A COMPARISON OF SIZE STRUCTURES IN INDIAN AND JAPANESE MANUFACTURING INDUSTRIES[1]

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The purposes of this paper are first to explore some of the characteristics of the size structures in Indian manufacturing industries in comparison with those in Japan, and secondly to examine from some limited aspects *certain conditions* that may govern these characteristics. The study at first begun aiming at preparing some empirical data for an analysis of the problem of investment choice between different techniques and different sizes of establishments in India, but was later extended to a broader scope including some of the Japanese data with a view to clarifying abnormalities and irregularities that were found from the Indian data concerning the behaviors of several important variables relating to the above problem. This is the reason why in the following discussions emphasis is placed on exploring the problems of the Indian side. Chapter I will discuss the characteristics of the size structure in terms of employment distribution with special attention paid on the relative weight of the biggest size class. A heavy concentration of employment in this size class in India is contrasted to the Japanese pattern which is characterised by the fairly even distribution of employment between the different size classes. Histrically observing too, this contrast seems to hold. Chapter II will examine this finding in terms of the structure of capital equipments by size and will indicate that, although the above contrast may have to be modified more or less, the analysis based on the size structure in terms of employment would be meaningful. Chapters III and IV will study the underlying factors which may determine these characteristics of size structure in a broad framework that is suggested by the theory of firm developed by E.A.G. Robinson and others. Chapter III will explore the problems of the wage and productivity differentials between sizes. It is noted that the patterns of differentials as observed from by-industries data are fairly similar in both countries, but the underlying causes seem different; a special attention is paid on the relative weight of the regional and the size differentials in a stricter sense in determining the above mentioned differentials. Chapter IV will examine the behaviors among sizes of capital-labour and gross profit ratios. It will be noted that while the optimum sizes tend to coincide with the dominant sizes in terms of employment in many industries, the behaviors of capital-labour ratios between sizes are quite irregular in so far as they are observed in the data in Indian Census of Manufactures: the capital-labour ratios decrease as the size expands. Some of the causes are explored.

The writer would like to apologize for that the study about the subject is still continu-

[1] This paper is originally published in Japanese under the title of "Indo no Nijukozo" (Aspects of Dualistic Structure in Indian Manufacturing Industries) in *Hitotsubashi Review*, Vol. 45, No. 6, June 1961. Taking this opportunity of translation into English, major revisions and additions were attempted about the impacts of regional differentials in wages, labor productivity, capital-labor ratios, etc. upon the subject; there are some minor alterations. The writer would like to acknowledge the receipt of written comments on the original paper from Prof. Kenjiro Ara and Mr. Yuzuru Tanaka, some statistical advices given by Mr. Yoshimasa Kurabayashi and Mr. Toshiyuki Mizoguchi and a part of caluculations assisted by members of Statistical Division of the Institute of Economic Research and Mr. Toshihiko Murashima.

ing and is not in the stage to be able to discuss the implications that these charactertistics may have upon the problem of investment choice between techniques and sizes of establishment.[2]

I. *Size Structure of Manufacturing Establishments*

At the beginning, let us observe statically the characteristics of the size structure of Indian manufacturing industries in an effort thereby to get a clue to an assessment as to what particular size group it is concentrating on.[3]

Observation of manufacturing industries as a whole

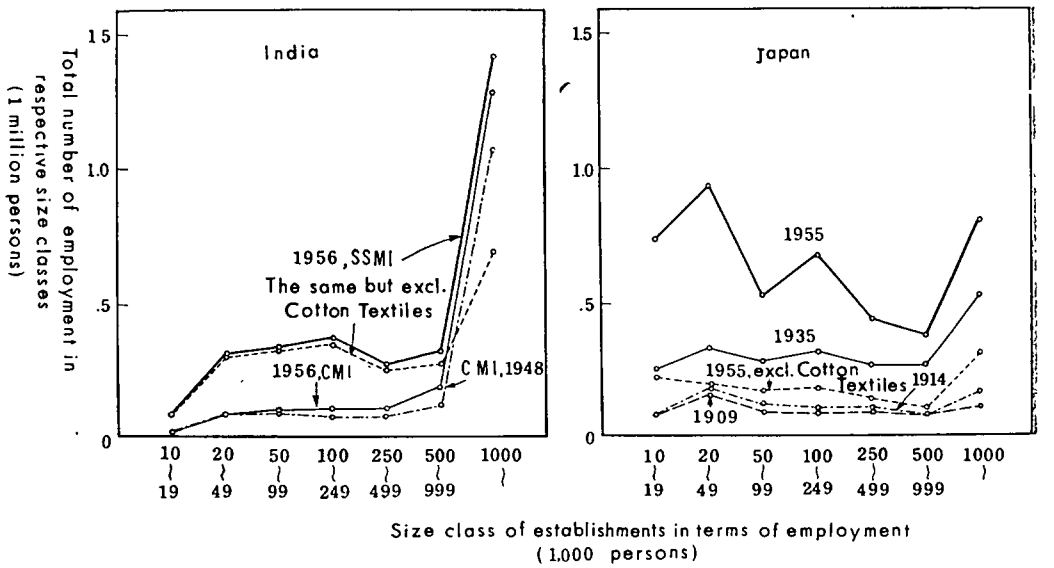
The size structures of Indian and Japanese establishments for the manufacturing industries as a whole are compared in Chart-I. This chart is drawn by taking the number of employment for respective size classes on ordinate, which is in accordance with the procedure initiated by Sergant Florence. For our purpose, this procedure is especially important because of the reason that, if we follow the usual way of taking on ordinate the number of establishments for respective size classes, the resulting curve showing the size structure would almost always indicate a heavy concentration of firms in the smallest size class and make obscure the characteristics of size patterns in the larger size classes. Intervals of size classes on abscissa are chosen arbitrarily, taking those of Indian CMI as given. Although this is not quite satisfactory, it may not cause a misleading conclusion if we confine our purpose to a certain limited scope.

Now, as seen from Chart 1, the Indian size structure presents a picture in which the size class covering 1,000 or more employees occupies an outstandingly high position while other size classes have a shape of gentle hill. This feature is also common to 1948, 1954 and 1955 when viewed in terms of the total of 28 industries. Another important feature may be found in that the rate of growth from 1948 to 1956 is highest for the largest size and in the case

[2] A result of further study attempted about the same subject has been published in Shigeru Ishikawa, Small and big establishments in Asian countries (in Japanese), *Keizai Kenkyu*, Vol. 13, No. 3 (April, 1962). This paper has dealt with the problem of size structure with emphasis rather on clarifying the characteristics of the cottage, small and medium size classes and also on exploring through it the technological characteristics of various industries. The study has extended the areal coverage of study to include the other parts of Asia.

[3] The major data used in this study are, for India, *Census of Manufacturing Industries* (hereafter referred to as CMI) and *Sample Survey of Manufacturing Industries* (hereafter referred to as SSMI) and for Japan, *Kojo Tokeihyo* or *Kogyo Tokeihyo*. In CMI and SSMI, the size structure can be grasped only in terms of employment but not in terms of capital stock. Although CMI has been held annually since 1946, the industrial coverage is confined to 28 industries out of 62 industries of Indian industrial classification, and the detailed publication has begun only since 1954. In SSMI the industrial coverage is almost complete, but the publication is made in very restricted ways. We have been able to use this only for the years 1949, 1950 and 1956, the last of which is published in Planning Commission, Government of India, *Occupational Pattern in Manufacturing Industries 1956*, 1959. In all these data, the coverage of establishments by size is different, but we have excluded the size class with employment less than 20 persons from our analysis. The reason is that the said size class is covered only in a limited scope in Indian CMI. In the tables shown up in this study, the figures for this size class are sometimes indicated for reference, but these are intended to have no relationship with the analysis.

Chart 1 *Size structure of Indian and Japanese Manufacturing Industries in terms of Employment*



Remarks: The number of employment under SSMI and CMI is measured on the basis of daily average number of employees attending on the days in which establishments are working. The division of size for Japan as given in *Kojo (Kogyo) Tokeihyo* has been adjusted to that for India as given in CMI. As for the distribution of employment between sizes for 1948 it is based on the summary as indicated in *Statistical Abstract, India, 1950*, p. 640. The above figures are all in terms of workers.

of other sizes, too, the smaller the size is, the lower the rate becomes. In addition, according to a study for 1931[4] we can see that this tendency of the employment in factory sector to concentrate on the largest size was not confined to the post-war years. This study, although not strictly comparable to the present data, tends to indicate that the weight placed on the size with 1,000 or more employees was even higher in 1931 as compared with 1956. In contrast, the Japanese size structure is characterized by the almost paralell growth of respective size classes since the Era of Meiji. One may notice in the Chart that the growth of the largest size became somewhat marked after 1935, but this tendency was accompanied after the War by a similar rise in the smaller size classes.

Observation by industries

It may be that these contrasting patterns of Indian and Japanese size structures as observed for the manufacturing industries as a whole have been due to the effect of the difference in the distribution of total employment between different industries (industrial structure), while the size structures of respective industries have been similar to one another. Or instead, it may have been resulted from the difference in the size structure between industries, while the industrial structure has been similar for both countries. Examinations of the structure

[4] V.K.R.V. Rao, *The National Income of British India, 1931—32*, 1940, p. 139.

of each industry were conducted for the purpose of clarifying these underlying causes. The emphasis here is placed on determining the relative weight in employment of the size class with employment of 1,000 and more persons. We define for this purpose the degree of concentration of employment as total number of employments in the establishments in this size class divided by total number of employments in all the establishments with 20 persons or more. We know only too well that, for observing the size structure, this is simply a partial measure, which, however, was chosen in the light of the findings in the above in respect of the manufacturing industries as a whole.

The results of our calculation have been summed up in Appendix-Table 1 in the descending order of the concentration degree in India. The industries having the concentration degree of zero and being of less importance have been omitted from the table. It may be pointed out from this table as tentative findings that:

(i) In many industries the degree of concentration in India is considerably or remarkably higher than in Japan. Especially in the cotton textile industry, jute textile industry, iron and steel industry, and paper and paper product industry, which are all said to be industries already established before the war, the degree of concentration is nearly the highest and widely different from that in Japan. The industries for which the grade of concentration in India is lower than in Japan are small in number, covering only the automobile industry, chemical industry, power generating and transmitting machinery industry, glass making industry, etc. The industries for which the calculated value is zero in both India and Japan are also comparatively small in number.

