Changes in the Size Structure of Industries

Analysis of Census of Manufactures 1953-58

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In the under-developed countries now trying to develop, a 'firm-size policy' to protect arid foster the growth of small enterprises has been made an integral part of growth policy from the very beginning of the process of planned growth. In India this policy involves the grant of subsidies for firms of the favoured size groups and/or taxes and restrictions on firms of other sizes.

Policies of this kind are based only partly on economic arguments. The main arguments for them are very often sociological. But it is necessary that, the strictly economic size-efficiency relationships are clearly analysed.

Size-efficiency relationships can be studied through (a) statistical cost analysis and (b) analysis of size distribution,

Statistical cost functions for Indian industries cannot be estimated in the present state of the availability of data. Therefore, an attempt is made in this paper to analyse the current size trends in India with the size distribution data from the Census of Manufacturing Industries.

The report on the Census of Manufacturing Industries 1959 *came out after the preparation of this paper and hence it was not possible to process the* 1959 *data. The comparison of the* 1953 *and the* 1958 *data, however, will still be found instructive.*

THE case for size distribution analysis rests, negatively, on the theoretical and practical difficulties involved in statistical cost analysis and, positively, on the so-called 'survival principle', namely, that the plant sizes which remain dominant in fairly competitive industries over considerable periods of time are likely to he optimal oi minimum average[1] cost sizes. The variations owr time in the relative shares of different plant size classes in the output of different industries can, therefore, provide a good indication of the optimal size ranges in those industries.

Size distribution analysis has been applied recently by George Stigler to some American industries.[1] It has also been the chief method used by Professor P S Florence in analysing the structure of British and American industries." The recently collected annual *Census of Manufactures* data now enable us to analyse changes in the size structure of 29 Indian industries as well.

[1] George J. Stigler, "The Economic of Scale'[1], *Journal of Law and Economics* (October 1958).

[2] P S Florence, "Post War Investment, Location and Size of Plant", Cambridge (1962).

Relative Share of Output

The first Indian Census furnishing figures by employment size classes was the J953 Census. The last Census of which figures were available at the time of writing is the 1968 Census, In Table 1 the proportions of value added in 'small*, 'medium' and 'large' units in 1953 and 1958 have been computed and compared for all the 29 Census industries. Units with less than 100 workers have been defined as "small" units, units with 100 or more but less than 1,000 workers as 'medium' units and units with 1,000 or more workers as "large[1] units.

The percentage distribution of value added is obviously a' more important indicator of the relative importance of different classes than the percentage distribution of the number of units. For a large majority of the units in an industry may cluster in the 'small' size classes and yet their share in the total net output of the industry may be very small in comparison with that of the few large units. Our data provide a good illustration of this asymmetry. In 17 out of the 29 industries, half or more of the units were 'small' but in only three of them they turned out half or more of the total output. We shall, therefore, concentrate our attention on the relative share of 'output rather than the relative proportion of units in the 'small', medium ' and ' large ' sectors of every industry. The Table reveals several important characteristics of the size structure of the Census industries.

Size Distribution by Industries

There are only three industries in which more than half of the total value added is accounted for by 'small' units : rice milling, vegetable oil processing and fruit and vegetable processing all food proces. sing industries. In 10 out of the 29 industries more than half of the output is produced in 'large' units; and in IS industries more than half of the output is produced in 'medium' units, hi one industry - general and electrical engineering about a third of the *net* output is produced in large' units, a little less than half in 'medium' units and about a sixth in 'small' units.

Thus we may characterize 10 out of the 29 industries as 'large-scale' industries. 16 as 'medium-scale' industries (including engineering) and only 3 as 'small-scale' industries.

It is noteworthy that the large-scale industries include many in which intensive efforts have been

made to promote small unit production; for example, soap, paper, matches, cotton textiles, woollen textiles, bicycles and sewing machines. But small units did not account for more than 6% of the net output in any of these industries except bicycles.

In some of the medium-scale industries again — glassware, ceramics, hydrogenated oil, electric lamps and electric fans, starch and sugar — small units have a negligible share. In others — copper and brass, plywood, paints and varnishes, chemicals,, distilleries and breweries — they have a small but significant share of 10 to 15 percent. In only three industries — biscuit making, tanning and wheat flour — they share about a third of the net output.

Not Altered Materially

When we consider the changes between 1953 and 1958, we find that the relative importance of small, medium and, large units did not alter materially. The small units increased their share significantly only in fruit and vegetable processing, vegetable oil extraction Hour making and bicycle making. In oil extraction the small units were already dominant. In the other three, they did snatch a sizeable share of output from the medium units. In the bicycle industry, large units as well as small units gained at the expense of medium units and the large units came to produce more than half of the output inspite of the expansion in small unit capacity fostered by the Government.

