Relative Efficiency of Modern Small Scale Industries in India:

An Inter-State Comparison*

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I. Introduction

Persistent efforts have been made to promote small-scale industries (SSIs hereafter) in India as a source of large-scale employment generation and equitable distribution of income. There has been substantial growth of these industries over last few decades[1]. Whether this growth has achieved the intended goals is subject to empirical scrutiny. However it has been observed that the growth and expansion of the small-scale sector have been uneven across the states[2]. It is in this context that the present paper intends to measure relative efficiency of SSIs in different states and to inquire into inter-state differences in these measures. An index of relative efficiency (based on the concept of total factor productivity) is used in this paper. This index gives a measure of efficiency of a SSI in a state compared to its counterpart in other states.

The rest of this paper is organized as follows. A brief review of the earlier studies on efficiency of SSIs in India is presented in the second section. The third section discusses the database and the methodology used in the present study. In the fourth section, we present the measures of relative efficiency of selected SSIs in fifteen major states of India. Reasons for inter-state differences in efficiency are investigated in the fifth section. The last section summarizes the major findings of this study.

II. Review of Earlier Studies

A number of studies on efficiency of SSIs in India were undertaken. Among the interesting ones were Dhar and Lydall[3] (1961); Hajra[4] (1965); Sandesara[5,6] (1966 and 1969); Mehta[7] (1969); Bhavani[8,9] (1980 and 1991); Goldar[10,11] (1985 and 1988); Little, Mazumdar and Page[12] (1987) and Ramaswamy[13] (1990). Most of the earlier studies used the partial productivity ratios for a measure of the relative efficiency of SSIs.

Dhar and Lydall, Hajra, Sandesara (1966 and 1969) and Mehta use CMI/ASI[14] data for their analysis. The first four studies report a positive relationship between size and output-capital ratio. This is attributed to economies of scale and better management in the relatively bigger units. Mehta's conclusion is contrary to those of others. However, he uses a different criterion for size classification of the firms : he classifies the firms into different size classes according to the value of fixed assets. Earlier studies, on the other hand, use employment as the criterion for size classification. Also, Dhar –Lydall-Sandesara use total productive capital (fixed plus working capital) as a measure of capital input while Mehta uses fixed capital. However it is difficult to fully understand the reasons for contradictory conclusions arrived at by these studies. It is possible that 'since the ratio of working capital to fixed capital is high in small scale units, efficiency comparisons based on fixed capital favor small scale units'[15].

Bhavani's study (1980) is an improvement over the previous studies in the sense that the basic data source for her study is the census of SSI units (CSSI), conducted by the Development Commissioner of Small Scale Industries (DCSSI) in 1973-74, which has a wider coverage than CMI/ASI does. A comparison between the census sector[16] of the ASI, the sample sector[17] of the ASI and the CSSI reveals that the capital productivity of SSI units is lower than that of large scale units suggesting efficiency differences in line with the findings of Dhar-Lydall-Sandesara.

Goldar, in his 1985 study, estimates a frontier production function (of Cobb-Douglas form) using firm level data from CSSI for the small scale Washing Soap industry to obtain measures of technical efficiency. Measures of partial and total factor productivity, and an analysis of technical efficiency reveal that tiny units are inefficient compared to relatively bigger units within the small scale Washing Soap industry. The positive relationship between unit size and efficiency, and high capital intensity of relatively larger units suggest a trade off between output gain and employment loss.

Little et al (1987) discover very little regularity in the patterns of partial and total factor productivity, and in their relationship with firm size in five SSIs when size is measured either by number of workers employed, or by the value of fixed assets. An analysis of technical efficiency, based on a three factor translog production function, reveals that there are wide variations in total factor productivity. Within each of the five industries, variation in technical inefficiency (measured by the difference between actual and predicted output) is substantial and there is no systematic relationship between employment size and technical efficiency. Only in Machine Tools industry, technical efficiency is correlated with firm size. As for the sources of variations in technical efficiency, four variables: the average experience of the labor force, the age of the capital stock, the experience of the entrepreneur and the level of capacity utilization, are found to be significant in one or more industries.

Goldar (1988) uses a total factor productivity index based on the Cobb-Douglas production function, to assess relative efficiency of 37 three-digit industries of the NIC[18]. The data for this study are drawn from the statistical reports of a sample survey of SSI units undertaken by the Reserve Bank of India (RBI), with 1976-77 as the reference year. Data on large-scale industries are drawn from census sector results of the ASI for 1976-77. It is observed that in almost all industries labor productivity in small-scale units is less than that in large-scale units. On the other hand, capital productivity in small units is higher in 22 industries when gross invested capital is used and in fifteen industries when net invested capital is used as a measure of capital input. The relative efficiency index which is a weighted average of partial productivity indexes, is less than unity for 34 out of 37 industries suggesting that the SSIs are relatively less efficient than large scale units. The study observes that economies of scale (as captured by relative size) and better management (as captured by the ratio of closing stock to consumption of raw materials) are significant sources of efficiency for large units. Similarly higher relative efficiency can also be attributed to mechanized technologies.

