiency. The larger the size the greater is the efficiency and this relationship holds with surprising constancy in practically all the indices we have employed to measure and compare the relative efficiency of different units. The remarkable degree of uniformity in all the observed tendencies undoubtedly reflects that the relationship between size and efficiency is unmistakable. As a general rule, the larger the size of the industrial unit, the greater is the industrial productivity, the lower the costs and higher the margin of profit per spindle, per loom, per worker or per unit of output.

Another striking conclusion which emerges from the foregoing analysis is that neither in Bombay nor in Ahmedabad, is there any tendency for costs to increase or productivity and profits to decline at any stage of output. This is presumably so because unit's seldom grow to a size, which brings to them lesser returns in the aggregate. Although, theoretically speaking, a stage is conceivable when the law of diminishing returns begins to operate, in practice that stage is hardly reached because the incentive for further expansion ceases to exist. Obviously, we do not find any confirmation of the general belief that after a certain point has been reached size becomes uneconomical and profits show a general decline. "It is really doubtful whether the law of decreasing returns applies to any existing industry." In practice, at least firms seldom grow to a size, which is less conducive to economical working.

No statistical analysis is, however, complete unless we advance adequate explanations for the facts established. If our inferences are to be more conclusive and less arbitrary it is essential that they should be viewed in the light of theoretical reasoning. We shall, therefore, analyse and examine why increase in size invariably leads to increase in efficiency? In other words why larger units are generally more economical in working and conducive to greater efficiency than smallar units? To answer this question with any degree of precision and exactitude we should examine the influence of size on each of the cost-factors, and see why the cost of production increases.

RAW-MATERIAL COSTS

In view of the fact that the costs of raw-materials represent nearly half the cost of production of cloth, any economy affected in its purchase will materially influence the efficiency of the industry. Evidently, it is of fundamental importance that the units must be able to buy their raw-materials as cheaply as possible. We shall, therefore, examine whether large units are in a position to buy their raw-materials more cheaply than the smaller units. While no doubt the smaller units may be and often are at some disadvantage in buying the material cheaply and at bargaining prices, the larger units can take full advantage of the economies of large-scale buying, selection of varieties, storage, mixing, financing and research. It is a matter of common observance that those who buy in bulk get better terms, cheaper credit and higher discounts than those whose purchases are small. Again, the large firms can afford to employ expert buyers, backed up by all the resources of scientific knowledge and equipment[1]. "Buying specification can be more detailed. The tests to which the materials will be put can be more rigid, so that less work is spoiled by faulty material and the quality of the final product is higher and more uniform, so that by its reputation it can command a higher price."[2] It would be somewhat expensive for smaller units to engage the services of such expert buyers. Moreover, the large units can afford to keep their own agents in cotton-districts, who can buy cotton on the spot, have it ginned and pressed and arrange for its transport. This system eliminates the services of middlemen and enables the mills to get the exact quality of cotton they require. While these are undoubtedly the advantages which are fully realized by the large mills, the smaller mills, owing to their inability to maintain agencies in a number of upcountry centres, find it a more expensive system than that of purchasing cotton in the local-market. Similar advantages also accrue to larger units in respect of the purchase of foreign cotton. It has been pointed out by several witnesses before the Tariff Board that the Japanese buyers, owing to their large-scale operations, are often able to purchase cotton at cheaper rates than those paid by Indian mills. Although this allegation is not fully believable, there seems some truth that large-scale buying does provide some scope for

1. Robinson, E.A.G., Structure of Competitive Industry, p. 65.
2. Ibid. p. 65.

efficiency and economy. Generally speaking the large units have better bargaining capacity, greater opportunity for comparison and selection, and lesser overhead costs in respect of storage, finance and supervision than those incurred by smaller units.

It is difficult to determine with any degree of precision and exactitude the extent of advantages secured by large units by reason of size. Such a variety of factors influence the purchasing policy of different units that it becomes difficult to distinguish whether the increased economies are the result of large size of the industrial unit or the result of other extraneous factors too complex and too interwoven to be singled out. With these reservations, however, an attempt has been made to study the raw-material costs of 58 units of Ahmedabad in order to find out whether the raw-material costs decline as size increases. We represent the results of our study in the following Table:

Table LXI

A COMPARATIVE STATEMENT OF THE RAW-MATERIAL COSTS AS PERCENTAGES OF THE TOTAL VALUE OF GOODS PRODUCED.

Spindles Installed.	No. of Mills Examined.	Percentage of raw-material costs to Total Value of Goods produced.
I. Group: 0—15,000 Spindles	3	45·10
II. Group: 15,000—30,000 ,,	37	44·45
III. Group: 30,000—45,000 ,,	14	44·93
IV. Group: 45,000—60,000 ,,	3	42.60
V. Group: Above 60,000 ,,	1	40.20

The above Table roughly indicates the tendency for costs to decline as scale of production increases. The operation of this tendency can, however, be ascribed to two factors, firstly, the larger units are in a position to buy their raw-materials at more advantageous terms than smaller units, and, secondly, the overhead costs per units of purchase, supervision, storage and research would be lower in a larger unit than in a smaller unit mainly because in the former case costs would be distributed over a larger volume of output than i the latter case. Thus we see that the economy of large-scale operation is not only a theoretical possibility but in some cases at least an undoubted fact.

LABOUR AND SUPERVISION COSTS

Similarly economies arise in case of labour and supervision costs. A larger unit is in a better position to take advantage of economies arising from 'Division of Labour,' 'Specialization' and 'Integration of Processes than a smaller unit.' "The principle of division of labour requires that a firm should be sufficiently large to obtain the maximum profitable division of labour."[1] In cotton-textile industry, however, no technical changes have occurred which render further sub-division possible than what existed a hundred years ago. A moderate-sized unit can, therefore, have access to all the economies of 'division of labour' that accrue to a large-sized unit. In the 'finishing' section, of course, the larger the scale of operation the greater are the possibilities for further division of processes, works specialization and diversification of production.

But it is in respect of supervision costs that the larger units are able to affect greater economies than smaller units. Certain services do not have to be increased in the same ratio as the expansion of the

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1. E.A.G. Robinson: The Structure of Competitive Industry, p. 23.

unit, or if increased in the same ratio are much more efficient. For example, if a unit doubles its size, it is not necessary for it to employ double the number of Departmental Managers, Engineers, Designers, Spinning and Weaving Masters and other technicians. The result is that the supervision costs per unit of output tends to decline as the scale of production increases. Further a large firm is in a position to engage the services of expensive but highly trained and expensive supervisory staff. The smaller units are often at a handicap in this respect. Thus in two important directions, economies accrue to larger units, firstly, supervision costs per unit of output are lower in larger units than in smaller units and, secondly, the larger units can afford to engage the services of highly trained and expert technicians. Comparing the cost of production of cotton-mills in Bombay and Ahmedabad, the Tariff Board also remarked that "Bombay has some advantage as compared with Ahmedabad and other up-country centres in respect of the salaries of supervisory and technical staff again owing in main to the larger-size of Bombay mills."[1]

POWER COSTS

Similarly power costs per unit of output diminish as the size of the firm increases. One of the most important factors that determines the economical size of an industrial unit in India is the extent of economy that can be affected in the power costs.[2] Both, in case the unit has its own power generating plant, and in case the power is supplied by some outside agency, the larger units are comparatively at a greater advantage than smaller units. "Whereas in Bombay, power is derived from an outside central source of supply, a larger load means

1. Indian Tariff Board Report on Cotton Textile Industry, 1927 Vol. I, p. 122.
2. Indian Tariff Board Report on Cotton Textile Industry, 1932 p. 99.

on the average a smaller cost per unit of power.''[1] Where, however, the units have their own power-generating plants, it has been found by experience that the larger-plants are more economical in working and less expensive to construct than smaller plants. "If we compare the capital cost of two electric generating stations, one of the largest efficient size, the other of small each representing about the same technical development, we find that the smaller station costs almost twice as much, for each kilowatt of capacity, as the larger station.''[2] So also power costs per unit would be lower for those that consume large quantity in the aggregate, and higher for those consuming less, thus pointing to the comparative advantages possessed by bigger units.

The following Table, which is based on the examination of the power costs in 58 units of Ahmedabad clearly indicates that power costs tend to decline as size increases:

Table LXII

PERCENTAGE OF POWER COSTS TO TOTAL COSTS IN COTTON-MILL INDUSTRY OF AHMEDABAD.

Class	Percentage of power to Total costs 1938.
GROUP I	
0—15,000 Spindles	5.63
GROUP II	
15,000 but less than 45,000	
GROUP III	
30,000 but less than 45,000	5.27
GROUP IV	
45,000 but less than 60,000	4.5
GROUP V	
Above 60,000	4.2

1. Ibid. p. 99.
2. E.A.G. Robinson: The Structure of Competitive Industry, p. 31.

Overhead costs

It is mainly in respect of overhead costs that the larger units are substantially at a greater advantage than smaller units. It is a well-known theory of industrial organization that the overhead costs per unit of output decrease as the scale of production increases. The reduction in overhead costs per unit of output may be ascribed to the fact that as the scale of operation increases, the cost of management and non-manufacturing operations can be spread over a larger and larger volume of output. The result is that the cost per unit of output is lower for those that produce large quantities in aggregate and higher for those that produce less. It is significant to note that economies arise in practically all the individual items of overhead expenses, such as Repairs and maintenance, Rent, Rates and Taxes, Insurance, Interest, Depreciation and Office Expenses and Establishment charges. All these expenses do not increase in the same proportion as the size increases. Obviously there is a saving in each of the cost-factors. Moreover, economies arise to larger units on account of the fuller utilization of the productive plants. A large unit can keep its plants and processes working to their full capacity. Smaller units are often unable to keep their expensive machinery fully occupied. The result is that the larger units are able to effect considerable economies in the interest and absolescence charges.

The numerous evidences tendered before the Tariff Board clearly show that the increase in the scale of output generally leads to reduction in overhead costs per unit of output. It was stated by Sheth Kasturbhai Lalbhai that one of the units under his management which has about 27,000 spindles and 400 looms was compelled to expand with a view to reduce the overhead costs and hence grew up into one of 36,000 spindles and 800 looms.[1] He further continued that most of the units in Ahmedabad were smaller than they should have been if overhead charges were to be as low as possible per unit of output.[2] The primary motive underlying the expansionist movement was, therefore, the desire to bring about a substantial reduction in overhead costs. Both Sir C. N. Wadia and Sir H. P. Modi stated before the Tariff Board that even in times of depression and industrial inactivity they were trying to increase the production to keep down costs by distributing overhead charges over a larger volume of output.[3] Another piece of evidence which throws some light on this question is the relative overhead costs in Bombay and up-country mills respectively. While comparing the costs of production of mills in Bombay with those of up-country centres, the Tariff Board came to the conclusion that although total works costs are appreciably higher in Bombay than in the up-country centres, the overhead expenses are decidedly lower. According to their cost-calculations, the overhead expenses in Bombay worked out at 1.51 pies per spindle per day as against 2.24 elsewhere and 60.36 pies per loom per day as against 70.88 for the up-country mills.[4] The differences in the overhead costs in Bombay and up-country centres have been rightly explained by the Tariff Board as resulting from the large average size of the Bombay mills and from the greater concentration of managing agencies in the same hands.[5]

Distributive costs

It is, however, difficult to generalize with any degree of certainty the relationship between size

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1. Report of the Indian Tariff Board on Cotton-Textile Industry, Vol. II p. 514.
2. Report of the Indian Tariff Board, 1927, Vol. II p. 514.
3. Report of the Indian Tariff Board, 1927, Vol. II
4. Report of the Indian Tariff Board, 1927, Vol. I p. 119-20.
5. Report of the Indian Tariff Board, 1927, Vol. I p. 122.

and marketing economies. Although it is a well-known fact of industrial organization that the distributive costs per unit of output tends to decline as the size increases, in practice, such a variety of systems is in vogue that it is possible for firms of very different sizes to carry on equally efficiently. Where marketing is done through one central organization some of the diseconomies arising from smaller-size can be easily offset. On the other hand, where units have their own independent marketing organization, a large-size generally makes for greater economy. It is, however, difficult to dogmatize whether the method of direct selling is preferable to that of selling through commission agents or other intermediaries. All that can be said is that while larger units may be able to realize some of the economies of the integrated system of manufacturing and marketing, the risks attending such expansion too may be very great. Diseconomies may result due to lack of co-ordination and inefficient management. In such cases it would be desirable that the business of marketing is taken over by some separate and independent organization. The choice for either of these methods will, therefore, depend on the efficiency of the management and the possibility of perfect co-ordination. In both the cases, however, a large-scale organization will undoubtedly lead to lower distributive costs per unit of output.

VI

CONCLUSION

We have examined all those forces which make for greater economy of production as the scale of business increases. They tend to show why larger units are generally more economical in working than smaller units. From this, however, no inference should be drawn that the tendency for diminishing returns never operates. In fact, that tendency may operate at any stage of output, if one or more of the factors of production remain constant or do not increase in the same proportion as the increase in the scale of output. But so long as that stage is not reached, the relationship between size and efficiency is unmistakable.

APPENDIX I

COMPARATIVE STATEMENT OF THE AVERAGE COMPONENT COST AS PERCENTAGE OF THE TOTAL COST OF PRODUCTION.

Heads.	Year.
1. Cotton, yarn, waste, etc.	
2. Stores.	
3. Dyeing and bleaching charges.	
4. Labour wages.	
5. Mill salaries.	
6. Manufacturing charges including repairs and depreciation.	
7. Establishment charges including office allowance and commission.	
8. Interest.	
9. Power and fuel.	
10. Profit or loss.	
Total Sales.	

Chapter VI

OPTIMUM-SIZE IN THE COTTON-MILL INDUSTRY OF INDIA

The object of this Chapter is to find out the optimum-size of industrial units in the Cotton-Mill Industry of India. We shall in the first instance examine those forces which determine the best scale of output in an industry, and secondly, in the light of our theoretical analysis, examine whether the industrial units working in the Cotton Mill Industry of India are of the size which can be regarded as most economical in working and conducive to the maximum of efficiency.

THE CONCEPTION OF OPTIMUM-SIZE

Let us first elucidate the concept of optimum-size. Optimum size has been defined as a "size which in the existing conditions of the technique and organizing ability has the lowest average cost of production per unit, when all those costs which must be covered in long run are included."[1] It, therefore, refers to a scale of output which taking into account the availability of the different factors of production and the extent of co ordinating ability, secures the lowest average cost of production per unit of output.

It is necessary to examine critically the fundamental implications of the above definition. One most important implication is that the concept of optimum-size is an essentially a relative concept. It is relative because the best size of the industrial unit always varies according to the availability of the resources and the extent of co-ordinating ability. In an article in the Economic Journal Mr. Robinson says that the conception of an optimum is always

1. Robinson, E.A.G: The Structure of Competitive Industry. (Cambridge, 1943), p. 15.

relative to the environment to which it refers.[1] Thus a firm which under certain conditions of technique and organizing ability is at the optimum-size may become bigger or smaller than the optimum if those conditions alter. It follows, therefore, that environments play a dominating role in the determination of the optimum-size. The optimum-size in one industrial centre may be very different from the optimum-size in another, and may vary also as between different units within the same centre. The concept of optimum should, therefore, be viewed always in relation to the environments in which the industry is conducted.

Another significant implication is that the concept of optimum-size is essentially concerned with costs and price. The determination of price-structure may be the result of forces other than size and efficiency. As such it may fail to reflect the differences in the standards of efficiency attained by each individual unit. Costs, on the other hand, render the measurement of such variations possible. Hence costs and not price, should be the relevant criterion for the determination of the optimum-size in an industry.

CONDITIONS FOR THE EXISTENCE OF OPTIMUM-FIRM

Let us first analyse the conditions for the existence of the optimum firm. Broadly speaking, the optimum firm is the result of the free play of economic forces under conditions of perfect competition. For in a perfectly competitive industry, each firm in full equilibrium will produce that output at which its average costs are at a minimum.[2] Each firm will then be of the optimum-size.

But where market is limited and imperfect, compe-

1. Austin Robinson: The Problem of Management and the Size of Firms'' in the Economic Journal, 1934.

2. Robinson, (Mrs.) Jean : Economics of Imperfect Competition. p. 97.

tition may tend to establish firms of other than the optimum-size. Indeed, when profits are abnormally high (either because of a sudden rise in demand or due to the failure of new firms to enter competition), firms grow to over-optimum size. The fact that at the optimum-level the average costs are at the minimum will not, in any way, influence entrepreneurs' decision. What concerns him most is not the cost but the aggregate net yield. It is to his interest, therefore, to select that scale of output which gives him the largest aggregate net yield. In other words, the entrepreneur will have no inclination to stop production till the point is reached where his marginal gains would be equal to his marginal cost. Hence, under imperfect competition, it is sometimes more profitable to the entrepreneur to produce an output greater than the optimum.

Similarly under conditions of imperfect competition, it may sometimes happen that a firm may prefer to remain at a size smaller than the optimum. Indeed when costs of growing exceed the gains of growing, firms will always profit by producing smaller than the optimum output. The entrepreneur, in such cases, will have no desire to produce the optimum output since any increase beyond the equilibrium output will mean to him a marginal cost greater than the marginal revenue.[1] He may then actually decrease and not increase his profits by expanding to the optimum-size. [2] Hence when market is limited and imperfect, and profit's normal, firms may prefer to produce less than the optimum output.

One important conclusion which emerges from the above analysis is that the optimum firm may not necessarily be of the most profitable-size. We have already examined two cases and have come to the conclusion that while in some cases it may be more

1. (Mrs.) Joan Robinson : Economics of Imperfect Competition. p. 97.
2. E. A. G. Robinson : The Structure of Competitive Industry, p. 16.

profitable for firms to be of less than optimum-size, in others they are likely to increase their aggregate net yield if they expand and outstrip the optimum-limit. It should, therefore, be clearly understood that the optimum-size is the best-size only in the sense that it is the most efficient scale of output, and not in the sense that it gives to the entrepreneur, the maximum returns. We have laid particular emphasis on this point simply because the concept of 'optimum-size' as used in economics, conveys quite a different meaning than what is commonly understood. It is with the "least-cost-firm" and not with the "most profitable-firm" that we are really concerned.

DETERMINANTS OF OPTIMUM-SIZE

The forces which determine the best-size of the industrial unit have been divided into five main categories,[1] namely, technical factors, managerial requirements, financial resources, marketing conditions and the forces of risks and fluctuations. We shall examine the influence which each of these factors exert in the determination of the optimum-size.

Let us first consider the role of technical factors in the determination of the optimum-size. From the point of view of the technique of production, the scale of output must be sufficiently large to secure on the one hand the maximum profitable division of labour, and on the other, the advantages derived from the integration of processes. These two factors will, in fact, determine the optimum technical scale of output. A firm of size smaller than this will not be most economical in working or conducive to maximum of efficiency. The technical optimum, therefore, sets a limit to the minimum scale of efficient operation. It, however, does not

1. E. A. G. Robinson : The Structure of the Competitive Industry (Cambridge, 1943). p.

fix a corresponding upper limit beyond which growth will result in countervailing diseconomies, and progressively increasing cost per unit of output. For, if such a stage is reached the resulting diseconomies can be counteracted through specialization and disintegration of productive processes. Thus the technical optimum though it sets a limit to the minimum scale of efficient operation, contributes hardly if at all to the fixing of a maximum scale beyond which production would be unprofitable.

The managerial forces, on the other hand, determine not only the lower but also the upper limit of efficient operation. Although an increase in the scale of output generally leads to an increase in the efficiency of management, a limit is conceivable when any further increase in efficiency will be more than offset by countervailing diseconomies resulting from lack of perfect co-ordination. The extent of co-ordinating ability available to each individual unit at any particular time is limited and cannot be increased with the increase in other factors of production. This limitation is of far-reaching importance because it ultimately determines the maximum-size to which a firm can profitably grow. The managerial optimum, therefore, determines both the minimum and the maximum scales of efficient operation.

Financial forces also play a significant role in the determination of optimum-size. Where capital is abundant and the borrowing facilities easily available, the firm will tend to be of bigger-size than where such facilities are limited. Again, in so far as borrowing facilities depend upon the size of the firm, the problem of finance will influence the optimum scale of production. Large firms can, as a rule, borrow more easily and cheaply than the smaller firms. A study made by the U. S. Department of

Commerce[1] shows that there are strict limits to borrowing by small concerns, and that the credit difficulties decrease with an increase in the scale of output. Hence financial considerations invariably point to the fact that when the capital market is large and the borrowing facilities are easily available, firms grow to a larger size than otherwise.

The influence of marketing on size is not easily determinable. Although as a general rule it may be said that the efficiency of marketing increases as size increases, in practice such a variety of methods is in vogue that it is possible for firms of very different sizes to carry on equally efficiently. Hence one cannot be dogmatic concerning the growth of efficiency with size. All that one can say is that where an integrated system of manufacturing and marketing prevails the optimum firm will necessarily be larger, than where the marketing is done through some central organization.

The forces of risks and fluctuations also exert an important influence in the determination of optimum-size. A firm which is of optimum-size under conditions of constant output may not necessarily be of optimum-size under conditions of fluctuating output. For in the latter case the firm may be too large and too rigid to possess the necessary adjustability. Again, when there is depression and the total output in an industry diminishes, the firms that survive are not necessarily those that are most efficient, but those which possess adaptability and tenacity to face industrial vicissitudes. In this respect the smaller firms have an advantage over bigger ones in that they possess ready adaptability which the latter lack. The existence of risks and fluctuations tends, therefore, to establish firms of

1. Survey of Reports of Credit Difficulties, Department of Commerce, 1935. Also see Temporary National Economic Committee's Monograph 17, p. 224.

smaller size than those that would prevail under conditions of constant output.

It is highly improbable for all these forces to reach their optimum-size at one and the same scale of output. It may happen that technical consideration may demand a size much larger than can be effectively managed, or in the reverse case, the managerial forces may, (in order to secure maximum economies) require a scale larger than what is already in existence. The problem would, therefore, arise of reconciling these differing optima so that an optimum size may become determinable. This reconciliation can, however, be brought about by attempting to make these differing optima work efficiently at one and the same scale of output. For example, where the managerial optimum is bigger than the technical optimum the problem of adjustment can be solved by expanding the business unit, for what is required is only a duplication of plants. Where, however, the reverse is the case, viz., the technical optimum being larger than the managerial optimum, the former has got to adjust itself to a lower scale of output because otherwise countervailing diseconomies would result and cost per unit increase. Similarly, when the optimum scale of marketing is larger than the optimum scale of production, efforts would be made either to disintegrate the marketing function by entrusting it to some specialist firm or, as is usually the case, to expand production so as to derive some more economies of large-scale marketing. We thus see that the problem of reconciliation can be solved to some extent by balancing the differing optima so as to make them work efficiently at one and the same scale of output.