(ii) Generally speaking, the size of Japanese industries has become gradually larger from 1914 to 1935, and again from 1935 to 1955, although detailed observations suggest a possibility to classify them into several categories: those having a high degree of concentration consecutively throughout all the periods concerned (ship-building, wool spinning and weaving); those having the degree of concentration at zero consecutively (sugar, soap, fur and leather manufacturing, match, wood manufacturing, vegetable oil, wheat flour); those indicating a tendency towards larger scale (refinery, paper-making, chemical manufacturing, silk, rayon, automobiles, glass etc.); and, on the contrary, those indicating a tendency towards smaller scale (iron and steel primary products, cotton spinning and weaving, general and electrical machinery, ceramic wares, rubber products). Some of these characteristics would be explained by the facts that the size of technological optimum for the industries concerned is invariably small, or large; the industries concerned have made such a development as it is possible to designate it as a succession from one industry to another (for example, in the case of the development from repairs, assembly to manufacturing), or the optimum size is decreasing (such as cotton textiles) as an effect of innovation. In the case of such industries we cannot deny that there are observed some common features in both Japan and India. Generally speaking, however, the observation of individual industries reveals complications that would not easily match a commonplace knowledge of the technical optimum sizes, and it is considered that an indiscriminate application of the assumption that there would be a similarity in the size structure for individual industries among countries should be given up.

The difference in the industrial structure has a bearing on this treatise as far as the size structure of each industry may have a similarity between both countries. Table 1 indicates the structure of employment by industries based on a broad classification. A tabulation of this type is not desirable because it appears to be based on an assumption that there is a

Table 1 *Structure of Employment by Major Branches of Manufacturing Industries*
In % with the total employment of establishments employing 20 or more employees as 100.

	Textile Industry	Foodstuff	Metal and Machinery	Chemical	Others
India					
Average of 1949 & 1950	47.4	11.3	10.3	4.7	26.3
1956	49.2	15.3	12.3	5.5	17.7
Japan					
1909	50.2	3.2	8.6	1.7	36.3
1919	57.3	3.2	18.6	4.1	16.8
1929	61.2	4.4	16.5	7.5	10.4
1939	32.0	3.7	47.8	11.6	4.5
1958	17.1	7.9	36.2	10.3	28.5

Source: For India, *SSMI 1949, 1950* and *1956;* for Japan *Kojo Tokeihyo* or *Kogyo Tokeihyo* for respective years. As the detailed industrial classifications are not given for *SSMI 1949 and 1950*, the figures for the same years are crude; the figure for metal and machinery does not include those of electric machinery in the same years.

pattern of change in the industrial structure common to all countries in spite of the differences in the natural resources endowment, in the dependency on imports and exports and also in the periodical stage in which industrial development has been taken place. However, from Table 1 a general observation can be made that the weight of textiles has decreased in parallel with the economic growth, and the weight of metals and machinery has increased in both countries and that the present stage of development in India may approximately be equivalent to the stage of Japan in the twenties as far as one and the same standard is applied.

In such observations, the first problem to appear would be whether an expanding weight of the machinery industry might possibly bring about a dispersion among the different size classes of employment for manufacturing industries as a whole, because the machinery industry is generally inclined to a medium or small size owing to its technological nature. In fact, the deviation towards larger sizes in the machinery industry is not marked also in India. However, in order for a machinery industry to be actually of a midium or small scale type, there must be economic conditions which would make possible the development of sub-contract enterprises in addition to its technical characteristic of divisibility. In India, however, the large-scale enterprises in engineering industry have been manufacturing finished products as well as parts, except a certain sort of parts to be imported, and no sub-contract system has been easily brought up under them.[5] The third Five Year Plan set forth for the first time the independency of machinery industry as one of its major goals but adopted a principle of encouraging the large-scale factories.[6] The second problem is this: In India where the textile industries, especially the cotton textiles have an overwhelming weight and in addition their size structure is remarkably deviated towards the largest size, isn't it anticipated that the future size structure of the industries as a whole would become more dispersed

[5] George Rosen, *Industrial Change in India*, 1959, Chap. 9.
[6] PC, Gov't of India, *Third Five Year Plan, A Draft Outline*, 1960 p. 215—5, 223—5.

as the weight of cotton textiles becomes smaller with the growth of national economy? To make sure of it, the structure of employment in India when excluding the cotton spinning and the weaving industry has been also plotted in Chart 1. As can be seen obviously, the structure of employment even when excluding the cotton textiles is still deviated towards the largest scale. In view of the above it may be concluded that the difference in industrial structure has been exerting no decisive influences upon the size structure of the industries as a whole.

Size Patterns in India and Japan

We carried out an investigation of the so-called small enterprise sector, having one or more employees but less than 20, along with the investigation of the size class covering 20 or more employees, although we have here no space to dwell on it. Combined with this result, we think that the patterns of size structures of manufacturing industries in both countries may be typified as illustrated in Fig. 1. It is noted that the pattern for India is the one characterized by an extreme division into two poles in respect of the size of establishment and within this pattern the smallest size class (the household industry) is decreasing and the largest growing over time, while the medium size classes have been extremely retarded in their maturity. This constitutes a contrast to the pattern for Japan where the smallest size has been decreasing but all other size classes have been growing almost in parallel.

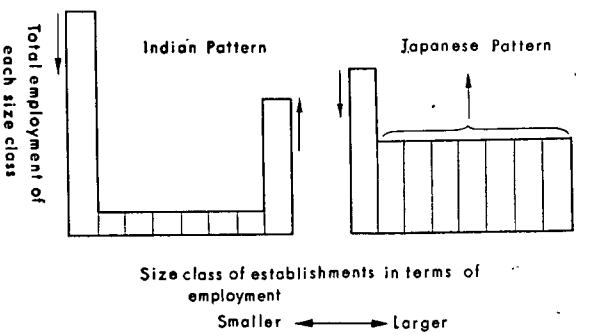


Fig. 1

Needless to say, the above observation is confined to a morphological grasping of the size structures of both countries but not extended to examinations of economic factors which have caused such morphological features. The latter are the problem to be considered next. Prior to it, however, we have to check upon this observation by investigating into one further point which may require an important reservations on it.

II. *Size structure in terms of capital——a check*

The point to be checked upon in this chapter is concerned with a possibility that the heavy concentration into the largest size class of the Indian size structure may be due to the abundance of labor power and if we measure the size structure in terms of capital, it may resemble rather the Japanese one. Only the case of cotton industry is discussed here out of the examinations attempted.

In Table 2 and 3, the equipment-labor ratios are shown up for spinning and weaving plants, respectively, in both countries. Readers are cautioned to the fact that, for India, the figures are indicated on the basis of one shift, while for Iapan they are shown without such allowance, although it can be ascertained that the spining industry has operated throughout

Table 2 *Labour-Equipment Ratio of India Cotton Spinning and Weaving Factories (per one shift).*

Average Count	Spinning: Number of Workers per 1,000 Spindles		Weaving: Number of Workers per 100 Looms	
	Minimum	Maximum	Minimum	Maximum
16	18.25	20.83	89.31	106.3
18	17.00	21.11	108.7	
22	12.21	13.80	48.69	63.67
26	10.30	15 52	75.88	87.00
32	8.82	15.00	70.00	95.40
42	7.14	10.96	75.4	81.32
60	7.97	9.47	70.25	

Source: Gov't of India, *Report of the Working Party for the Cotton Textile Industry*, April 1952, p. 109.

Table 3 *Labour-Equipment Ratio of Japanese Cotton Spinning and Weaving Factories (per one day).*

	Spinning: Number of Workers per 1,000 Spindles	Weaving: Number of Workers per 100 Looms
1958	9.4	45.4 (70.3)
1955	10.2	48.1
1952	15.5	53.9 (108.4)
1948	21.3	93.5 (149.1)
1939	16.1	48.6
1935	18.4	44.4
1930	21.8	48.9
1925	38.4	85.1
1920	46.0	101.6
1915	47.8	93.7
1910	53.9	106.4
1905	55.9	118.0
1902	60.1	

Source: *Menshi Boseki Sankosho* for each year.
Remarks: Figures for the prewar years are those for the latter half of the respective years. Figures in the column of for cotton weaving represent only the weaving section of the composite mills: those for the professional weavers are shown in brackets.

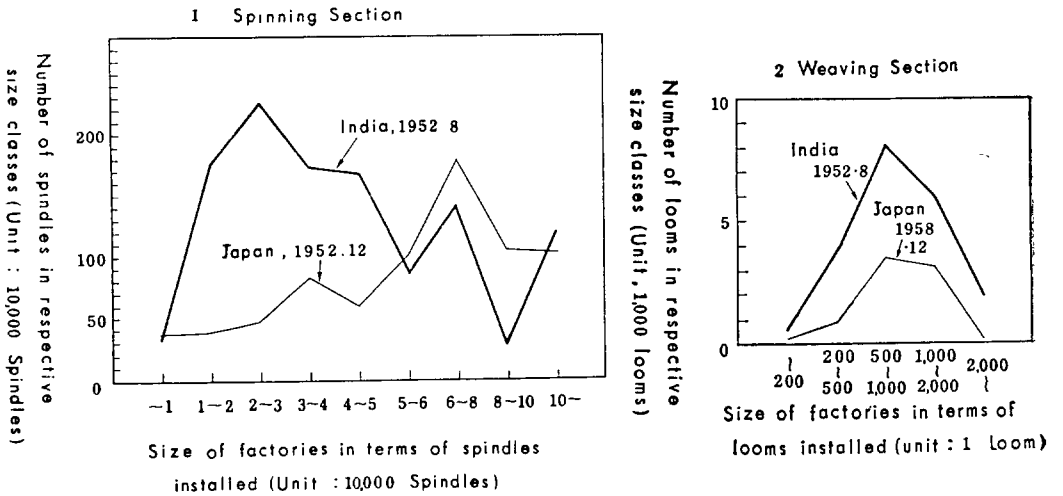
the period on the basis of two shifts a day and the weaving industry on the basis of one shift a day in prewar years at least until the end of the Taisho era; and two shifts a day after the war.[7] It should also be emphasised that these ratios do not indicate the number of fine spinners or weavers per equipment, but do indicate the ratio of the number of fine spinning machines and power looms to the total number of both direct and indirect workers. Strictly speaking, the representation of all equipments by the fine spinning machine and power loom runs a risk to disregard the different compositions by mills of equipments, and at the same time a simple parallelism of both machines would be subject to an error due to the differences in the required number of workers resulting from the different counts of cotton yarn or different qualities of cotton cloth. In the case of our comparison, however, the risk mentioned has been neglected and in connection with the error mentioned the only consideration taken was that the coefficient for Count 26 as indicated on Table 3 has been adopted in view of the average count prevailing in India.[8] Since the figures in Table 2 represent those for 1951 to 1952, the comparison with Japan has been made for the year of 1952. With the reservations mentioned above, it may be concluded that the equipment-labour ratio for India is 50 to 60% of that for Japan in the case of spinning, while in the case of weaving 30 to 35% when compared to the Japanese composite mills and 60 to 70% when compared to the midium size weavers. Taking a clue from these figures we could reach a rough estimate: providing that two shifts

[7] Japan Textile Association (ed.), *Nihon Seni Sangyo Shi, Soronhen* (History of Japan Textile Industry, Introductory Volume), 1958, Chap. 4 which has dealt with the labour conditions of that industry; *Menshi Bosiki Jijo Sankosho* (Reference Book of the State of Cotton Spinning Industry) for each year upto the end of the Taisho era (1925).