Ramaswamy (1990) estimates partial productivity of labor and of capital, and relative efficiency using unit level data for four industries: Motor Vehicle Parts, Agricultural Machinery and Parts, Machine Tools and Parts, and Plastic Products. He uses the same relative efficiency index as Goldar (1985) does. His analysis indicates that capital intensity and partial productivity are sensitive to alternative measures of firm size. There is little regularity in the behavior of capital-labor ratio and employment size. Partial factor productivity of labor and of capital also do not exhibit any significant relationship with firm size when size is measured in terms of employment. However, a positive relationship is observed between capital-labor ratio and investment size of the unit. Labor productivity rises while capital productivity falls as the investment size of the unit increases. Efficiency indexes show neither systematic nor substantial differences between employment or investment size classes of units. Ramaswamy's analysis suggests existence of increasing returns to scale and thus rejects the assumption of constant returns to scale. His results are consistent with those reported by Little et al (1987).

Using firm level data drawn from CSSI, Bhavani (1991) makes an attempt to measure technical efficiency of 4 four-digit level metal products industries using a translog production frontier with three inputs, viz. capital, labor and materials. It is observed that for all the four metal products industries and five size groups within each one of them, the average level of efficiency is quite high and that efficiency measures increase with the increase in size upto a size class and then decreases.

III. Database and Methodology

Database

The basic source of data for the present study is the Report on the Second All India Census of Small Scale Industrial Units. State level data are obtained from the corresponding state-wise volumes of the report. The census was conducted in 1988-89, taking 1987-88 as the reference year, by the Development Commissioner of Small Scale Industries (DCSSI) in association with the Directorates of Industries (DI) of the states. The census data relate to SIDO units[19] registered with the state DIs upto March 31, 1988. A `modern small scale industrial unit' was then defined as one with investment in plant and machinery (original value) not exceeding Rs 3.5 million and Rs. 4.5 million in case of ancillary unit[20].

Most of the data were reported for the two-digit level disaggregation[21] of the SSIs. Data on gross output, investment in fixed assets, gross value added, net value added and employment are reported for top 100 industries - in order of their contribution to gross output - at four-digit level of disaggregation for India as a whole, as well as for the states. We are considering nine industries in fifteen major states in this study. These nine industries constitute the intersection of the samples of 100 industries in each of the fifteen states. The choice of the level of disaggregation is dictated by the availability of data.

Gross value added is taken as the measure of output[22]. Gross value added is that part of the value of the products, which is created in the unit and is obtained by deducting total value of inputs from the value of gross output. Investment in fixed assets is taken as the measure of capital. 'Fixed assets are those which are of permanent nature like land, building, plant and machinery, transport equipment, tools etc. which have normal production life of more than one year'[23]. Investment in fixed assets is reported at original purchase prices. Since the vintages of these assets are not known, no adjustment could be made for price changes.

Number of employees is taken as the measure of labor input. Employment comprises own account workers, direct workers and contract/casual employees. Own account workers are those self-employed, i.e., proprietor, partners, or members of the family of the owner, who work (whether paid or not) in the unit regularly or casually. A direct worker, according to the Factories Act, is a person employed directly, whether for wages or not, and engaged in any manufacturing process or in any kind of work incidental to or connected to manufacturing process. A contract or casual employee is one who is engaged through some agency. This measure of labor input, however, doesn't take into account the quality differences. Moreover, preponderance of casual workers highly inflates the measure of labor input.

Intermediate inputs include `value of raw materials, fuels, packing materials, consumable stores etc. consumed and other incidental expenses incurred by the unit, like sales expenses, hostage expenses, stationary charges, publicity expenses, legal fees, insurance etc.'[24].

Total wages paid to the persons employed were reported for the SSIs at two-digit disaggregation level of industries. To obtain total wages paid to the employees in the four-digit level industries, wages per employee have been calculated for the corresponding two-digit level industry first, and then they are multiplied by the number of persons employed at the four-digit level. However there could be wide differences in wage rates among the four-digit industries within the two-digit level industry group. Moreover, in SSIs the own account workers are not paid a fixed amount.

Methodology

The analysis of efficiency is grounded in the theory of production. A production function, by definition, gives the maximum possible output that can be produced from given combination of inputs with a given level of technology. Production is said to be efficient if there is no way to produce more output with the same inputs or to produce the same output with less inputs. Based on this theoretical framework, Farrell's seminal paper[25] of 1957 furnished measures of efficiency. Farrell's measure of technical efficiency is given by the ratio of inputs needed to produce a given level of output to the inputs actually used to produce that level. After Farrell, efficiency measurement has grown into a voluminous literature and over the years has added to its richness and sophistication. For empirical work, the Farrell indexes as proposed in the 1957 paper entail two measures of efficiency. The first is given by the extent to which actual total factor productivity (TFP hereafter) differs from a potential or maximal TFP and the second measure is given by the extent to which TFP of a firm/industry differs from that of another.