This is in brief the theory of optimum-size. In the light of our foregoing analysis and observations we shall now consider whether the industrial units working in the Cotton-Mill Industry of India are of the size which can be regarded as most economical in working and conducive to maximum of efficiency In other words, we have to ask, 'do they represent a scale of output which under the existing circumstances can be called 'optimum?'

At the outset it must be borne in mind that in applying these theoretical conclusions to practical issues we are at once faced with several limiting factors that render our task extremely difficult. Although Mr. E. A. G. Robinson has suggested a method of reconciling the differing optima, it lacks a realistic approach because in practice there hardly exists any method by which these differing optima can be quantitatively measured. In the absence of such a method, therefore, it would be difficult to judge whether the technical, managerial or financial forces have reached their optimum-size or are still below their optimum-level. Moreover, under the complicated system of industrial production it would be difficult to distinguish whether the increased economies are the result of technical efficiency or managerial efficiency or both, for only in a closed and static economy can such a study be possible. In the face of these serious limitations, therefore, the "factorial approach" to optimum-size is of very little significance. Only through a calculation of 'average costs' can we form some idea, if at all, whether the different determinants have reached their optimum-size or are still below their optimum-level. It is in the light of these 'average costs' that we shall examine whether the industrial unit working in the Cotton-Mill Industry of India represent a size which is most economical in working and conducive to maximum efficiency.

BOMBAY AND AHMEDABAD MILLOWNERS' VIEWS

For studying the most economical scale of production let us start with an exposition of the views expressed by the Bombay and Ahmedabad Millowners' Association and such other organizations and individuals, as have given their evidences before the Tariff Board.[1] In replying to the questionnaire issued by the Tariff Board in 1927, the Bombay Millowners maintained that a mill should have at least 30,000 spindles and 1,000 looms to ensure efficient and economic working.[2] Again, in 1932, replying to another questionnaire of the Tariff Board, the Bombay Millowners restated their views as to what they considered a reasonably economical size for a combined spinning and weaving mill in India. In their opinion "a mill spinning on the average 40s counts of yarn and using the whole of its yarn production in weaving cloth should have 40,000 spindles and about 1,000 looms to ensure efficient and economic working."[3] It is very interesting to analyse the implications of these statements. The first obviously refers to the minimum scale of "efficient and economic working". In the second case, although it is not explicitly clear whether they referred to the most efficient scale of output or to the minimum scale, one can, nevertheless, infer from such indirect evidences, as are available, that they primarily referred to the minimum scale of output requisite to ensure economical working. Some justification for this inference is furnished by the statement of the Tariff Board which clearly stated that "it has except in case of Ahmedabad mills, accepted as a reasonable economical standard a capacity corresponding to *not less than* 1,000 looms and 35,000 to 40,000 spindles."[1] It is, therefore, quite evident that both the statements of the Bombay Millowners' referred

1. A list of such evidences is attached in Appendix I.
2. Report of the Indian Tariff Board on Cotton Textile Industry, Vol. II, 1927, p. 136.
3. Report of the Indian Tariff Board on Cotton Textile Industry, Vol. I, 1932. p. 84.
1. Report of the Indian Tariff Board of Cotton Textile Industry, 1932, p. 97.

mainly to the minimum scale of production required to ensure efficient and economical working.

One thing which at once strikes out to an independent observer is the significant difference between the views expressed in 1927 and those expressed in 1932. While the Bombay Millowners' Association did not advance any specific reasons for this significant departure, we have some plausible reasons to explain why these two statements materially differ. In their second statement the Millowners' Association have, while suggesting an economic-size for a mill, taken into account both the structure of the industry and the character of output. It specifically referred to a combined spinning-weaving mill, spinning on the average 40s counts and using the whole of its yarn production in weaving cloth. The first statement did not make any reference to these two factors. Obviously, a mill producing on the average 40s count of yarn (which is considered a much higher average for a Cotton Mill in India) and using the whole of its yarn supply for the production of cloth will necessarily require a larger spindleage equipment relative to its loom equipment than a mill which operates on lower counts of yarn and uses part of its yarn supply not in the production of cloth, but for sale. This explains why the Millowners in their first statement gave a ratio of 30 spindles to 1 loom as against 40 to 1 in their second statement. It is interesting to note that this alteration also reflects the changing character of output in the Bombay Industry. Between 1927 and 1932, there was a substantial increase in the production of higher counts of yarn and finer varieties of cloth,[1] which necessitated a higher proportion of spindleage to loomage. It seems, therefore, that while suggesting

1. Report of the Indian Tariff Board on Cotton Textile Industry, 1932. pp. 23-24.

an economic-size for a combined spinning and weaving mill, the Millowners' Association has taken full cognisance of these changing trends in the Cotton-Mill Industry of Bombay.

One thing which is very surprising is that the Millowners' Association did not advance any specific reasons as to why they considered a mill of 30-40 thousand spindles and 1,000 looms, as the minimum-size required to ensure efficient and economic working. The Tariff Board, too, while admitting that it is impossible to lay down any rigid standards as to the minimum economical capacity of a mill, subscribed to the Millowners' views "that a mill should have a capacity of not less than 35-40 thousand spindles and 1,000 looms to ensure economical working." Both the Millowners' Association and the Tariff Board refrained from advancing any evidence in their support, firstly, because they wished to avoid any unnecessary controversy on this delicate and exceedingly technical subject and, secondly, it seems that the data at their disposal were too inadequate to warrant any definite generalization as to the minimum scale of efficient operation. Whatever may be the reason for their silence, it can hardly be denied that there was little justification for holding this empirical view that a mill should have at least 30-40 thousand spindles and 1,000 looms to ensure efficient and economic working. For, if we accept this empirical statement, we shall find that out of the 277 cotton-mills working in India in the year 1931, as many as 203 had less than 40,000 spindles. Even if we accept 30,000 spindle-size the minimum scale required for efficient operation, we find that out of the 277 mills 158 mills had a capacity of less than 30,000 spindles, and 47 out of those 158 had less than 15,000 spindles. This apparently shows that the majority of the mills working in India are, according to the Millowners' statement much smaller than the size required to ensure economic working. This, however, they contradict in their subsequent statement when they assert that "with a few exceptions the mills in Bombay, Ahmedabad and other industrial centres in India are carried on with reasonable efficiency and economy."[1] This anomaly looks surprisingly astonishing because on the one hand they maintained that a mill should have at least 30,000 spindles and 1,000 looms to ensure economic working and on the other they ascribed to the view that with a few exceptions, the mills in India were working with reasonable efficiency and economy. Some explanation of this apparently contrarious opinion, however, lies in the fact that the Bombay Millowners' were on the one hand, trying to establish a case for the grant of protection to the Cotton Textile Industry, and on the other they were expressing an opinion, which they thought was true, particularly of the Bombay Industry.

One interesting fact which the foregoing analysis reveals is that the minimum economical scale suggested by the Millowners' Association, is rather too large in the prevailing conditions of the Indian industry. The fact that most of the mills in Ahmedabad are smaller than this size and yet are fairly economical in working suggests that one cannot be dogmatic regarding the minimum scale of efficient operation. It has been held that in cotton-textile Industry a mill of 20,000 spindles and 500 looms can secure all the economies of division of labour and integration of processes, open to a large-sized unit.[2] Hence as far as technical scale is concerned, there seems to be no reason why a mill of 20,000 spindles

1. Report of the Indian Tariff Board on Cotton Textile Industry, Vol. II, 1927, p. 135. Of course this was a loose statement made to impress the Tariff Board.

2. Robinson, E. A. G., Structure of Competitive Industry. pp. 23-24 See also S. J. Kennedy: Profits and Losses in Textiles (New York, 1936), pp. 184-87.

cannot operate as economically and efficiently as a mill of 30,000 spindles. Thus from the technical point of view it seems that the minimum economical scale suggested by the Bombay Millowners does not coincide with the technical minimum required in an industry for efficient and economical working.

AHMEDABAD MILLOWNERS' VIEWS

Similarly, it is interesting to examine the views expressed by the Ahmedabad Millowners' Association as to the minimum scale required for efficient operation. In replying to the questionnaires of the Tariff Board they gave it as their opinion that a mill having 25,000 spindles and 600 looms would be conducive to efficient and economical working.[1] Their statement, too, was empirical, and they did not adduce any reason or evidence in their support. If, however, we accept their scale, as the normal economic capacity for a mill in Ahmedabad, we shall find that out of the 65 mills working there in 1931, 34 were of smaller size than this, and of these 34, 25 had even less than 20,000 spindles. Further, the evidence given by the President of the Ahmedabad Millowners' Association also bears out the fact that most of the mills in Ahmedabad were smaller than they should have been if overhead charges wereto be as low as possible per unit of output.[2] Both these statements clearly reflect that most of the mills in Ahmedabad are still below the normal economical capacity. It is significant to note that if we compare the scale of output suggested by the Bombay Millowners with that suggested by Ahmedabad Millowners, we shall find that while in case of Bombay, only 12 mills out of the total of 70 were smaller than this "economic-size," in Ahmedabad as many as 34 mills, out of the total of 65, had a size, smaller than

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1. Report of the Indian Tariff Board on Cotton Textile Industry, Vol. II, 1927, p. 396.

2. Ibid p. 514.

the economical scale suggested by the Ahmedabad Millowners' Association. It seems, therefore, that while in Bombay the mills are considerably larger than the minimum required in the opinion of the Millowners' Association, in Ahmedabad most of them are below their normal economical capacity.

The evidences furnished by other organizations and individuals with regard to the economic-size are not of much significance. Three of the four individual witnesses,[1] who appeared before the Tariff Board in 1927 stated that a mill should have 40-50 thousand spindles and 1000-1200 looms to ensure efficient and economic working. It is interesting to note that all these witnesses were, directly or indirectly, connected with Bombay Cotton Industry, and hence in suggesting an economic size for Cotton-mills were influenced by the conditions prevailing in that centre. The fourth witness[2] who based his opinion on the experience gained at Madras and Ahmedabad Mills, stated that a mill having 25-35 thousand spindles and 600-800 looms would ensure the most economical and efficient working. Again, two of the three witnesses[3] who submitted their written statements before the Tariff Board in 1932 stated that a mill should have at least 30,000 spindles and 750 looms to ensure efficient and economical working. The third witness[4] gave quite a different opinion and stated that a mill having 20,000 spindles and 500 looms would be one of reasonable economical-size. It seems, therefore, that in suggesting these minimum scales of efficient operation, each one of

1. Mr. M. H. Manek, Mr. P. A. Baptista, and Mr. C. M. Gupta. See Evidence Report on the Cotton-Textile Industry, Vol. IV, 1927, p. 153. 179 and 249.

2. Mr. G. N. Iyer, See Evidence Report, Vol. IV, 1927 p. 262.

3. The Bengal National Chamber of Commerce and Messrs. Delhi Cloth and General Mills, Co. Ltd. See Evidence Report on Cotton Textile Industry, Vol. I, 1932, p. 77 and 171.

4. Messrs. Maharaja Mills Co. Ltd., Ibid. p. 174.

them was influenced by the peculiar conditions prevailing in his own centre.

FROM MINIMUM TO OPTIMUM

The real difficulty, however, arises when we pass on from the minimum economical scale to the optimum scale of output. Whereas it is possible to set some limit for the minimum economical scale in an industry, it is difficult to fix any correspondingly upper limit, beyond which growth will lead to progressively increasing cost per unit. Such a limit will always vary according to the availability of different factors of production and the extent of co-ordinating ability that each individual unit possesses. Thus like the "fixed" minimum, there is no "fixed-optimum"-size in an industry. "The interaction of the various technical, financial, managerial and marketing factors in an industry, instead of securing one optimum firm, has often the effect of bringing about a number of optima at various stages in the evolution of that industry and at different centres in the country."[1] The result is that there can exist in an industry, not one but as many optimum units as there are firms in existence. Thus, there cannot be any generalization in respect of the existence of the optimum-size in an industry. Firms may reach their optimum-size at different scales of output; some may outstrip their optimum limit even at 40,000 spindles, others may have reached a size of 80,000 spindles and still remain below their optimum-level. Further some spectacular changes in demand or the technique of production may bring about important changes in the size of the optimum units. Firms, which under normal conditions are of the optimum-size, may become smaller or larger than the optimum, when those conditions alter. Thus the concept of the optimum

1. Lokanathan, Dr. P. S.: Industrial Organization in India. (1935 Ed.) p. 87.

is not only relative to time and place but also relative to resources available to each individual unit. The question of the existence of the optimum firm in an industry should, therefore, be viewed not from the point of view of the industry as a whole, but from the point of view of each individual unit—whether it has reached a scale of output, which under the existing conditions of technique and organizing ability can be called 'optimum'?

It must, however, be admitted that the task of analysing the 'optimum-size' in practice, is one of insuperable difficulties. Although theoretically speaking, it is correct to say that a firm will reach its optimum-size at that scale of output, where taking all costs into amount, in practice, such a stage can be determined only by gradual experimentation. But no firms, in practice, can possibly possess full knowledge regarding the nature and shape of its complete "cost-curve." Obviously it will be very difficult for a firm to determine at which scale of operation it is likely to secure the lowest cost per unit of output. It is only through the method of trial and error that the firm may be able to reach its optimum-size. In practice, therefore, the complete lack of factual data, relating to cost of production at different stages of output, renders the determination of optimum-size exceedingly difficult if not quite impossible.

The only workable method which can indicate whether the units working in an industry have reached their optimum-size is that of inter-comparing the average long period costs in units of varying scales of output. Such inter-comparison will amply reveal which of the industrial units working in the industry are nearing their optimum-size, and which of them are still at a significant distance from their optimum-level. For, broadly speaking, it looks quite justifiable to suggest that firms with lower costs per unit would be nearer to their optimum-size than those with relatively higher costs per unit of output. For such a study and analysis, it is, however, essential that the units under investigation are confined to the same centre or area, and the time selected is the same in all cases. In otherwords, the difference in costs should not arise because of the differences in locational economies or variations in time-limit. Further, the units selected should be such that no significant differences in costs arise because of the variations in the character of output or the type of technical equipment used. The greater the uniformity in environmental conditions affecting the units the greater is the possibility of our result being more conclusive and less arbitrary.

While undertaking such an enquiry we are, however, faced with several limiting factors that render the task of analysis extremely difficult. The first and foremost difficulty is with regard to the lack of statistical data relating to cost of production. In our last Chapter we have examined at length the difficulties of obtaining and verifying cost of production of different units, and the numerous limitations and reservations which one has to bear in mind while attempting such comparisons. We have also noticed that the method of expressing costs as "per unit of output" conceals important differences in the quality of produce, and hence is quite unsatisfactory for the purpose of cost-comparisons. The alternative method that we suggested for inter-comparisons was that of expressing "Costs as percentage of Value of Goods Produced." Here too, we shall make use of the same method, for it will tend to eliminate differences in the character of output and thus render the data more uniform for cost-comparisons. While no doubt these distortions and irregularities will tend to affect the accuracy of our cost-comparisons, they will not completely vitiate our general conclusions. The resultant findings should, therefore, be regarded as nothing more than roughly indicative of general tendencies.

We have for the purpose of our enquiry, selected the Cotton-Mill Industry of Ahmedabad for the simple reason that the conditions prevailing there are more uniform and homogeneous for inter-comparison than those in any other centres of the industry. Almost all the units working there are equipped with ring-spindles, and are more or less self-sufficing in character. The methods of promotion, finance and management, too do not show significant variations, as the industry is manned and managed entirely by local talent. The greater degree of uniformity in the environmental conditions will, therefore, lend greater accuracy to our cost-comparisons and will reveal more distinctly the existing tendencies.

The Table on the next page shows the long period cost of production in industrial units of Ahmedabad. The period selected for our study is from 1930-39, and the cost of productions has been expressed as percentage of the Value of Goods Produced.

The Table roughly indicates the general trends towards optimum-size. Firms with lower cost of production seem to be nearer their optimum-size than those whose costs are relatively higher. It is of course difficult to say whether the units with lowest costs have reached their optimum-size or are still below or above their optimum-level. All that one can say is that they must be very close to their optimum-size since their costs are lowest. Another interesting fact which the Table reveals is that the interaction of the technical, financial, managerial and marketing forces instead of securing one optimum-size has often the effect of bringing about a number of optima at various stages in the evolution of that industry. While some units like Vijai, Ajit, Nagri and Nutan are struggling to reach their

Table LX

LONG PERIOD AVERAGE COSTS OF 20 COTTON-MILLS IN AHMEDABAD

		1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	Long Period Average Costs.
1.	Bharat Suryodaya ..	..	..	..	100	95	97	102	98	101	..	99
2.	Kalyan ..	..	..	103	95	93	104	107	103	100	104	101
3.	Patell	105	95	98	100	97	98	96	98	100	98	99
4.	Bhalakia ..	94	94	92	95	95	95	99	94	95	95	95
5.	Bihari ..	..	..	..	99	93	98	99	96	100	100	98
6.	Harivallabhdas ..	95	95	95	97	99	102	102	96	98	99	98
7.	Vivekananda ..	94	93	95	96	97	102	91	93	92	..	95
8.	Himabhai ..	102	91	93	..	97	100	108	..	100	100	99
9.	Nagri	96	94	94	97	95	97	99	97	93	94	86
10.	Rustom ..	99	93	94	102	99	96	..	101	102	99	98
11.	National ..	85	84	84	91	93	105	107	100	100	..	94
12.	Monogram ..	97	93	92	99	99	100	100	98	97	99	97
13.	Vijai	..	99	90	91	94	95	95	94	90	93	93
14.	Vikram ..	94	89	91	98	95	95	95	96	95	94	93
15.	Lalbhai ..	..	89	89	94	88	93	88	93	95	94	91
16.	Shorrock ..	91	85	87	98	93	..	97	97	87	96	92
17.	Asoka ..	89	82	82	93	94	100	92	94	94	97	92
18.	Aruna ..	95	88	89	92	93	93	92	88	94	91	92
19.	Arvind ..	..	..	..	..	..	..	85	84	83	81	83
20.	Calico ..	87	93	85	86	86	87	80	86	85	85	87

optimum-size at a very small scale of output, viz., 20 to 25 thousand spindles, other units like Calico, Arvind and Ambica are still trying to expand their scales of output so as to reach their optimum-size.

If this inference is correct, it suggests another reflection. If, in practice, firms continue to prosper or to suffer on a widely different scales of output and equipment, it is not because there is no optimum-size" for the industry, but because firms reach their optimum-size at different scales of output. This is why we find in practice that success is not necessarily conditioned by a particular size only. The fact that units are able to secure the lowest costs at different scales of output clearly reflects that there exists not one but many optimum points in the industry.

APPENDIX I

A LIST OF EVIDENCES SUBMITTED TO THE TARIFF BOARD REGARDING THE "ECONOMIC-SIZE" OF A COTTON-MILL IN INDIA

1927

1. A mill should have at least 30,000 spindles and 1,000 looms to ensure efficient and economical working.

—Bombay Millowners' Association

2. In our opinion a mill having 25,000 spindles and 600 looms is considered to ensure efficient and economical working in Ahmedabad.

—Ahmedabad Millowners' Association

3. I would not make any investment in a mill with less than 1000/1200 looms and 45,000-50,000 spindles to ensure efficient and economic working.

—M. H. Manek

4. A fair-sized mill is one with 1,000 looms and 45,000 spindles.

—P. A. Baptista

5. A mill should have 40,000 spindles and 1,000 looms to ensure economical working.

—C. M. Gupta, Bombay

6. I consider a mill between 25 to 35 thousand spindles and 600 to 800 looms ensures the most economical and efficient working.

—G. N. Iyer

1932

1. "A Mill spinning average 40s counts and using the whole of it's yarn produce in weaving cloth should have 40,000 spindles

and about 1,000 looms to ensure efficient and economical working.

—Bombay Millowners' Association

2. We consider a mill with 25,000 spindles and 6,000 looms to be one of economic-size.

—Ahmedabad Millowners' Association

3. We consider a mill with 30,000 spindles and 750 looms to be one of economic-size.

—Delhi Cloth and General Mills Co., Ltd.

4. We consider 20,000 spindles and 500 looms will be a reasonable economic-size in India.

—Maharaja Mills Co., Ltd

5. A mill of 750 looms and 30,000 spindles may be said to be the minimum-size for a mill which ought to pay under normal circumstances. It is difficult for smaller mills to run profitably.

—Bengal National Chamber of Commerce

INDIAN TARIFF BOARD'S VIEWS

1932

"We have, except in case of Ahmedabad Mills, accepted as a reasonable economical standard a capacity corresponding to not less than 1,000 looms and 35,000 to 40,000 spindles."

Chapter VII

THEORY OF INDUSTRIAL LOCATION

I

The question whether industrial units are located at a place which can secure the maximum economies of production and distribution is of great practical significance. For unless the individual units are so located that the cost of production tends to be as low as possible, the efficiency of the industry and its competitive power will be adversely affected. It is, therefore, of fundamental importance that we should first study and examine the principles that govern industrial location, and then in the light of the same consider whether the present distribution of Cotton-Mill Industry in India is conducive to the attainment of maximum efficiency. A systematic exposition of the theory of industrial location is of vital importance both for explaining the fundamental framework of industrial orientation and for formulating a correct policy of locational planning.

II

Although attempts were made by earlier writers like Sonnenfield, Busch, Roscher, Ross, Frenchman Maunier, Launhardt and others to formulate a systematic theory of industrial location, they could not go beyond the elemental stage of enumerating the various factors which affect the location of industries. The English economists, too, have neglected a strictly theoretical analysis of the problem of location, for in their discussion, the problem of location only emerged incidentally while dealing with rent. It was Alfred Weber,[1] a German economist, who for the

1. Alfred Weber: Theory of Location of Industries (English edition, with introduction and notes by C. J. Friedrich, Ph. D.) Chicago, 1929.

first time worked out a comprehensive and systematic theory of location of manufacturing industries. His theory is based on the critical study of different factors which pull an industry towards different geographical regions and which determine the fundamental framework of industrial orientation.

