

Economic Behavior of Small Scale Industries in Meghalaya: An Econometric Analysis

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The active role played by the small scale industries in the process of development of modern economies has now widely accepted. This paper makes an in depth analysis of the major characteristics and development of SSI sector in Meghalaya, a state located in the North-Eastern region of India. In the process, size distribution, classification, characteristics of different categories of labor, firm size and organization have been dealt with to study the role of labor, capital and technology as productive resources for SSI. Efforts have also been made to identify the determinants of output and to evaluate its relationship with inputs like labor and capital. At the first stage, these issues have to be ascertained for the aggregate level, i.e., for the SSI sector as a whole and at the disaggregated level, i.e., at the subsector level. All indicators of industrialization reveal that the state economy is a simple economy where emergence of small scale sector in a significant manner has begun in the last thirty years only, where large and medium scale industries are yet to develop. SSIs are showing decreasing returns to scale. The reason for this is that manufacturing industries are dominated by household goods industries and agro and forest based industries. The minimum size for efficiency in these industries tends to be relatively small. The state economy is passing through a preliminary stage of 'industrialization', where the full advantage of technology and economies of scale are not being enjoyed by the existing SSIs. As a policy measure, it is recommended that additional manufacturing industries are developed in the state, as this would lead to the full exploitation of economies of scale and technical advantages to put the state economy on rapid growth trajectories.

Introduction

The Small Scale Industrial (SSI) sector has been considered as a powerful instrument for realizing the twin objectives of achieving 'Accelerated Industrial Growth' and creating 'Productive Employment Opportunities' in an economy. This sector also plays two important roles as producers of consumer goods and absorbers of surplus labor thereby addressing the

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problems of poverty and unemployment. Small scale industries also have a merit of being agents that help in mitigating regional imbalances, act as a nursery for entrepreneurship and facilitate mobilization of local resources and skills, which might have otherwise remained unutilized. In recent years, the SSI sector has emerged as a dynamic and vibrant sector of the Indian economy displaying its phenomenal growth in the varied fields of production, employment, and dispersed development, in general, and exports, in particular.

Throughout the historical process of industrial development, the SSI sector has contributed significantly. It may be in the form of a beginning from domestic to cottage or artisan level, from artisan to manufacturing, from traditional to modern and from small scale to large scale industries. Even in the era of fast technological advancement, small scale industries are still playing a vital role in various economies of the world. The active role played by the small scale industries in the process of development of modern economies has now been widely accepted. This paper is organized in the following manner: literature review, research questions and gaps, methodology and data, the economy of Meghalaya, SSIs in Meghalaya, econometric analysis and at last the conclusion.

Literature Review

A number of studies have been conducted in the field of SSI at international, and national levels and very few at regional level. These studies highlighted various issues related to SSIs; for example their relationship with economic development, employment, capital, technology and inter-industrial linkages. Dealing with small scale industries and their contribution to economic development, Staley and Morse (1965) in a classic textbook on small and medium industries in developing countries identified the areas in which the small scale industry could contribute positively to national economic development. A study conducted by the United Nations (UNIDO, 1969) asserted that the promotion of small and medium scale industries was justified because they helped in fulfilling the major social economic development objectives. Vepa (1980) traces how development of SMEs in China has been accorded a high place particularly in the rural areas since the revolution of 1949. Japan began as a developing country in the later half of the 19th century and was quick to appreciate the importance of small entrepreneurs for generating economic growth (Vepa, 1983). Mancuso (1984) gave an account of the importance of small business in the United States of America. Eyo (1989) examines the impact of public policies on the development and performance of small scale industries programs in Nigeria. According to Sato (1989) small firms have been considered to be an important element of the industrial structure in Japan since the turn of the century.

The role of small businesses in the US economy is studied by Brock and Evans (1989) from the standpoint of various economic theories of the size distribution of firms. Phillips and Kirchoff (1989) attempt to examine the statement "four out of five new firms fail within the first five years". Survival rates vary by industry with manufacturing having the greatest (46.9%) and construction the smallest (35.3%). More important, however, is the discovery that survival rates more than double for firms that depicted the significant levels of growth. Even a small amount of growth boosts the average survival rate to 66.3%; that is two out of three growing firms survive. Growth that occurs the earlier in the life of the business, the higher the chance of survival.