[8] S.D. Mehta, *The Indian Cotton Textile Industry, An Economic Analysis*, 1953, p. 9

are in effect, the size class covering more than 1,000 persons in the spinning ndustry corresponds to the size class in terms of equipment covering more than 60,000 to 70,000 spindles in Japan, whereas in India it corresponds to the size class covering more than 30,000 to 50,000 spindles; for the weaving industry, the same size class in terms of employment corresponds to the size class of equipment covering more than 900 units in the case of professional weavers and more than 1,800 units in the case of composite mills in Japan, whereas it corresponds to more than roughly 600 units.

Chart 2 *Distribution of cotton textile equipments by size of cotton spinning and composite mills*



Source: For India, *Nihon Boseki Geppo*, December 1954. For Japan, *Menshi Boseki Jijo Sankosho*, for the first half of 1959, p. 163.

Chart 2 indicates the equipments of cotton industry by size of equipments in both countries. It should be emphasised that the Chart excludes the equipment operated by the professional weavers and that these excluded equipments are in 1958 as many as 3.6 times of those weaving machines owned by composite mills in Japan, whereas in the case of India the number of power looms for professional weavers is only 12% of that of composite mills. The above comparisons suggest the extent that the observed size structure in term of employment would exaggerate the relative weight of the larger size classes which might perhaps more appropriately be assessed in terms of capital equipment. As a method to eliminate this exaggeration, a hypothetical picture of the Indian size structure was drawn by (1) subdividing the scale covering more than 1,000 persons into two classes as is given in CMI, that is, into the one covering 1,000 to 2,499 persons and the other covering 2,500 persons and more, (2) assuming that the latter category in reality represents the scale covering 1,000 persons and more, the former category in reality represents the scale covering 500 to 999 persons and (3) by shifting downward each of the other size classes by one class. The resulting picture still shows that the largest size class is justing out, although in this case the relative position of the next largest size class becomes also considerably high.

For the purpose of just one of the similar checks for the other industries than cotton, figures are shown in brackets in Appendix-Table 1 indicating the ratio of employment in the largest size under the same assumption. These figures suggest a possibility that the concentration in terms of capital stock in the largest size bracket may not be much different for the other industries taken as an average. But one should keep it in mind that there is no definite evidence showing the equipment-labour ratios being similar in these industries to that in cotton industry, irrespective of the various differences that exist between them. One example may be mentioned here about the iron and steel industry, the capital-labour ratio of which are found, according to a recent study, almost the same between India and United Kingdom.[9]

To sum up, the heavy concentration into the largest size class as was noted in the previous chapter as an important characteristic of the Indian size structure must be discounted more or less if it is reassessed in terms of capital stock, and in some industries the size structure in terms of capital equipment may be not much different from those in Japan. However, it should also be emphasised that the criterion used in this chapter for evaluating the exaggeration was the equipment-labour ratio that was prevailing in Japan in 1952. Needless to say, this criterion is solely relative and if another criterion is chosen from the pre-war Japan, especially from the period prior to the big rationalization drive in the first half of the Showa Era, the proposition of the heavy concentration in India into the largest size class is not necessary to be discounted, but it should acquire a fimer stand. To mention the case of the cotton industry, the equipment-labour ratio at that time in Japan was far inferior to the present day level of India as seen from Table 2. And still, the employment distribution in Japan has been fairly even among different size classes throughout the whole period. We may conclude from these considerations that the study of the size structure in terms of employment is meaningful irrespective of its divergence in any degree from the size structure in terms of capital equipment.

III. *Wage and Productivity Structure by Size of Establishments*

The above findings concerning the contrasting patterns of size structures in India and Japan require explanations. Why in India an extreme bi-polarisation of size structure without accompanying growth of the size groups in between is observed, whereas in Japan all size classes except the household industry of the lowest size have been almost parallel in their growth? A most orthodox approach for the explanation to this would be to locate the optimum size for each industry in accordance with the theories of firm of A. Marshall, E.A.G. Robinson and thereafter, and compare it with the dominant size measured in terms of employment distribution. An application of this theories however, would cause some inconveniences in reality because it presupposes the perfect competition and static conditions. As we shall soon find out, some of the answers to our problem must be sought by focussing our attention on the characteristics of imperfections in various forms centering around Indian and Japanese manufactures. However, as a broad framework of our study, the theory of "optimum size" is quite suggestive, because we also intend to locate ultimately the specific

[9] Rosen, *op. cit.*, Chap. 6.

size which private investors or government planners want to choose when they make investment decisions.

As a broad framework in this study, we set our final aim at a comparison of the gross profit rates among the different size classes which we examind in terms of employment distribution in the preceeding chapters. The concept of the gross profit rates is defined as $\frac{O-W}{K}$, where O denotes the total of value added in respective industries; W the total of wages and salaries paid and K to total value of capital stock used. This concept is chosen mainly because of limited availability of data as a substitute of the concept of the long-term production costs as was used by E.A.G. Robinson for locating the optimum size.

We also aim at identifying the characteristics of differentials by size of labour productivity $\left(\frac{O}{N}\right.$, where N denotes number of employees$\left.\right)$, average wages per employee $\left(\frac{W}{N}\right)$, gross profit per employee $\left(\frac{O-W}{N}\right)$, and capital-labour ratio $\left(\frac{K}{N}\right)$, as factors determining the final value of $\frac{O-W}{K}$. In this chapter, we concentrate our attention on the behaviors of $\frac{W}{N}$ and $\frac{O}{N}$ among different size classes.

Wage structure by size of establishments

The wage structure by size of establishment as observed in the data given by industries in the Indian CMI is characterised by the differentials of a remarkably increasing nature with size not only as to the total 28 industries but also as to most of individual industries. Although the available data prevent direct international comparisons,[10] it is almost safe to say that these Indian differentials are very similar in shape to those for postwar Japan, which are publicized by those Japanese economists who compared them with those in other industrialized countries, as internationally unique with steep inclination. On the other hand, from the data for 1909 and 1914, which are the only two years such comparison can be attempted, we recognise that the wage differentials by size did not exist for the total industries, and in the case of individual industries they were generally not uniform and without any rising inclinations.

In order to substantiate these findings, the patterns of wage structure by scale for 28 industries in India and the same for those industries in Japan which are classified and reclassified as much as possible to enable a comparison of the both are contrasted in Appendix-Table 2 in a summerised way. As for the total industries, cotton textiles, iron and steel and general and electric engineering, an attempt was made to observe the differentials more closely by fitting the log-linear normal equation: $\log X_1 = \log a + b \log X_2$ into the relationship

[10] The data for the total wages, salaries and other benefits that are convertible into money term (W) are divided by the daily average number of employees for the days in which establishments were in operation (N). This is the only way we can derive the wage earnings per employee from CMI in so far as we want to observe them by size of establishments. It is easily seen that the annual wage earnings of employees working in the establishments of smaller size classes will be smaller than those in the establishments of larger size, if the number of the days in which the establishments are in operation is systematically smaller in the smaller size classes than in the larger size classes. In the case of the data given by industries, the number of the days in which the establishments were in operation or the number of hours worked by employees is available and the above problem does not exist. Readers are requested to keep this point in mind throughout this paper.

between the average wages (X_1) and the average employment level (X_2) of respective size classes. The estimated regression coefficients of X_1 to X_2 and coefficients of correlation between them are shown in Table 4.

Table 4 *Relationship between Sizes of Establishments in Terms of Employment and Wages*

	Year	Regression coefficient	Correlation coefficient
All manufacturing industries: India	1956	0.1612	0.9801
	1955	0.1511	0.9793
	1954	0.1587	0.9903
Japan	1955	0.1695	0.9933
	1914	0.0158	0.4313
	1909	0.0005	−0.0380
Cotton spinning & weaving: India	1955	0.1499	0.9613
Japan	1955	0.1313	0.9522
	1914	0.0961	0.8734
	1909	0.0614	0.8369
Iron & Steel: India	1955	0.1391	0.9412
Japan	1955	0.1725	0.9655
	1914	0.0926	0.7616
	1909	0.0463	0.8198
General & electrical machinery(1): India	1955	0.1407	0.9932
Japan	1955	0.1158	0.7298
	1914	0.0097	0.2504
	1909	0.0584	0.8617

Remarks: Calculated by excluding the size class covering less than 10 persons. (1) The figures are calculated on a basis of the figures on Appendix-Table 2 for the general and electrical machinery (which excludes the textile machines, power generating and transmitting machines) plus the figures on the same table for the sewing machine, electric lamps and electric fans.

Now, one of the problems that arise from the above findings is why the pattern of wage differentials of present day India is similar, not to the prewar Japanese pattern but to the present day Japanese one, although a comparison of the industrial structures in both countries indicates a rather contrary conclusion as we observed in Table 1. One way of tackling this problem is to explore the causes that determined the specific pattern of Indian wage differentials in comparison with those in Japan. Statistically speaking, the wage differentials by size as observed in the above way are the ones composed by various wage differentials in a stricter sense, among which we can take up (1) differentials by jobs and occupations (2) differentials by ages (sometimes differentials by degrees of skilfulness and seniority), (3) differentials by sexes, (4) differentials by size of enterprises and establishments, and (5) differentials by regions. An influential opinion among Japanese economists seems to explain

these changes in the wage structure by size chiefly with the fact that the major factors determining the wage structure by size shifted during the 1930's from the above (1) to (4) and (2) (chiefly differentials by seniority within the identical firm).[11] Given this expalnations, what are the major factors that determine the Indian pattern of wage structures; how can they be compared with those in Japan in each period of time?

As a result of consultation with various, but rather fragmental, descriptive materials, we can see that the wages differentials in India up to the end of 1940's were markedly high between jobs, enterprises and regions, and that this historical situation has been undergoing an important change with the Labour Tribunal system and the "Minimum Wages Act", going into effect since around 1948. This act, enacted in 1948, aims at fixing the minimum wage rates and regulating the conditions of work of the workers employed in the "unorganized and sweated industries". The industries covered by this act are a few in number and generally confined to those of a medium and small enterprise type.[12] However, for the industries not covered by this act, the awards of Labour Tribunals play the same role of determining the minimum wage rates.[13] As for the cotton industry, such awards started to have a legal binding power in various regions in 1947 and 1948.[14] With the possible impact of these state interventions in mind, an assessment of the relative weight of each factor was attempted from the scattered materials.

Let us begin with the wages by job. The main pillars of the new wage system which has been established by the Minimum Wages Act and the awards of Labour Tribunals are the basic wage rates and dearness allowance. As for the basic wages, although the differentials between jobs have been legally permitted, the boosting of the basic wages for the unskilled labourers in respective industries resulted in the reduction of the differentials by jobs. In addition, the dearness allowance became an additional factor to reduce further the differentials, since the allowance was paid in a uniform amount irrespective of difference of jobs and basic wage rates and, furthermore, with the increase in living cost of workers in various regions the share of the dearness allowance expanded in the total amount of wages paid. However, while the reduction of differentials thus caused is said to have entailed a rather serious situation between the skilled workers and unskilled workers,[15] the differentials within skilled workers are still at the level to be compared to the advanced countries.[16] Therefore, it may be possible to say that at least one of the mainstays of the Indian wage structure is yet in the differentials by job, although a problem still remain to be solved regarding the controversy of wages based on jobs *versus* wages based on work load. (Management associations intend to make the wage differentials by job, now based exclusively on skilfulness, proportional to the work load, responsibilities, working conditions etc. But the labour unions has so far frustrated this move by a strong resistance.)[17]

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[11] Showa Dojin Kai (ed.), *Wagakuni Chingin Kozo no Shiteki Kosatsu* (Historical Considerations of Wage Structure in Japan) Vol. 1. Chap. 3.