Weber's Theory, although it has stimulated much research and provoked critical discussion, has not provided a definitive solution to the problem of industrial location. It has been severely criticised for many of its unreal assumptions, oversimplified argumentation and abstract reasoning. Oskar Englander[2] and Werner Sombart[3] have disputed the theory of 'transport orientation' and 'labour orientation,; Andreas Predohl[4] and Ritsh have characterized Webers' theory as 'abstract' and 'unrealistic.' while S. R. Dennison[5] and Florence Sargant[6] have attributed to it all the limitations, characteristic of a deductive approach. But all these criticisms have been constructive, and have helped the formulation of a more dynamic and realistic theory of industrial location.

But despite all the criticisms and limitations Weber's theory has been taken as the starting point for further study of the theory of industrial location. We shall, therefore, briefly examine the fundamental implications of Weber's analysis, and also study the various adaptations and modifications suggested to render it more useful for practical application.

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1. Oskar Englander : Theorie des Guterverkehrs under Fsachtasatize, p. 121.
2. Werner Sombart : Auchiv For Sozialwissenschaft und Sozialpolitic, p. 784.
3. Andreas Predohl : Theory of Location and General Economics. The Journal of Political Economy (1928) Vol. 36 pp. 371-390.
4. S. R. Dennison : Theory of Location of Industry, The Manchester School, Vol. III, No. 1.
5. Sargant Florence : Economic Research and Industrial Policy, The Economic Journal, December, 1937.

III

WEBER'S DEDUCTIVE APPROACH: AN ANALYSIS:

Weber attempts to discover, by investigation and analysis, those factors which determine the fundamental framework of industrial orientation. After studying the cost-structure of different industries he discovers the operation of certain general factors which influence the location of manufacturing industries. He divides these general factors into two distinct categories, those which are primary causes of the regional distribution of industry, and those which are secondary causes of the redistribution of industry. Those which fall in the first category have been designed as "Regional Factors" and those in the second category as "Agglomerating and Deglomerating" Factors. It is only the regional factors that exert a dominating influence on the location of the industry, and create the first basic framework of industrial orientation. The other locational factors such as the advantages derived from the initial concentration of the industry in a particular area, availability of banking, insurance and marketing facilities or disadvantages of high rents in congested areas only explain the "agglomerative" or "deglomerative" tendencies within those regions. These locational factors are, therefore, of secondary importance.

Weber deductively finds two regional factors of location : transportation costs and labour costs, and also analyses the effect of change in both variables. For systematic exposition of his theory he starts with certain simplifying assumptions. Firstly he ascertains the laws determining the location when labour costs are constant and then he proceeds to ascertain the alterations, resulting from varying costs of labour. Weber succeeds in formulating certain definite rules. The general pattern of location will at first be at the most advantageous (optimal) point of transporatation costs. Any deviation from such a point of orientation may be caused by lower labour costs in other regions. Weber thus "gains the conception of a fundamental orientation of industry according to costs of transportation, and of an alteration of this fundamental orientation by "labour locations" (Arbeitsplatze). Further deviation may be caused by "Agglomerating" factors. Thus the two deviating tendencies, viz., labour and agglomeration tend to alter the basic framework of transport orientation. On the basis of these three general factors Weber constructs his whole theory of locational dynamics.

Weber then worked out the theory of transport orientation. The two basic elements which determine transport orientation costs are the weight to be transported and the distance to be covered. Since these two factors are capable of quantitative measurement they provide a definite basis for an abstract theory. Of course there are other factors too, like the type of transportation system, nature of the region and the quality of goods transported, which influence transportation costs,but since their influence is ultimately reflected in the two predominant factors, weight and distance,[1] Weber disregards them for theoretical reasoning. He then examines how these two factors influence the orientation of the industry. Every industry will at first be drawn to those locations which have the most favourable transport relations both with regard to the sources of raw materials and markets. The relative attraction of raw materials and markets will depend upon two conditions, namely, the type of raw materials used and the nature of their transformation into products. Raw materials, may be classified either

1. Weber's concept of 'distance' was fundamentally different. Geographical distances, he thought, should not be measured by their geographical distances, but in proportion to the decreasing rate-scale. Developing this idea further Ohlin opines that it is the transport relations and not mere geographical distance relations, that have economic significance.

as "ubiquities" or "localized" materials.[1] Ubiquities like water or brickclay are available everywhere, while localized materials like coal, wood pulp or iron are available only in geographically well-defined localities. Obviously the latter possess greater attracting power than the former. Again, the localized materials may behave in the process of production either as "pure materials" or as "gross-materials." The "pure materials" like cotton or wool imparts whole or bulk of its weight to the final product ; the "gross materials" like coal or iron none or only a part of it. Evidently the latter which are called "weight losing materials" will exert a greater influence on the location of the industry than the former.

On the basis of these simple deductions, Weber frames his laws of transport orientations. The location of manufacturing industries is determined (transport cost being variable, labour costs constant) by the ratio between the weight of the localized materials and the weight of the final product. This ratio Weber calls "the Material Index." If this material index is greater than one, production is attracted to the places of deposit, if less it lies at the centre of consumption. It follows, therefore, that "pure materials" whose material index is negligible can never bind production to their deposits, while "weight-losing" materials, like coal or iron, tend to attract production to their deposits, Next, the relation between weight of localized materials to ubiquitous materials has also to be considered. If ubiquitous materials add to the weight of the final product, production is attracted towards the places of consumption. It is thus the proportion of the weight of ubiquities used to the weight losses of

1. Ubiquities may be either "absolute ubiquities" or "relative ubiquities". Cotton may be a ubiquitous commodity for Southeast American or West Berar or Khandesh but not for the world at large.

localized materials that provides the basic answer whether the point of lowest transport cost lies at the place of consumption or material deposits anywhere within the locational figure.

Industry may deviate from the point of minimum transportation costs to more favourable labour locations. But such deviation will take place only if the additional cost of transportation is compensated or more than compensated by the economy in labour cost. The potential attracting power of labour location depends on two basic factors ; firstly on the ratio of labour cost of the manufacturing industry to the weight of the product: this he calls Labour Cost Index, and secondly on the weight to be transported during the whole process of production : this he calls "Locational Weight." The extent of deviation caused by the varying labour costs can thus be determined by the ratio of the labour cost to the locational weight : this he calls its "Labour Coefficient." On the basis of this analysis, Weber formulates his laws of labour orientation. When labour costs are varied, an industry deviates from its transport locations in proportion to the size of its labour coefficient.

Further deviation from the point of minimum transportation costs may be caused by the advantages of agglomeration. They thus provide an alternative attraction for manufacturing industries. But such a deviation can be economical only if the advantages derived from agglom-locations exceed the additonal cost of transportation. The power of agglom-locations to attract industry depends on two factors, namely, the ratio of manufacturing costs to the final weight of the product ("Index of Manufacture"), and on the total weight to be transported during the whole process of production ("Locational Weight"). The extent of agglomeration can be measured by the "Ratio of Manufacturing Costs to Location Weight".

This ratio Weber calls "Coefficient of Manufacture" or "Value added through manufacture per locational ton." On the basis of the foregoing analysis Weber formulates his laws of agglom-locations : "Industries with high coefficient of manufacture show strong tendencies to agglomerate ; industries with low coefficient of manufacture show weak tendencies to agglomerate ; and these tendencies are inherent in their nature."[1] It follows, therefore, that industries having a high proportion of manufacturing expenses in their total costs of production have a strong tendency to move towards agglom-locations. Thus there seems a remarkable analogy between laws governing labour orientations and agglom-orientations.

This is a brief and simplified account of what Weber calls the "pure theory" of industrial location. In the rest of his analysis, Weber examines his "realistic theory" based on the study of locational distribution of German industries and the general trends of economic evolution elsewhere. He comes to the conclusion that the kind of industrial location which we have today is not entirely explained by the "pure" rules of location, and therefore, is not purely economic. It should be viewed in the light of historical and social setting.

IV

CRITICISM OF WEBER'S ANALYSIS :

The fundamental criticism against Weber's Theory of Industrial Location is that his deductive analysis cannot explain the concrete reality. That aspect of industrial location which is the result of historical and social factors cannot be explained in terms of "mathematical formula" or certain scientific "laws" framed by deductive reasoning. The deductive

1. Alfred Weber : Theory & Location of Industries (English Edition) Chicago, 1929 p. 166.

Provinces.		PERCENTAGE DISTRIBUTION OF			
		Spindle-age.	Loom-age.	Workers	Raw-Cotton.
Rajputana	..	1.24	1.45	1.61	1.77
Berar	..	0.66	0.72	0.76	0.79
C. P.	..	2.91	2.62	3.64	2.92
Bihar	..	0.25	0.36	0.30	0.12
Hyderabad	..	1.17	1.21	1.57	1.44
Central India	..	3.91	5.48	5.42	5.61
Bengal	..	4.62	5.55	5.42	3.48
Punjab	..	1.10	1.39	1.21	1.79
Delhi	..	1.10	1.66	1.29	2.18
United Provinces	..	7.52	6.05	6.80	8.48
Madras Presidency		15.24	3.80	13.42	13.92
Travancore	..	0.13	0.16	0.14	0.09
Mysore	..	1.58	1.40	2.19	1.93
Pondicherry	..	0.82	0.97	1.13	0.72
Total	..	100.01	100·00	100.00	99.99

Whichever standard of measurement we employ, the regional disparities in the distribution of the industry are quite obvious. The distribution of spindleage shows that the Bombay Presidency contained 57.76 per cent of the spindles installed in India, Madras 15.24, U. P. 7.52, Bengal 4.62, Central India 3.91, C. P. and Berar 3.57, and the others contain a relatively very small share. The distribution of loomage shows that not less than 67.18 per cent of looms were localized in the Bombay Presidency, while Madras contained only 3.80, U. P. 6.05, Bengal 5.55, Central India 5.48, C. P. and Berar 3.34 per cent of the looms installed in India. The distribution of workers and cotton-consumed show equally the glaring regional disparities in localization, and the predominant position of Bombay Presidency. Bombay City and Island also contained more than one-fourth of the number of spindles and a little less than one-third of the number of looms installed in India while Ahmedabad contained a little over one-sixth and one-fifth of the spindles and looms installed in India. Another significant feature of localization is the character and composition of spindle and loom activity in different Provinces and States. While Madras contained about 15.24 of the spindles installed in India, its share in the total loomage was only 3.80. This is because the Cotton-Mill Industry in Madras is predominantly spinning in character. On the other hand, Bengal has a larger share in weaving than in spinning. Outside Madras and Bengal the industry is fairly well balanced.

The full significance of the nature and extent of localization cannot be realized unless it is considered in relation to the distribution of population or the size of the various regions. For, although States like Mysore or Provinces like Delhi or Ajmer-Merwara may have a very small percentage share in the total distribution of the industry, yet, if considered in relation to size of the province and the population, it has a share larger than that of the other provinces and states. For correct measurement of localization it is essential that we should compute the "location factor" for each Province and State, and judge whether it has a larger or smaller share in the distribution of the industry than warranted by its share in the total population.

The following Table gives the "Location Factor" of the Cotton-Mill Industry for different Provinces and States:

Table LXVI

LOCATION FACTOR, 1946.

Provinces and States.	Percentage of popula-tion 1941. P	Percentage of workers in Cotton-Mill Industry 1946. I	Location Factor. 1946. $\frac{I}{P}$
Bombay Presidency	8.4	55.14	6.56
Madras Presidency	14.8	13.42	0.91
U. P.	14.1	6.80	.48
Bengal	15·5	5.42	0.35
C. P. and Berar	4.3	4.40	1.02
Punjab	7.3	1.21	0.17
Delhi	0.2	1.29	6.45
Bihar	9.4	0.30	0.03
Rajputana	3.6	1.61	0.45
Mysore	1.9	2.19	1.15
Hyderabad	4.2	1.57	.37
Central India	1.9	5·42	2.85

The Table shows the regional disparities in the localization of the Cotton-Mill Industry. The Provinces of Bombay, Delhi, Ajmer-Merwara and the States of Baroda and Central India have a larger share in the distribution of the Cotton-Mill Industry than is warranted by their share in the total population. Madras, C. P. and Berar, and Bombay States have what may be called a fair share in the distribution of the industry. Other Provinces and States particularly the Punjab, Bihar, Bengal and Rajputana States have relatively very small share in the distribution of the industry, while Provinces like

Assam, Orissa, N.-W. F. P. and Baluchistan have no share at all.

We have discussed at some length the nature and character of the present localization. It shows certain characteristic features. The industry is unevenly distributed not only absolutely but also in relation to the distribution of population. The industry is predominantly concentrated in two important industrial centres, viz., Bombay and Ahmedabad which together contain a little less than half the number of spindles and about half the number of looms installed in the Cotton-Mill Industry of India, and produce about 40 per cent of the total yarn and a little over 50 per cent of the woven goods manufactured in India. The other centres of the industry are of relatively smaller importance.

We shall now study how the present distribution of the Cotton-Mill Industry in India can be explained in the light of the theoretical analysis.

III

THEORY OF LOCALIZATION AND THE COTTON-MILL INDUSTRY

The most dominating factor in the location of an industry is the "transport" relation of a centre in regard to raw-materials, power and market. The relative attraction of these factors depends on two conditions, namely, the nature and character of the raw-materials used, and their transformation into products. Raw-cotton may be considered as almost a "pure" material for it imparts bulk of its weight to the final product. There is not much difference between the weight of the raw-cotton and that of the finished product. To use Weber's terminology, the industry has a "material index" not much greater than one.[1] Obviously it cannot bind industry

1. Alfred Weber: Theory of Location of Industries, p.61.

to its places of production. If we look at the map, we shall find that while there is a wide distribution of raw-cotton in Bombay Presidency, Central Provinces and Berar, Hyderabad, Central India, Madras, Punjab, Sind, parts of United Provinces and Rajputana, the Cotton-Industry of India is localized mainly in four or five industrial centres. Similarly in the United States, while the main cotton-belt lies across the Southern States of North and South Carolina, Georgia and Alabama, the production was carried on till recently almost exclusively in the New England States (particularly in Massachusetts and Rhode Island).[1] This fact points out that the location of the Cotton-Mill Industry is not conditioned by the availability of the raw-materials in the neighbouring regions. The industry has even prospered in countries like Great Britain and Japan, which do not grow raw-cotton at all.

Secondly, it must be remembered that in the textile industries the cost of transportation is so small that raw-material and finished product can go very great distances with very little addition to total costs.[2] Water transport is particularly cheaper compared to land transport and hence those centres which have access to sources of raw-materials and markets either by sea or through inland waterways command special 'transport' relation. To cite an interesting example, the freight for cotton from India to Japan was 4.56 yen per bale subject to a discount of 1.40 yen per bale to Japanese spinners. This worked out at 2 pies per pound. The freight on piecegoods from Japan to India was 14.5 yen per ton less a discount of 10 per cent. which worked out at 2.1 pies per pound. The total freight on both raw-cotton and piecegoods thus amounted to 4.1 pies per pound, which it may be noted, is the railway

1. Report of the I. L. O. on the World Textile Industry—Its Economic and Social Problems, p. 113.

2. Dr. P. S. Lokanathan: Industrial Organization in India, p. 61.

freight on piecegoods alone per pound from Bombay to Sholapur.[1] Again, the freight rates charged on cotton piecegoods from Manchester to Bombay, Calcutta or Karachi is 42s. 6d. per ton of 40 c.ft. This works out at about Re. 1 per maund, which rate is much lower than that charged by rail from Bombay to Ahmedabad.[2] These facts serve to reflect that it is not the proximity of raw-materials or markets but the "transport relations" that are of real economic significance.

Thirdly, the cotton-industry has better chances to prosper in a big and organized assembling market of cotton than in the region of production of any particular variety of cotton.[3] This is partly because of the wider choice of selection of raw-cotton and partly because of the regularity and reliability of its supply throughout the year. Since mixing of several varieties of cotton is essential to give additional strength, texture and fineness to the yarn, such big and organized markets no doubt possess some decisive advantage over others.

The cost of power is also an important factor in the location of the cotton-mill industry. It has been estimated that in the production of cloth of medium counts, the cost of power and fuel forms about 8 to 16 per cent of the total works cost.[4] As such, those centres which command favourable 'transport' relations in regard to power resources have better chances to attract the industry than those centres which are not so favourably located. One of the factors that has retarded the development of the cotton-mill industry in the Punjab is the lack of

1. Report of the Tariff Board on Cotton Textile Industry, 1927, Vol. I, p. 53.
2. Report of the Tariff Board on Cotton Textile Industry, 1932. Vol. I (Evidences), p. 127.
3. Dr. P. S. Lokanathan: Industrial Organization in India, p. 60.
4. Indian Tariff Board Report on Cotton Textile Industry, 1932, p. 98.

coal or any other equally good source of motive power to supply the needs of the industry. On the contrary the extraordinary development of the spinning industry in Coimbatore, Madura and Tinnevelly in recent years may largely be attributed to the completion of Pykara Hydro-electric Project. The development of new sources of power specially, hydro-electricity and oil has consideraby broken down the hegemony of coal deposits as a location factor, and has rendered power a less important, but nevertheless an indispensable factor in industrial location.

The influence of consumers' market on the location of the industry depends on two factors, namely, the nature of the finished products and their transportability, and character and size of the consumers' market. Although cotton piecegoods, like raw-cotton, can be carried over long distances without any appreciable increase in the total costs, the existence of consumers' market in close proximity, gives the industry some decisive advantage. This advantage is likely to be great if the consumers' markets are larger in size and relatively more concentrated. For a large and concentrated market, like Bombay, Delhi or Calcutta, with high spending power per square mile of area (high market density) can secure greater economies of production and distribution than a moffusil town or a rural area. Further, a large and concentrated market has better access to other productive factors such as labour, capital and organization, and also provides greater opportunities to consumers, traders and producers for closer personal contact. All these factors have tended to increase the relative influence of consumers' market on the location of the industry.

These three factors, raw-materials, power and consumers' market will determine the most advantageous or "optimal" point of transportation costs, and determine the basic framework of industrial orientation.

IV

TRANSPORT-ORIENTATION AND THE INDIAN COTTON-MILL INDUSTRY

We shall now study how far the present distribution of the cotton-mill industry of India is based on the transportational framework of the country and see whether the principal manufacturing centres of the industry command the most "favourable transport" relations in regard to raw-materials, power and markets. Owing to the great paucity of statistical data such a study cannot be very exhaustive. Nevertheless it will throw some light on the comparative advantages of different centres.

The localization of the industry in the Bombay City and Island was largely the result of its excellent transport relations in regard to raw-materials and consumers' markets. Owing to its insular position, it enjoyed the advantages of cheap sea freights on her import of machinery, mill-stores and other accessories and on her export of yarn to China market. Further, Bombay, being the important junction of main railways, was also well connected with the interior markets of raw-cotton and piecegoods. The policy of the railways to charge lower freight-rates from and to the ports increased the 'transport' advantage of Bombay over other inland towns. The cumulative effect of the operation of all these factors was that Bombay became a leading centre of textile production. Even up to the beginning of the twenties Bombay Island contained about half the number of spindles and looms working in India.

But with the progressive loss of yarn market in China, the emphasis on foreign market shifted to internal piecegoods market. The high cost of land transport and the enormous distance of contry in accordance with the principles of strategy.[1] With Wars still on the horizon, the need for decentralization should no longer be ignored.

Recent advances in Technology have considerably changed the physical basis of industrial location and have strengthened the case for dispersal of industries. The substitution of electricity for steam and new possibilities of electric transmission of power have opened up vast potentialities for the development of industries in regions that are not supplied with coal. The application of atomic energy to industrial uses may almost revolutionize the productive technique and fundamentally alter the basis of industrial orientation. Further mechanization of the industry and the introduction of the schemes of ratonalization and scientific management may considerably reduce labour costs, and thus lessen the attracting power of labour locations. The development of synthetic substitutes may serve to overcome the deficiency of certain 'basic' raw-materials. All these tendencies reveal the fact that the influence of raw-materials, labour and power is relatively declining and that of markets gaining ground in recent years. These changes may help to bring about a wider dispersal of industrial activity.

The foregoing analysis shows that the factors determining location are so numerous and so complex that it is difficult to encompass them in some simple and intelligible analysis. Economic factors undoubtedly exert a most dominating influence on the location of an industry. But in recent years the exigencies of defence and advances in Technology are tending to bring about a more even distribution of industrial activity. These developments will have a far-reaching influence on the future of industrial location.

1. P. E. P. Report on the Location of Industries in Great Britain, p. 178.

Chapter VIII

LOCATION OF COTTON-MILL INDUSTRY IN INDIA

I

In the light of the theory of industrial location we shall now study and examine the present distribution of Cotton-Mill Industry in India. It is a significant fact that the location of an industry is not entirely the result of the operation of economic forces; it may be the consequence of many "historical accidents" and other extraneous factors, which may be quite irrelevant to the industry itself. To cite some interesting examples, "Mr. Ford started to manufacture motor cars in Detroit, because it was his home town. Sir William Morris (now Lord Nuffield) selected Cowley because the school in which his father was educated happened to be for sale."[1] Similarly the cotton-textile industry first settled in Lancashire for no particular reason except that the woollen industry was already there, that foreigners were kindly received and that Manchester was not a corporation.[2] In Cawnpore also, the first Cotton-textile mill was established for no specific reason except that Mr. Hugh Maxwell, one of the chief promoters and directors of the Mill happened to own large estates in Cawnpore District, and other Directors were members of the Cawnpore Cotton Committee, a newly-formed association to meet the clothing requirements of the army.[3] All these examples serve to reflect that the location of an industry is not wholly governed by economic considerations. Al-

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1. E. A. G. Robinson : The Structure of Competitive Industry, p. 152.
2. Board of Trade quoted from Royal Commission on the Distribution of Industrial Population in Great Britain, 1940. p. 151.
3. Sir J. P. Srivastava : The Textile Industry in the United Provinces.

though it may be that those very 'fortuitous' locations may subsequently acquire the advantages of 'early start' and may become the centres of industrial activity, it can hardly be admitted that the initial concentration of the industry in these areas was the result of strictly economic calculus. In so far as the present distribution is the result of such non-economic factors, it cannot be wholly explained in the light of theoretical analysis. The treatment must be to some extent historical and descriptive.

We shall, therefore, find out, by investigation and analysis, the nature and character of present distribution, and also explain how far it has been the result of the economic factors, and how it has been conditioned by "historical circumstances" and other factors of non-economic significance.

II

NATURE AND CHARACTER OF LOCALIZATION

We shall first examine, as critically as possible, the nature and character of the present distribution. Table LXIV shows the Regional Distribution of Industrial Units in the Cotton-Mill Industry of India. This Table suggests some characteristic features of the present distribution. Firstly the units are very

Table LXIV

DISTRIBUTION OF INDUSTRIAL UNITS IN THE COTTON-MILL INDUSTRY OF INDIA—1946.