Zoltán and Audretsch (1989) pointed out that centrally planned economies usually prefer larger plants and firms to smaller ones. After the twin oil shocks of 1973 and 1980 it is widely recognized that strengthening the small firm sector is a prerequisite to revitalize the Hungarian economy. One of the striking conclusions is that the small business sector in the Hungarian

economy is smaller than that of any other industrialized country. Zoltán and Audretsch (1989) presented a model hypothesizing that the level of small firm presence in any given industry emanates from the exogenous stock of entrepreneurial talent, a stochastic element of managerial and entrepreneurial talent, entry deterrence, and the entrepreneurial strategy deployed by small firms. Tambunan (1992) examines the relative pattern of change and development of small firms in the manufacturing sector in Indonesia in the last two decades and possible factors affecting their growth. Also the relative importance of small firms in terms of income generation was assessed. While discussing the development of small scale and cottage industries, their role, present position and problems faced by these industries with special reference to industrial sickness, Jhanwar (1992) examines the role of government policies in developing small scale and cottage industries.

In a comparative study on small and medium-sized enterprises in the four Asian newly industrialized economies (Hong Kong, Korea, Singapore and Taiwan), Regnier (1993) deals with the existing or potential role of small firms in Korea's industrialization process. He reviews Korea's industrial heritage up to the post-Korean war period. Mathew (1999) found that small enterprises are almost equated with poverty and deprivation in the modern world. Audretsch (2002) provides a conceptual and empirical account of the dynamic role of SMEs in the US economy. Nugent and Yhee (2002) gives an overview of the evolution of the small and medium enterprise sector in Korea during the past quarter century. Wiboonchutikula (2002) reviews the evolution of small and medium firms in Thailand in recent years. According to Luken and Stares (2005) many developing countries see Small and Medium sized Enterprises (SMEs) that are exporters themselves facing a dilemma. They do not know how to respond to the rising social and environmental requirements of global buyers and supply chains. Yamawaki (2002) focuses on the various aspects of the evolution and structure of clusters in Japan, namely, what gives rise to clusters and what benefits are acquired by small firms from participating in clusters. Kimura (2002) provides an empirical analysis of the choices made by Japanese firms with respect to subcontracting status. Berry *et al.* (2002) discusses the role of clusters and subcontracting as factors in the evolution of small and medium firms in Indonesia during the past quarter century.

Krongkaew (1988) describes and analyzes the status and development of small and medium industries in Thailand, where initially the emphasis of industrial development was on import substitution and government took certain promotional measures to encourage private investment both from within and outside the country to expand industrial development. Johnson (1989) provides a taxonomic framework for analyzing inter-industrial flows. Quf and Ahmed (1989) attempts to examine the hypothesis that "small scale enterprises were viewed as notoriously inefficient and backward" in the economies of less developed countries. Berry and Mazumdar (1991) opine that small scale industry has been important in the successful development of many of the economies of East and Southeast Asia, in cases like Japan, Korea, Taiwan and Hong Kong where import-substitution preceded and/or accompanied the manufacture exporting phase.

The Indian experience of promoting small scale industry over the last four decades reviewed by Sandesara (1988) based on official reports and academic studies on the subject. Dealing with the industrial development and process of industrialization in North-Eastern region of India, Neog (1988) in a broad sense denotes the organization of production in business enterprises, characterized by specialization and division of labor and involving the

application of technology and mechanical and electric power to supplement and/or replace human labor. While discussing labor turnover referring to the inter-firm mobility of labor, Rao and Rao (1993) discuss the effects of labor turnover for the employer and the employee. Vepa (1997) have noted the importance of the small scale sector not merely for providing jobs at reasonable cost but also as a dynamic engine of growth for the national economy. According to Nath (1998) persistent efforts have been made to promote small scale industries in India as a source of large-scale employment generation and equitable distribution of income. Dutta and Singh (2003) argue that the small scale industry is a key to India's growth and a tool for alleviation of poverty and unemployment in the country.