In empirical works, two approaches are usually taken to measure efficiency as envisaged by Farrell. A frontier or best practice production function is estimated to predict the maximum output which could be obtained from a set of production inputs which are actually observed in the sample. The difference between this predicted output and the actual output of the firm is considered to be due to technical inefficiency in production. In the specification of the production function either a one-sided negative error term or a stochastic error term is included. In the first case the estimates of the error represent technical inefficiency. In the second case, on the other hand, the error term consists of two components: one represents technical inefficiency which is assumed to be negative and the other represents measurement error and other statistical noise and which could be positive or negative or zero. The second approach is to calculate a weighted average of partial productivity indices of various inputs. The first approach is used to obtain the first measure of efficiency as described above. The second approach can be used for both the measures.

Given the availability of data and their inadequacies, the frontier production function approach is not appropriate. First, the data source doesn’t provide information on various characteristics of the SSIs at sufficiently disaggregated level. Even four-digit level disaggregation that has been used in this study leaves room for heterogeneity of products, which in turn has crucial implications for technology which is captured by the hypothesized production function. Second, as we have already seen, the measures of capital and labor are grossly inadequate. Absence of vintage information pertaining to capital stock measures and lack of information on hours worked and quality of workers could account for a large part of the deviations from the best practice production frontier. Under such circumstances, the role of production frontier as an efficiency standard is questionable.

Since the aim of the present study is to investigate inter-state differences in efficiency of SSIs we are focusing on the second measure implied by the Farrell index. As we have seen that the frontier production function approach might involve serious problems we are using the total factor productivity approach. This is not to say that we can do away with the problems created by data inadequacy in this approach. Moreover this approach has its own limitations. Nevertheless the measures obtained by using this approach are good approximations and the whole exercise is a useful first step in analyzing inter-state differences in efficiency of SSIs in India. First we discuss the measure to be used and then comment on its merits and demerits.

We are using gross value added per employee as the measure of labor productivity and the ratio of gross value added to investment in fixed assets as the measure of capital productivity. For each industry, relative productivity of labor and capital in a state (say, in the ith state) are obtained by dividing productivity of labor and of capital in the ith state by those in `all other states'. The relative efficiency index for the jth industry in the ith state, denoted by RE_j^i (a ratio of total factor productivity in the ith state to that in all other states), is computed as a weighted average of relative productivity of labor and of capital[26]. Thus,

$$\mathbf{RE_j^i = \left(\frac{LP_j^i}{LP_j^{A-i}}\right)^w \left(\frac{KP_j^i}{KP_j^{A-i}}\right)^r}$$

where

$$\mathbf{w = \frac{(w^i + w^{A-i})}{2}}$$

$$\mathbf{r = \frac{(r^i + r^{A-i})}{2}}$$

$$\mathbf{w + r = 1}$$

where LP and KP denote productivity of labor and of capital respectively. Subscript j refers to the jth industry and superscripts i and A-i refer to `ith state' and `all but the ith state'. w and r are the income shares of labor and capital respectively.

This measure of relative efficiency assumes that there is constant returns to scale and competitive equilibrium prevails in the market. The efficiency measure described above is based on the Cobb-Douglas production function. Using the logarithmic transformation we can write

$$\mathbf{InRE_j^i = wIn\left(\frac{LP_j^i}{LP_j^{A-i}}\right) + r\ln\left(\frac{KP_j^i}{KP_j^{A-i}}\right)}$$

The vintages of capital might vary widely across the states but while computing relative productivity of capital, taking average over all the states excepting the one for which relative productivity is being calculated has taken care of the effect of extreme cases. Similarly, there could be wide variations of hours worked among the states but even in this case taking average has reduced the effect of extreme cases sufficiently.

As we have already mentioned, measures of technical efficiency based on total factor productivity involve problems, particularly when they are used to make comparisons between firms or industries that use different technologies. It is very difficult to separate out the effects of technological differences. This problem is relevant because within each industry group the composition of product-specific industries might vary widely across states and so might their technology. Another problem[27] of determining relative levels of total factor productivity consists in establishing the productivity differential between firms which use different levels of inputs and produce different levels of output. The problem in this case is to separate the effect of different input levels among the firms.