Place of Location.	No. of Industrial units.	CHARACTER OF INDUSTRIAL UNITS. Spg.	Wvg.	Combined.	Total.
Bombay Presidency					
(i) Bombay City	..	2	..	51	53
(ii) Ahmedabad	..	5	..	62	67

Place of Location.	No. of Industrial units.	CHARACTER OF INDUSTRIAL UNITS. Spg.	Wvg.	Combined.	Total.
(iii) Sholapur	..	..	..	5	5
(iv) Rest of Bombay Prov.:					
Barsi	3				
Broach	2				
Jalgaon	2				
Bhiwandi	2				
Surat	2				
Hubli	1				
Gokak	1				
Amalner	1				
Dhulia	1				
Nadiad	1				
Chalisgaon	1				
Poona	1				
Gadag	1				
Budhagaon	1				
Tikkerwadi	1				
Viramgam	1				
(v) Baroda State:					
Baroda City	5				
Kalol	3				
Petlad	3				
Sidhpur	3				
Billimoria	1				
Nadol	1				
Khadi	1				
		14	7	39	60
(vi) Rest of State Territory:					
Bhavnagar	2				
Sangli	2				
Jamnagar	2				
Bhor State	2				
Porbandar	1				

Place of Location		No. of Industrial units.	CHARACTER OF INDUSTRIAL UNITS. Spg.	Wvg.	Combined.	Total.
	Cambay	1				
	Kolhapur	1				
	Wadhwan	1				
	Rajkot	1				
	Wankaner	1				
	Morvi	1				
	Mahuva	1				
	Miraj	1				
	Kutch	1				
	Ichalkaranji	1				
Rajputana						
	Beawar	3				
	Bhilwara	2				
	Kishengarh	1	1	..	8	9
	Pali	1				
	Bijainagar	1				
	Kotah	1				
C. P. and Berar						
	Nagpur	2				
	Wardha	3				
	Akola	2				
	Burhanpur	1	..	..	11	11
	Amraoti	1				
	Badnera	1				
	Rajnandgaon	1				
Bihar						
	Patna	1	..	..	2	2
	Gaya	1				
Hyderabad						
	Elchigudda	2				
	Aurangabad	1				
	Warrangal	1	..	..	6	6
	Gulburga	1				
	Nanded	1				

Place of Location.		No. of Industrial units.	Character of Industrial units. Spg.	Wvg.	Combined.	Total.
Central India						
	Indore	7				
	Gwalior	2				
	Ujjain	3	2	..	13	15
	Ratlam	1				
	Bhopal	1				
	Dewas Junior	1				
Punjab						
	Lahore	2				
	Bhiwani	2				
	Amritsar	1	1	..	7	6
	Okara	1				
	Lyallpur	1				
Delhi		4	1	..	3	4
United Provinces						
	Cawnpore	12				
	Agra	4				
	Hathras	3				
	Aligarh	1				
	Ujhani	1				
	Benares	1	9	3	15	27
	Lucknow	1				
	Moradabad	1				
	Allahabad	1				
	Mirzapur	1				
Mysore						
	Bangalore	5				
	Mysore	1	1	2	5	8
	Subramanyapura	1				
	Devangere	1				
Bengal			3	10	18	31
Madras			42	4	12	58
Travancore			...	..	2	2
Pondicherry					3	3

unevenly distributed between different Provinces and States. About half the number of industrial units are located in Bombay Presidency alone. The other Provinces like Bihar and Orissa, Punjab, C. P. and Berar, Bengal, United Provinces, and Delhi have a relatively very small share. Similarly, while some of the States like Baroda, Indore, Gwalior and Mysore have a fairly large share in the distribution of the Cotton-Mill Industry, the other States, particularly those in the Punjab, Rajputana. Central Provinces and Orissa have a relatively very small share in the distribution of the industry. Secondly, even within the Provinces and States, the industry is localized within certain regions, almost to the complete exclusion of the others. For example in Madras, the industry is mainly localized in the districts of Coimbatore, Madura and Tinnevelly, while other districts like Godavari, Nellore, Vizagapatam, Chittoor, Cuddapah and Tanjore have a relatively very small share in the distribution of industry. Similarly in the United Provinces, the industry is localized in the Western districts of Agra, Aligarh, and Cawnpore, almost to the complete exclusion of the Eastern Districts. In Bengal, units are mostly located in the Districts of Dacca, Hooghly, 24-Perganas and Khulna. Thirdly, Cotton-Mill Industry of India is predominantly localized in a few important industrial centres, like Bombay, Ahmedabad, Cawnpore, Coimbatore, Delhi, Sholapur, Baroda and Indore. Leaving these centres, there is no other city in India which has five or more than five cotton-mills. And lastly, the localization of purely spinning and weaving units show some characteristic features. Most of the spinning units are located in the heart of the cotton-growing districts. Only 6 or 7 units out of the total of 81 are located outside the cotton-growing tracts. It is mainly because in the spinning of yarns, the cost of raw-material accounts for about four-fifths of the total costs. Proximity of raw-material is, therefore, an important factor in the localization of the spinning industry. Most of the weaving units, on the other hand, lie outside the cotton-growing regions.

Mere enumeration of industrial units cannot give us a true indication of the nature and character of localization. The differences in the size and structure of the industrial units may be so great that they may fail to reflect correctly the regional disparities in the distribution of the industry. It is, therefore, essential that the distribution of productivity in an industry should also be measured by other criteria, viz., size of the technical equipment, the number of industrial workers employed, and the total quantity of raw-cotton consumed in each region.

Table LXV shows the intra-regional Distribution of Spindleage, Loomage, Industrial Workers and Cotton-Consumed in the Cotton Mill Industry of India for the year 1946. The Table suggests the same characteristic features of localization.

Table LXV

INTRA-REGIONAL DISTRIBUTION OF INDUSTRIAL UNITS IN THE COTTON-MILLS INDUSTRY OF INDIA

1946

Provinces	PERCENTAGE DISTRIBUTION OF			
	Spindle-age	Loom-age	Workers	Raw-Cotton.
Bombay City ..	27·49	32·53	25·79	29·94
Ahmedabad ..	17·72	21·40	15·41	13·32
Rest of Bombay Prov.	12·55	13·25	13·94	11·44
Total ..	57·76	67·18	55·14	54·75

Provinces.	PERCENTAGE DISTRIBUTION OF			
	Spindle-age.	Loom-age.	Workers	Raw-Cotton.
Rajputana ..	1.24	1.45	1.61	1.77
Berar ..	0.66	0.72	0.76	0.79
C. P. ..	2.91	2.62	3.64	2.92
Bihar ..	0.25	0.36	0.30	0.12
Hyderabad ..	1.17	1.21	1.57	1.44
Central India ..	3.91	5.48	5.42	5.61
Bengal ..	4.62	5.55	5.42	3.48
Punjab ..	1.10	1.39	1.21	1.79
Delhi ..	1.10	1.66	1.29	2.18
United Provinces..	7.52	6.05	6.80	8.48
Madras Presidency	15.24	3.80	13.42	13.92
Travancore ..	0.13	0.16	0.14	0.09
Mysore ..	1.58	1.40	2.19	1.93
Pondicherry ..	0.82	0.97	1.13	0.72
Total ..	100.01	100·00	100.00	99.99

Whichever standard of measurement we employ, the regional disparities in the distribution of the industry are quite obvious. The distribution of spindleage shows that the Bombay Presidency contained 57.76 per cent of the spindles installed in India, Madras 15.24, U. P. 7.52, Bengal 4.62, Central India 3.91, C. P. and Berar 3.57, and the others contain a relatively very small share. The distribution of loomage shows that not less than 67.18 per cent of looms were localized in the Bombay Presidency, while Madras contained only 3.80, U. P. 6.05, Bengal 5.55, Central India 5.48, C. P. and Berar 3.34 per cent of the looms installed in India. The distribution of workers and cotton-consumed show equally

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the glaring regional disparities in localization, and the predominant position of Bombay Presidency. Bombay City and Island also contained more than one-fourth of the number of spindles and a little less than one-third of the number of looms installed in India while Ahmedabad contained a little over one-sixth and one-fifth of the spindles and looms installed in India. Another significant feature of localization is the character and composition of spindle and loom activity in different Provinces and States. While Madras contained about 15.24 of the spindles installed in India, its share in the total loomage was only 3.80. This is because the Cotton-Mill Industry in Madras is predominantly spinning in character. On the other hand, Bengal has a larger share in weaving than in spinning. Outside Madras and Bengal the industry is fairly well balanced.

The full significance of the nature and extent of localization cannot be realized unless it is considered in relation to the distribution of population or the size of the various regions. For, although States like Mysore or Provinces like Delhi or Ajmer-Merwara may have a very small percentage share in the total distribution of the industry, yet, if considered in relation to size of the province and the population, it has a share larger than that of the other provinces and states. For correct measurement of localization it is essential that we should compute the "location factor" for each Province and State, and judge whether it has a larger or smaller share in the distribution of the industry than warranted by its share in the total population.

The following Table gives the "Location Factor" of the Cotton-Mill Industry for different Provinces and States:

Table LXVI

LOCATION FACTOR, 1946.

Provinces and States.	Percentage of population 1941. P	Percentage of workers in Cotton-Mill Industry 1946. I	Location Factor. 1946. $\frac{I}{P}$
Bombay Presidency	8.4	55.14	6.56
Madras Presidency	14.8	13.42	0.91
U. P.	14.1	6.80	.48
Bengal	15·5	5.42	0.35
C. P. and Berar	4.3	4.40	1.02
Punjab	7.3	1.21	0.17
Delhi	0.2	1.29	6.45
Bihar	9.4	0.30	0.03
Rajputana	3.6	1.61	0.45
Mysore	1.9	2.19	1.15
Hyderabad	4.2	1.57	.37
Central India	1.9	5·42	2.85

The Table shows the regional disparities in the localization of the Cotton-Mill Industry. The Provinces of Bombay, Delhi, Ajmer-Merwara and the States of Baroda and Central India have a larger share in the distribution of the Cotton-Mill Industry than is warranted by their share in the total population. Madras, C. P. and Berar, and Bombay States have what may be called a fair share in the distribution of the industry. Other Provinces and States particularly the Punjab, Bihar, Bengal and Rajputana States have relatively very small share in the distribution of the industry, while Provinces like

Assam, Orissa, N.-W. F. P. and Baluchistan have no share at all.

We have discussed at some length the nature and character of the present localization. It shows certain characteristic features. The industry is unevenly distributed not only absolutely but also in relation to the distribution of population. The industry is predominantly concentrated in two important industrial centres, viz., Bombay and Ahmedabad which together contain a little less than half the number of spindles and about half the number of looms installed in the Cotton-Mill Industry of India, and produce about 40 per cent of the total yarn and a little over 50 per cent of the woven goods manufactured in India. The other centres of the industry are of relatively smaller importance.

We shall now study how the present distribution of the Cotton-Mill Industry in India can be explained in the light of the theoretical analysis.

III

THEORY OF LOCALIZATION AND THE COTTON-MILL INDUSTRY

The most dominating factor in the location of an industry is the "transport" relation of a centre in regard to raw-materials, power and market. The relative attraction of these factors depends on two conditions, namely, the nature and character of the raw-materials used, and their transformation into products. Raw-cotton may be considered as almost a "pure" material for it imparts bulk of its weight to the final product. There is not much difference between the weight of the raw-cotton and that of the finished product. To use Weber's terminology, the industry has a "material index" not much greater than one.[1] Obviously it cannot bind industry

1. Alfred Weber: Theory of Location of Industries, p.61.

to its places of production. If we look at the map, we shall find that while there is a wide distribution of raw-cotton in Bombay Presidency, Central Provinces and Berar, Hyderabad, Central India, Madras, Punjab, Sind, parts of United Provinces and Rajputana, the Cotton-Industry of India is localized mainly in four or five industrial centres. Similarly in the United States, while the main cotton-belt lies across the Southern States of North and South Carolina, Georgia and Alabama, the production was carried on till recently almost exclusively in the New England States (particularly in Massachusetts and Rhode Island).[1] This fact points out that the location of the Cotton-Mill Industry is not conditioned by the availability of the raw-materials in the neighbouring regions. The industry has even prospered in countries like Great Britain and Japan, which do not grow raw-cotton at all.

Secondly, it must be remembered that in the textile industries the cost of transportation is so small that raw-material and finished product can go very great distances with very little addition to total costs.[2] Water transport is particularly cheaper compared to land transport and hence those centres which have access to sources of raw-materials and markets either by sea or through inland waterways command special 'transport' relation. To cite an interesting example, the freight for cotton from India to Japan was 4.56 yen per bale subject to a discount of 1.40 yen per bale to Japanese spinners. This worked out at 2 pies per pound. The freight on piecegoods from Japan to India was 14.5 yen per ton less a discount of 10 per cent. which worked out at 2.1 pies per pound. The total freight on both raw-cotton and piecegoods thus amounted to 4.1 pies per pound, which it may be noted, is the railway

1. Report of the I. L. O. on the World Textile Industry—Its Economic and Social Problems, p. 113.

2. Dr. P. S. Lokanathan: Industrial Organization in India, p. 61.

freight on piecegoods alone per pound from Bombay to Sholapur.[1] Again, the freight rates charged on cotton piecegoods from Manchester to Bombay, Calcutta or Karachi is 42s. 6d. per ton of 40 c.ft. This works out at about Re. 1 per maund, which rate is much lower than that charged by rail from Bombay to Ahmedabad.[2] These facts serve to reflect that it is not the proximity of raw-materials or markets but the "transport relations" that are of real economic significance.

Thirdly, the cotton-industry has better chances to prosper in a big and organized assembling market of cotton than in the region of production of any particular variety of cotton.[3] This is partly because of the wider choice of selection of raw-cotton and partly because of the regularity and reliability of its supply throughout the year. Since mixing of several varieties of cotton is essential to give additional strength, texture and fineness to the yarn, such big and organized markets no doubt possess some decisive advantage over others.

The cost of power is also an important factor in the location of the cotton-mill industry. It has been estimated that in the production of cloth of medium counts, the cost of power and fuel forms about 8 to 16 per cent of the total works cost.[4] As such, those centres which command favourable 'transport' relations in regard to power resources have better chances to attract the industry than those centres which are not so favourably located. One of the factors that has retarded the development of the cotton-mill industry in the Punjab is the lack of

1. Report of the Tariff Board on Cotton Textile Industry, 1927, Vol. I, p. 53.
2. Report of the Tariff Board on Cotton Textile Industry, 1932. Vol. I (Evidences), p. 127.
3. Dr. P. S. Lokanathan: Industrial Organization in India, p. 60.
4. Indian Tariff Board Report on Cotton Textile Industry, 1932, p. 98.

coal or any other equally good source of motive power to supply the needs of the industry. On the contrary the extraordinary development of the spinning industry in Coimbatore, Madura and Tinnevelly in recent years may largely be attributed to the completion of Pykara Hydro-electric Project. The development of new sources of power specially, hydro-electricity and oil has considerably broken down the hegemony of coal deposits as a location factor, and has rendered power a less important, but nevertheless an indispensable factor in industrial location.

The influence of consumers' market on the location of the industry depends on two factors, namely, the nature of the finished products and their transportability, and character and size of the consumers' market. Although cotton piecegoods, like raw-cotton, can be carried over long distances without any appreciable increase in the total costs, the existence of consumers' market in close proximity, gives the industry some decisive advantage. This advantage is likely to be great if the consumers' markets are larger in size and relatively more concentrated. For a large and concentrated market, like Bombay, Delhi or Calcutta, with high spending power per square mile of area (high market density) can secure greater economies of production and distribution than a moffusil town or a rural area. Further, a large and concentrated market has better access to other productive factors such as labour, capital and organization, and also provides greater opportunities to consumers, traders and producers for closer personal contact. All these factors have tended to increase the relative influence of consumers' market on the location of the industry.

These three factors, raw-materials, power and consumers' market will determine the most advantageous or "optimal" point of transportation costs, and determine the basic framework of industrial orientation.

IV

TRANSPORT-ORIENTATION AND THE INDIAN COTTON-MILL INDUSTRY

We shall now study how far the present distribution of the cotton-mill industry of India is based on the transportational framework of the country and see whether the principal manufacturing centres of the industry command the most "favourable transport" relations in regard to raw-materials, power and markets. Owing to the great paucity of statistical data such a study cannot be very exhaustive. Nevertheless it will throw some light on the comparative advantages of different centres.

The localization of the industry in the Bombay City and Island was largely the result of its excellent transport relations in regard to raw-materials and consumers' markets. Owing to its insular position, it enjoyed the advantages of cheap sea freights on her import of machinery, mill-stores and other accessories and on her export of yarn to China market. Further, Bombay, being the important junction of main railways, was also well connected with the interior markets of raw-cotton and piecegoods. The policy of the railways to charge lower freight-rates from and to the ports increased the 'transport' advantage of Bombay over other inland towns. The cumulative effect of the operation of all these factors was that Bombay became a leading centre of textile production. Even up to the beginning of the twenties Bombay Island contained about half the number of spindles and looms working in India.

But with the progressive loss of yarn market in China, the emphasis on foreign market shifted to internal piecegoods market. The high cost of land transport and the enormous distance of consumers' market have placed Bombay at a certain disadvantage specially in relation to up-country market. The adoption by Indian railways of a more uniform policy in respect of freight-rates based on distances has further reduced Bombay's advantage in respect of 'transport' relation, and has placed inland centres in a more favourable position. Moreover, Bombay being a port, has to meet full force of foreign competition. Owing to the operation of all these factors, Bombay now no longer enjoys special 'transport' advantage in respect of consumers' market. With regard to raw-cotton, the chief advantages that Bombay enjoys are in respect of imported cotton and the existence of an organized cotton market. It is also at some advantage in the purchase of Hubli, Dharwar and other cotton grown in the Southern Mahratta region.[1] But so far as other varieties are concerned, Bombay is at a substantial disadvantage, and has not only to incur transportation charges, but has also to pay a slightly higher price. On the whole it may be said that "the balance of advantage in regard to the supplies of raw-material is against Bombay."[2] Again, the cost of fuel is slightly higher in Bombay than in other centres of the industry.[3]

Ahmedabad is much better located than Bombay both in respect of raw-materials and consumers markets. It is situated in the midst of the cotton growing districts of Gujrat and Kathiawar and has therefore, convenient access to two important varieties of cotton, Broach and Dholleras. Owing to its geographical position, and nearness to Gujrat ports, it can also import foreign—particularly Egyptian

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1. Indian Tariff Board Report, 1927. Vol. II, p. 134.

2. Indian Tariff Board Report, 1927, Vol. I, p. 123,

3. Indian Tariff Board Report, 1927, Vol. I., p. 120, 121. also Vol. II, p. 134. Indian Tariff Board Report, 1932, p. 98.

and East African cotton easily. The finished products of the mills can be conveniently distributed in Gujrat, Kathiawar, Delhi, Punjab and western parts of the United provinces and C. P.[1] As most of the production of Ahmedabad mills consists of fine, light and fanciful fabrics, it has to incur a lower percentage of freight-rate to total costs. Consequently, it is in a position to compete in more distant markets. The only disadvantage from which Ahmedabad suffers is in regard to power costs. Being situated at a great distance from coal mines of Bengal, Bihar and C. P. it has to incur high freight charges on its coal supplies. But so for as localization depends upon raw-material and consumers' markets Ahemdabad definitely commands a very favourable position.

In the rest of the Bombay presidency the Cotton-Mill Industry is scattered over a wide area. The principal centres of production are Sholapur, Baroda, Broach, Petlad, Surat, Navsari, Gokak, Amalner and Jalgaon. Practically all the units are located in the heart of the cotton-growing areas, and therefore, have convenient access to those varieties of cotton grown in the surrounding tracts. The units in Broach, Surat, Navsari, Baroda and Nadiad mostly use Dholleras, Broach, and Surti, the three-prominent varieties grown in those regions, while the units in Amalner, Dhulia, Chalisgaon and Jalgaon are mostly dependent on Jarilla (Khandesh), Hyderabad Oomras and Hyderabad Gaorani. Units in the South of Bombay Presidency, namely, in Hubli Gadag and Gokak use Southerns (mainly Kumptas Jayawant and Kumptas unspecified). With regard to consumers' markets it may be said that the units located in Gujrat and Kathiawar States (Bhavnagar, Porbandar, Jamnagar, Rajkot and Vankaner) mainly cater for local markets, and enjoy a certain measure of protection from the State in the from of import

1. Report of the Indian Tariff Board, 1927. Vol. II. p. 390.

duties on piecegoods. They are, therefore, typically small in size. The units situated in Sholapur, Broach, Baroda and Navsari, generally cater for more distant markets. They are located on the main lines of the important railways and are well connected with the un-country markets. The one great handicap to the mills in the Bombay Presidency is in regard to power costs. They get their coal supplies from very long distances and have to bear high freight-charges. Some of the centres like Sholapur, Dhulia and Amalner have also to pay a slightly higher freight-rate both on raw materials and finished products, and, therefore, are at a certain disadvantage compared to other centres. The following Table shows a typical case of freight discrimination:

Table LXVII

Railway Station.	Distance in Miles.	Freight-charges per Maund.		
FROM		Rs.	a.	p.
Sholapur to Madura	778	2	8	2
Bombay to Madura	1136	1	10	0
Sholapur to Bombay	283	1	8	5
Sholapur to Nagpur	572	2	11	2
Ahmedabad to Nagpur	596	2	6	10

In the Central Provinces and Berar, the industry is located in Nagpur, Wardha, Akola, Burhanpur, Amraoti and Badnera, all of which are situated in the main cotton belt, producing Oomras, Verum and other varieties of short-stapled cotton. The supply of coarse cotton is, therefore, plentiful. But with regard to the supply of long-stapled cotton, mills in

C. P. and Berar are in a very unfavourable position. Eighty per cent of the yarn produced in the province is, therefore, below 20s counts.[1] Mills in C. P. and Berar are, however, well situated both in regard to consumers' markets and power resources. They are nearer to up-country markets of Cawnpore and Calcutta, and within easy reach of the supplies of coal from Warora, Pachmarhi, and Chanda collieries. The only disadvantage is in regard to freight charges. Mills in C. P. and Berar have to pay slightly higher freight-rates than those paid by mills in Bombay and Ahmedabad. The following Table gives another case of freight discrimination:

Table LXVIII

Railway Station.	Distance in Miles.	Freight-rate on cotton cloth and yarn per maund.		
From		Rs.	a.	p.
Burhanpur to Shalimar	911	3	3	4
Bombay to Shalimar	1221	1	8	0
From				
Nagpur to Shalimar	701	2	5	7
Bombay to Shalimar	1221	1	8	0

Conditions similar to those in the Central Provinces and Berar also prevail in Central India States and Hyderabad. Of the 15 units working in Central India, 7 are located in Indore, 5 in Gwalior and one each in Bhopal, Ratlam and Dewas Junior. In Hyderabad, 2 units are located in Elchigudda, and one each in Aurangabad, Warrangal, Gulbarga and Nanded. All the units are located in the cotton-growing districts and have favourable relation both in regard to raw-materials and markets. In addition

1. C. P. Textile Labour Enquiry Committee Repot, 1941, p. 9.

to this, units located in Hyderabad State have easy access to Singareni coalfields and those in Central India States to the Penchvalley and Chanda collieries. The units in the Hyderabad and Indore States have advantage over mills in British India owing to the imposition of export duties on cotton, and import duties on piecegoods.[1] The map on the opposite page shows the location of the cotton-mill industry in Hyderabad,

In the United provinces, the cotton-mill Industry is predominantly localized in Cawnpore, one of the biggest distributive centres of Northern India. Its importance can be judged from the fact that more than 90 per cent of the yarn and piecegoods manufactured in the United provinces comes from this city alone. It is situated on the edge of the main cotton-growing region of the Indo-Gangetic plain and being important raw-material assembling centre has access to abundant supply of short stapled cotton. Owing to its favourable geographical position it commands excellent 'transport' relation not only in regard to the large consuming markets of the United Provinces but also in regard to certain up-country markets of Calcutta, Delhi and Amritsar. It is also favourably located in respect of good coal supplies from Daltonganj, Jharia and Raniganj. The only serious handicap is in the matter of the supply of long-stapled cotton. The cotton grown in the United Provinces is generally not suitable for spinning anything higher than 10 to 12 counts.[2] For the production of finer counts of yarn and cloth it has, therefore, to depend almost entirely on Punjab sources. The railway freight on the imported cotton is so high that it is not very economical for mills in Cawnpore to use more than limited quantities of long-stapled cotton. The progess of the industry

1. Report of the Indian Tariff Board, 1927, Vol. II, p. 134.
2. J. P. Shrivastava: The Textile Industry in the United Provinces. The Indian Textile Journal, 1940. p. 151.

is, therefore, limited by the location of the mills in tracts, which grow coarse varieties of cotton, and by the distance of the mills from the sea-ports for supply of Egyptian, East-African and other finer varieties of imported cotton. Outside Cawnpore, the industry is mainly located in the cotton-growing districts of Agra, Hathras, Moradabad, Badaun and Rampur State. Most of the mills are purely spinning mills and produce yarn for the handloom weaver. The only two cotton-manufacturing towns lying outside the cotton belt are Benares and Lucknow. The map on the opposite page shows the location of cotton-mill industry in the United provinces.