[12] Ministry of Labour and Employment, Gov't of India, *Report on the Working of the Minimum Wages Act, 1948 for the Year 1957*, 1960.

[13] Ministry of Labour and Employment, Gov't of India, ed., *Current Problems of Labour in India*, 1959, pp. 136~154.

[14] S.D. Mehta, *op. cit.*, pp. 34—5.

[15] PC, Gov't of India, *Third Five Year Plan, etc.*, p. 91.

[16] S.D. Mehta, *op. cit.*, p. 135; *Report of Working Party etc.*, p. 236.

[17] *Ibid.*, pp. 127—9, 236—7. This problem is directly connected with the controversies centering

As for the differentials by seniority, it should be pointed out first that the degree of settling down of Indian factory workers is higher than that generally supposed excluding those workers in industries of a seasonal nature. Their strong tie with native villages is reflected in the high absenteeism on statistics. But their turnover is unexpectedly low.[18] In terms of the service period of the workers engaged in various enterprises, the share of the workers in service for 10 years or more is extremely high in the established industries or in those industries employing many skilled workers.[19] Therefore, if there is a system for the increase in wages according to the differences in service period, the seniority would play a part in determining the differentials in wages of such industries. In fact, the nation-wide survey conducted in 1944 revealed that such a system was prevailing in the machinery industry, chemical industry, ceramic industry, cigarette manufacturing industry, ship-building industry etc. However, in the textile industries and seasonal industries (mining and plantation) such a system was existing only exceptionally.[20] This suggests that the difference in occupational careers was playing at least a part in the differentials by size. Although these data originate from the period during the war, they are supposed to be effective even at the present time.

The differentials by sex are as wide as about 1 to 2 (female to male) for several jobs and the situation seems to be the same as in Japan. The share of female workers is, however, far below as compared with Japan and it seems to have no fixed trend by size.[21] In view of the above this problem may be disregarded at this point.

As for the differentials between enterprises within one and the same industry or within one and the same region, they are regarded as the ones which have been reduced most strikingly under the impact of the governmental intervention in wage fixation. Up to the end of 1940's, the fixation of wage rates had been carried out wilfully among enterprises with a result of making the differentials wider. Only in Ahmedabad, a collective approach among cotton mills was started in 1934 concerning the fixation of wage rates, but with the outsiders to the Spinners Association existing, the differentials in wages remained yet conspicuous. In these differentials was reflected the situation at that time in which the reduction of wage cost was taken recourse to as a main means for the competition among enterprises. And it was also this trend that the Minimum Wages Act and the awards of Labour Tribunals intended to check. It should be remembered, however, that the wage standardizations thus made effective have mainly been confined to the lowest wages paid for unskilled workers, or even when wages of workers of other categories are fixed by Labour Tribunals standardizations are made only on the basis of the broadest classification of workers, such as unskilled, semi-skilled and skilled categories. Therefore, a possibility cannot be excluded that the difference between firms may result more or less in the wage differentials between the same jobs and occupations. Although there are no available data to determine to what extent this possibility has been realized, there are some descriptive data which state that the differ-

around rationalization which constitute one of the biggest problems in the Indian cotton industry at the present time. The only agreement between management and labour concerning this problem was the Delhi Agreement concluded in February 1951. Cf: *Ibid.*, p. 39.

[18] *Ibid.*, pp. 105~8; Gov't of India, *Indian Labour Statistics*, 1959, p. 119; Charles Myers, *Labor Problems in the Industrialization of India*, 1958, pp. 45—48.

[19] Gov't of India, *Labour Investigation Committee, Main Report*, 1944, p. 92.

[20] *Ibid.*, p. 113.

[21] *Occupational Pattern etc.*

entials in wages between enterprises are still generally wide. On the other hand, attention should be paid to some examples in heavy industries where the effect of "economy of high wages" is believed in and high wage rates is boasted of, as in Tata Iron and Steel Company and Indian Aluminium Company.[22]

As for the remaining problem concerning the differentials between regions it will be readily understood from the above that the Minimum Wages Act and the awards of Labour Tribunals have played a role of reducing those differentials. Nevertheless, there are wide

Table 5 *Differentials in Wages between Regions (Coefficient of Variation)*

	Coefficient of Variation (Year in brackets)		
India	(1947)	(1950)	(1957)
All manufacturing industries 10 states	25.48	20.25	14.89
	(1950)	(1954)	(1956)
Rice polishing industry 12 states		16.04	14.95
9 states	16.99	16.12	14.83
Spinning & weaving industry 11 states		16.67	15.05
9 states	13.38	15.58	13.26
Iron & steel industry 7 states		25.87	26.40
6 states	26.97	22.52	26.03
Japan	(1935)	(1955)	
Textile industry 46 prefectures	20.83	17.61	
Iron & steel industry 46 prefectures	30.64	23.77	

Remarks: The figures for all manufacturing industries of India are based on the yearly average wage earnings of those employees whose monthly incomes are not exceeding 200 rupees and who are working at the factories to which the Factory Act is applied. Calculated from Gov't of India, *Indian Labour Statistics* 1959, pp. 35—40. Other figures for India are based on the average wage earnings per hour of those male workers who are directly employed by the factories under CMI. The figures for Japan are based on *Kojo (Kogyo) Tokeihyo*. The figures for 1935 are based on the average wages per hour per worker. The figures for 1955 are based on the figures obtained by dividing the yearly total of cash compensation by the number of employees as of the end of the year.

differentials yet remaining between regions. This may be statistically grasped to some extent by means of the coefficient of variation $\left(\frac{\sigma}{M}\right)$ between regions as to the wages of all industries as a whole, individual industries and individual jobs. The figures indicated on Table 5 suggest that while the differentials have been reduced remarkably from 1947 (prior to the coming into effect of the Minimum Wage Act and Labour Tribunal system) and thereafter, they have still remained at a considerably high level even now. At the same time, it should be noticed that the coefficient of variation between prefectures in Japan is also never insignificant, although both figures are not strictly comparable, as the grouping of regions is different for the both countries.

The above study of descriptive materials indicate that the wage differentials between occupations, between seniority, between sexes, between firms and between regions have by no

[22] National Council of Applied Economic Research, *Techno-Economic Survey of Bihar*, Vol. I, 1959, p. 77.

means disappeared even after the implementations of post-war wage legislations. The problem which remains to be checked upon is relating to the relative weight of each of these factors in determining the wage differentials between the size classes of total and individual manufacturing industries as observed in the statistical data. Although it is not easy to do this on the basis of available statistical data, we attempted to get a rough idea about it by some indirect approach. We selected the wage differentials between the size classes and those between regions, both in a stricter sense, as the two most important factors to be checked upon statistically for the purpose of clarifying the underlying causes of wage differentials between the size classes as observed in the CMI data; (in this approach, the wage differentials between occupations, between seniority and between firms will become components of the wage differentials between size classes). CMI gives us informations on the average wage earnings of workers by States (X_1) and the average size of employments in establishments by States (X_2), and we can get the informations on the amounts of the legal minimum wages by States, or the level of wages and incomes of agricultural labourers by State, which are expected to represent the wage differentials among regions in a stricter sense (X_3). The normal equations like

$$X_1=aX_2^bX_3^c;\ X_1=aX_2^b \text{ and } X_1=aX_3^b$$

are assumed and the regression and correlation analysis in accordance with these are attempted.

(1) India, 1957 At first, the correlation of X_1 with X_2 was checked for a certain number of industries. Results are

1.	Manufacturing industries, total	not significant (refer to Chart 3)
2.	Rice Milling	not significant
3.	Cotton Textile	significant
4.	Iron and Steel	significant
5.	General and Electric Engineering	not significant

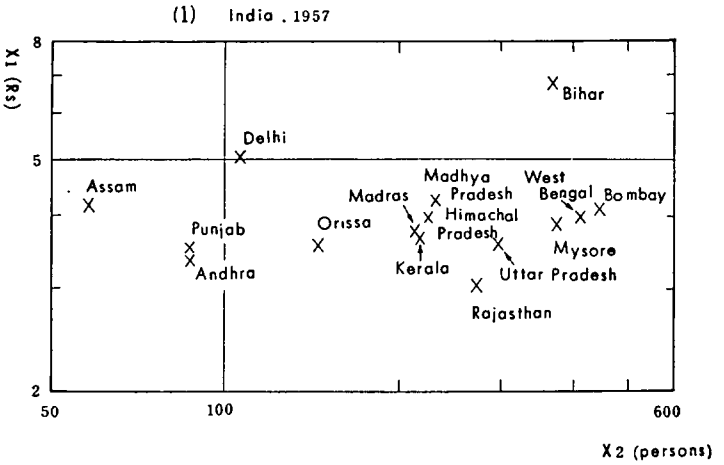
As for cotton textiles, the indices chosen to represent X_3 are the total of the basic wages *plus* dearness allowances in each major cotton industry center. The correlationship between X_1 and X_3 is far better than between X_1 and $X_2(R_{X_1\cdot X_2}{}^2=.5892, R_{X_1\cdot X_3}{}^2=.7307)$. The estimation by the least square method is

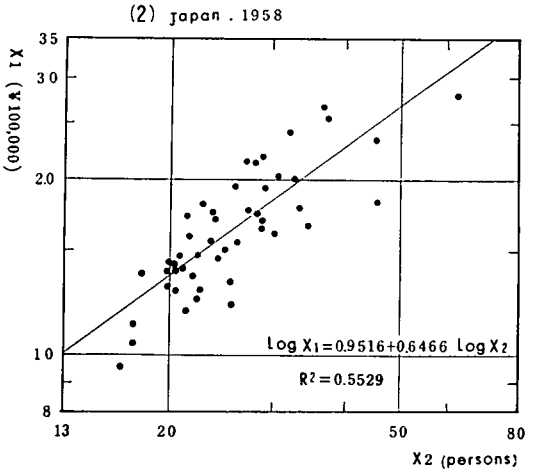
$$X_1=8.337X_2^{\cdot088}X_3^{\cdot647}$$
$$R^2=.8412 \text{ (significant at 1\% level)}$$

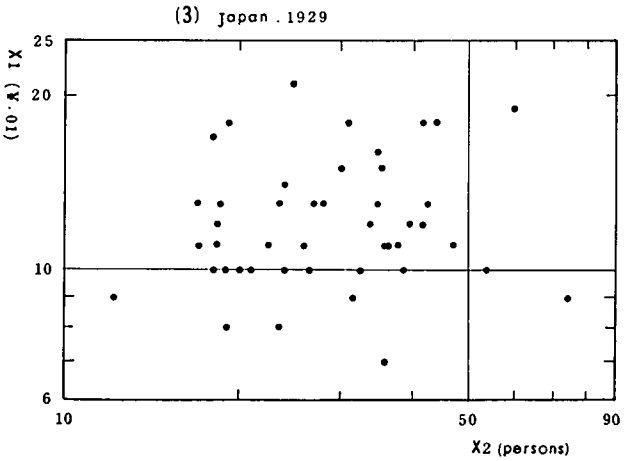
This implies that the statistically observed wage differentials among states are actually determined by 88% by the wage differentials among states and by 12% by those among size classes both in a stricter sense. Although this will not indicate directly the relative importances of the true wage differentials among size classes and those among regions in determining the statistically observed wage differentials between the size classes, a strong suggestion is that the role of regional differentials is far greater than that of size differentials even in this case.