IV. Empirical Measures of Relative Efficiency

Relative Labor Productivity

Table 1 shows relative labor productivity of SSIs in different states. It is seen from the table that in Maharashtra labor is relatively more productive than in other states as a whole, in case of eight industries. It may be noted that in Maharashtra labor in the Non-ceramic Bricks industry (3209) is more than eighteen times, and in the Structural Metal Products industry (3410), more than thirty one times as productive as in other states. Besides, the Utensils industry (3452) has the highest labor productivity in this state. Maharashtra is followed by Madhya Pradesh with five industries which exhibit higher labor productivity relative to their counterparts in other states. In Madhya Pradesh, two industries: Rice Milling (2042) and Iron and Steel Casting industry (3311) have the highest relative labor productivity among the states. In Haryana, four industries have relative labor productivity greater than unity. In fact, labor productivity in Ready-made Garments industry (2641) is more than eleven times higher than that in other states. Labor in the Washing Soap industry (3142) in Rajasthan, and in the Wooden Furniture industry (2760) in Gujarat, is several times as productive as their counterparts in other states.

In Andhra Pradesh, Bihar, Tamilnadu and West Bengal, labor is relatively less productive in all nine industries. West Bengal with seven industries having relative labor productivity less than 0.50 and Andhra Pradesh with six industries having relative labor productivity less than 0.50 are the worst cases.

Relative Capital Productivity

Measures of relative capital productivity are presented in Table 2. They also follow similar patterns, capital being relatively more productive in Maharashtra for eight industries, closely followed by Madhya Pradesh with seven industries. Madhya Pradesh has two industries with the highest capital productivity relative to their counterparts in other states. Relative capital productivity in the Non-Ceramic Bricks industry (3209) in Maharashtra : 28.15, and in the Ready-made Garments industry (2641) in Haryana : 10.07 need careful examination.

Haryana, Karnataka and Kerala are doing worse in terms of relative capital productivity than in terms of relative labor productivity. Orissa and West Bengal, on the other hand, are doing better in terms of capital productivity. For example, in West Bengal none of the industries has labor productivity higher than in other states. But two industries: Drums-Tanks-and-Metal Products industry (3403) and Utensils industry (3452) have relative capital productivity greater than unity in this state. Because of the shortcoming of the measure of capital as mentioned earlier, it is possible that higher relative capital productivity indicates that the fixed assets are of old vintages.

It is seen that there is strong positive correlation between relative labor productivity and relative capital productivity in each of the industries across states and across industries in each of the states. This suggests that labor and capital are complementary rather than substitutes to each other. This is further reinforced by a strong positive correlation between capital and labor inputs.

Relative Efficiency

Relative efficiency measures are presented in Table 3. It is observed that relative efficiency index is less than unity for all nine industries in five states : Andhra Pradesh, Bihar, Kerala, Tamilnadu and West Bengal. That is, SSIs in these states are less efficient than their counterparts in other states. In fact, in Andhra Pradesh, Kerala and Tamilnadu, none of the nine industries has a relative efficiency index greater than 0.90. In five other states: Gujarat, Karnataka, Punjab, Rajasthan and Uttar Pradesh, only one industry each (Wooden Furniture industry (2760) in Gujarat; Drums-Tanks-and-Metal Products industry (3403) in Punjab; Washing Soap industry (3142) in Rajasthan and Iron and Steel Casting industry (3311) in Karnataka and Uttar Pradesh) is relatively more efficient than in other states. Similarly, Haryana and Orissa have got two industries each with relative efficiency indexes greater than unity.

Madhya Pradesh and Maharashtra have only one industry each, out of the nine considered here, which is relatively less efficient than in other states. In Maharashtra, Non-Ceramic Bricks industry (3209) is more than four times, and Structural Metal Products industry (3410) is more than two and half times as efficient as those in other states. This is not surprising given the fact that relative labor and capital productivity of those two industries are quite high in this state. On the other hand, in Madhya Pradesh Rice Milling (2042) is almost two and a half times as efficient as in other states. In fact, Rice Milling (2042) and Iron and Steel Casting industry (3311) in this state have the highest relative efficiency indexes among the states.

The Ready-made Garments industry (2641) in Haryana, the Wooden Furniture industry (2760) in Gujarat and the Washing Soap industry (3142) in Rajasthan have the highest relative efficiency indexes among the states. The pattern of labor and capital productivity estimates discussed above is a pointer to these results.

A use-based classification of industries and estimates of coefficient of variation (CV) of the relative efficiency measures of the industries would throw lights on a few other aspects of the inter-state differences in relative efficiency measures. A three category classification puts Rice Milling (2042), Ready-made Garments (2641) and Washing Soap (3142) into the category `consumer non-durables'; Wooden Furniture (2760), Drums- Tanks-and-Metal Products (3403) and Utensils (3452) into `consumer durables' and Non-Ceramic Bricks (3209), Iron and Steel Casting(3311), and Structural Metal Products (3410) into `intermediate products' category. As Table 4 shows, the intermediate product industries and the consumer non-durable industries have greater variations of relative efficiency indexes among the states. The consumer durable industries have the highest average efficiency indexes and relatively smaller CVs. It could be inferred that there is greater diffusion of technical knowledge, more uniform demand for the products and greater uniformity of efficiency of these industries across the states. Intermediate goods industries have some of the highest CVs. It is possible that there is wide variation in technological knowledge and in opportunities of vertical integration for, say, Non-Ceramic Bricks industry or Structural Metal Products industry across the states. Among the intermediate product industries, Non-ceramic Bricks industry has the widest dispersion of relative efficiency indexes.