The medium unit sector increased its share substantially in the hydrogenated oil, electric fans, match and sugar industries entirely at the ex pense of large units.

The large units made gains in non-ferrous metals, cement, paper and chemical industries while maintaining their dominant position in weight other industries.

Weighted Average Size

The changes in the size structure of industries can also be analysed in another way. We can compute weighted average size of the units in an industry in terms of the number of persons employed and compare them as between different industries on the same date and at different dates in the same industry. The 'weighted average size' may be defined as $S\ w_i s_i$, were s_i are the mid-points of the size intervals in terms of employment and wi the proportions of value added in the various size classes.

Table 2 shows the weighted average size of the units in each of the 29 Census industries in 1953 and 1958, If we stick to our definition of large-scale, medium-scale and small-scale industries, it appears that, considering the size of the

Table 1 : Percentage of Value Added in Small, Medium and Large Units

Industry	Small Units			Medium Units			Large Units		
	1958	1953	Increase or Decrease	1958	1953	Increase or Decrease	1958	1953	Increase or Decrease
Aluminium, Copper and Brass	12.4	19.8	— 7.4	54.2	56.4	— 2.2	33.4	23.8	+ 9.6
Iron and Steel	1.8	0.9	+ 0.9	5.5	2.8	+ 2.7	92.7	96.3	— 3.6
Bicycles	15.2	7.4	+ 7.8	31.8	46.4	— 14.6	53.0	46.2	+ 6.8
Sewing Machines	5.8	4.0	+ 1.8	3.9	3.9	0.0	90.3	92.1	— 1.8
Biscuit Making	30.0	26.8	+ 3.2	70.0	73.2	— 3.2	0.0	0.0	0.0
Fruit & Vegetable Processing	60.8	30.4	+ 30.4	39.2	69.6	—30.4	0.0	0.0	0.0
Cement	0.0	0.0	0.0	45.0	50.7	— 5.7	55.9	49.3	+ 6.6
Glass and Glassware	2.0	2.6	— 0.6	86.2	89.5	— 3.3	11.8	8.7	+ 3.1
Ceramics	3.1	3.5	— 0.4	50.8	51.8	— 1.0	46.1	44.8	+ 1.3
Plywood and Tea-Chests	15.5	20.1	— 4.6	84.6	80.7	+ 3.9	0.0	0.0	0.0
Cotton Textiles	0.4	0.3	+ 0.1	9.2	5.9	+ 3.3	90.4	93.8	— 3.4
Woollen Textiles	3.2	3.2	0.0	35.1	27.8	+ 7.3	61.7	69.0	— 7.3
Edible Hydrogenated Oils	0.0	0.8	— 0.8	100.0	68.0	+32.0	0.0	31.2	— 31.2a
Paints and Varnishes	14.2	12.9	+ 1.3	85.8	87.1	— 1.3	0.0	0.0	0.0
Electric Lamps	3.8	3.7	+ 0.1	96.2	96.3	— 0.1	0.0	0.0	0.0
Electric Fans	7.0	5.3	+ 1.7	77.1	46.9	+30.2	15.9	47.8	—31.9a
Engineering	19.2	25.7	— 6.5	46.3	41.1	+ 5.2	34.5	33.2	+ 1.3
Jute Textiles	0.0	0.0	0.0	0.8	0.7	+ 0.1	99.2	99.3	— 0.1
Chemicals	13.7	16.1	— 2.4	51.1	53.5	— 2.4	35.2	30.4	+ 4.8
Paper and Paperboard	1.0	1.0	0.0	15.0	17.1	— 2.1	84.0	81.9	+ 2.1
Matches	0.6	0.2	+ 0.4	16.5	5.9	+10.6	82.9	94.0	—11.1
Soap	1.6	5.5	— 3.9	23.2	20.0	+ 3.2	75.2	74.6	+ 0.6
Tanning	32.3	37.0	— 4.7	68.0	63.0	+ 5.0	0.0	0.0	0.0
Starch	2.3	5.4	— 3.1	97.7	96.4	+ 1.3	0.0	0.0	0.0
Vegetable Oils	69.9	62.5	+ 7.4	30.1	37.5	— 7.4	0.0	0.0	0.0
Sugar	0.2	0.0	+ 0.2	60.9	47.9	+13.0	39.1	52.2	—13.1
Distilleries and Breweries	17.8	23.3	— 5.5	82.2	76.9	+ 5.3	0.0	0.0	0.0
Wheat Flour	32.4	14.4	+18.0	67.8	85.6	—17.8	0.0	0.0	0.0
Rice Milling	94.1	97.7	— 3.6	5.9	2.3	+ 3.6	0.0	0.0	0.0

Source : Computed from data in the "Census of Manufacturing Industries", 1953 and 1958.