Delhi, another important textile manufacturing centre of northern India, is very favourably situated both in regard to raw-materials and consumers' markets. Owing to its excellent geographical position it is well connected with almost all the important raw-material assembling centres of central and northern India, and the important up-country markets of Amritsar, Cawnpore and Calcutta. It can use with advantage not only local but also Punjab-American (Lyallpur), Oomras and Bengals grown in surrounding regions of Punjab, Central India and United Provinces. The chief handicap in the development of the industry is the lack of cheap power supply. At present the mills have to obtain their coal supplies from such distant places as Jharia and Raniganj.

In the north-west of Delhi lies the rich and fertile cotton belt of Punjab with abundant supplies of raw-cotton (both short-and long-stapled) and a vast consuming market, not only of Punjab but also of Kashmir and North-Western Frontier Province. But in spite of its rich resources and wide markets, Punjab has not been able to develop the cotton industry commensurate with its resources. At present only 7 units working in Punjab, 2 of which are located in Lahore, 2 in Bhiwani, and one each in

Amritsar, Okara and Lyallpur. The last one is the branch of Delhi Cloth Mills. All of these units are located in the heart of the cotton-growing tracts and have access to abundant supply of deshi and the Punjab American cotton. The principal cloth distributing centres are Amritsar, Gujranwala, Sialkot, and Lyallpur all quite near to the textile-producing centres. The greatest disadvantage is in regard to power supply, and this is one of the principal factors that have retarded the rapid development of the industry in Punjab.

Bengal, Assam and the adjacent parts of Bihar and Orissa are the only regions which are particularly very deficient in the supply of raw-cotton. But despite its deficiency in raw-material Bengal has succeeded in developing the cotton textile industry. Its success is mainly due to two factors, large consumers' markets and proximity to coalfields. Calcutta is a big cloth-distributing centre and commands wide markets not only in Bengal but also in Assam, Bihar, Orissa, and parts of Central Provinces. It can also obtain its coal supplies very cheaply from Raniganj and Jharia coalfields. Calcutta is therefore favourably situated both in regard to power and market but not so favourably located in regard to raw-material.

The cotton-mill Industry of Madras Province reveals two characteristic features, firstly, it is predominantly spinning in character and secondly, it is mainly localized in the Districts of Coimbatore, Madura and Tinnevelly. Coimbatore alone contains about half the number of cotton-mills working in Madras presidency. It is interesting to note that almost all the mills in Coimbatore District are situated within 10 miles of Coimbatore town, mainly in Singanallur, Tiruppur, Udumalpet and Pedanur.[1]

1. The Textile Industry in Coimbatore: Indian Textile Journal, October 1941, p. 23.

The mills in Coimbatore are very favourably located in regard to raw-material, power, and consumers' market. They have access to abundant supplies of fine 'Cambodia' cotton grown extensively in the surrounding tracts. They can also import easily Tinnevelly and Karunganni, two other finer varieties of long-stapled cotton grown in the neighbouring districts of Madura, Ramnad and Tinnevelly. The hand-loom weaving centres which lie scattered all over Madras presidency provide an extensive market for yarn. But the main factor which has contributed to the rapid expansion of cotton industry in Coimbatore is the availability of cheap power from Pykara Hydro-electric scheme. This scheme supplies power not only to mills in Coimbatore, but also to those in Udumalpet and Madura.[1] Outside the Coimbatore District, the spinning industry is localized in the black cotton soil tracts of Madura, Ramnad and Tinnevelly. The important manufacturing centres are Madura, Kovilpatti, Tuticorin, Tinnevelly and Ambasamudram. They have easy access to the long stapled Karungannies and Tinnevelly cotton, the two predominant varieties grown in these regions. They can also import through Tuticorin, Punjab American, Egyptian and East African Cotton for spinning higher counts. Besides the local market, the mills in Madura, Tuticorin, Kovilpatti and Tinnevelly are in a very favourable position to cater the up-country markets by sea via Tuticorin. Here it may be mentioned that the South Indian Railway is charging exceptionally low rate on yarn from Madura to Calcutta, for in the absence of low rates, Madura's traffic would seek the rail-cum-route via Tuticorin.[2] Similarly low freight-rates are charged on yarn from Madura to Bombay and Ahmedabad. At the same

1. The Location of Industry in India, p. 69.

2. V. V. Ramanadham: Railways and Industrial Location. The Indian Journal of Economics, Conference Number, October, 1946, p. 170.

time it is of interest to note that Coimbatore which is an equally important centre of spinning was denied similar facilities of low freight rate.[1] These examples show the special transport relations which these centres command in regard to up-country markets. For power-supply these centres are mainly dependent on Papanasam Hydro-electric scheme. The transmission system under this scheme covers Tuticorin, Kovilpatti, Madura and Ambasamundram. We thus see that all these centres are very favourably situated in regard to all the three factors, raw-material, power and consumers' market. Outside these three Districts, viz., Coimbatore, Madura and Tinnevelly, the only centres of importance are Madras, Mettur and Salem. Madras is the biggest spinning-weaving centre of Madras Presidency. It is a good distributive centre and commands excellent 'transport' relations both in regard to raw-materials and consumers' market.

In Mysore, five out of the eight units are located in Bangalore City, which is a good distributive centre of South India. "It also enjoys the best 'transport' relations both for securing the raw-material and distributing the finished product."[2] The other units are located in Mysore, Davangere and Subramanyapure (Uttanhalli). Davangere is a leading ginning and trading centre,[3] and has convenient access to supplies of Kumptas and Hyderabad Oomras. It has a purely spinning mill, which supplies yarn to the local handloom industry.

The foregoing analytical survey reveals that almost all the principal cotton-manufacturing centres in India have good 'transport' relations both for securing the raw-material and for distributing the

1. Ibid, p. 170.

2. Dr. Balkrishna: Industrial Development of Mysore (Bengalore City). p. 111.

3. G. V. Rajaratnam: Textile Industry in Mysore State, Indian Textile Journal, 1941, p. 165.

finished product. Some of the centres, like Bombay, Ahmedabad and Delhi are, however, not so favourably located in regard to power supply as some of the other centres. But the disadvantage arising from this fact is more than counterbalanced by the existence of large, organized and concentrated markets quite near at hand. Moreover, the policy of the Railway of granting continuous concessions of low-rates to the already developed places, has definitely favoured these large cities at the cost of small inland centres. Incidentally, it may be mentioned that it is the structure of railway rates in India that has obstructed the dispersal of the industry in the most interior regions.

V

LABOUR ORIENTATION AND THE COTTON-MILL INDUSTRY IN INDIA.

We have seen that the pull of raw-material, power and consumers' market determine the most advantageous (optimal) point of transportation cost. This is not necessarily the most desirable place of production for greater economies may be available at other places either because of lower labour costs or because of the advantages of "agglomeration." "Every point of lower labour costs, therefore, constitutes economically a centre of attraction which tends to draw industry away from the point of minimal transportation costs to centres of lower labour costs."[1] These centres thus provide an alternative attraction for the location of the industry. It is significant to examine how labour locations have influenced the present distribution of the cotton-mill Industry in India.

In the cotton-textile industry wages form 20 to 27 per cent of the total costs or 40 to 54 per cent of

1. Alfred Weber: Theory of Location of Industries (English Edition), hicago, 1929, p. 102.

the total works cost, depending on the productivity of labour, level of wages and the character of output. Any advantage in respect of labour costs will, therefore, exercise a decisive infulence on the location of the industry. A comparative study of labour costs in different centres of the industry will throw considerable light on the relative advantages and disadvantages of different centres in respect of labour costs. The following Table shows the percentage of labour costs to works costs in the principal cotton-manufacturing centre of India:

Table LXIX

PERCENTAGE OF LABOUR COSTS TO WORKS COST IN THE PRINCIPAL COTTON-MANUFACTURING CENTRES OF INDIA

Bombay	49.40
Ahmedabad	53.80
Baroda	52.65
Delhi	51.60*
Calcutta	42.40
Cawnpure	40.75
Nagpur	38.60

Source: Tariff Board Report on the Cotton Textile Industry, 1932, p. 98.

* includes supervision costs also.

An analysis of labour costs shows that some of the centres like Nagpur, Cawnpore and Calcutta are more favourably located in regard to labour than centres like Bombay, Ahmedabad, Baroda and Delhi. The figures of moffusil centres are not available, but one has plausible reasons to infer that labour costs in these centres must be much lower as compared to those in big cities like Bombay, Calcutta or Delhi. These differences in labour costs are primarily the result of differences in wage-rates prevailing in different centres. The following Table shows such differences in wage-rates;

Table

SHOWING AVERAGE DAILY EARNINGS OF COTTON-MILL WORKERS IN SELECTED OCCUPATIONS IN THE COTTON MILL INDUSTRY IN INDIA—1944.

Name of Occupations.	Ahmedabad	Bombay	Cawnpore	Delhi	Madras	Baroda	Indore	Nagpur	Sholapur	Lahore
	Rs. as. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. Drawing Tenters ..	3 8 9	2 6 4	2 5 4	2 11 2	2 0 6	2 13 11	2 8 3	1 15 6	1 9 7	2 1 11
2. Slubbing Tenters ..	3 9 8	2 7 3	2 7 2	.. 2	2 6 4	2 14 8	2 8 10	2 0 0	1 11 2	2 0 6
3. Inter Tenters ..	4 4 5	2 5 4	2 2 4	2 4 6	2 5 8	2 13 5	2 7 8	2 0 4	1 10 8	1 12 5
4. Roving Tenters ..	3 8 3	2 4 7	2 0 3	2 2 4	1 15 2	2 12 3	2 7 4	1 15 4	..	1 7 10
5. One Loom Weavers ..	3 7 3	..	1 14 5	2 3 1	2 5 2	..	2 4 8	1 14 0	..	1 7 10
6. Two Loom Weavers ..	4 1 5	2 13 11	2 7 1	2 13 5	2 5 2	3 5 7	2 12 2	2 6 9	2 5 9	2 7 7
7. Reelers ..	3 1 0	2 0 4	1 11 0	..	2 2 4	2 5 10	2 3 2	1 6 2	1 2 7	1 6 6

Name of Occupations	Coimbatore	Bangalore	Bengal	Lyallpur	Akola	Madura	Mysore	Davangere	Ambasam-udram.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. Drawing Tenter ..	0 15 8	1 4 1	1 4 6	2 5 1	1 10 8	1 7 8	..	12 6	1 11 1
2. Slubbing Tenter ..	1 2 10	1 5 6	1 7 1	2 5 3	1 12 10	1 9 2	1 5 2	12 8	1 10 3
3. Inter Tenter ..	1 4 1	1 6 1	1 15 6	2 1 3	1 7 6	1 3 0	1 3 2	15 8	1 11 3
4. Roving Tenter ..	1 2 8	1 5 8	1 2 11	2 1 1	1 9 3	1 0 0	..	14 2	1 11 7
5. One Loom Weaver ..	1 2 8	1 2 6	1 1 9	1 12 5	1 12 1	1 7 4	1 2 10	..	..
6. Two Loom Weaver ..	1 10 0	1 11 3	2 4 9	2 6 10	2 4 4	1 8 7	1 6 6	..	..
7. Reelers ..	0 13 0	0 15 2	0 15 2	1 10 3	1 11 11	1 6 1	0 14 10	7 3	1 7 10

Another factor which determines labour costs is 'labour productivity.' In view of the complete lack of factual data, it is, however, not feasible to work out computations which would permit inter-comparison of labour productivity in different centres. But it is generally true that labour in old-established centres is more skilled and better trained than that available in an infant industrial town. It is firstly because of the existence of a well-settled labour force devoting itself wholly to industrial occupations, and, secondly, because of the inherited skill and aptitude of the workers who, for many generations, are closely associated with the industry. Obviously, labour productivity is slightly higher in those centres which have a permanently settled labour force than those where the labour is of a relatively migratory character.

We should also analyse the character and composition of labour force in different centres of the industry. The industry in Bombay City draws its labour force mostly from the neighbouring districts of Konkan, Satara and Sholapur. A certain portion of workers also comes from the Deccan and the United Provinces.[1] The district of Ratnagiri alone accounts for about 40 per cent of Bombay's labour force. The workers belong to classes known as Dheds, Nahars, Sheikha and Julahas. Gradually the labour force is getting more stable and is almost wholly dependent for its sustenance on the industry.[2] In Ahmedabad the labour is mainly drawn from the adjoining districts of Gujrat, Baroda State and Rajputana. Unlike Bombay there is very little seasonal migration for agricultural operations. Ahmedabad has thus an advantage over Bombay in regard to continuity of labour supply. Further, percentage of absenteeism is much higher in Bombay than in Ahmedabad.

1. Report on an Enquiry into Conditions of Labour in the Cotton Mill Industry in India, 1945, p. 7.
2. Ibid. p- 7.

Both these factors account for the fact that labour in Ahmedabad is slightly more efficient than labour in Bombay. In Nagpur the whole of labour force is permanent.[1] About 50 per cent of the labour is purely local and belongs to classes known as Nahars, Kunbis, Koshtis and Karathas. There is no seasonal exodus of labour. In Cawnpore the bulk of the labour force employed in the mills comes from the neighbouring agricultural areas in the United Provinces.[2] Most of the labourers, therefore, belong to agricultural classes. The proportion of the locally settled labour is very small, being only about 20%. About one-third of the workers regularly return to their villages in the harvesting season, but there is no dearth of labour because there is always a number of workers in search of employment waiting at the factory gates in the city.[3] In Bengal the labour is mainly drawn from the neighbouring agricultural areas. Mills in Bengal represented to the Tariff Board that they had to keep a large number of spare hands than mills in Bombay because there were only a few cotton-mills there, and if the men were absent they would not get spare hands at once as in Bombay.[4] But there seems little truth in the above statement for most of the cotton-mills are situated in areas where jute mills are already in existence, and there is always a surplus labour force, waiting at the factory gate for employment. Moreover, labour requirements in Cotton and Jute mills are fairly uniform.[5] In Madras 95 per cent of the labour is permanently settled. Practically in all cases, workers live with their families, and there is no seasonal migration, which is a characteristic

1. Royal Commission on Labour in India. Evidence Volume III, Part I. pp. 65-80.
2. Conditions of Labour in Cotton-Mill Industry in India (1946). p. 72.
3. R. K. Mukerji: The Indian Working Class (1945). p. 8.
4. Report of the Indian Tariff Board, 1927. Vol. III. p. 329.
5. I. L. O. Report on World Cotton Textile Industry, p. 1.

feature of the industry in other centres. It is only in Punjab that the labour is not only costly but also relatively scarce. The scarcity of cheap industrial labour is one of the important factors that has retarded the industrial development of Punjab.

VI

AGGLOMERATING AND DEGLOMERATING FACTORS.

We shall now study the influence of agglomerating and deglomerating factors on the location of the cotton-mill industry in India. These factors, as we have seen, do not operate regionally but only aid the concentration or dispersal of industrial activity within a given region. The initial concentration of the industry in Bombay Island was not only the result of its favourable "transport" relations in regard to raw-material and consumers' markets, but was also conditioned by the presence of rich and enterprising Parsi and Bhatia merchants, who possessed, besides vast financial resources, considerable experience of business management and organization. It were these merchants who were responsible for the pioneering and promoting of cotton-mills in Bombay. Further, Bombay being an important trading and commercial centre, offered numerous financial, banking and marketing facilities, not easily obtainable at other centres. Technical and professional services too were easily available and there was a reserve of skilled labour. All these factors led to the remarkable expansion of cotton-mill industry in Bombay. The prospects seemed so bright that no less than 90 mills came into existence by 1913. But with lapse of time, deglomerating tendencies set in. Those very "agglomerating factors" which favoured initial concentration of the industry set into motion opposite tendencies favouring dispersal of industry. These deglomerating tendencies began as a result of (i) increase in land values and rents, (ii) rise in cost of living, leading to increase in wage-rates (iii) increase in internal cost of transport, and (iv) increase in rates and taxes, town duty, water charges, etc. The operation of deglomerating tendencies has by increasing the cost of production, considerably weakened Bombay's competitive position vis-a-vis other centres. The industry is gradually declining and the results are already evident from the fact that the number of industrial units has decreased from 74 in 1911 to 53 in 1946. For more than two decades the Bombay industry has been struggling to hold its own against internal and external competition, and although war has given it a temporary respite, the future does not seem to be very promising.

Symptoms of deglomerating tendencies are also visible in case of Ahmedabad and Cawnpore. It is significant to note that no new mill has been established in Ahmedabad since 1938, while no less than eight mills have been scrapped, dismantled or gone into liquidation during this period. High rents of land, high wages and high cost of internal transport are tending to break down further concentration of the industry. Similarly in Cawnpore, the extraordinarily rapid development of the city particularly during the last decade has resulted in a spectacular rise in rents, wages and cost of living. It is significant to note that the population of Cawnpore has nearly doubled between 1931 and 1941. Since 1941 the population has further increased and to day it is estimated to be in the neighbourhood of about eight lakhs. Between 1939 and 1943 the number of registered factories at Cawnpore has gone up from 96 to 158, and the average daily number of persons employed has increased from 56,250 to 1,03,045 an increase of over 83 per cent. within four year.[1]

1. Report on an enquiry into Conditions of Labour in the Cotton Mill Industry in India (1946), p. 89.

This extraordinarily rapid development has resulted in an enormous increase in the cost of production and it is extremely doubtful that this industrial centre will any more attract new industries and new floatations.

VII

CONCLUSION

We have attempted to explain in the light of theoretical analysis the locational distribution of the Cotton-Mill Industry in India. It should be clearly understood that no theoretical analysis can adequately explain that phase of industrial location which is the result of "historical accidents" or other extraneous circumstances. Sometimes the industry gets localized at particular places for no specific reason except that the entrepreneur is interested in a particular site, or the town which he chooses happens to be his native place. These very 'fortuitous' locations, subsequently acquire the advantages of early start, and become the centres of labour and agglom-orientations, thus profoundly influencing the future basis of locational regrouping. Inasmuch as the present distribution is the result of such irrational motives or whim and idiosyncrasies of the entrepreneurs, it remains outside the perview of economic analysis.

CHAPTER IX

RECENT TRENDS IN THE LOCATION OF COTTON-MILL INDUSTRY IN INDIA

I

The object of this Chapter is to study the recent tendencies in the location of Cotton-Mill Industry in India. Such a study is of vital importance not merely because it will reveal the nature and character of industrial dispersal, but also because it will indicate the relative attractiveness of different regions. Secondly, we shall critically examine those factors which can explain and account for the relative decline of some important areas and the subsequent spreading out of industrial activity in more interior regions. Thirdly, we shall analyse whether these locational tendencies suggest the shifting of productive activity from regions of high to regions of low labour costs. And lastly, we shall examine whether it is possible to find out the relative locational importance of different centres through an analysis of profits, productivity and costs? In other words does productive activity shift to those centres which can secure greater economies of production and distribution? Such a study will not only be of great theoretical interest but also of great practical importance.

II

INTRA-REGIONAL SHIFT OF PRODUCTIVE ACTIVITY IN COTTON-MILL INDUSTRY OF INDIA —SOME STATISTICAL TRENDS

Table LXXI on the next page shows the intra-regional shift or productive activity in the Cotton-

SHIFTING OF PRODUCTIVE ACTIVITY IN COTTON-MILL INDUSTRY (CONTD). —SOME STATISTICAL TRENDS— 1911—1941.