(2) Japan, 1958 The correlationship between X_1 and X_2 is already far better than in the Indian cases for Manufacturing industries as a whole (refer to Chart 3), textile industries ($R^2=.3304$) and iron and steel industry ($R^2=.7108$) and all significant at 1% level. As for the textile industry, the indices chosen to represent X_3 are average daily wages of women agricultural labourers in 46 prefectures. The correlationship between X_1 and X_3 is significant ($R^2=.1930$), but worse than that between X_1 and X_2. The estimations of pa-

Chart 3 *Relationship between Average Wages of Employees (X_1) and Average Size of Establishments (X_2) in each States (Prefecture): Manufacturing Industries as a whole*







Notes and Sources: (1) X_1—Average daily wages of workers, *CMI, 1957*, X_2—*Ibid.* (2) X_1—Average annual wages of persons employed, *Kogyo Tokei-hyo 1958*, X_2—*Ibid.* (3) X_1—Average hourly wages of workers, *Kojo Tokei-hyo, 1929*, X_2—*Ibid.*

rameters of the same normal equation as mentioned above resulted in

$$X_1 = 1.0271 X_2^{.239} X_3^{.637}$$

$$R^2 = .51225 \text{ (significant at } 1\% \text{ level)}$$

This suggests that, in contrast to India, the relative weight of wage differentials by size classes is far greater in Japan in determining the statistically observed wage differentials among different size classes, although in this industry regional differentials still plays a bigger role than the wage differentials.

(3) Japan, 1929 However, when we look back into the wage behaviors in inter-war Japan, the relative positions of regional and size differentials in wages in determining the statistically observed wage differentials between size classes are found to be very similar to those in present day India. The correlationship between X_1 and X_2 did not exist (refer to Chart 3), but it appears to exist between X_1 and X_3. In the case of textile industry, R^2 between X_1 and X_3 was .5076 and significant at 1% level for 1929 when estimation is made from samples of 13 prefectures by taking hourly wages of women power loom workers in respective prefectures as X_3.

In the findings one may draw out of the above analysis, perhaps the most important is that the relative importance of regional differentials may be greater than any other types of differentials both in the present day India and pre-war Japan, in the formation of the overall differentials. This reminds us of the similarity of the Indian and Japanese industrial structures in the respective periods, about which we discussed earlier. The regional differentials may perhaps be a function of the economic growth, if other things being equal. However, this raises another question: how to reconcile this finding with the fact that the wage differentials by size as observed by data given by industries in Indian CMI are characterised by steep inclinations, while those in prewar Japan was flat or just irregular? A strong suggestion we got from a further investigation into the regional pattern of Indian cotton industry is that, in India, the regional concentration of manufacturing industries is still marked and the big establishments are usually located in big industrial centers with higher wages prevailing, while in Japan industrial location was far more dispersed over the country. To the extent that we cannot substantiate this proposition by the data concerning the other industries than cotton texile, it remains to be tested further.

Productivity structure by size of establishments

As far as all industries under CMI are concerned, the differentials by size of establishments of value added also indicates a curve smoothly ascending as size expands. This is quite similar to the pattern we have seen about the wage differentials by size. In the case of individual industries, the number of industries in which the relationship between the productivity and the size of establishments becomes irregular is greater than that of the cases in the wage differentials. These characteristics about productivity differentials are also similar to those observable in post-war Japan. Crude patterns of the productivity differentials for 28 industries are shown in Appendix-Table 2 and, as for the four selected industries, the coefficients of regression and correlation are caluculated in Table 6, when normal equations of the same type as utilised in the case of wage differentials are fitted to these relationships. Unfortunately, the data from which productivity differentials could be calculated in a comparable way are not available for the pre-war years. The differentials in productivity thus statistically observed from the by-industry data may be a composite result of various

differentials, just as in the case of the differentials in wages. It is therefore quite natural that a question will be raised whether the true productivity differentials which play a role of parameter for entrepreneurs in making a decision about the size of establishment might

Table 6 *Relationship between Size of Establishments in Terms of Employment and Labour productivity*

		Year	Regression coefficient	Correlation coefficient
All manufacturing industries:	India	1955	0.2004	0.8984
	Japan	1955	0.2438	0.9815
Cotton spinning & weaving:	India	1955	0.3199	0.9048
	Japan	1955	0.2260	0.9348
Iron & Steel:	India	1955	0.1423	0.8992
	Japan	1955	0.1799	0.9205
General & electrical machinery:	India	1955	0.1845	0.9781
	Japan	1955	0.1719	0.8914

be different from those. The factors to be analysed are classified in the light of the previous analysis into two: differentials of productivity between regions and differentials of productivity between sizes within respective regions. In the latter may be reflected the economies of scale and the strength of labour organizations which would increase as the size of establishments expands. The former, in their pure form, may be chiefly determined by regional differentials of prices for raw materials, fuels, electricity and products. Statistical investigations were made in a more limited scope, aiming at getting a rough idea about the relative importance of these two factors. The normal equations assumed for this purpose are similar in type of those in the case of wage differentials: $X_1=aX_2^bX_3^c$ and $X_1=aX_2^b$, where X_1, X_2 and X_3 indicate annual net value added per employee of each state, average employments of establishments in each state and certain indices representing the regional differentials of prices, respectively. As for India in 1957, the correlationships between X_1 and X_2 are not significant both for the total manufacturing industries (refer to Chart 4) and for the cotton industry. In the case of cotton textiles, X_3 can be represented by the ratio of the raw material prices (woven piece, grey *dohties* and *sarries*) to the prices of product (cotton fibre, short) in each state. The correlationship between X_1 and X_2 is better than the previous one, but still not significant even at the 5% reliability level ($R_{X_1\cdot X_2}{}^2=.3520$, $R_{X_1\cdot X_3}{}^2=.4063$). When X_1 is correlated to both X_2 and X_3 at once, we get the estimated equation:

$$X_1=.3182X_2^{.1878}X_3^{.1150}, \text{ and}$$

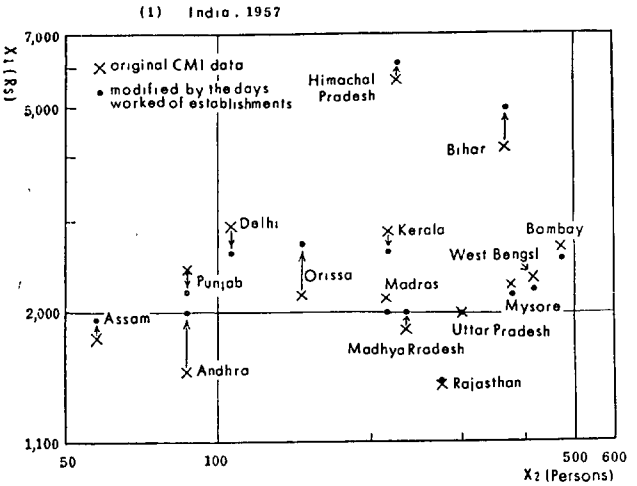
$R^2=.5333$, which is significant at 5% level.

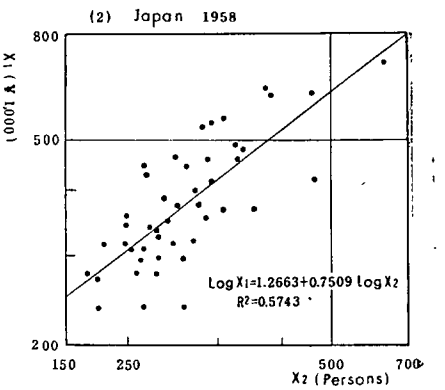
This suggest that, even in the case of productivity differentials as observed in the CMI data, the relative importance of regional differentials is larger than expected, having roughly a half of the weight of productivity differentials by size.

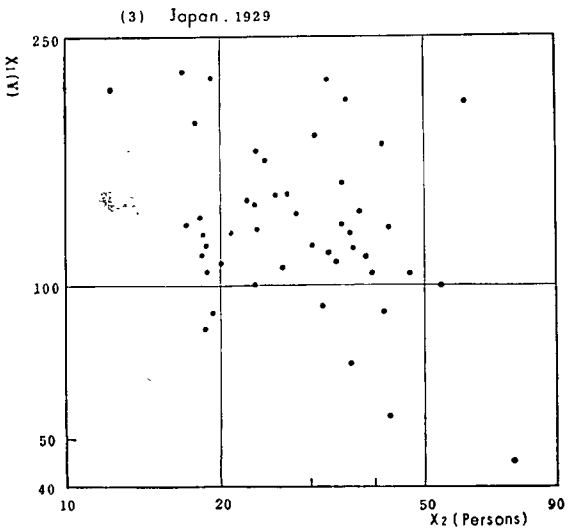
In Japan, the correlationship between X_1 and X_2 for the manufacturing industries as a

whole is fairly good in 1958 but again for 1929, it does not exist (refer to Chart 4). These results suggest that the role played by the regional differentials might have been very important for determining X_1 in 1929.

Chart 4 *Relationship between Annual Net Value Added Per Employee* (X_1) *and Average Size of Establishments* (X_2) *in Each State (Prefecture): Manufacturing Industries as a Whole*







Notes and Sources: (1) *CMI, 1957*, Manufacturing industries as a whole refers to total 28 industries in CMI. (2) *Kogyo Tokei-hyo. 1958*, (3) *Kojo Tokei-hyo, 1929*, X_2 taken average hourly value of production per employee.

IV. *Differentials of gross profit ratios by size*

As indicated earlier, this chapter will investigate the differentials by size of the gross profit per employee $\left(\frac{O-W}{N}\right)$, capital-labour ratio $\left(\frac{K}{N}\right)$ and the gross profit ratio $\left(\frac{O-W}{K}\right)$ in both Indian and Japanese manufactures. Deriving figures corresponding to each term is almost a matter of simple calculations, because we have already known the values of $\frac{O}{N}$ and $\frac{W}{N}$, which will tell us automatically the values of $\frac{O-W}{N}$; the figures of $\frac{O-W}{K}$ are easily found, when we can access to the data from which $\frac{K}{N}$ will be derived. However, a short comment seems necessary on the theoretical relationship between these variables which we have chosen for the analysis.