Bhavani (2002) looks at firm level process of diffusion of new technologies for the small enterprises in developing economies. Shah (1994) finds that along with the growing industrial sector, functional complementarities between large and small scale enterprises have become a widely prevalent phenomenon. The empirical evidences on the differences on social relationships between rural and urban communities are very weak. Social relationships do not differ all that much between rural and urban communities but important differences tend to be related to size and distance. Family businesses in rural areas face obstacles because of their locations where distances from centers of business may impose additional costs for them. It would be an important area of research to examine how spatial differences make social relationship to influence the behavior of family businesses. Ahmad (1987) traces the problems of varied nature both at the micro and macro levels faced by the small scale industries and cottage industries in Jammu and Kashmir. Highlights the factors causing or contributing to the success and failure of the small scale industry on the one hand and the factors those responsible for the failure on the other hand. Vepa (1998) discusses the organizational issues and suggests setting-up of a department for small scale industry in the Ministry of Industries and to include all organizations and agencies relating to small scale industry in that department.

Research Questions and Gaps

The mentioned literature review reveals clearly that there is a dearth of study on SSIs at regional/state level in India, especially on North-Eastern states. We have not come across with any systematic study on SSIs for the state Meghalaya, a state located in the North-Eastern region of India. The present study is supposed to fill this research gap. The purpose of this paper is to make an in-depth analysis of the major characteristics and development of SSI sector in Meghalaya. Realizing the importance of the SSI sector, it would be understandable to study the process of development of SSIs in any economy. To begin with, it would be pertinent to raise a number of research questions. For example, what is the prevailing structure of the SSI sector in the economy? What has been the process of structural transformation within a given timeframe and can this transformation be evaluated on the basis of distribution patterns of the existing SSI units, in terms of employment, fixed capital investment and production levels? What are the major determinants of output? How to evaluate its relationship with inputs like labor and capital? At the first stage, these issues have to be ascertained for aggregate level i.e., for the SSI sector as a whole. At a later stage, it would be possible to analyze on disaggregated level i.e., at sub sector level.

The SSI sector is studied in terms of size distribution, classification, characteristics of different categories of labor, firm size and organization. This focuses specifically on the role of labor, capital and technology as productive resources for the SSI. Efforts are also made to identify the determinants of output and to evaluate its relationship with inputs like labor and capital.

Methodology and Data

This study is based on statistics collected from various sources at national, state and district levels, mainly from the Reports of All India Census of SSIs, Basic Statistics of North-Eastern council and publications of the State Directorate of Industries, State Directorate of Economics and Statistics, etc. The Second and the Third All India Censuses of SSIs are two major data sources, which were considered important and relevant for this purpose. These two censuses were conducted during 1990-91 and 2002-03 respectively. Though, the First Census was conducted for the state in 1973-1974, for the purpose of the study it was not considered because Meghalaya had just gotten its statehood and hence data available was not adequate enough for the purpose of analysis. The Second Census was conducted during 1990-91. This census covers altogether 748 units in the State of Meghalaya of which, 588 (78.61%) units were found working, and the remaining 160 (21.39%) units were either closed or not traceable.

In the Third Census, a total of 3,847 units were surveyed in Meghalaya out of which 1,938 units are working and the remaining 1,909 are closed. The percentage of working units comes to 50.38% and the closed units to 49.62% in the state. The analysis of statistical information obtained from the two consecutive census reports not only indicates the distribution pattern of the industrial units in the state but also indicates the nature of sampling to be chosen in order to give proper representation to each segment of the overall industrial structure of the state. The units considered to be incorporated in the study are only the registered SSI units. The Third Census data for the SSIs of Meghalaya is the most recent one and the detailed available information and the use of firm level data for the analysis make results of this study more reliable.

Usage of the firm level data has made this study unique in a number of ways. Firstly, very few studies are available, which use unit record data. For example there are some studies, on poverty and consumer behavior that used household consumer surveys conducted by the National Sample Survey Organization (NSSO), are available. But we have not come across with any study carried out so far for SSIs based on firm level data for any of the North-Eastern state. Secondly, this study gives an opportunity to deal with the most disaggregated level data, along with large number of observations, which are about 2,000 in the present case. This makes statistical estimation more reliable and statistically unbiased. Thirdly, estimations are free from error that arises due to aggregation problem as pointed out by Fisher (1969). Lastly, the state level report on the Third Census of SSIs for Meghalaya is made public in the year 2004; using statistics of this census makes the present study the most recent and expected to give most correct and up to date scenario of SSIs in Meghalaya.