Provinces	Percentage Distribution of workers 1911	1921	1931	1941	Percentage Distribution of Cotton-consumed 1911	1921	1931	1941
1. Bombay City and Island ..	45.24	54.58	32.66	27.22	50.03	50.00	31.87	27.00
2. Ahmedabad ..	13.06		17.60	16.44	10.58	..	.15.72	13.92
3. Rest of Bombay Presidency	10.75	26.81	13.08	14.23	9.18	21.77	11.82	11.69
Total ..	69.05	81.39	63.34	57.89	69.05	71.77	59.41	52.61
4. Rajputana	.95	.42	.72	1.24	.95	.35	1.14	1.48
5. Berar	.70	.84	1.08	.99	.70	.68	.91	.88
6. Central Provinces ..	4.76	4.54	4.84	4.05	4.76	4.29	4.15	3.12
7. Bihar and Orissa ..	..	..	..	.26	..	..	..	0.25
8. Hyderabad ..	1.16	.91	1.13	1.72	1.16	.69	5.98	1.75
9. Central India ..	1.38	2.15	4.47	5.91	1.38	2.11	3.89	6.27
10. Bengal Presidency ..	4.33	3.61	3.75	5.64	4.33	4.74	2.92	3.89
11. Punjab	1.16	1.25	1.97	1.16	1.16	1.35		1.85
12. Delhi Province ..	..	..	..	1.38	..	..	..	2.40
13. United Province ..	5.20	5.41	6.71	6.49	5.20	6.50	8.95	9.66
14. Madras Presidency ..	7.82	7.54	8.53	12.12	7.82	5.63	9.10	13.62
15. Travancore ..	.30	.20	1.97	.21	.30	.39	1.60	0.08
16. Mysore	.52	.57	1.34	2.09	.52	.69	.74	1.64
17. Pondicherry ..	2.06	1.61	.21	1.08	2.06	1.01	.33	0.45
GRAND TOTAL ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Mill Industry of India during the years 1911-41. A study of this Table will reveal the nature and extent of dispersal that has taken place during the last thirty years. In 1911 more than one-third of the industrial units were located in the City and Island of Bombay, about one-fifth in Ahmedabad, and one-sixth in the Rest of Bombay Presidency. Thus Bombay Presidency alone contained about seventy per cent of the industrial units working in the cotton-mill Industry of India. The other Provinces had a relatively very small share, United Provinces 5.36, Madras 4.60, Bengal 4.98, Punjab 4.60, C. P. and Berar 3.83 and the others less than 2 per cent each. Upto 1921 no significant change took place in the distribution of the industry. The period 1921-31, however, witnessed some remarkable changes. The percentage share of Bombay declined from 32.30 in 1921 to 23.89 in 1931, while that of Madras increased from 4.68 to 7.95. There was also a general increase in the share of other regions except Central Provinces, Pondicherry and Travancore. The share of Bombay further declined from 23.89 in 1931 to 16.41 in 1941, while that of Madras increased from 7.95 to 16.13. There was a relative decline in the share of Ahmedabad, Rest of Bombay Presidency, Central Provinces and Berar, and an increase in the share of Bengal, Central India and Mysore.

The principal conclusion which emerges from the foregoing analysis is the relative decline in the predominant position of Bombay and the relative spreading out of industrial activity in the more interior regions. The share of Bombay has declined from 33.34 in 1911 to 16.41 in 1941 while that of Madras Presidency has increased from 4.60 to 16.13. There has also been a substantial increase in the share of Central India, Bengal and Mysore. The other Provinces whose relative position has recorded a slight decline are C. P., Berar and Punjab. We thus observe from the Table that although half the number of industrial units are still located in the Bombay Presidency, some tendencies are in operation which suggest that the industrial units are gradually spreading out to newer and newer regions.

INTRA-REGIONAL SHIFT OF SPINDLEAGE AND LOOMAGE

Mere enumeration of industrial units disguises differences in the size and structure of the industry and thus significant differences in the character and extent of localization. For, although the distribution of mills in Bengal shows that the relative share of the province has almost doubled between 1911 and 1941, the distribution of spindleage does not support this conclusion. On the contrary, it shows a relative decline in the share of Bengal Presidency. Some plausible explanation for this seemingly inconsistent result is to be found in the stunted growth of the spinning section. Similarly, in the case of Madras Presidency while the distribution of mills shows that Madras' share in the total mills was about 16.1 per cent the distribution of loomage shows its share to be only about 3.45 per cent. It is mainly because the industry in Madras is predominantly spinning in character. Thus mere enumeration of industrial units cannot show the variation in the character of localization. Again the differences in the size of the industrial units may fail to show the extent of dispersal in the industry. For, while Bombay contained in 1941 only about one-sixth of the total number of mills working in India, its share in the total spindleage and loomage was about one-fourth and one-third respectively. Thus the measurement or dispersal by number of units alone may distort the picture of reality. The shift in productive activity should also be measured by the spindles and looms working in the industry.

It is interesting to observe that the distribution of spindleage and loomage in the cotton-mill Industry of India also reveals the same characteristic tendencies, namely, the relative decline in the predominant position of Bombay and the gradual dispersal of the industry to other Provinces and States. The percentage share of Bombay in the total spindleage has declined from 45.48 in 1911 to 27.91 in 1941, while that of Madras has increased from 5.70 to 14.57. Similarly the distribution of loomage shows that the percentage share of Bombay has declined from 50.03 in 1911 to 32.9 in 1941, but the share of Madras in the total loomage has not recorded any significant increase. The share of all other Provinces and States, except that of Central Provinces, Berar, Pondicherry and Travancore has relatively increased.

INTRA-REGIONAL DISTRIBUTION OF INDUSTRIAL WORKERS

Trends in the Intra-Regional Distribution of Industrial Workers also suggest the relative decline in the predominant position of Bombay, and a significant increase in the share of Madras, Central India, Ahmedabad, Rest of Bombay Presidency, and Mysore. The other Provinces and States which have gained relatively are Bengal, United Provinces, Hyderabad, Delhi, Bihar and Orissa, Berar and Rajputana. Only three regions, viz., Central Provinces, Travancore and Pondicherry have recorded some decline in the percentage share of the industrial workers. Thus, broadly speaking the distribution of industrial workers also reveals the dominance of the same locational tendencies, as shown by the distribution of spindleage and loomage.

COTTON-CONSUMPTION—A PLAUSIBLE BASIS OF ANALYSIS

Intra-regional variations in raw-cotton consumption also indicate the nature and char cter of industrial dispersal. But this method of analysis has two serious limitations, firstly, it ignores the differences in the structure of the industry and secondly, it fails to take into account the differences in the character of output. For example, in 1941, while Ahmedabad's share in the total spindleage and loomage was 18 and 22 per cent. respectively, its share in the raw-cotton consumption was only about 13 per cent. This is principally because the goods manufactured in Ahmedabad are of finer varieties than those produced in other Provinces and States. Similarly in proportion to the size of the industry, Bengal's share in the total cotton-consumption is smaller and that of Madras comparatively larger, mainly because the industry in the former is largely weaving and in the latter predominantly spinning in character. These differences in the structure of the industry and the character of output may be so considerable as to conceal the true nature and character of the industrial dispersal.

But despite these limitations and reservations it is interesting to observe that the regional distribution of raw-cotton consumption also suggests the dominance of the same locational tendencies. The percentage share of Bombay in the total cotton-consumption has considerably declined while that of Madras and the United Provinces has recorded a significant increase. Other Provinces and States which have gained relatively are Central India, Hyderabad, Delhi, Mysore, Rajputana and the Rest of Bombay Presidency. Only four regions, viz., Central Provinces, Bengal, Travancore and Pondicherry have recorded a slight decline in their share of cotton-consumption.

REGIONAL TRENDS IN THE PRODUCTION OF YARN AND PIECEGOODS

Table LXXII shows the regional trends in the production of yarn and woven goods in the Cotton-

Mill Industry of India during 1911-41. In preparing this Table we had to adopt a slightly different classification. This classification was forced upon us by the character and arrangement of the statistical data. The figures of yarn and piecegoods production compiled by the Director General of Commercial Intelligence and Statistics do not give details of each individual State. Thus the figures of Mysore, Hyderabad, Baroda, Indore, Gwalior, Travancore, along with other States and foreign territories are given as "Totals of Indian States and Foreign Territories." On the other hand figures of mills, spindles, and looms compiled by the Bombay Millowners' Association give details of all individual mills, but their classification of Provinces and States is quite different. The figures of Rest of Bombay Presidency include the figures of Baroda, Kathiawar and Western India State. Similarly the figures of Madras Presidency include the figures of Cochin and Podukkotai State.

We have laid particular stress on this point because while making comparisons between the figures of production and those of mills, spindles and looms these differences in the classification, character and arrangement of the statistical data should be fully borne in mind. Moreover, the year adopted for the purpose of the returns of mills, spindles and looms published by the Bombay Millowners' Association is not the financial year for which the figures of production are compiled. Obviously, for scientific accuracy and exactitude it is desirable that the figures of production are shown in a separate Table.

The analysis of Table on the next page reveals some distinct tendencies in the yarn and piecegoods production in the Cotton-Mill Industry of India. Firstly, there has been a phenomenal increase in the share of the Indian States both in production

Table LXXII
REGIONAL DISTRIBUTION OF YARN AND PIECEGOODS PRODUCTION IN COTTON-MILL INDUSTRY OF INDIA
—SOME STATISTICAL TRENDS—

Province	Percentage Distribution of yarn of all counts.				Percentage Distribution of woven goods (all counts.)			
	1911	1921	1931	1941	1911	1921	1931	1941
Bombay Island ..	52.4	51.9	31.2	26.3	54.8	52.8	37.8	30.7
Ahmedabad	10.8	11.6	15.9	13.8	20.1	22.1	27.0	26.9
Rest of Bombay Province ..	7.4	7.8	7.8	6.5	6.8	8.2	6.7	5.6
Total ..	70.6	71.2	54.9	46.5	30.7	83.1	71.5	63.1
Madras	6.9	6.2	8.9	14.2	2.3	2.5	2.8	2.3
Bengal	5.2	5.1	4.4	4.3	1.3	1.5	3.2	4.7
United Provinces ..	6.3	5.6	9.9	9.9	3.5	1.3	5.1	6.8
Ajmer-Merwara (a) ..	..	.3	.7	.9	..	.4	.4	.6
Punjab	1.1	.4	1.3	1.4	.2	.1	.8	1.5
Delhi (b)	..	.6	1.0	2.1	..	.2	.9	2.2
Central Provinces & B. ..	4.4	4.7	5.2	4.1	4.1	3.8	2.4	1.9
Bihar	..	..	..	.3	..	..	..	.3
Sind	..	..	..	..	..	..	..	..
Total Br. India ..	94.5	94.8	84.2	83.6	94.9	93.8	86 .2	83.2
INDIAN STATES & F. T. ..	5.5	5.2	15.8	16.4	5.1	6.2	13 .8	16.8
TOTAL ..	100	100	100	100	100	100	100	100

(a) Prior to 1915-16 figures for Ajmer-Merwara were included in the United Provinces figures.
(b) Prior to 1915-16 Delhi figures were included in Punjab.

of yarn and piecegoods. Secondly, there has been remarkable decline in the share of Bombay Island. The decline is much greater in case of spinning than in case of weaving. Bombay which once produced more than half of the total yarn manufactured in India, is now producing only a little over one-fourth of the total yarn production. Ahmedabad's share in the production of yarn and piecegoods has increased while that of the Rest of Bombay Presidency has recorded a slight decline. In case of Madras, while there has been a striking expansion of the spinning section, the weaving section has not expanded to any considerable extent. On the contrary, Bengal's share in the total piecegoods production has increased considerably but its share in the production of yarn has recorded a slight decline. United Provinces and Delhi have increased their shares both in the production of yarn and piecegoods. These tendencies reflect that there has been a considerable dispersal of productive activity in the Cotton-Mill Industry of India.

CONCLUSION

The foregoing analytical study in the intra-regional shift of productive activity has clearly shown that the relative position of Bombay as a predominant centre of cotton-textile industry has considerably declined during the last thirty years and specially after 1921. Whichever standard we may employ for measuring the locational shift of productive activity we shall find the dominance of the same tendencies. Percentage distribution of mills shows that the share of Bombay has decreased from 33.34 in 1911 to 16.41 in 1941. So also the percentage distribution of spindleage has declined from 45.48 to 27.91, of loomage from 50.03 to 32.88, of workers from 45.24 to 27.22, of total quantity of yarn spun from 52.42 to 26.25 and of the woven goods manufactured from 54.79 to 30.66. Those

Provinces and States which have gained relatively are Madras, United Provinces, Central India, Bengal, Delhi, Baroda, Mysore, Hyderabad, Rajputana, Bihar and Orissa. Other Provinces like N.-W.F.P., Sind, Orissa and Assam have so far not succeeded in attracting the industry. The study of these trends is very helpful for they indicate the directions in which future expansion is likely to take place in the absence of state regulation.

III

ANALYSIS OF LOCATIONAL TRENDS

ABSOLUTE MEASUREMENT

We have hitherto analysed the relative position of different Provinces and States and the nature and character of dispersal in the industry. It is essential to examine whether absolutely also we observe the dominance of the same locational tendencies. For although Bombay's relative position as a predominant centre of cotton-mill industry has much declined during the last thirty years, the production of yarn and woven-goods has recorded an increase of 43 and 140 per cent respectively. So also looms installed in the cotton-mill industry of Bombay have increased by 54 per cent, workers by 11 per cent and the Annual mill-consumption of cotton by about 20 per cent between 1911 and 1941. These tendencies presumably reflect that absolutely Bombay's position as a predominant centre of cotton-mill industry has not declined during the last thirty years. Thus in order to get a complete picture of the nature and character of shift in production activity we should study not merely relative but also absolute measure of industrial dispersal.

Table LXXIII shows the trends in the intra-regional distribution of cotton-mill industry in India during 1911-41. It is interesting to observe that although the number of mills in Bombay City and Island has declined from 87 in 1911 to 64 in 1941, and the spindles by about 3.5 per cent the distribution of looms, workers, cotton-consumption, yarn and piecegoods manufacture show a substantial increase between 1911-41. It may look a little surprising that despite a fall in the number of mills and spindles, the production of yarn and piecegoods has increased by about 43 and 140 per cent respectively. But it should be remembered that the period between 1911-41 witnessed great expansion in the average-size of Bombay-mills and the general replacement of of mule spindles by ring spindles. Both these factors have considerably increased Bombay's productive capacity. Moreover, during the early period of its development, the Bombay industry was predominantly spinning in character. With the loss of yarn market in China the industry has gradually become more and more self-sufficing in character. Obviously, the expansion of the weaving section has been truly remarkable. All these tendencies show that absolutely Bombay's share in the Cotton-Mill Industry has increased between 1911 and 1941.

Another fact which emerges from this Table is the expansion of the industry in all other Provinces and States. The greatest expansion has been in Madras, Ahmedabad, Central India and the United Provinces. In Bengal there has been a remarkable expansion of the weaving section. In Central Provinces, although the number of mills has not increased since 1911, the number of spindles, looms, workers and the production of yarn and woven goods have recorded a significant increase. In the Rest of Bombay Presidency, Mysore and Hyderabad the industry has expanded in every direction but more especially in weaving than in spinning. The expansion of spinning (except in case of Madras Presi-

Table LXXIV

VARIATIONS IN LOCATION FACTOR

	Percentage of population in 1921.	Percentage of workers in Cotton Industry 1921.	Location Factor $\frac{I}{P}$ 1921.	Percentage of population. 1941.	Percentage of workers in Cotton Industry 1941.	Location Factor. $\frac{I}{P}$ 1941.
	P.	I.		P.	I.	
Bombay Presidency ..	9.3	81.39	8.75	8.4	57.9	6.89
Madras	14.9	7.54	0.50	14.8	12.1	.82
United Provinces ..	14.9	5.41	0.36	14.1	6.5	.46
Bengal	15.9	3.61	0.24	15.5	5.6	.36
Central Provinces ..	4.5	5.38	1.19	4.3	5.0	1.16
Punjab and Delhi ..	7.0	1.25	0.18	7.5	1.5	.20
Bihar	..	..	..	9.4	.3	.03
Rajputana	3.4	.42	0.12	3.6	1.2	.33
Mysore	2.0	.57	0.28	1.9	2.1	1.10
Hyderabad	4.0	.91	0.23	4.2	1.7	1.40
Central India	2.0	2.15	8.07	1.9	5.9	3.10

dency) has mostly been the result of the expansion of weaving rather than the reverse. These tendencies show that, absolutely, the industry has expanded in all the Provinces and States.

VARIATIONS IN LOCATION FACTOR

Location Factor undoubtedly provides a very satisfactory measure of ascertaining the nature and extent of industrial dispersal. If the location factor approaches unity, the industry moves to less developed areas; if, on the other hand it shows a greater deviating tendency, the industry gets concentrated at few locations. Variations in 'location factor' thus indicate the increase or decrease in the relative share of each Province or State. In Table LXXIV an attempt has been made to study the changes in the location factor of each Province and State between 1921 and 1941:

The Table on the last page shows that both in 1921 and 1941, the industry was unevenly distributed not merely absolutely but also in relation to the distribution of the population. Bombay has a remarkably large share of the Cotton-Mill Industry. The other provinces and States which have a larger share of the industry than is warranted by their share of the total population are Central India, Central provinces and Berar, and Mysore. Madras is tending to have what may be called a fair share in the distribution of the industry. United Provinces, Bengal, Hyderabad, Rajputana, Bihar, Delhi and Punjab have increased their share of workers in the industry relatively to their population. The variations in the 'location factor' between 1921 and 1941 suggest a broad tendency for the dispersal of productive activity in the Cotton-Mill Industry of India.

IV

FACTORS IN THE DISPERSAL OF THE INDUSTRY

The development of the means of transport and communication has played an important role in the dispersal of cotton-mill industry. For a long time the industry could not be established in the interior regions, for no transport facilities were available for collection of raw-materials and distribution of finished products. It was only when the country was covered with network of railways that numerous interior centres sprang up. New mills were established in Cawnpore (Elgin, 1864), Madras (Buckingham, 1876), Sholapur (Sholapur Spg. and Wvg.), Nagpur (Empress, 1877), Mysore (Mysore Spg. & Wvg., 1884), Coimbatore (1888), Delhi (D. C. M. 1889), and Madura (Madura Mills, 1889). These centres were favourably located both in regard to raw-materials and consumers' markets. They were situated in the heart of the cotton-growing tracts and had access to abundant supply of raw-cotton. They had also large consuming market in the surrounding areas. With the completion of railways and diffusion of machine technology, these centres gradually began to attract the cotton-industry. Between 1876-96 no less than 66 new mills were floated in the up-country centres. Thus initial dispersal of the industry was mainly due to the development of the means of transport and communication in the interior regions.

Secondly, the vast size of the country with its enormous distances and high transportation costs led to the shifting of productive activity to consumers' market. In a large country like India it is not profitable for any single centre to cater the requirements of all the different markets, for its transport relations must necessarily be inferior to those located in the interior regions. This is particularly so in case of an industry, like the cotton-textiles, which does not command any decisive natural advantage, and is capable of thriving in widely divergent environments. Numerous industrial centres, like Delhi, Nagpur, Cawnpore and Calcutta, therefore, sprang up to take advantage of the proximity of consumers' market.

Thirdly, the change in the railway rates policy of discriminating in favour of port towns and the gradual introduction of more uniform rates based on distances, have considerably helped the dispersal of productive activity.

Fourthly, the development of hydro-electric power has considerably helped the general trends towards industrial dispersal. The extraordinarily rapid expansion of the spinning industry in Madras, mainly in the districts of Coimbatore, Madura and Tinnevelly, was greatly assisted by the completion of the Pykara Hydro-electric scheme, and the readiness of the local industrialists to take advantage of the new sources of power.[1] Similarly, the expansion of the industry in Mettur, Salem, Erode, Tirchengode, Singarappet was greatly assisted by the construction of Mettur Stanley Dam. In Mysore the mills are dependent for their power supply on the Mysore Hydro-electric Works. In Punjab the development of hydro-electric power has given considerable impetus to the cotton-manufacturing industry. Mills have been established in Lahore, Amritsar, Ludhiana, Lyallpur and Okara. The expansion of cotton-mill industry in Madras, Mysore, Travancore and Punjab has been greatly assisted by the development of hydro-electricity.

Lastly, the inter-regional differences in wages and the encouragement and assistance given by the native States have considerably helped the dispersal

1. Location of Industry in India.

of industrial-activity. The Government of the States have offered numerous inducements and concessions to mill companies such as grant of free land, remission of custom duties and municipal taxes, supply of electricity at concession rates and grant of loans at very low rates of interest. In most of the Indian States the mills are immune from income-tax provision. The labour and factory laws too are not as stringent as they are in British India. Moreover, some states like Hyderabad and Indore have levied export duties on cotton and import duties on piece-goods with the object of developing the cotton-mill industry. It is interesting to note that the pioneering mills in Indian States were started as government concerns and subsequently sold to private interests at concession rates. The encouragement given by the Indian States led to the rapid expansion of the cotton-industry. The share of Indian States in the production of yarn and piecegoods increased from 5 to 16 per cent between 1911-41.

V

SHIFTING OF PRODUCTIVE ACTIVITY FROM REGIONS OF HIGH TO REGIONS OF LOW LABOUR COSTS

The Cotton-Textile Iudustry furnishes a striking example of the shifting of productive activity from regions of high to regions of low labour costs. Indeed, the manufacturers of coarse cotton fabrics have tried most persistently to locate their plants in wage-minimum areas, and this has caused perhaps the greatest international industrial migration of modern times. Cotton manufacturing has long been moving from areas of high productivity and high wages such as Lancashire and eastern Massachusetts to industrially backward regions like Japan, India, and China. In the United States of America, the cotton manufacturing activity has long been shifting from such centres as New Bedford, Fall River and Lowell to Southern States of Georgia, Alabama, North and South Carolina. Virginia and Tennesse[1]. In Great Britain the centres of industrial activity have been shifting from North to South, and the South-east districts of England have gained at the expense of north and north-east.[2] These locational tendencies suggest that certain industries which do not possess any decisive natural advantages, and in which labour costs form a large proportion of total costs, tend to shift to those regions, where labour is both cheap and abundant.