Let us start from the simplest case, which can most effectively be considered in terms of the productivity function of Wiksellian type. On Fig. 2, the point is located on a which will maximise the rate of profit for new investment under the given wage rate w and the shape of productivity function α. Following the usual practice by which the size of establishment is simply assumed to change in exact proportion to $\frac{K}{N}$, the point a coincides with the optimum size. If we relax the assumption of perfect competition in so far as wage rate is concerned and assume that it increases as the size expands, the optimum size becomes smaller and finally it coincides with the point b which corresponds to the minimum wage rate $\overline{w}$. The next relaxation of the assumptions inherent in the Wicksellian type productivity function is necessitated by the indivisiblity of productive equipments and the capital-rationing in the actual economies. Fig. 3 is drawn on this basis and shows the case in which different techniques being represented by the discreat productivity functions α, β and γ coexisting with each other. The wage rates w_α, w_β and w_γ are considered as unique to α, β and γ, respectivity. The third point in which a realistic modification is required in respect to the above productivity function is related to its assumption of linear homogeneity. The existing economies or diseconomies of scale precludes the usual assumption that the size of establishments changes in exact proportion to $\frac{K}{N}$. This case can also be explained by Fig. 3, where α, β and γ correspond not only to different values of $\frac{K}{N}$, but also to different magnitude of K and N. Economies of scale are represented by the shifts of productivity functions from γ to β and from β to α as the size expands. As a result, the investors must make another choice among different values of K and N.

Now, the theories of firm must hold in all of these cases, and in terms of this theory the above discussions can be summerised in such ways as: (1) the minimum condition in which the profit ratio will not decrease as the size expands, is that $\frac{O-W}{N}$ must increase with the enlargement of the size. Here, we are precluding an abnormal situation in which $\frac{K}{N}$ will decrease as the size becomes larger; (2) but the additional condition is that the rate of in-

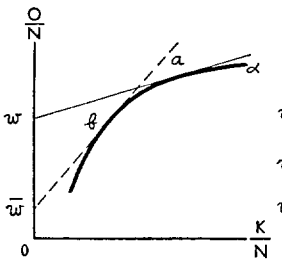


Fig. 2

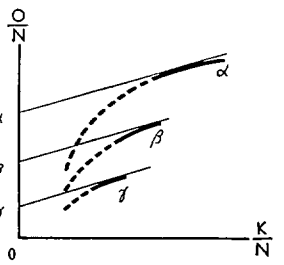


Fig. 3

crease in $\frac{O-W}{N}$ is not lower than that in $\frac{K}{N}$. These conditions will tell us not only the location of optimum size but also the behaviors of the factors that determine it.

These preliminary considerations may perhaps be enough for the empirical analysis in this chapter of the post-war Japanese case. However, for Indian case, an additional comment is necessary regarding the implications which regional differentials may have in the above considerations. This again can be discussed briefly by utilizing Fig. 3. There, α, β and γ may be considered as representing different techniques that are chosen in different regions: R_α, R_β and R_γ, respectively. Because of the different levels of wage rates and the different price levels which are implicit in the location of α, β and γ of this Fig. 3, the levels of profit ratios are similar and the establishments in each region can coexist with each other. In spite of this anomaly that may arise from the imperfection of markets for products as well as for factors of production, the above two conditions relating to the optimum size remain effective to the extent that the competitions between regions are taking place. The following statistical investigations will be made with these *a prior* examinations in mind.

Appendix-Table 3 shows the figures by size of $\frac{O-W}{N}$, $\frac{K}{N}$ and $\frac{O-W}{K}$ for total 28 industries, cotton textiles, iron and steel and machinery as calculated from the original data given in CMI, 1955. Corresponding figures for Japan are compared only for the manufacturing industries as a whole. Reservations are needed for some incomparable terms. Combined with the observations from the figures for the industries not shown up in this table, we can see that the values of $\frac{O-W}{N}$, $\frac{K}{N}$ and $\frac{O-W}{K}$ are remarkably irregular in India. Generally speaking, however, (1) the values of $\frac{O-W}{N}$ increase, in a general tendency, as the size expands; (2) the values of $\frac{K}{N}$ decrease first with the enlargement of the size within the smaller size brackets; after that they increase with the enlargement of sizes until the size class with 500 to 999 employees, after which they again decrease; (3) a combined result of the above two items is that the values of $\frac{O-W}{K}$ shows quite irregular picture but increasing trends can be noticed. In contrast to this, Japanese figures for $\frac{O-W}{N}$ and $\frac{K}{N}$ are in many cases quite regular and increase as the size expands. However the comparative rates of increase between the both variables change at around the size class with 50 to 100 employees, so that the values of $\frac{O-W}{K}$ indicate a bell shape with the top locating at the same size class.

As an implication of these findings, it may be noted that the behaviors of $\frac{O-W}{K}$ are compatible both in India and Japan with their patterns of size structure in terms of employ-

ment: in India, the dominant size is found in many industries to be located towards the largest extreme where the gross profit ratios too are generally the highest; in Japan, the size structure is very much dispersed over the whole range of size classes and the gross profit ratios are never highest in the largest bracket. However, one must not overlook the importance of the finding that the behaviors of $\frac{K}{N}$ among sizes are abnormal in India in terms of any criteria, while in Japan they are quite normal. Chart 5 is added for the purpose of emphasizing this point by drawing it in such a way as it resembles the Wicksellian productivity function. Of course, the latter is related only to the new investment, while the former is inclusive not only of this year's investment but also of all the existing stock of capital; both are comparable only under the assumptions of the constant techniques and prices. With this reservation in mind, compare this chart with a normal pattern in Fig. 2 or 3. The abnormality of the behaviors of $\frac{K}{N}$ in India requires further investigations; otherwise any conclusions drawn simply from the behaviors of $\frac{O-W}{K}$ does not seem meaningful.

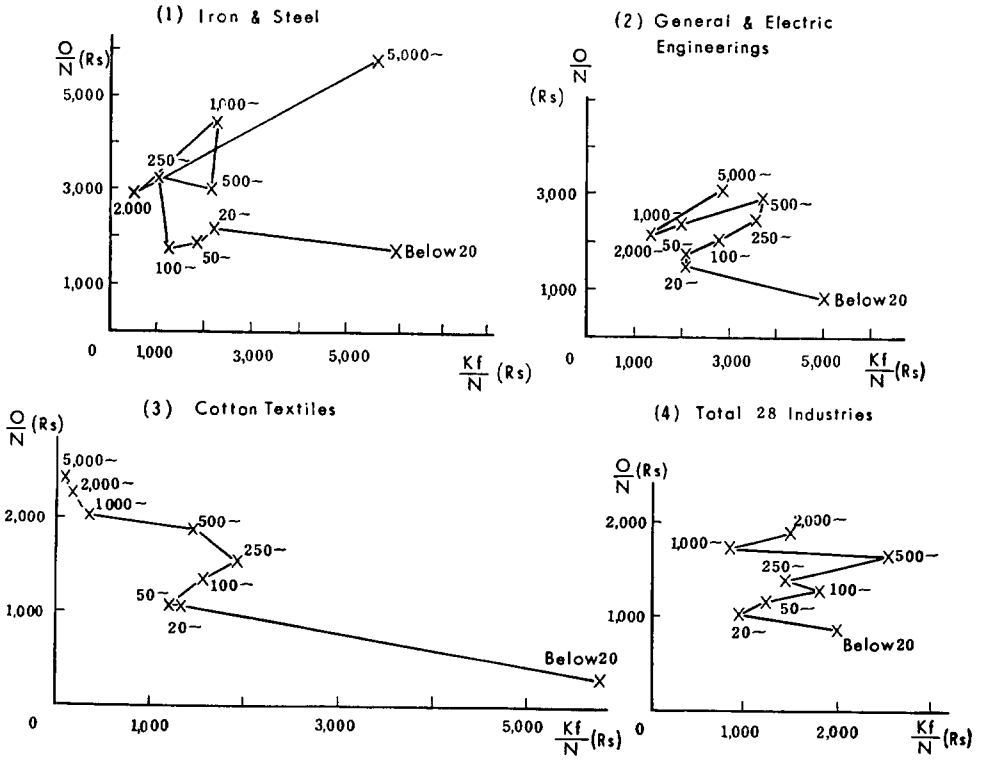
Data problems concerning $\frac{K}{N}$

Perhaps these results have been more or less influenced by the bias originating from the natures of data given in CMI. The examinations of data are made on K and N seperately.

(1) K The first bias to think of is related to the specific procedure adopted in CMI to measure the value of fixed assets in terms of book value; namely, the fixed assets are evaluated on the basis of original aquisition prices (in India, revaluations due to the changes in prices are said to have been conducted only in very rare cases) and net of yearly depreciations. However, the gross profit ratio in the definition of this paper will be a measure of efficiency only when fixed capital is evaluated in terms of replacement cost and perhaps gross of depreciation. Although it is almost impossible to attempt the revaluation by size of fixed assets, any information about the age-compositions of machineries and their life-span by size of establishments as well as the past trend of prices would be very useful, because the discrepancy of the book value, net of depreciation, from the replacement value, gross of depreciation is mainly dependent on these factors.[23] Some fragmentary data suggest that almost all enterprises of medium and small type in the present day India have been founded or enlarged amidst the sellers market during and after the war until the days of Korean boom. Few new investments were said to be made thereafter. As to the larger scale enterprises, the age-compositions of equipments seem to be different by industries. In cotton industry, for example, well over the half of the exsiting equipments are reported to have been installed before the war. A similar situation may exist in the other industries already established before the War. However, in many of the presently expanding industries which belong to the heavy-chemical categories, new investment during the plan period seems remarkable. In this connection, an estimation made by Indian economists is suggestive. Ac-

[23] As for the attempts to re-evaluate the book value assets in India we can enumerate Rosen, *op. cit.*, V.N. Murti & V.K. Sastry, Production Functions for Indian Industry, *Econometrica*, April 1957; M. Mukerjee & N.S.R. Sastry, An Estimate of the Tangible Wealth of India, *The Measurement of National Wealth* (*I.W. Series VIII*), 1959; etc., any of which, however, cannot be utilized for comparison between sizes.

Chart 5 *Relationship between* $\frac{O}{N}$ *and* $\frac{Kf}{N}$ *by size of establishments, India 1955*



Source: *CMI, 1955*. K_f refers to fixed capital stock.

cording to this,[24] the gross value of fixed assets in the corporate sector in India, totaling 24.5 billion rupees, is classified as follows: about 5 billion rupees due to the investment prior to 1946, about 5 billion rupees due to the investment during 1946 to 1950, 5.8 billion rupees due to the investment during the first Five Year Plan period, and 8 billion rupees due to the investment during the beginning three years of the second Five Year Plan period. The same authors constructed the indices amounting 28, 68 and 92 with the present point of time as 100 for the said periods I, II and III, respectively, for the purpose of using these indices as inflator to re-evaluate the said amount of value in terms of the current prices. In the light of these considerations, it seems difficult to say definitely that the degree of under-valuation of the value of $\frac{K}{N}$ is larger with the enlargement of size, excepting perhaps the cases of a few industries such as cotton and jute textiles.