The decline in the share of large units in these industries is due to some large units failing to file returns in 1958 and is, therefore, spurious.

Representative unit', 12 industries were large-scale industries, 16 industries were medium-scale industries and only one industry rice milling — a small-scale industry in 1953. In 1958, two industries non-ferrous metals and engineering .... graduated from the medium-scale to the large-scale class. Other industries remained in the same class as before. But the average size increased in 19 industries and decreased in 10. Neglecting changes of less than 10 per cent in the average size we find that the average- size decreased only in o industries, viz, fruit and vegetable processing, hydrogenated oil- matches, tanning and wheat Hour. In 12 other industries, the average size increased by more than 10 per cent.

Familiar Historical Pattern

From these hrulings we may conclude that:

(a) So far as the 29 Census industries are concerned medium and large units ac count for a major part of the output except in 3 food pro cessing industries. The share of the small units dues not exceed 15 per cent in any non-food-processing industry with the exception of tanning.

lb I During the 5 years of planned growth 195:U9ob\ cycle-making is the only non-food industry in which small units increased their share of the output significantly, hut it still remained less than a sixth. On the whole, the relative share of production in large and medium units increased more than that of small units.

(c) The average unit size increased in 19 and decreased in 10 industries. But the industries in which the decrease was significant were. again. food processing, tanning and match-making.

it seems, therefore, that industrial growth in India is. by and large, following the historically familiar pattern ' of the increasing dominance of large-unit production in a wrde range of industries, Government effort to encourage small unit production does not seem to have succeeded in significantly altering this trend.

Choice of Techniques Not Widened

The explanation for this fact is not merely that the scale of the effort has been inadequate. It lies, above all. in the failure to widen the effective choice of techniques. So long as the imported techniques available for most of the consumer goods industries are economicals viable only when production is organised on a large scale the scope for expanding the small-scale sector must remain severely limited. The small-scale sector will then remain confined to industries which are auxiliary to large-scale industries or only require design development or organisational improvement. Bui if it is to extend beyond these., nothing less than the discovery of a whole range of new techniques which can enable small units to produce almost as cheaply as large units will have to he discovered and adapted to the milieu of the newly developing countries. The future of small industry is hound up with the prospect of discovering such techniques.

If governments. international organisations and scientists wish to translate, the. sociological I advantages of small-unit operation into a realitly they must devote more attention and resources to research oriented to the discovery and application of such techniques.

Table 2: Changes in the Weighted Average Firm Size in Indian Industries 1953-58

Industry	Weighted Average Size (Number of Persons Employed) 1953	1958	Increase or Decrease Absolute	Per Cent
Aluminium, Copper and Brass	778	1,003	+ 225	+ 28.92
Iron and Steel	11,896	13,679	+ 1,783	+ 14.99
Bicycle	916	980	+ 64	+ 6.99
Sewing Machines	3,232	3,170	- 62	1.92
Biscuit Making	323	672	+ 349	+ 15.17
Fruit & Vegetable Processing	143	110	33	23.08
Cement	1,101	1,466	+ 365	+ 33.15
Glass & Glassware	478	651	+ 173	+ 36.19
Ceramics	1,572	1,570	- 2	0.13
Plywood & Tea-Chests	301	372	+ 71	+ 23.59
Cotton Textiles	3,366	3,725	+ 359	+ 10.66
Woollen Textiles	1,969	2,111	+ 142	+ 7.21
Edible Hydrogenated Oils	783	522	- 261	- 33.33
Paints & Varnishes	466	449	- 17	3.57
Electric Lamps	476	535	+ 59	+ 12.40
Electric Fans	612	695	+ 83	+ 13.56
Engineering	952	1,302	+ 350	+ 36.76
Jute Textiles	3,455	3,653	+ 198	+ 5.73
Chemicals	1,431	1,496	+ 65	+ 4.54
Paper & Paperboard	2,552	2,427	- 125	4.90
Matches	2,686	1,295	- 1,391	51.79
Soap	1,249	1,270	+ 21	+ 1.68
Tanning	265	234	- 31	11.70
Starch	365	440	+ 75	+ 20.55
Vegetable Oils	140	153	+ 13	+ 9.29
Sugar	1,187	1,109	- 78	6.57
Distilleries & Breweries	180	231	+ 51	+ 28.33
Wheat Flour	357	214	- 143	40.06
Rice Milling	56	58	+ 2	+ 3.57

Source: Computed from data in the "Census of Manufacturing Industries", 1953 and 1958.

Statistical documentation of this trend in British and U S industry may he found in Florence, op cit and S S Sands "Concentration in United States Manufacturing Industry, 1940-1947'*, International Economic Review, (January 1962), In Japan, as is well known, the trend has been somewhat different for special historical reasons.