In order to test for the appropriateness of the two-factor production function implied by the measure used in this study we obtain relative efficiency measures of the SSIs by an alternative method based on weighted average of relative productivity indexes of three factors of production: capital, labor and intermediate inputs. Broadly the pattern of efficiency measures doesn't change. However, for those industries and for those states where relative indexes were higher than unity the new indexes are slightly lower in magnitude than the earlier ones though not less than unity. On the other hand, for those industries and for those states where relative indexes were lower than unity the new indexes are slightly higher in magnitude than the earlier ones thus reducing the dispersion of these measures.

V. Reasons for Inter-State Differences in Relative Efficiency

Measures of relative efficiency presented in Table 3 show considerable variations across states. An analysis of these variations would be useful for understanding the causes of inefficiency of SSIs in various states. The explanatory variables chosen for this purpose are discussed below.

Several studies [including Dhar and Lydall,1961 and Sandesara, 1966 & 1969] suggest that higher efficiency could be attributed to economies of scale. To capture the effect of economies of scale on relative efficiency, three different measures of relative size are used : first, value of production per unit in a state divided by value of production per unit in other states (RS1); second, fixed investment per unit in a state divided by fixed investment per unit in other states (RS2); third, employment per unit in a state divided by employment per unit in other states (RS3). States with higher average relative firm size are expected to have higher relative efficiency indexes.

Better management could be a source of higher efficiency. Goldar (1988) uses the ratio of closing stock of raw materials to consumption as the measure of quality of management in SSIs.`This ratio indicates how efficiently small scale units manage their inventories'[28]. But our data source does not provide the relevant information on inventories. Therefore percentage capacity utilization has been taken as the measure of quality of management. It is assumed that this ratio indicates how efficiently small scale units manage to utilize their installed capacity (a higher ratio indicating better management).

‘Differences in TFP can...reflect differences in levels of technology’[29]. Therefore variations in relative efficiency indexes of SSIs can be ascribed to differences in technology among various states. To obtain a good proxy for level of technology is difficult. The proportion of units using power is being taken as an indicator of level of technology in a state. Use of power signifies mechanization of industries. The ratio we are using here indicates to what extent mechanization has taken place in an industry in a state. It is assumed that the higher is the ratio the higher is the level of technology.

Correlation coefficients between relative efficiency indexes and the explanatory variables are shown in Table 5. Contrary to our expectation, relative efficiency and relative size are negatively correlated for Rice Milling industry. In other industries, these two measures are positively correlated but the correlation coefficients are significant only in Non-Ceramic Bricks, Iron and Steel Casting and

Structural Metal Products industries when we use RS1 as the measure of relative size. If we use RS2 as the measure of relative size, relative efficiency is negatively correlated with relative size in Washing Soap industry as well. If employment per unit is taken as the size criterion, the situation is still worse as is evident from the table. It may be noted that in the intermediate product industries there is significant positive correlation between relative efficiency and relative size (when size is defined in terms of value of production per unit). That is, as the firm size increases efficiency also increases thus suggesting that intermediate product industries might have substantial economies of scale.

There is positive correlation between relative efficiency and capacity utilization indexes except in two industries: Wooden Furniture industry and Utensils. However the correlation coefficient is significantly different from zero only in the Ready-made Garments industry. In seven out of nine industries, there is positive correlation between relative efficiency and proportion of power using units. The coefficient is, however, not significantly different from zero in most of the cases suggesting a weak relationship between efficiency and level of technology. These two measures have significant positive correlation only in Non-Ceramic Bricks industry.

Examining the correlation coefficients, we have decided to regress relative efficiency indexes on three variables: relative size (RS1), level of capacity utilization (CU) and level of technology (TECH). The regression results are presented in Table 6.

The coefficient of the explanatory variable: relative size is positive and significant for six industries. It supports the hypothesis that there are some economies of scale in these industries. The coefficient of relative size is negative but not significant in rice milling industry. In other two industries, the estimated coefficients are smaller and not significantly different from zero. In these industries small firms could be the most efficient ones and at higher level of production there could be decreasing returns to scale.

Level of capacity utilization, which has been taken as a measure of the quality of management, is a significant source of variations in relative efficiency only in the Ready-made Garments industry. The coefficient of level of capacity utilization is positive in five other industries but are not significant. It is surprising to note that the relationship between relative efficiency and level of technology-as measured by the proportion of power using units- is negative in most industries and in one or two cases, this is even significant. Only in Rice Milling, the elasticity of efficiency with respect to level of technology is positive and significant at 0.10 level. It is possible that since in most states, particularly in relatively less developed states, power supply is irregular and insufficient, as the number of units using power increases their efficiency suffers. This hypothesis is substantiated by the fact that average consumption of power is low in relatively backward states even if the proportion of power using units may be high[30].