The second category of bias might be found out of more detailed examination of the capital stock data. For instance, we know many irregularities come from overvaluations of buildings in the small scale industries, as they are usually factories and family residence at the same time. As far as we know, however, the small-scale enterprises in India utilize the

[24] K.A. Antony, *Stock of Capital in India*, paper presented at 2nd ICRNI (1960).

land and buildings on a basis of lease,[25] and in this respect there is rather a higher possibility towards an underestimation of K in smaller sizes.

(2) N In the by-size data published in CMI, N cannot be measured in terms of shifts. Therefore, a possibility will arise from the published N data by size that $\frac{K}{N}$ is overvaluated in the larger sizes and undervaluated in the smaller size, if in the former more than one shift is in effect and in the latter even one shift is scarcely in effect for one reason or other. In fact, at the beginning of the first Five Year Plan such examples seem to have been rather conspicuous. At that time general difficulties which the medium and small enterprises met with were the marked decrease of operational rate due to the shortage of raw materials, (especially cast iron, rolled steel non-ferrous metal, imported machine parts and yarn) as well as the contraction of markets for finished goods. In 1955 to 1956 the operational rate is reported to have recovered much for the cotton, jute, cement, sugar and paper manufacturing. However, in some sectors of machinery industry, such as diesel engine, radio etc., in the re-rolling sector of iron and steel and non-ferrous industries (here is in effect, still only one shift and only 35 to 40% of equipments are utilized), and in the industries manufacturing chemicals, soap, vegetable oil, paints, vanish etc., the rate of equipment utilization is reported to be low as yet.[26] A phenomenon peculiar to India that $\frac{K}{N}$ gradually decreases from larger scales to smaller scales seems to be explained mainly by such difference in the number of shifts between sizes.

Regional differentials

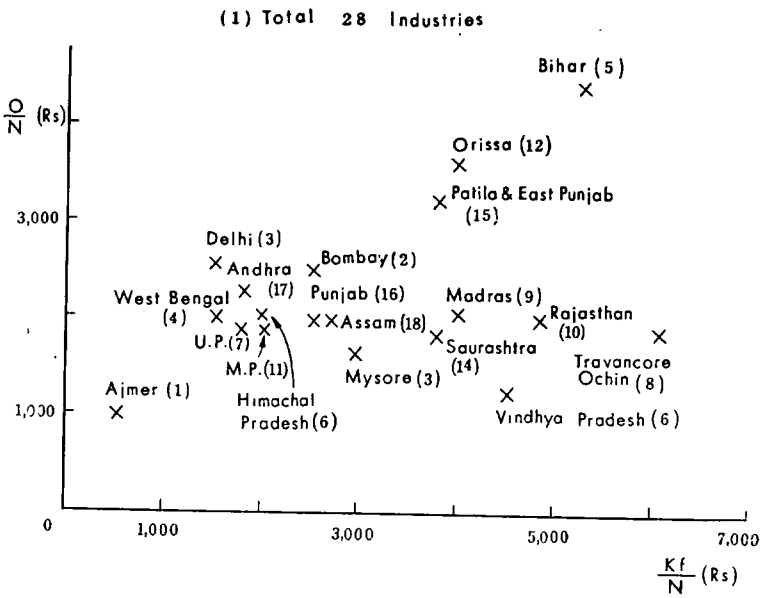
In the light of our analysis given in the preceding chapter regarding the regional wage and productivity differentials, we are induced to look into the possible impact of the regional differentials upon the abnormal behaviors of the value of $\frac{K}{N}$ as observed from the national data. As a quick survey of the problem, Chart 6 was drawn by relating the values of $\frac{K}{N}$ to those of $\frac{O}{N}$ by states. The method is just the same as that of Chart 5 and the idea is to compare the resulting locational relationship of each state again with Fig. 3. First of all, one may be impressed by some resemblance of the locational relationship of respective size classes in Chart 5 and that of respective states in Chart 6. In Chart 6 serial number is attached to the name of each state indicating the decending order of average size of establishments of each state. In the case of cotton textiles it is fairly clear that the states with the larger average size of establishments are located in the northwest direction and the states with the smaller average size of establishments in the southeast direction. This is quite consistent with what Chart 5 would indicate. This may suggest that the peculiar relationship between sizes as is observed in Chart 5 is considerably influenced by the regional differentials. Secondly, a comparison of these two Charts with Fig. 3 indicates that these characteristic behaviors of $\frac{K}{N}$ in India may represent the case in Fig. 3 in which α corresponds not only

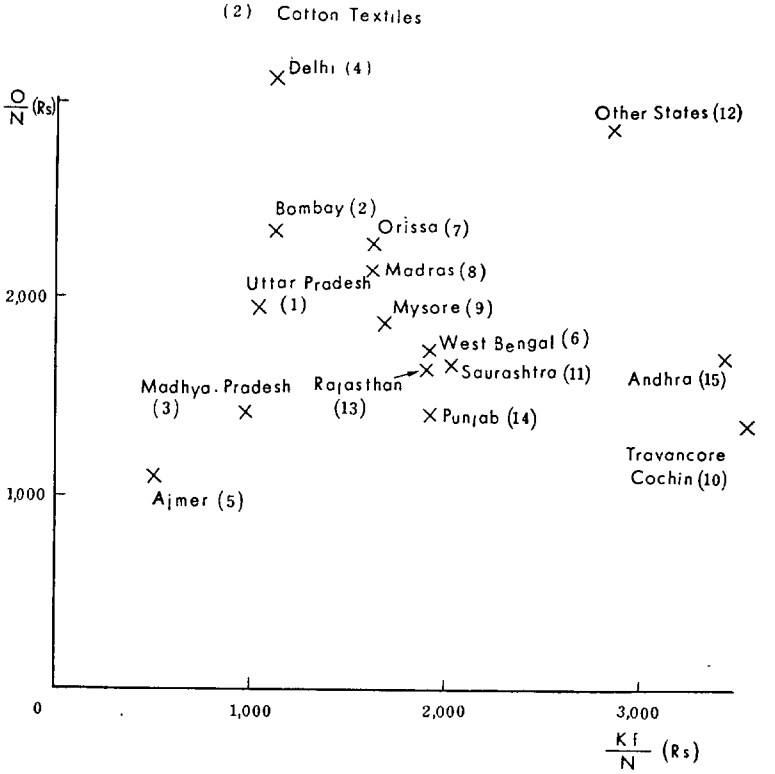
[25] SSES, *Capital for Medium and Small Scale Industries*, 1957, pp. 27—9; P.N. Dhar, Some Aspects of Technical Progress in Small Scale Industries, *IER*, Feb. 1956.

[26] Refer to the introductions to PC, *Programmes of Industrial Development, 1951—56* and PC, *Programmes of Industrial Development, 1956—61.*

Chart 6 *Relationship between* $\frac{O}{N}$ *and* $\frac{Kf}{N}$ *by states, India 1956*

Source: *CMI, 1955.* *O* as given in it was modified in this chart by the days in which establishments were in operation so that it may become closer to the capacity output.





to the larger size classes but also to the states with the larger average size of establishments and so on, with an important modification that α must be shifted from the existing position to the far left and γ to the far right. In such a case, it is almost certain that α is most efficient and profitable even with a considerable degree of wage differentials. But this does not necessarily mean that the smaller size establishments will soon disappear out of the market, because each size class could survive if it is located in a particular locality and is protected by the imperfection of market as characterising the Indian economy.

By way of post-script, we should mention here our treatment of the value of output: O as is observable from CMI. This clearly is not in terms of capacity output but in terms of yearly flow. It follows that the given value of O must be modified in such a way as the resultant value will represent at least approximately the capacity output, if and when the purpose of analysis is better served by it. In Chart 6 as well as in Chart 4, the given value of O in CMI are modified by the average days in which establishments were in operation in the year, but in Chart 5 it is not, as the informations about the days of operation is not given by size classes. Readers may also recall that we have not take into considerations this factor when the productivity differentials were discussed earlier. It is reasonable to consider that to the extent that the difference of shifts between size classes may cause an impact on the behavior of $\frac{K}{N}$ among sizes, the difference of the days in operation of establishments among sizes may also present a problem. However, it is our impression that the difference of the degree of operation between size classes may not be much serious. One of the foundations of this impression is the results of our modification of the value of O related to Charts 4 and 6. Further, according to some data related to the implementation of the Factory Act,[27] responses of the degree of factory operation with regard to the difference of sizes were not very clear in many industries and even when they were discernable the responses are rather weak. It was thought, therefore, that neglecting this factor may not cause a serious error.

V. *Concluding remarks*

As concluding remarks of the above examinations, we may note the followings:

(1) The phenomenon that in factory sector the employment is concentrated in the largest size class and the medium and small enterprises could not easily be grown up is closely connected with the fact that the gross profit ratios is largest among the biggest size classes. However, it should at the same time be emphasised that this relative profitability of the largest size classes is at least partly enabled by insufficient operations and resultant low ratios of gross profit in the smaller size establishments. If there were any decisive factors which had made the largest size class most profitable in the long-run basis irrespective of this irregularity, they should be found among the institutional factors. We recall in this connection that Indian industry has been characterised by the big enterprises supported by the Managing Agency System and is now (especially since the inaugulation of the Five Year Plans) going to be characterised more and more by the large-scale state-owned factories. In

[27] Ministry of Labour and Employment, Gov't of India, *Statistics of Factories, 1952 and 1953*, Delhi, 1957, pp. 76—87.

order to clarify the whole problem of a dominant position which the largest size classes are holding, further investigations have to be made regarding the monopolistic natures of these organizations.

(2) A peculier behavior in which the value of $\frac{K}{N}$ becomes larger as size decreases may perhaps partly be explained by a possibility that a smallness of the domestic market prevents the growth of the small and medium size firms. In a stricter term, a low rate of economic growth in India may have played a role to check their growth. In contrast, the fact that the rate of economic growth has continuously been high in Japan may explain at least party the parallel growth of small and medium size classes with the larger ones, because the high rate of economic growth may have assured medium firms an almost constant share of market which could not have been filled with solely by the products of the larger firms, as there must have been certain upper limit to the growth rate of large firms. If the rate of economic growth would accelerate in India, this may create a condition that the value of $\frac{K}{N}$ in the smaller size decreases at least to a closer level to the larger ones. A protective policy of the Indian Government regarding the cottage and small-scale enterprises has to be examined in the light of these considerations.

(3) The problem of investment choice among different techniques and sizes must be analysed not only on the basis of the behaviors of variables in capacity term, but also on the basis of these market conditions. An effective seperation of these factors from one another remains to be attempted.

(4) We have found that the influence of regional differentials is quite big in India in determining the various differentials as observed by industries on the national basis. In spite of this, however, the study based on these national data seems meaningful, to the extent that the competitions between the regions have been taking place even at this stage. Generally speaking, the regional differentials are considered a function of economic growth; and in the course of economic growth and increase in competition, the regional differentials will become smaller. As far as we are concerned with economic development on the national basis, we have to be watchful on this change in term of its impact upon the national structures.