The multivariate statistical techniques like linear, lin-log and log-log models with stepwise regression have been used for the propose of estimation and to analyze the information in order to throw some light on the economic behavior of the small scale industrial sector in the state and how it has grown and developed over the last two decades. A detailed econometric analysis was conducted in order to find out the major determinants of the output of the SSIs. Further, an aggregate and sectorwise approach was used to study the production structure and its major characteristics revealed by a variety of production functions.

Economy of Meghalaya

The economy of Meghalaya is basically agrarian and rural based. Agriculture plays a predominant role in the economy of the state. It constitutes the main economic activity for about 80% of its population. The hilly surface and wet climate have made Meghalaya well known for its extensive forest area with a wide variety of flora and fauna. Through its rich forest reserve, products such as industrial wood, fuel wood, bamboo, cane, thatch etc., it has helped

a great deal in generating substantial revenue for the state. This state is popularly known as a storehouse of natural and mineral resources. The vast, splendid and overwhelming natural beauty of the state provides tremendous scope for developing tourism industry here and which could also be highlighted as one of the major tourist attraction areas. This would not only help in generating revenue for the state but also provide gainful employment for the large number of educated unemployed in the state. With the lifting of the Restricted Area Permit (RAP) completely, the state along with some non-governmental organizations has taken steps in establishing infrastructure and facilities needed for promoting tourism in the state, which has attracted tourists from within and outside the country.

Along with the other states in the North-East region of the country, Meghalaya is also considered an industrially backward state. Industrialization in Meghalaya is lagging far behind as compared with the other states of the country. The growth and development of the industrial sector in the state has, no doubt, been slow but steady with the growth in the number of SSIs, being higher in proportion than that of medium and large scale enterprises. This is equally true in case of the number of persons employed in the respective sectors. The industrial activity in the state has been very slow. The state has in fact achieved very little on this front regardless of the potentialities that the state is endowed with for a healthy growth. The state of Meghalaya is rich in mineral resources and by utilizing the locally available resources, several cement plants were set up by both the public as well as the private sectors.

Though this state is richly endowed with mineral resources like coal, limestone, and uranium and only state in India with surplus power generation, opens up big opportunity to set up various resource-based and demand-based industries. However, in spite of its richness in terms of raw material, both mineral and natural resources, yet there are several constraints like low capital formation, dearth of sophisticated machinery and modern technology, lack of technically skilled manpower, geographical isolation, and limited market, which limit the scope for development of large scale and even medium scale industries. The industrial activity in the state has been very slow and the state has in fact achieved very little on this front regardless of the potentialities that the state is endowed with for a healthy industrial growth pattern. Much of the industrial activity in the state since its statehood in 1972 has been in the small scale sector. Efforts have been made by the government through its industries department, central government agencies along with those in the private sectors to tap the resources and the potentialities in setting up industrial units all over the state.

Small Scale Industries in Meghalaya

The overall scenario of the small scale industries in Meghalaya in the region and its comparison with the all India level are given in Table 1. This suggests that the NE Region, likewise in many other fields of economic activities, has a long way to go in the field of industries. For instance, in the share of small scale industries, about 9,330 units of the North-East Region constitutes a petty 1.60% of the all India level 5,82,368 units. Small scale industries which are considered to be a major source for providing job opportunities in an economy are not really reaching the expectation in this part of the country. The small scale industrial units in the region have really not contributed much with respect to providing employment opportunities. The number of the employed in the small scale industrial units in the region is just 1.87% at the all India level. It is to be noted, however, that the population density in this part of the country is also lower than in the rest of the country. The picture is quite the same for the other parameters as well such as production capacity (1.25%), working capital (1.67%) except for capacity utilization (50.01%), which is almost at par with that of all India level which is 50.89%.