A test for heteroscedasticity[31] based on the regression of the squared residuals on squared fitted values has been carried out and the F-statistics are found to be insignificant for all nine regressions. Thus it is reasonable to use ordinary least square estimates under the assumption that the error terms are homoscedastic.

VI. Conclusion

The relative efficiency measures presented in this paper indicate that only in seven states we observe some general patterns: in Maharashtra and Madhya Pradesh, most of the SSIs are relatively more efficient than in other states. On the other hand, in Andhra Pradesh, Bihar, Kerala, Tamilnadu and West Bengal they are relatively less efficient. In other states, some industries have efficiency indexes greater than unity and others have less than unity. A use-based classification of industries reveals that consumer durable industries have some of the highest average efficiency indexes and relatively smaller coefficient of variations. It could be because of greater diffusion of technical knowledge, more uniform demand for the products across the states. On the other hand, the intermediate product industries and the consumer non-durable industries have wider variations in their relative efficiency indexes across states. In case of the intermediate product industries, it could be ascribed to greater variation in technological knowledge and opportunities for vertical integration among the states.

Relative efficiency is positively correlated with relative size, but is significantly so only in three industries: Non-Ceramic Bricks, Iron and Steel Casting and Structural Metal Products. The index has positive correlation with the level of capacity utilization in seven out of nine industries. The correlation coefficient, however, is significant only in the Ready-made Garments industry. The proportion of SSI units using power-which has been taken as a proxy for the level of technology, is found to be positively correlated with relative efficiency in seven industries. A careful perusal of the data on this important ratio will reveal that in industrially developed states like Maharashtra, the industries with higher proportion of power using units are relatively more efficient. However, even if this proportion is high, with irregular and insufficient supply of power the industries may be relatively inefficient as it is the case in some backward states.

The multiple regression analysis involving three explanatory variables: relative size, level of capacity utilization and level of technology, shows that relative size of the firm is the most important explanatory variable. It explains inter-state differences in relative efficiency of six industries. It may be noted that intermediate product industries have scale advantages. The level of capacity utilization is a significant source of efficiency differences only in the Ready-made Garments industry. The level of technology explains inter-state differences in efficiency only in Rice Milling.

The results of this study have policy implications. The decade of nineties has witnessed widespread economic reforms in India. Higher growth has been the primary objective of these reform measures. In a liberalized environment the SSIs are facing competition and there is an apprehension that some of them might have to close down. But given the social and economic condition of India the relevance and role of small-scale sector can’t be looked down upon. It can be instrumental in containing rising inequalities. Also, in the transition of backward regions from predominantly agriculture-based economic activities to industrial activities SSIs can play the role of a catalyst by creating an infrastructure for the growth of industries, in terms of capital formation and entrepreneurship development. In this context, this study provides important guidelines to the policy-makers who wish to achieve growth by smooth restructuring of the economy and without increasing regional disparities in India.

Notes

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2. See Hiranya K. Nath, "Relative Efficiency of Modern Small Scale Industries in India : An Inter-State Comparison" (M. Phil. dissertation, Delhi : Jawaharlal Nehru University, 1996) and National Council of Applied Economic Research and Fredrich Naumann-Stifling, Structure and Promotion of Small Scale Industry in India : Lessons for Future Development, (New Delhi : NCAER, 1993)

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14. CMI = Census of Manufacturing Industries

ASI = Annual Survey of Industries

15. B. N. Goldar, "Relative Efficiency of Small Scale Industries in India" in K. B. Suri (ed.) Small Scale Enterprises in Industrial Development: The Indian Experience (New Delhi : Sage Publications, 1988).

16. Census sector includes all those units registered under the Factories

Act. A factory has been defined as one with 10 workers and use of power, or one with 20 workers and without use of power.

17. Sample sector includes a sample of units which are not registered under the Factories Act but registered with one or more of the government organizations or departments.

18. NIC = National Industrial Classification

19. Those units which are registered with the Small Industries Development Organization (SIDO).

20. Development Commissioner of Small Scale Industries, Report on the Second All India Census of Small Scale Industrial Units, (New Delhi: Government of India, 1992).This definition since then has changed.

21. This is according to the National Industrial Classification (NIC). As the number of digits in level of disaggregation increases the industry group becomes more product specific.

22. For a discussion, see Z. Griliches and V. Ringstad, Economies of Scale and the Form of Production Function, (Amsterdam : North Holland Publishing Co, 1971).

23. Development Commissioner of Small Scale Industries.

24. ibid.