(5) On the other hand, the fact that the optimum size in Japan is located in the middle of the whole size classes would explain the characteristics of her size structure in so far as the dominant size is not among the larger classes. However, the phenomenon of parallel growth of respective size groups remains to be explained in such a way as to reconcile with the bell type behavior of the gross profit ratios as observed in the above.

Appendix-Table 1 *Degree of Concentration of Employment on the Establishments of Size covering 1,000 Persons or more* (Unit: %)

	India	Japan		
	1956	1955	1935	1914
Jute Textiles	98.0 (59.1)			
Iron & steel, primary products	97.4 (97.4)	52.2	71.5	30.8[1]
Railway wagon manufacturing	91.1 (85.5)			
Cotton Textiles	88.2 (51.6)	17.4	44.2	51.9
Shipbuilding & repairing	72.4 (33.1)	77.3	79.7	75.0
Petroleum Refinery	69.3 (—)	*x*	—[2]	—
Aluminium, copper & brass, primary products	66.2 (—)	32.5[3]	30.4	
Cement	64.9 (—)	(32.7)	—	17.7
Paper & paper products	60.5 (25.3)	19.0	4.0	—
Webbing narrow fabrics	53.0 (—)			
Aircraft assembling and repairing	51.7 (—)	(50.0)[4]		
Sugar	51.2 (4.6)	—	—	—
Bicycles	45.5 (—)	—	12.4	
Woolen textiles	42.7 (—)	30.5	51.6	48.5
Rubber & its manufacturing	40.4 (35.5)	21.9	15.5	43.1
Lac	40.1 (40.1)			
Iron & steel, secondary products	37.7 (24.2)	*x*	3.3	—
Soap	37.1 (—)	—	—	—
Textile machinery	33.9 (15.2)	14.6	19.9	[6]
Ceramic	33.0 (22.6)	(12.0)	13.2	33.6
Rubber & rubber manufacturing	32.9 (—)	—	—	—
Matches	32.5 (—)	—	—	—
Chemicals (including drugs)	24.6 (8.2)	42.8	27.2	—
Silk & artificial silk	24.6 (10.6)	(29.2)	18.0	4.4
General & electrical machinery	24.4[6](8.5)	18.7	28.6	46.4
Automobile & coach building	24.0 (11.9)	74.0[7]	38.1[8]	—[9]
Woodware (including furniture)	21.3 (—)	—	—	—
Printing & book-binding, etc.	18.0 (5.9)	(3.8)	2.5	5.6
Tobacco products	16.1 (4.6)			
Peanuts & others, processing	10.5 (—)			
Textiles, dyeing & bleaching, etc.	10.0 (—)	(5.1)	5.2	—
Aluminum, copper & brass (secondary products)	5.4 (—)			
Vegetable oil	2.5 (—)	—	—	
Tea manufacturing	1.1 (—)	—	—	
Wheat flour	—	—	—	—
Rice milling	—	—		
Brewery	—	(4.7)	—	—
Glass & glassware	—	12.9	5.6	—
Hosiery & other knitted goods	—		—	—
Thread & threadball making	—	*x*	—	26.7
Sewing	—	*x*	22.0	
All manufacturing industries	46.4 (24.5)	22.0	19.6	10.3
(Total number of employment in 1,000 persons)	(3,046)	(3,659)	(2,091)	(806)

Remarks: Degree of concentration is defined in the text. The figures in brackets under the column for India represent the corresponding figures when the numerater in the definition of the concentration degree was changed into total number of employments in the size class covering 2,500 persons or more. The figures in brackets under the column for Japan represent those figures which are derived from the total sum given in *Kogyo Tokeihyo* by

combining the number of employment in the size class covering 1,000 or more persons with that in the size class with 500 to 999 employees on the basis of the assumption of equal distribution of employment between the both size classes. x indicates the case where the scale covering 1,000 persons or more is summed up with other smaller scales. (1) Including the primary products of copper, brass, lead, tin etc. (2) Mineral oil manufacturing. (3) Primary smelting and refining of aluminum and copper. (4) Airplane parts manufacturing (5) Included in general and electrical machinery. (6) General and electrical machinery plus bulbs plus electric fans under SSMI. (7) Automobile and parts manufacturing. (8) Automobile assemblying and manufacturing. (9) Automobile, horse carriage, rickshaw, cart etc.

Appendix-Table 2 *Comparison of Size Differentials in Wages and Labour Productivity*

	Wages				Productivity	
	India	Japan			India	Japan
	1955	1955		1914	1955	1955
1. Wheat Flour	II 1.81	III 2.46	} III	I Reg.	3.53	2.95
2. Rice Milling	III 1.35	IV			D	B
3 Biscuit Making	III 1.91	III I Reg.	II	D	1.92	B
4. Fruit & Veget. Process	IV 1.45	II D	III	D	1.45	D
5. Sugar	I 2.74	II 1.85	III	1.14	5.52	B
6. Distilleries of Breweries	III 1.28	I 1.83	II	B	D	2.22
7. Starch	III 1.68				B	
8. Vegetable Oil	II 5.18	II B	III	B	9.29	B
9. Paints & Varnishes	I B	III 1.37	III	1.44	4.02	I
10. Soap	I 3.62	II 1.55(1)			9.08	2.65
11. Tanning	II 1.27				1.77	
12. Cement	I I Reg.	I I	I	I	B	B
13. Glass & Glassware	I 7.91	I 3.08	II	I	B	7.09
14. Ceramics	I 2.27	I 1.81			1.98	2.37
15. Plywood & Teachest	II 1.62		II	D	6.48	
16. Paper & Paperboard	I 1.81	I 3.13	II	D	4.17	5.18
17. Matches	I V	II 1.35	II	B	I Reg.	1.34
18. Cotton Textiles	I 2.11	I 1.67	I	I	2.22	2.75
19. Woolen Textiles	I 2.64	I 1.45	I	I	I Reg.	1.62
20. Jute Textiles	I				I Reg.	
21. Chemicals	I I Reg.	I 1.63			I Reg.	
22. Aluminium, Copper, Blass	I 2.19				4.64	
23. Iron & Steel	I 2.24	I 2.02	I	I	1.93	2.55
24. Bicycle	I 1.51	III 1.52			4.24	3.71
25. Sewing Machines	I V	I 1.68			2.75	2.50
26. Electric Lamps	II I Reg.	II 1.56			I Reg.	3.03
27. Electric Funs	I 1.42				4.43	
28. General & Electric Engineering	I 1.55	I 1.82			2.24	2.12
29. Total 28 industries	I 1.98	I 2.23	I	I Reg.	1.98	2.69

Source: *CMI, 1955; Kogyo (Kojo) Tokeihyo*

Remarks: Roman numerals under the column of wages mean as follows: I indicates that the scale covering 1,000 persons or more is the highest, II indicates that the scale covering 500 to 999 persons is the highest, III indicates that the scale covering 250 to 499 persons (in the case of Japan, 300 to 499) is the highest, and IV indicates that the scale covering 100 to 249 persons (in the case of Japan, 200 to 299) is the highest. In cases where the differentials between scales show a regular gradual increase, the magnification of the highest scale as compared with the scale covering 20 to 49 persons (in the scale of Japan, 20 to 29) is indicated. The cases where increasing trends are observed, although there are not a few irregularities are denoted I. D indicates the cases with decreasing trend; B, those with Bell Shape trend. (1) The figures indicating magnification of the fourth scale as compared with the lowest scale, because the figures for the highest scale has not been revealed.

Appendix-Table 3 *Values of* $\frac{O-W}{N}$, $\frac{K}{N}$ *and* $\frac{O-W}{K}$ *in India, 1955 and Japan, 1957*

(size class)	(1) $\frac{O-W}{N}$	(2) $\frac{Kp}{N}$	(3) $\frac{Kf}{N}$	(4) $\frac{O-W}{Kp}$	(5) $\frac{O-W}{Kf}$
			Cotton Textiles, India		
—20	—	8,585	6,800		
20—49	320	4,090	3,329	7.82	13.73
50—99	327	3,210	2,207	10.18	14.80
100—249	391	4,052	2,567	12.11	19.11
250—499	621	4,526	2,959	13.73	21.00
500—999	898	4,416	2,453	20.34	36.62
1000—1999	764	3,243	1,351	23.55	56.55
2000—4999	769	3,353	1,171	22.93	65.65
5000—	869	3,034	1,100	27.33	75.35
			Iron and Steel, India		
—20	796	8,259	6,062	9.64	13.13
20—49	1,114	4,846	2,165	20.39	51.48
50—99	755	5,471	1,821	13.79	41.44
100—249	794	3,746	1,251	21.19	63.44
250—499	1,724	4,360	1,015	39.55	169.79
500—999	1,549	4,208	2,289	36.81	67.67
1000—1999	2,583	7,179	2,222	35.97	116.25
2000—4999	793	3,936	506	20.16	155.89
5000—	3,389	10,064	5,677	33.67	59.70
			Machineries excl. Transportation and Textile Machineries, India		
—20	395	4,650	2,995	8.49	13.19
20—49	552	3,340	1,942	16.53	28.44
50—99	744	3,931	2,223	18.92	33.47
100—249	712	5,274	2,794	13.50	25.48
250—499	946	5,371	2,415	17.61	39.17
500—999	788	6,863	3,517	11.49	22.41
1000—1999	1,571	4,553	1,733	34.51	90.73
2000—4999	2,201	5,428	2,470	40.54	89.09
			Total of 28 industries, India		
—20	196	7,284	5,001	2.69	1.67
20—49	734	4,302	2,080	17.07	35.31
50—99	894	4,609	2,037	19.40	43.92
100—249	982	5,655	2,754	17.35	35.25
250—499	1,256	6,848	3,525	18.35	35.64
500—999	1,670	7,664	3,710	21.79	45.01
1000—1999	1,111	5,009	1,986	22.19	55,97
2000—4999	725	3,394	1,384	21.35	52.37
5000—	1,333	5,348	2,885	24.93	46.20
			Total Manufacturing industries, Japan		
1—20	98		71		1.38
20—49	176		84		2.10
50—99	263		120		2.20
100—249	333		175		1.90
250—499	451		276		1.63
500—999	550		408		1.35
1000—1999	663		589		1.13
2000—4999	777		687		1.13
5000—	533		615		0.87

Source and Notes: For India, *CMI, 1955;* for Japan, Ministry of Trade and Industry, *Chusho-kigyo Sogokihonchosa Hokokusho, 1957* (Report on the General Fundamental Survey of the Small-Scale Enterprises, 1957) as reclassified in EPA, Institute of Economic Research,

Shihonkozo to Kigyokan Kakusa, 1960. Size classes are reclassified here according to that of CMI. The unit of measurement for the columns of (1), (2) and (3) is either rupees or thousand yens; for the columns (4) and (5) it is per centage.