Table 1: Principal Characteristics of SSIs in North-Eastern Region

State	SSI Units ¹	Employment ¹	Fixed Investment ²	Investment in Plant and Machinery ²	Working Capital ²	Production Capacity ²	Utilization Capacity ³
Arunachal Pradesh	326	2,771	703	395	631	2,624	51.23
Assam	4,430	34,475	9,369	5,168	7,746	30,235	19.31
Manipur	2,078	10,216	2,078	669	723	2,988	65.37
Meghalaya	587	3,780	888	478	765	2,700	55.25
Mizoram	917	4,223	1,388	471	457	1,470	71.88
Nagaland	183	3,059	729	489	649	11,247	46.29
Tripura	809	10,069	1,479	571	972	2,957	40.76
North-East	9,330	68,593	16,634	8,241	11,943	54,221	50.01
All India	5,82,368	36,65,810	9,29,603	5,54,258	7,14,808	43,21,907	50.89

Note: ¹ in numbers, ² in lakhs and ³ in percentages.

Source: Basic Statistics of North-Eastern Region, 2000.

Total output in the year 2001-2002 was estimated to be Rs. 106.5 cr. Distribution of principal characteristics by gross output given in Table 2 reveals that 82.55% of the units had gross output less than Rs. 10 lakh. It can also be seen from Table 2 that large output units (with output more than Rs. 100 lakh) had a share of only 27.59% output with a share of only 5.06% in the number of units. The top 20 economic activities are contributing to 73.80% of gross output, whereas 30 most important products are contributing to 78.32% to the gross output in the registered SSI sector.

Table 2: Percentage Distribution of Principal Characteristics by Gross Output Slabs

Gross Output Slabs (Rs. Lakh)	No. of Units	Employment	Fixed Capital	Orig.Val.of P and M	Gross Output
1	2	3	4	5	6
Up to 1	32.51	30.52	8.45	7.17	3.14
1 to 2	17.19	16.92	11.67	12.01	7.25
2 to 5	20.74	21.14	19.79	21.30	13.67
5 to 10	12.11	12.50	17.51	16.63	11.88
10 to 15	3.24	3.55	5.16	6.07	6.78
15 to 20	2.41	2.54	5.57	5.83	5.29
20 to 25	1.53	1.58	2.50	2.81	4.59
25 to 30	0.34	0.35	0.36	0.57	1.54
30 to 50	4.31	4.88	4.13	4.32	7.04
50 to 70	0.56	0.59	0.71	1.01	3.27
70 to 100	1.59	1.66	12.39	7.74	7.66
100 to 200	2.54	2.74	8.22	10.79	8.60
200 to 500	0.90	0.94	2.91	3.18	11.05
Above 500	0.03	0.09	0.64	0.57	7.94
Total	100.00	100.00	100.00-	100.00	100.00

Source: Final Results: Third All India Census of Small Scale Industries 2001-02, Development Commissioner (SSI), Ministry of Small Scale Industries, Government of India, New Delhi (2004).

The development of SSIs in Meghalaya, which was slow before 1985, picked up after 1986. During the 14-year period from 1987-1988 to 2001-2002, these SSIs have grown by 18.24% annually. Manufacturing/Assembling/Processing sector of SSIs comprises the largest of total SSI sector followed by services and repairing and maintenance sector. There are three basic changes in the resource based structure of SSIs in the state during this period. They are: (i) The proportion of hoisery, electrical and electronics has increased; (ii) The Small Scale Service Business Enterprises (SSSBs), and agro-based industries have emerged in a significant manner; and (iii) food-based, forest-based, repairing and services and electrical and electronics SSIs are growing by more than 10% average annually.

The proportion of SSIs located in urban areas has declined while its proportion for rural areas has increased. The number of small scale industries has swollen four times in 2001-2002 to the number it was in 1987-1988 in the rural areas and more than doubled in the case of urban areas. In aggregate, the number and the percentage of small scale industries in the rural areas are much higher than those in the urban areas during the same period. This may be attributed to the development of infrastructural facilities including power in some of the rural areas of the state. The predominance of sole proprietary SSIs (98.9%) and the share of partnership, limited companies and cooperatives in the state is indicative of its simple economy with limited and localized market activities. The sole proprietorship units' share of the total workers employed in the small scale industries is the largest; and its share has increased by 15%, from 82.7% in 1987-1988 to 97.7% in 2001-2002. The number of small scale industries in the state has no doubt increased almost four times during these 14 years. Of course, the number of workers engaged in these units has also increased but not in the same proportion as the increase in the units.