25. M. J. Farrell, "The Measurement of Production Efficiency", Journal of Royal Statistical Society, No.A120, 1957.

26. S. Ho, "Small Scale Enterprises in Korea and Taiwan" (World Bank Staff Working Paper 384, Washington, D.C.: World Bank,1980) and B. N.

Goldar, "Relative Efficiency of Small Scale Industries in India" in K. B. Suri (ed.) Small Scale Enterprises in Industrial Development : The Indian Experience (New Delhi : Sage Publications, 1988) use similar index.

27. This was pointed out by Little et al.

28. B. N. Goldar, "Relative Efficiency of Small Scale Industries in India" in K. B. Suri (ed.) Small Scale Enterprises in Industrial Development : The Indian Experience (New Delhi : Sage Publications, 1988).

29. Little et al

30. Nath

31. This is the test built in the package 'MICROFIT' that has been used for estimation in this paper.

TABLE 1

RELATIVE LABOR PRODUCTIVITY OF 9 SSIs IN 15 MAJOR STATES

States	2042	2641	2760	3142	3209	3311	3403	3410	3452
A.P.	0.65	0.16	0.51	0.27	0.41	0.42	0.38	0.88	0.48
Assam	0.50	0.93	1.37	0.48	0.41	0.67	0.51	1.36	1.28
Bihar	0.73	0.22	0.54	0.37	0.66	0.77	0.34	0.90	0.47
Gujarat	0.83	0.41	7.21	0.42	0.33	0.50	0.99	1.00	0.62
Haryana	0.77	11.27	1.18	0.53	0.71	0.87	2.11	1.18	0.93
Karnataka	0.62	0.72	0.66	0.42	0.67	1.13	0.98	1.09	1.07
Kerala	0.37	0.15	0.65	0.20	2.17	0.36	0.48	0.65	0.68
M.P.	5.35	0.37	0.85	0.80	0.75	4.46	1.35	2.86	1.26
Maharashtra	1.49	3.92	2.04	0.53	18.47	2.65	1.88	31.65	1.94
Orissa	2.26	0.35	0.49	0.17	0.17	2.00	0.72	0.78	0.45
Punjab	0.69	0.44	0.53	0.44	0.39	0.49	3.09	0.66	0.51
Rajasthan	0.83	0.73	0.59	9.24	0.71	0.51	0.83	0.91	0.53
Tamilnadu	0.53	0.31	0.70	0.28	0.27	0.54	0.47	0.95	0.58
U.P.	0.70	0.46	0.61	0.32	0.54	1.36	0.66	1.20	0.83
W. B.	0.14	0.36	0.46	0.29	0.16	0.34	0.51	0.66	0.28

TABLE 2

RELATIVE CAPITAL PRODUCTIVITY OF 9 SSIs IN 15 MAJOR STATES

States	2042	2641	2760	3142	3209	3311	3403	3410	3452
A. P.	0.75	0.24	0.73	0.21	0.55	0.46	0.36	0.21	0.66
Assam	0.41	1.01	1.37	0.24	0.65	0.46	0.55	0.28	1.33
Bihar	0.62	0.28	0.80	0.39	0.96	0.74	0.53	0.21	0.45
Gujarat	0.65	0.48	4.84	0.49	0.35	0.53	0.73	0.19	0.32
Haryana	0.75	10.07	0.69	0.50	0.30	0.59	2.43	0.21	0.42
Karnataka	0.45	0.79	0.73	0.48	0.27	1.20	0.84	0.18	0.66
Kerala	0.32	0.23	0.48	0.18	0.16	0.23	0.50	0.12	0.48
M. P.	7.89	0.77	2.13	1.12	1.72	3.15	1.96	0.74	1.22
Maharashtra	1.19	3.03	1.46	0.60	28.15	1.94	1.55	3.65	1.15
Orissa	3.12	0.65	0.88	0.22	0.48	1.91	0.55	0.18	0.97
Punjab	0.64	0.36	0.34	0.39	0.32	0.58	3.62	0.12	0.40
Rajasthan	0.69	0.64	0.45	6.56	0.42	0.42	0.98	0.17	0.47
Tamilnadu	0.64	0.50	0.80	0.33	0.23	0.47	0.65	0.21	0.53
Uttar Pradesh	0.54	0.26	0.51	0.23	0.24	1.08	0.65	0.25	0.45
West Bengal	0.29	0.94	0.96	0.64	0.39	0.67	1.09	0.21	1.40