In the Cotton-Mill Industry of India the productive capacity has long been moving from Bombay to up-country centres like Ahmedabad, Sholapur, Cawnpore, Coimbatore, Delhi, Nagpur, Baroda and Indore. It is interesting to examine how far this shift can be attributed to the differences in labour costs in different centres. We have already indicated in Chapter IV the reasons why it is not possible to work out detailed computations which would permit inter-regional comparisons of labour costs. Strictly speaking, labour costs per unit of output is influenced by many extraneous factors, such as character of machinery employed, standard of efficiency attained in various processes, differences in the character and quality of output, general conditions of work and managerial efficiency. The information on these subjects is so meagre that it is not possible to arrive with any degree of accuracy and exactitude at the regional differences in labour costs. Nevertheless any study in this direction will be helpful in so far as it can indicate the general tendencies. The Table on the next page shows the differences in wage-costs in Bombay and other up-country centres:

1. I. L. O. Report on the World Textile Industry, 1937, p. 115.

2. Economic Journal, June, 1930, p. 274.

Table LXXV

AVERAGE WAGE-COSTS PER SPINDLE PER DAY

	Number of Mills taken	Pies
Bombay	8	5.04
Up-country centres	6	3.86

AVERAGE WAGE-COSTS PER SPINDLE PER DAY

	Number of Mills taken	Pies
Bombay	8	317.64
Up-country centres	6	255.50

Analysing these costs the Tariff Board came to the conclusion that the greatest disability from which Bombay suffered was in its high costs of labour. Wage-costs are substantially higher in Bombay than in other centres of the industry except Ahmedabad.[1] These differences in wage-costs have been the primary factors in motivating the shift of productive activity from Bombay to the up-country centres.

Since the Tariff Board reported, there has been a further increase in wage-rates. The following Table shows the trends in wage-rates in Bombay between 1914-44:

Table LXXVI

WAGE-TRENDS IN THE COTTON MILL INDUSTRY OF BOMBAY

Year.	Month.	Average Daily Earnings.			Average Monthly Earnings.		
		Rs.	a.	p.	Rs.	a.	p.
1914	May	0	10	1	16	6	0
1921	May	1	2	10	30	10	0

Source: Indian Tariff Board Report, 1927, p. 120-21

1. Tariff Board Report on Cotton Textile Industry, 1927, pp. 223-24.

Year.	Month.	Average Daily Earnings.			Average Monthly Earnings.		
		Rs.	a.	p.	Rs.	a.	p.
1923	August	1	4	2	32	12	0
1926	July	1	5	3	34	9	0
1933	December	1	1	2	27	14	0
1934	October	1	1	10	29	0	0
1937	July	1	1	6	28	7	0
1938	February	1	3	9	32	2	0
1939	December	1	5	9	35	6	0
1941	August	1	7	6	38	3	0
1942	July	1	13	0	47	2	0

Another indication is furnished by the trends in labour costs to total costs. The statement of cost of manufacture, submitted by Bombay Millowners' Association in their original representation showed that in 1914 the cost of labour formed 37.8 per cent of the total manufacturing costs against 40 per cent in 1924.[1] In 1932, the Tariff Board calculated that on the average, cost of labour in Bombay formed about 49.10 per cent of the total manufacturing costs.[2] These tendencies suggest that the labour costs in Bombay have increased not merely absolutely but also in relation to other cost factors.

A comparative study of the labour costs in different centres of the industry will reveal the disadvantage of Bombay and Ahmedabad in respect of labour costs. Table LXIX on page 259 shows the percentage of labour costs to works cost in different centres of the industry. These costs relate to production of cloth of medium counts. It is interesting to observe that the cost of labour is substantially

1. Indian Tariff Board Report on Cotton Textile Industry 1927, Vol. I. p. 113.

2. Indian Tariff Board Report on Cotton Textile Industry 1932, p. 98.

lower in centres like Nagpur, Cawnpore and Calcutta than in centres like Bombay, Ahmedabad, Delhi or Baroda. One reason why no new mill has been established in Bombay, Ahmedabad and Delhi since 1933 is that the labour costs in these centres compared very unfavourably with those in other centres. The locational trends also suggest that the manufacturing activity has mainly moved to centres of low labour costs.

Intra-regional variations in wage-rates also indicate the same tendencies. Table LXX on page 260 shows the Average Daily Earnings of cotton-mill workers in Selected occupations in almost all the important cotton-manufacturing centres in India, and Table LXXVIII shows the frequency distribution of Average Daily Earnings of cotton-mill workers in different centres of the industry (including Bombay Province) The figures relate to the year 1944.

An analytical study of these Tables reveals that wages in some of the centres like Bombay, Ahmedabad, Delhi, Baroda and Indore are substantially high compared to those in other centres of the industry. Indeed, it is surprising to note that the Average Daily Earnings of Cotton-Mill Workers in Baroda and Indore are higher than even those in the Bombay City.

Table LXXVIII

SUMMARY FREQUENCY TABLE SHOWING AVERAGE DAILY NET EARNINGS OF COTTON-MILL WORKERS IN DIFFERENT CENTRES OF INDIA (EXCLUDING BOMBAY PROVINCE)

	Percentage to total						
	Under 0-12-0	0-12-0 and under Rs. 1 4 0	Rs. 1 4 0 and under Rs. 1 12 0	Rs. 1 12 0 and under Rs. 2 4 0	Rs. 2 4 0 and under Rs. 2 12 0	Rs. 2 12 0 and above.	Total
British India							
South India							
1. Madras ..	..	..	69.08	11.09	10.28	9.55	100.00
2. Coimbatore ..	48.03	45.89	5.95	.13	..	..	100.00
3. Madura ..	3.81	6.12	89.96	.61	..	..	100.00
4. Ramnad ..	36.82	60.56	2.62	..	..	..	100.00
5. Ambasamudram ..	..	..	100.00	..	..	..	100.00
6. Trinnevelly ..	28.36	12.71	33.81	25.12	..	..	100.00
7. Gudiatham ..	81.86	18.14	..	..	..	..	100.00
8. Salem ..	72.31	27.69	..	..	..	..	100.00
9. Trichnopoly ..	69.01	30·99	..	..	..	..	100.00
United Provinces							
Cawnpore ..	0.18	3.25	17.72	37.50	40.02	2.33	100.00
Central Provinces							
1. Nagpur ..	..	..	37.40	53.79	8.58	0.23	100.00
2. Akola ..	..	0.26	70.98	17.38	11.38	..	100.00
Delhi ..	..	2.59	7.84	48.14	12.08	29.64	100.00
Punjab							
1. Lahore ..	..	25.59	54.98	6.93	12.50	..	100.00
2. Lyallpur ..	..	..	32.55	26.49	40.96	..	100.00
Bengal ..	1.90	23.85	48.61	1.65	23.99	..	100.00
Indian States							
1. Indore ..	..	..	.49	50.20	31.04	18.27	100.00
2. Baroda ..	..	..	..	..	34.13	65.87	100.00
3. Mysore ..	13.14	47.77	30.49	8.60	..	..	100.00
4. Cochin ..	55.72	35.03	9.25	..	..	..	100.00
5. Travancore ..	55.71	44.29	..	..	..	..	100.00
6. Pudukota ..	79.89	15.74	4.37	..	..	..	100.00

In Baroda State over 65 per cent of the cotton-mill workers have an average earning of Rs. 2-12 and over per day. In other centres of the industry, particularly those in Madras Presidency (including Madras City) and Southern Indian States, wages are comparatively very low. They are lowest in Cochin, Travancore, Pudukota, Davangere (Mysore), Ramnad, Tinnevelly, Gudiatham, Salem and Trichinopoly. Those centres which are at a substantial disadvantage as regards labour costs are Ahmedabad, Bombay, Delhi, Madras, Baroda, Indore, Cawnpore, Lahore and Lyallpur. Indeed, it is significant to note that no new mill has been established in Ahmedabad, Bombay, Delhi and Madras since 1933. This fact presumably reflects that these centres have ceased to be great attractive centres for future expansion of the textile industry. On the other hand the extraordinarily rapid development of the industry in centres like Coimbatore, Madura, Tinnevelly, Dacca, Beawar, and other interior centres like Sholapur, Barsi, Gokak, Dhulia, Amalner, Jalgaon, has been considerably assisted by the prevalence of low wage rates in these centres. Indeed since 1931, certain tendencies are operating which clearly show that the productive activity is gradually moving from centres of high-wage rates like Bombay, Ahmedabad, Delhi and Madras to centres of low-wage rates like Coimbatore, Madura, Trinnevelly, Bangalore, Dacca and Beawar (Ajmer-Merwara).

VII

LOCATIONAL TRENDS AND COST AND PROFIT ANALYSIS

We shall now study and examine the locational importance of different centres of production in the light of 'costs' and 'profits' and also discover whether the shift of productive activity is due to production in some centres being more economical or more proitable than in others. For, unless this aspect of the problem is minutely analyzed and examined no authoritative and objective information would be available to show that the shift in productive activity has been the result of strictly economic calculus and not mere "historical accidents." But unfortunately the data available for such a study are so meagre, inadequate and fragmentary that it is not possible to undertake a very comprehensive and searching analysis. We, however, present some data which indicate the relative advantages and disadvantages of different centres in respect of each cost-factor.

The Table on the next page shows the Average Costs of Manufacturing cloth of medium counts in some important centres of cotton industry.

An analysis of the Table reveals the comparative advantages and disadvantages of different centres in regard to each cost-factor. Labour costs are comparatively very high in centres like Bombay, Ahmedabad, Delhi and Baroda than in centres like Cawnpore, Nagpur and Calcutta. Power costs are slightly higher in Cawnpore and Delhi than in Calcutta and Nagpur which are nearer to the coal-fields. As regards Stores, mills in Bombay are at a substantial advantage compared to mills in other centres of the industry. This is partly because Bombay is a port and can import stores cheaply and partly because of the large average-size of mills in Bombay and greater concentration of Managing Agents. Again, costs of repairs and maintenance

Table LXXIX

AVERAGE MANUFACTURING COSTS IN SOME IMPORTANT CENTRES OF THE COTTON-MILL INDUSTRY

	Bombay	Ahmedabad	Cawnpore	Delhi	Calcutta	Nagpur	Baroda
No. of Mills Considered	11	4	2	2	3	1	2
Items	%	%	%	%	%	%	%
Labour	49.40	53.80	40.75	51.60	42.40	38.60	52.65
Fuel and Power ..	10.80	8.70	15.45	15.46	8.20	9.28	6.21
Water	0.60	0.53	0.14	0.04	..	0.46	
Stores	13.40	18.50	17.13	27.34	18.50	13.61	17.70
Repairs and Maintenance	2.50	2.64	4.14	5.87	0.70		1.00
Supervision ..	7.50	8.10	11.60	7.70	14.99	..	1.83
Insurance ..	0.90	0.90	1.56	0.67	1.60	2.33	8.33
Rent, Rates and Taxes ..	1.90	0.23	0.96	0.44	1.50	0.41	1.85
Packing ..	2.50	1.60	2.55	..	2.20	3.24	0.66
Selling Expenses ..	7.00	1.10	..	8.35	11.10	14.75	1.97
Other Expenses ..	3.50	3·90	5.85	1.32	6.10	2.28	9.77
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Indian Tariff Board Report on Cotton-Textile Industry, 1932, p. 98.

supervision, insurance, advertisement, and other administrative and distributive costs are lower in Bombay than in up-country centres mainly because of the large average-size of mills in Bombay. As against this, Bombay is at some disadvantage as regards water charges and rent, rates and taxes. In respect of raw-material costs the balance of advantage is against Bombay.[1]

The concluding remarks of the Indian Tariff Board are of great interest:

"Our examination of the costs of production in various centres shows that by far the greatest disability from which Bombay suffers is its high cost of labour. It is also under substantial disadvantages in regard to cost of fuel and power, cost of water and higher local taxation, but these are rather more than offset by advantages in regard to the cost of stores, of insurance and of office-expense. So far as costs of production are concerned, it is in labour costs that is to be found the main reason why the depression in the industry has been felt so much more acutely in Bombay than it has elsewhere."[2]

PROFIT ANALYSIS

The task of analysing the regional variations in profit-rates is one of extraordinary difficulty. In our Chapter V we have pointed out the fundamental difficulties in the measurement and comparison of industrial profits. These difficulties are much greater when comparisons are made between units situated in different centres of the Industry. The differences in the financial structure of the industry (as in Bombay and Ahmedabad), the methods of management and organization and the practice of inter-investment of funds in subsidiary companies pro-

1. Indian Tariff Board Report on Cotton-Textile Industry, 1927, p. 123.
2. Indian Tariff Report on Cotton Textile Industry, 1927, p. 123.

foundly influence the profits of the industry. Moreover, the task of drawing hasty inferences based on the regional variations of profit-rates is both risky and dangerous, and utmost caution has to be exercised while making deductions.

The extreme paucity of statistical material, however, prevents us from undertaking a minute and searching analysis. The figures that are easily available are those of "profits distributed" in the industry. Although these figures cannot give us a complete picture of the profits earned in the industry, they are sufficiently indicative of the general tendencies. We, therefore, present these figures for their suggestiveness.

Table LXXX shows the variation in dividend-rates in different centres of the industry. A minute examination of these figures will reveal that dividends paid in up-country centres, particularly in Ahmedabad, Sholapur, and Cawnpore were higher than these paid in Bombay. It is significant to note that in Bombay about half the number of mills did not declare any dividend between 1936-39, while of the remaining, about half the number of mills paid dividends ranging from 0 to 5 per cent. Very few mills paid dividend exceeding 10 per cent. In other centres of the industry, the frequencies are few and very unevenly scattered, but they tend to show that mills in up-country centres are in slightly better position than those in Bombay.

VIII

LOCATIONAL TRENDS DURING WAR AND POST-WAR PERIOD—1939-46

A study of the locational trends during the war and post-war period (1939-46) reveals several interesting features. Although the number of mills in India has increased from 389 in 1939 to 421 in 1946, the number of mills in Bombay and Ahmedabad had declined from 68 to 65 and from 77 to 74 respectively. This seems particularly striking in view of the fact that the industry has been passing through an abnormally prosperous period. These failures, however, reflect that the future of small and uneconomic units specially in places like Bombay and Ahmedabad is by no means very promising. The 'deglomerating' tendencies are already in operation, and with the return of normal conditions, the industry in Bombay and Ahmedabad would be faced with severe competition from the up-country centres. It is extremely doubtful whether in the changed circumstances, Bombay and Ahmedabad would continue to hold their former predominant position in Cotton-Mill Industry of India.

Another significant feature of the war and post-war trends is the expansion of the industry in Madras, Bengal, Rest of Bombay Presidency, United Provinces, Rajputana, Central India, Delhi and Punjab. Of the 39 new mills that have commenced work since 1939, 14 are located in Madras, 9 in the Rest of Bombay Presidency, 7 in Bengal, 4 in United Provinces, 3 in Rajputana and one each in Central India and Travancore. The distribution of spindleage and loomage also shows a marked increase in the share of Madras, United Provinces, Bengal and Rajputana.

Table LXXXII shows the changes in relative position of different Provinces and States during the war and the post-war period (1939-1946). It is significant to observe that the relative position of Bombay and Ahmedabad as predominant centres of cotton-mill industry has further declined between 1939-46. Those Provinces and States which have gained relatively are Madras, United Provinces Bengal, Rajputana and Travancore. The relative position of Central Provinces and Berar has recorded a further decline.

The locational trends during the war and post-war period suggest that there has been further dispersal of productive activity in Cotton-Mill Industry of India. The share of Madras, United Provinces, Bengal, Rajputana, Central India and Delhi has recorded a substantial increase. Another characteristic feature of the war and post-war trends is the spreading of the productive activity in such newer centres as Jaipur, Ghaziabad (U. P.), Bhawaniganj and Mandsaur (C.I.), Naihati, Chandpur, Faridpur, Dassnagar, (Bengal), Adoni, Bellary, Pettai (Madras), Nanjangud (Mysore District) and Bagalkot (Bombay Presidency). These locational trends are of great material significance for they roughly indicate the relative attractiveness of different regions and the future course of development in the absence of state regulation.

Table LXXXI

LOCATIONAL TRENDS IN THE COTTON-MILL INDUSTRY OF INDIA 1939-1946

—ABSOLUTE MEASUREMENT—

Provinces	Distribution of Mills. 1939	1946	Variation	Distribution of Spindles. 1939	1946	Percentage Variation.	Distribution of Looms. 1939	1946	Percentage Variation.	Distribution of Workers 1939	1946	Percentage Variation.	Distribution of Cotton-Consumers 1939	1946	Percentage Variation
				'000 omitted			'000 omitted			'000 omitted			'000 omitted		
1. Bombay City	68	65	— 3	2,851	2,833	— . 6	6,724	6,595	— 1. 9	1,133	1,278	+12. 8	3,453	4,769	+38. 1
2. Ahmedabad ..	77	74	— 3	1,902	1,826	— 3. 9	4,685	4,342	— 7. 3	779	764	— 1. 8	2,016	2,121	+ 5. 2
3. Rest of Bombay Presidency. .	62	71	+ 9	1,264	1,292	+ 2. 3	2,685	2,688	+ 0. 1	635	691	+ 8. 8	1,520	1,821	+19. 8
Total ..	207	210	+ 3	6,017	5,951	+ 1. 1	14,094	13,625	— 3. 3	2,547	2,733	+ 7. 3	6,989	8,719	+24. 5
4. Madras ..	58	72	+14	1,368	1,569	+14.68	671	770	+14. 8	517	667	+29. 2	1,782	2,218	+24. 5
5. United Provinces.	26	30	+ 4	725	774	+ 6. 9	1,153	1,225	+ 6. 2	267	348	+26. 6	1,254	1,350	+ 7. 6
6. Bengal ..	30	37	+ 7	444	476	+ 7. 2	994	1,126	+13. 4	221	270	+22. 2	445	554	+24. 4
7. Central India	16	17	+ 1	389	402	+ 3. 3	1,197	1,112	+ 1. 4	257	270	+ 4. 9	893	894	+ 0.11
8. Central Provinces.	8	7	— 1	324	301	— 7. 1	575	531	— 7. 9	187	181	— 3. 3	485	466	— 3. 9
9. Berar ..	4	4	Nil	68	68	Nil	143	147	+ 2.80	41	38	— 7.32	143	130	— . 1
10. Mysore ..	8	8	Nil	165	163	— 1.24	261	284	+ 8.81	90	109	+21.11	216	308	+42. 6
11. Rajputana ..	6	9	+ 3	89	128	+44. 9	213	295	+38. 5	48	80	+66.66	189	283	+49. 5
12. Delhi ..	6	6	Nil	109	114	+ 4.58	311	333	+ 7.07	50	60	+20.00	326	347	+ 5. 8
13. Punjab ..	8	8	Nil	111	114	+ 2.7	265	283	+ 6.79	66	60	— 9.09	255	286	+12. 1
14. Hyderabad ..	6	6	Nil	124	120	— 3.22	216	246	+12.89	69	78	+13.04	243	230	— 5. 3
15. Bihar ..	2	2	Nil	28	26	— 7.14	27	35		..	15	..	..	19	
16. Travancore ..	1	2	+ 1	12	13	+ 8.33	30	31	+ 3.33	6	7	+16.67	12	14	+16.67
17. Pondicherry ..	3	3	Nil	88	85	— 3.41	195	197	+ 1.01	52	56	+ 7.69	100	114	+14.00
GRAND TOTAL ..	389	421	+32	10,059	10,303	+ 2.42	20,246	20,280	+ 0.16	442	496	+12. 2	13,337	15,924	+20. 1

LXXXII

-MILL INDUSTRY OF INDIA DURING THE AR PERIOD—1939-1946.

MEASUREMENT—

Distribution of Loomage 1939	1946	Variation	Distribution of Workers. 1939	1946	Variation	Distribution of Cotton-Consumption 1939	1946	Variation
33.20	32.53	— .67	25.64	25.79	+ .15	25.88	25.59	— .29
23.13	21.40	—1.73	17.61	15.41	—2.20	14.11	13.32	— .79
13.80	13.35	— .55	14.04	13.94	—0.19	11.39	11.44	+ .05
70.13	67.18	—2.95	57.28	55.14	—2.14	51.38	54.75	+3.37
1.05	1.45	+ .40	1.09	1.61	+ .52	1.42	1.77	+ .35
.70	0.72	+ .02	.92	.76	— .16	1.07	0.79	— .28
2.02	2.62	+ .60	4.22	3.64	— .98	2.63	2.92	+ .29
.13	0.36	+ .23	..	0.30	+ .30	..	0.12	+ .12
1.06	1.21	+ .15	1.56	1.57	+ . 1	1.78	1.44	+ .34
5.41	5.48	+1.07	5.83	5.42	— .41	6.67	5.61	—1.06
4.90	5.55	+ .65	5.00	5.42	+ .42	3.31	3.48	+ .17
1.30	1.39	+ .09	1.03	1.21	+ .13	1.91	1.79	— .12
1.54	1.66	+ .12	1.13	1.29	+ .16	2.44	2.18	— .26
5.62	6.05	+ .57	6.01	6.80	+ .79	9.41	8.48	— .93
3.34	3.80	+ .46	11.73	13.42	+1.69	13.34	13.92	+ .58
.15	0.16	+ .01	.11	0.14	+ . 3	.92	0.09	— .83
1.31	1.40	+ .09	2.02	2.19	+ .17	1.62	1.93	+ .31
.94	.97	+ .03	1.18	1.13	— . 5	.97	.72	— .25
100.00	100.00		100.00	100.00		100.00	100.00	

CHAPTER X

A NATIONAL POLICY OF INDUSTRIAL LOCATION

I

The foregoing analytical examination has clearly revealed that the distribution of Cotton-Mill Industry in India is extremely uneven both absolutely and in relation to the distribution of the population. Bombay and Ahmedabad, the two predominant cotton-manufacturing centres together contain over two-fifths of the total workers employed in the industry. The excessive concentration of the industry in these two centres has given rise to extraordinarily grave social problems, such as overcrowding, insanitation, atmospheric pollution, high mortality rate and traffic congestion. These "beehives" of industrial activity are the most fertile breeding grounds of poverty and pestilence, disease and destitution. The deplorably tragic sight of the 'slums', 'chawls' and 'bustees', the incredibly high mortality rate, the unhygienic and insanitary conditions of life and work are too revolting for description. They constitute a menace to the health and well-being of the working populace. They spell social chaos and moral disaster, and create in the thousands of sensitive souls a profound sense of disgust, futility and despair. There is indeed a growing feeling that if we are to reap the fullest benefits of modern industrialism, we should check the continued and haphazard growth of industrial towns. Thus, from a purely social and humanitarian viewpoint, it is essential that the State should formulate a policy which will prevent the alarming evils and disquieting consequences of excessive concentration.

The need of state control is much greater even from a purely economic standpoint. Under the stimulus provided by the War and under the shelter of high protective duties, numerous new factories have been started without due regard to the problems of industrial location. With the return of normal conditions, many of them will be faced with severe competition not merely from their foreign rivals but also from the old and well-established firms. "It is no part of the duty of the state to come to the aid of an industry which suffers from wrong location and has no hope of consolidating its position owing to the competition of energetic young rivals from more favourable areas."[1] Indeed, there is not the least justification that the coffers of the poor consumer be taxed for lack of foresightedness or wisdom on the part of those, who have floated such ill-conceived ventures. Any country which takes upon itself the responsibility of protecting the nascent industries should see that they are suitably located in regard to all the productive factors, and with this end in view may justifiably direct or control industrial location.