TABLE 3

MEASURES OF RELATIVE EFFICIENCY OF 9 SSIs IN 15 MAJOR STATES

States	2042	2641	2760	3142	3209	3311	3403	3410	3452
A.P.	0.88	0.50	0.83	0.53	0.74	0.71	0.65	0.63	0.79
Assam	0.69	1.00	1.15	0.57	0.77	0.74	0.77	0.70	1.13
Bihar	0.82	0.56	0.86	0.66	0.95	0.88	0.73	0.61	0.71
Gujarat	0.84	0.72	2.04	0.72	0.62	0.75	0.89	0.62	0.67
Haryana	0.88	2.74	0.89	0.74	0.66	0.82	1.46	0.63	0.75
Karnataka	0.71	0.90	0.86	0.72	0.64	1.08	0.93	0.59	0.88
Kerala	0.61	0.49	0.76	0.49	0.56	0.56	0.73	0.55	0.77
M.P.	2.43	0.85	1.24	1.03	1.15	1.68	1.31	1.03	1.09
Maharashtra	1.09	1.64	1.22	0.79	4.10	1.36	1.23	2.61	1.12
Orissa	1.62	0.78	0.87	0.50	0.56	1.33	0.79	0.59	0.88
Punjab	0.83	0.66	0.66	0.67	0.63	0.78	1.74	0.53	0.70
Rajasthan	0.86	0.83	0.73	2.30	0.73	0.70	0.98	0.58	0.73
Tamilnadu	0.82	0.70	0.89	0.61	0.54	0.73	0.80	0.63	0.77
Uttar Pradesh	0.78	0.66	0.77	0.55	0.59	1.05	0.83	0.68	0.76
West Bengal	0.53	0.89	0.86	0.75	0.54	0.78	0.97	0.61	0.87

TABLE 4

SUMMARY OF THE RELATIVE EFFICIENCY MEASURES FOR 9 SSIs IN INDIA

Ind/Measures	Mean	Std.Dev.	C.V.	Min.	Max.
2042	0.96	0.46	0.48	0.53(WB)	2.43(MP)
2641	0.93	0.55	0.60	0.49(Ker)	2.74(Har)
2760	0.98	0.33	0.34	0.66(Pun)	2.04(Guj)
3142	0.78	0.43	0.55	0.49(Ker)	2.30(Raj)
3209	0.92	0.87	0.94	0.54(TN)	4.10(Mah)
3311	0.93	0.30	0.32	0.70(Raj)	1.68(MP)
3403	0.99	0.30	0.30	0.65(AP)	1.74(Pun)
3410	0.77	0.50	0.65	0.53(Pun)	2.61(Mah)
3452	0.84	0.15	0.18	0.70(Pun)	1.13(Asm)

Notes: The states in brackets refer to those states where the efficiency indexes are minimum or maximum as the case may be.

Std. Dev. = Standard Deviation

Min. = Minimum

Max. = Maximum

TABLE 5

CORRELATION COEFFICIENTS BETWEEN RELATIVE EFFICIENCY AND EXPLANATORY VARIABLES

Industry	RS1	RS2	RS3	CU	TECH
2042	-0.03	-0.26	-0.43	0.15	0.32
2641	0.49	0.30	0.12	0.83 **	0.04
2760	0.29	0.08	0.18	-0.02	0.40
3142	0.16	-0.05	-0.24	0.31	0.04
3209	0.95 **	0.50	0.25	0.41	0.53 *
3311	0.72 **	0.13	0.11	0.09	0.02
3403	0.24	0.11	-0.16	0.15	-0.16
3410	0.90 **	0.70 **	0.52 *	0.38	0.31
3452	0.44	0.26	0.29	-0.03	-0.07

Note: * significant at 10 % significance level.
** significant at 5 % level.

TABLE 6

REGRESSION RESULTS

Industry	Intercept	RS1	CU	TECH	Observ- -ations	R-square	F-Statistic	FStatistic for Heteroscedasticity Test
2042	-4.55	-0.16 (-0.84)	0.14 (0.61)	0.88 (1.42 *)	15	0.19	0.84	0.06
2641	-0.18	0.36 (4.40 **)	0.51 (3.12**)	-0.56 (-4.74)	15	0.82	16.53 *	0.19
2760	0.13	0.11 (0.82)	-0.17 (-0.47)	0.12 (0.37)	15	0.20	0.92	1.08
3142	0.11	0.23 (0.72)	0.18 (0.54)	-0.28 (-0.40)	15	0.20	0.94	1.22
3209	-1.14	0.69 (3.16 **)	0.37 (1.19)	-0.15 (-0.56)	15	0.58	5.12 *	0.76
3311	0.74	0.35 (2.72 **)	-0.02 (-0.11)	-0.18 (-0.60)	15	0.40	2.49	2.95
3403	1.65	0.23 (1.63 *)	0.26 (1.04)	-0.64 (-1.91)	15	0.31	1.67	0.97
3410	0.67	0.47 (2.61 **)	0.16 (0.50)	-0.37 (-0.88)	15	0.43	2.76	0.37
3452	0.83	0.15 (1.61 *)	-0.07 (-0.43)	-0.17 (-0.79)	15	0.20	0.93	0.80

Notes: * significant at 10 % significance level

** significant at 5 % level.