Secondly, in the larger interests of national economy and efficiency, it is essential that each individual unit secures the maximum economies of production and distribution. Experience shows, however, that no individual entrepreneur is fully equipped to weigh the countless different factors that govern industrial location. There are instances when his choice has been governed by nothing more than his personal interest in a particular site, or some other whims or idiosyncrasies. "What is more serious is that the absence of perfect competition in the widest sense of the term or other extraneous factors may tend to protect an industry for a considerable length of time from the consequences of bad loca-

1. P. S. Lokanathan: Industrial Organization in India, (London, 1935), p. 54.

tion."[1] Obviously such uneconomic units may continue to survive till they are forced into liquidation by the competition of young, energetic rivals from more favourable areas. In the larger interests of the national economy and stability, it is highly desirable that the state takes upon itself the responsibility of directing and controlling the location of individual units. Moreover, "in a comparatively undeveloped country like India, a great amount of waste can be avoided if haphazard methods of choosing sites are replaced by deliberate and carefully worked out plans for the future development of industrial locations".[2]

Finally, strategic considerations demand that there should be a wider dispersion and decentralization of industrial activity. The principal industrial centres are generally the main targets of aerial attack, and there is no disguising the fact that such attacks, even if aimed primarily at what are usually considered strategic objectives such as munition works, ports and docks, are likely to deal destruction to large number of civilian population."[3] The destruction of one or two important industrial centres like Bombay and Calcutta, may also result in the disorganization and dislocation of entire national economy. The exigencies of war have, therefore, necessitated that either we should decentralize our industrial production or locate our plants in regions which are comparatively immune from strategic dangers. Indeed, there is growing conviction that it is only the decentralized type of industrial production that can successfully defy modern warfare, and the outstanding examples of Soviet Russia and China have further strengthened our belief.

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1. The Location of Industry in India (A Memorandum prepared by the Office of the Economic Adviser to the Government of India), p. 1.
2. Dr. P. S. Lokanathan: Industrial Organization in India, p. 54.
3. Royal Commission Report on the Distribution of Industrial Population in Great Britain, 1940, p. 186,

II

OBJECTIVES OF NATIONAL INDUSTRIAL POLICY

For a planned, systematic and co-ordinated development of national resources, it is vitally essential that the state should formulate a policy which will not only stimulate the fullest utilization of productive resources, but also ensure a more even distribution of economic activity between different parts of the country. A policy of industrial location should, therefore, be based on some pre-conceived and pre-determined objectives. These objectives can be broadly stated as follows:

(i) All new factories installed or preposed to be installed should be suitably located in regard to all the productive factors.

(ii) The State should take positive measures to encourage the decentralizations or dispersal of productive activity to less congested and less developed areas.

(iii) The State should prevent by legislative measures the overgrowth of industrial towns and excessive congestion of population and industries in vulnerable areas ; and lastly,

(iv) The State should encourage a more even distribution of industrial activity throughout the country, coupled with appropriate diversification of industry in each region or area.

'The need is for some kind of regional planning of industry, with will aim not merely at maximum efficiency of production and distribution but also at an optimum distribution of industrial activity based on broader economic social and strategical considerations.'[1]

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1. The Location of Industry in India. (The Memorandum prepared by the Office of the Economic Adviser to the Government of India), (New Delhi) p. 1.

III

REGIONAL DISTRIBUTION OF INDUSTRY

The problem of re-distribution of industry on regional basis is, however, not so easy as it may look at first sight. 'Different regions have different potentialities for industrial progress and the task of securing a balanced development of all regions is one of extraordinary difficulty'. It is often asked whether in view of vast disparities in natural resources, and the maldistribution of other productive factors such as capital and organizing ability, is it desirable to enforce a pattern of industrial distribution less conducive to economic working and industrial efficiency. "Public opinion apparently holds that considerations of national economy and industrial efficiency must remain paramount, and that no industry should normally be prevented from going where costs are lowest."[1] Any arbitrary or unreasonable interference with the freedom of the individual to select the most "economic" location might seriously handicap industrial development especially in periods of fierce foreign competition.[2]

On the other hand, there is a growing feeling that the state should actively participate in securing for each region a more even distribution of economic welfare. "Even where concentration appears relatively cheap on the basis of financial cost of production and distribution, it would in many cases be found, in the long run both socially and economically cheaper to disperse industry, if regard is paid to the benefits of widely spread industrial structure and its integration with agriculture."[1] The Barlow Commission which thoroughly examined the question of industrial location, unanimously accepted that the

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1. The Location of Industry. (P. E. P. Pamphlet No. 87) (London. 1937), p. 3.
2. The Distribution of Industrial Population in Great Britain.

1. Government's Industrial Policy: Statement of the Planning and Development Department, 1945, p. 7,

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objective of national economic policy should be 'the encouragement of a reasonable balance of industrial development, so far as possible, throughout the various divisions or regions of Great Britain, coupled with appropriate diversification of industry in division or region throughout the country.'[1] The Political and Economic Planning (P. E. P.) Group too, stressed the vital need of 'Balanced Regional Development' so as to avoid the undesirable social, economic and strategical consequences of uncontrolled growth of industry, and of excessive industrialization and urbanization of large areas[2]. Indeed, the development of industries on regional lines will not only yield benefits of diversified economy, but also 'bridge the yawning gulf between rural backwardness and lop-sided parasitical, urban growth'.

Looking from this wider perspective, there is apparently no conflict between 'economic' and 'social' considerations. The objective of a national policy is to achieve maximum results at least cost—monetary or real. It implies that the state has not merely to maximize the earning capacity, but also to do it in a way which minimizes social cost of industrialization. 'The real issue is, therefore, not between natural economic locations for industry and arbitrarily enforced uneconomic locations, nor is it even between economic and social considerations: it is between locations which may be economic for the individual or small group in the short run and those which are economic for the community as a whole in the long run.[3] The need for planned redistribution of industry on regional basis is vital for economic security and national well-being.

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1. Royal Commission on the Distribution of the Industrial Population in Great Britain, 1940, p. 202.

2. P. E P. Report on the Location of Industry in Great Britain,' (March, 1939), pp. 18-19.

3. P. E. P. Report on the Location of Industry in Great Britain, (London, 139), p. 17.

IV

POSSIBILITIES OF PLANNED REDISTRIBUTION

Before formulating a tentative scheme for planned redistribution of Cotton-Mill Industry, we should appraise ourselves of the economic possibilities and prospects of decentralization and dispersal of the industry. Fortunately, the cotton textile industry does not possess any decisive natural advantage, and is, therefore, capable of developing in very different circumstances. Both raw-cotton and finished products can be carried over long distances without any significant increase in transportation costs. The industry can, therefore, be established in any region where other productive factors, such as labour, capital and organization, are easily available. Moreover, the Cotton-textile industry has an inherent tendency to be attracted towards markets rather than towards the sources of raw-material.[1] Obviously, it is capable of considerable dispersal between different regions.

Besides this there are many other factors in our national economy which favour decentralization and dispersal of productive activity. The vast size of the country with its enormous distances and high transportation costs, renders it advantageous for each region to supply whole or part of its requirements locally. This will undoubtedly bring about a wider distribution of cotton industry in India. Secondly, the huge post-war plans for development of road and rail transport offers another opportunity for decentralization and dispersal of cotton industry. Indeed the improvement in internal means of transport and communication will result in the establishment of new centres of industry and trade and help in the diffusion of machine technology in

1. The Location of Industry in India, p. 23.

backward areas. Thirdly, the development of hydro-electricity in the interior regions, remote from coal-fields, will considerably aid industrial dispersal. With 'power' becoming an ubiquity of almost insignificant cost, the industry can migrate to any region or area, wherever there is scope for its expansion. Finally, the wide distribution of raw-cotton and the plentiful supply of cheap labour offer excellent opportunities for the development of the cotton industry in the interior regions. It is really unfortunate that while the distribution of raw-cotton is fairly wide, and while the market for finished goods is spread all over the country, the industry is principally localized in a few important centres. Advantages derived from proximity of raw-materials and markets have been continuously overlooked for want of adequate power-supply and transport facilities in backward areas. With co-ordinated development of national resources, productive factors, viz., raw-material, labour and markets, will undoubtedly stimulate the dispersion of industrial activity.

V

BASIS OF PLANNED REDISTRIBUTION

In the absence of decisive natural factors it is always advantageous to locate a plant near the consumers' market. Indeed, such a policy will save the unnecessary cost of moving the goods from centres of production to centres of consumption. Moreover, it will furnish opportunities to producers, traders, and consumers to come into closer contacts. These factors suggest that so far as economic resources permit, the redistribution of cotton-mill industry should take place on the basis of regional demand for yarn and piecegoods.

A detailed examination of production as well as of consumers' demand in different regions is, therefore, necessary for planned redistribution of the Cotton-Mill Industry. Difficulty, however, arises in the estimation of production and demand on regional basis. Hitherto the word 'region' denoted the exisitng political boundaries of different Provinces and States. But for future planning and industrial development it is essential that we should re-group these territorial units in a number of suitable economic regions so that it may be possible for us to devise a uniform, co-ordinated policy of balanced regional development. Indeed it is a happy augury that the Reconstruction Committee of Council of the Government of India has at last accepted that 'industrial development cannot proceed acccording to artificial governmental boundaries; it must depend upon the geography of raw-materials, power and markets.[1] Division of the country into suitable economic region is, therefore, necessary for planned industrial development.

We have accepted, for planned redistribution of cotton industry, the following territorial division of India as suggested by the Post-War Planning Committee (Textiles),[2] and as defined in Cotton Cloth Movement Control Order, 1943. They undoubtedly constitute the most suitable geographical areas for the development of the industry on regional basis.

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1. Reconstruction Committee of Council: Second Report on Reconstructional Planning, p. 27.

2. Post-war Planning Committee (Textiles): Report Part I. p. 13.

Table

REGIONAL GROUPING OF PROVINCES AND STATES FOR PLANNED RE-DISTRIBUTION OF COTTON-INDUSTRY

Area or Zone as defined in the Cotton-Cloth Movements Control Order, 1942	Territorial Delineation of Area or Zone.
I. Bombay Surplus Area.	Comprising the Bombay Province, the States of Western India, Baroda States, and the Deccan States.
II. South Deficit Zone.	Comprising Madras Province, Mysore, Travancore, Coorg, Cochin and other States situated in Madras Presidency.
III. C.P. Deficit Zone.	Comprising the Central Provinces, Berar, all States situated therein, and those of C. I. States and United Provinces.
IV. U.P. Deficit Zone.	Comprising the United Provinces and all States territories situated therein.
V. Bihar Deficit Zone.	Comprising Bihar Province.
VI. Bengal Deficit Zone.	Comprising Bengal and Assam Provinces and all State territories situated therein.
VII. Orissa Deficit Zone.	Comprising Orissa Province and all Eastern India States.
VIII. Rajputana Deficit Zone.	Comprising Ajmer-Merwara, and all States situated in Rajputana, including Gwalior and all States of Central India Agency except those that lie between C. P. and U. P.
IX. Punjab Deficit Zone.	Comprising the Punjab, the N.-W.F. P. and the Province of Delhi and all State territories situated therein and to the north of Punjab.
X. Sind Deficit Zone.	Comprising the Province of Sind, Biluchistan and Khairpur State.

Table TXXXIV on the next page shows the estimates of production and demand in different regions. It is interesting to observe that except Bombay, all the other regions of India are deficit areas. The annual requirement of Bengal and

Table

SHOWING THE ESTIMATED ANNUAL REQUIREMENTS OF CLOTH OF EACH AREA OR ZONE AND THE PRESENT AVAILABLE PRODUCTION

Zone.	Area or Zone defined in the Cotton Cloth Movements Control Order, 1943	Estimated Annual Requirements of cloth I	Estimated mill cloth available for civil consumption II	Estimated Handloom cloth available for civil consumption III	Total cloth available for civil consumption IV	Annual Surplus (+) or Deficit (—) V
Zone A.	Bombay Surplus Area	830	2878	121	2999	+2169
Zone B.	South Deficit Zone ..	1366	279	599	878	— 488
Zone C.	C. P. Deficit Zone ..	346	118	72	190	— 156
Zone D.	U. P. Deficit Zone ..	955	340	132	472	— 483
Zone E.	Bihar Deficit Zone ..	610	12	50	62	— 548
Zone F.	Bengal Deficit Zone ..	1235	220	170	390	— 845
Zone G.	Orissa Deficit Zone ..	280	..	31	31	— 249
Zone H.	Rajputana Deficit Zone	379	316	4	320	— 59
Zone I.	Punjab Deficit Zone	1100	157	166	323	— 777
Zone J.	Sind Deficit Zone ..	99	..	5	5	— 94
	Total ..	7200	4320	1350	5670	—1530

Punjab fall short by about 850 and 780 million yards respectively. United Provinces, Bihar and South India zones—each has a deficit, exceeding 450 million yards per annum. Bombay is, however, the only region which has a very large surplus for export to deficit areas. A comparative study of production and demand in different regions of India thus shows that production of cloth has not kept pace with consumption. Another characteristic feature of present distribution is that the areas which have the smallest deficit, viz., Rajputana, C. P., and Sind are nearest to the "Bombay Surplus Area," while those regions which have the largest deficit, viz., Bengal and Punjab lie farthest from it. This maldistribution of productive activity results not only in considerable increase in transportation costs, but also in chronic shortage of cloth during abnormal times in distant places like Bengal, Bihar, Punjab and parts of the United Provinces.

The primary object of planned distribution of Cotton Industry is to see that so far as economic resources permit, each region satisfies its demand for cloth locally and depends as little as possible on the resources of other regions. Where, however, any region is unable to satisfy its demand locally, it is desirable that it gets its requirements from neighbouring regions rather than from distant areas. This will undoubtedly result in considerable saving of frieght rates.

For realization of this objective it would be necessary to fix targets, allocate them on regional basis and to see that these targets are achieved within a fixed period.[1] The targets will of course be fixed after a careful investigation of the potentialities of each region. Fortunately, the location

1. Government Industrial Policy: Statement of Planning and Development Department, Government of India, 1945, p. 7.

of cotton industry is not much influenced by the availability of natural resources. The industry can, therefore, be developed under very different circumstances. Moreover, there is a very wide distribution of raw-cotton in India, and nearly all the deficit regions (except Bengal, Bihar and Orissa) grow cotton in excess of their normal requirements. Obviously there is no serious difficulty in the further expansion of the cotton industry. Bengal and Orissa have a vast coastal line, and if harbour facilities are developed and coastal traffic encouraged, they can easily obtain their raw-material supplies from Madura and Tinnevelly Districts of Madras, and even from the port towns of Bombay Presidency and Sind. But the future development of the industry is likely to be confined to coastal areas and to important interior centres, well connected with rail, road or river transport. Thus our raw-material resources are quite adequate for the development of the industry on regional basis. As regards labour, our country is at a decisive advantage as compared to other countries. Almost all the regions have easy access to plentiful supply of cheap labour, mainly drawn from agricultural population. Indeed, four of the five big deficit zones, viz., Bengal, Bihar, United Provinces and South India, have the advantages of very low wage-rates. Wages are also very low in Rajputana and Orissa zones. The prevalence of low wage-rates will undoubtedly help the rapid expansion of the industry in 'deficit' areas. The other productive factors, viz., capital and organizing ability, which formerly were scarce are now becoming relatively abundant. All these conditions are favourable for the rapid expansion and development of the cotton industry in deficit regions.

The only factor which stands in the way of regional dispersal of industry is the lack of cheap power supply. Indeed, it is mainly on account of this factor that Punjab, Sind, Rajputana and parts of the United Provinces could not develop a cotton industry commensurate with their resources in raw-materials and markets. The development of hydro-electric power in industrially backward regions affords the only practical solution for bringing about a more wider distribution of Cotton-Mill Industry in India. Fortunately, there is a vast scope for expansion of hydel power in Punjab, United Provinces. Madras, Hyderabad and Mysore. The Government of India too has declared its policy to secure the development of electric power on regional basis, and to promote the maximum economic development and utilization of such power. If this plan materializes, the industry can be developed in backward regions.

The foregoing analysis has clearly revealed that the task of securing the redistribution of Cotton Industry on regional basis is by no means very difficult. Our economic resources are quite adequate to ensure the development of the industry on regional basis, and if the State adopts a systematic and well-planned policy of industrial development, it would not be difficult for us to achieve our desired objective.

VI

CONTROL OF INDUSTRIAL LOCATION

The question whether the State should actively intervene to guide and control the location of individual units has aroused widespread controversy in recent years. Indeed a section of the public opinion has expressed its apprehension that 'any arbitrary or unreasonable interference with the freedom of the individual industrialist to select his own location might seriously handicap development especially in a period of fierce foreign trade and competition.'[1] The Barlow Commission which mi-

1. Report of the Royal Commission on the Distribution of Industrial Population in Great Britain, p. 188.

nutely examined the question of control of industrial location, accepted that "so far as the profitability of industrial enterprise is concerned, the State, if it takes on itself unduly wide and autocratic powers of regulation and control of industrial location, will not prove any wiser, or make more far-sighted and enlightened choice, from the point of view of industry, than the generality of those who guide individual undertakings'.[2] The successful conduct of the industry, therefore, requires, that each individual is given the fullest freedom to choose the most advantageous place of location. Moreover, it is argued that "if the State induces or influences an employer to choose a particular location and for any reason, due to location of not, the venture turns out badly, there is a risk that claims for compensation may be put forward, a risk which would have to be foreseen and steps taken to provide against it."[1] Consequently it is desirable that the final decision as to the location of each industry be left to those who are ultimately responsible for the financial success of the industry.

On the other hand there is a growing feeling that the State should actively intervene to secure the desired pattern of industrial localization. The economic, social and strategic disadvantages arising out of excessive concentration constitute serious handicaps and even in some respects dangers to the nation's life and development, and unless some definite action is taken to remedy them, the task of reorganization and rehabilitation will become exceedingly difficult. Industry is a growing organism, and the only means of arriving at the form which is ultimately desirable is by training its growth in the required directions.[3] Moreover, the problem

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1. Ibid., p. 192.
2. Dennison, S. R., Theory of Industrial Location, Manchester Guardian School. Vol. VIII, p. 23.
3. P. E. P. Report on the Location of Industry in Great Britain, 1939, p. 217.

of industrial location is national in character; it touches and indeed tends to overlap those of agriculture, land, water, transport, roads, amenities and many of the major activities of the national life. Its solution should, therefore, be sought along the lines of national enquiry and national guidance.[1]

MECHANISM OF INDUSTRIAL CONTROL

We shall now study the different methods that can be adopted to secure the desired pattern of industrial localization. Broadly speaking, these methods can be classified into two main categories, direct and indirect, or positive and negative. We shall briefly study the direct and indirect methods of industrial control.

INDIRECT METHODS OF INDUSTRIAL CONTROL

Indirect methods are of two kinds, viz., (i) incentives, and (ii) deterrents. The first includes all those measures which encourage the decentralization and dispersal of productive activity in backward areas. The second includes measures which discourage further concentration of industry or industrial population in already congested areas. The most obvious forms of "control-incentives" are:

(a) *Psychological*, such as:

Mass persuasion of industrialists to locate their plants in certain backward regions which offer vast possibilities of development.

(b) *Social*, such as:

Provision of improved amenities and social services such as education, health, recreation, etc.

(c) *Financial*, such as:

(i) Grant of loans at low rate of interest,

(ii) Direct subsidies from the Treasury,

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3. Report on the Royal Commission on Distribution of Population in Great Britain, p. 201.

(iii) Rebates or exemptions from certain taxes.

(d) *Administrative*, such as:

Readjustment of pays so as to make services in backward areas relatively less unattractive.

(e) *Developmental*, such as:

(i) Free grant of land for factory premises and residential quarters.

(ii) Provision of Transport and Communication facilities.

(iii) Location of Government defence factories.

(iv) Development of Public Utility Services, etc.

Deterrents may also be psychological, social or financial. Psychological measures include propaganda campaign to educate public opinion as to the undesirability from social, economic and strategic standpoint of further concentration in highly developed or vulnerable areas. Social deterrents grow of their own accord, and include inconveniences caused by housing shortage and traffic congestion. Financial deterrents include such measures as Levy of Special Duties on prosperous regions to financial schemes of national redevelopment.

The indirect methods of industrial control can considerably help the decentralization and dispersal of industrial activity. They can prevent the undesirable economic and social consequences of uncontrolled growth of industry, correct the lack of balance between highly developed areas and industrially backward regions, and bring about the industrial development of the country in accordance with the requirements of national security.

DIRECT METHODS OF INDUSTRIAL CONTROL

Direct control may be exercised with the object of:

(a) Preventing overgrowth of industrial towns, and

(b) Securing a more even distribution of industrial activity between different regions through the system of industrial licensing.

The problem of preventing the overgrowth of industrial towns requires direct control by the State. For, despite the operation of certain "deglomerating" tendencies, some of the industries with a high proportion of manufacturing costs to total costs continue to be attracted to these towns. This tendency cannot be checked except by a conscious state control. The State should, therefore, adopt some legislative measures to prevent further concentration of the industry in highly developed areas.

LICENSING OF INDUSTRY

For the realization of the desired objectives the State should take powers to license the starting of new factories and the expansion of existing ones. It should be definitely laid down that no new factory or extension to an existing factory be built or begun without a licence from a properly constituted authority. For the successful working of the licensing system it is also essential that the power, acquired by the State, are used in a manner that will command general public confidence. 'The scope for administrative discretion and corruption is so high, that unless the Licensing Board is given a very definite set of rules and criteria for steady guidance, public confidence in the integrity of the system would be greatly undermined.'[1] The Government

1. Industrial Licensing : The Eastern Economist (New Delhi, 1946), Vol. VI. No. 12, p. 460.

should, therefore, lay down definite rules and conditions which should guide the decisions of the Licensing Authority. As a general rule, the State should formulate some (a) general economic criteria, (b) social economic criteria, and (c) wider social criteria for weighing the competing claims of different applicants. This will inspire greater confidence in the general public, and also enable the Licensing Authority to discharge its duties most impersonally and impartially.

VII

Both the negative control of the location of industry and the positive policy of encouraging the development of backward areas should form an integral part of a systematic, co-ordinated policy of economic reconstruction.

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