During the period from 1987-88 to 2001-02, the number of SSI units has increased four times, but employment has risen less than three times only. On the basis of fixed investment, 87.8% of SSIs are having fixed investment up to Rs. 1 lakh. Less than 1% of the SSIs have fixed investment higher than Rs. 5 lakh. More than 50% of SSIs are using energy as a source of their input. The energy source is predominantly power or hydro electricity. The SSI units are mostly run by the indigenous tribal entrepreneurs of the state. More than 50% of the entrepreneurs are educated and 40% are 'first generation' entrepreneurs.

The prominent factors that influence the entrepreneurs to start their own enterprise include, personal and family experience in the line, less competition in the trade/activity, high demand of product and availability of raw materials. The entrepreneurs face a number of problems in running the enterprises. The problems are both external as well as internal. The external problems like finance, technical help, procuring licenses, and getting power supply are dominating and the major internal problems include marketing, management and labor problems. The number of women-owned enterprises in the total SSI sector was estimated at 3,658 (16.24%). The estimated number of enterprises actually managed by women was 3,581 (15.9%). The Districts of West Khasi hills and East Garo hills accounted for more than 50% share of women employment in the state. And 17.5% of the enterprises run by women are in the registered SSI sector and 82.5% are in the unregistered SSI sector.

Small Scale Industries in Meghalaya: Econometric Analysis

The Small Scale Industrial sector is a vital constituent of the economy of Meghalaya. The economic behavior of SSIs is analyzed applying the various econometric methods of estimation. This is approached through identifying the relevant economic factors, which affect the variations in the output of SSIs in a significant manner. This helps in finding out the major

determinants of the output of SSIs in the state. The standard estimations help in understanding the relative role and importance of various factors of production like labor, and capital, by evaluating the elasticities of factors of production with respect to output and degree of returns to scale. These estimation processes further extended to the different sub-groups of SSIs for the purpose of cross-sectional analysis in order to make inter-sectoral comparisons within and with the aggregate SSI sector. For the purpose of temporal comparative analysis, estimates for these sets of industries are further estimated for three consecutive years i.e., 1999-2000, 2000-01 and 2001-02.

Determinants of Output among Small Scale Industries

In order to understand the production structure of SSIs an appropriate production relationship is to be derived first in the functional form. Then this has to be estimated in different forms of linear to derive linear equations. These estimations are compiled first for all SSIs and then for three sub-groups; namely: (i) Manufacturing, assembling, processing; (ii) Repair and maintenance; and (iii) Service industries. For the purpose of comparative analysis estimates for these sets of industries are estimated for three consecutive years i.e., 1999-2000, 2000-01 and 2001-02.

In an economic system the output of a firm/industry depends mainly on the amount of input used along with the age of the firm. The age of the firm is determined from the year of its initial production. Keeping this in mind, the output of firm is treated as the function of capital (K), Labor (L), Fixed Assets (FA) and age of the firm (Age). But to what extent these factors explain the variations in output and what is their relative importance is of great interest for the researcher.

As an input 'Fixed Assets', in this study are defined as the difference between the total value of fixed assets and plant and machinery. According to the Third All India Census of Small Scale Industries 2001-02, Development Commissioner (SSI), Ministry of Small Scale Industries, Government of India, New Delhi (2004), fixed assets are the assets held for the purpose of producing or providing goods and services such as land, building, plant and machinery, transport equipments, tools and other assets (new or old) that have a normal economic life of more than one year from the date of acquisition through outright purchase/hire purchase/loans/mortgage/construction regardless of their use. They are not held for resale in the normal course of entrepreneurial activities. Full value of assets taken on hire purchase/installments (whether, fully paid or not) excluding interest should be considered. Intangible assets like goodwill are excluded. Advance payment for fixed assets not yet received is not considered. The information to be recorded is by physical approach. Fixed assets owned but rented out are not to be accounted for. Additions to the fixed assets during the reference period are to be included. For the unit, which has not yet started providing service and is engaged in the process of installation, fixed assets are duly considered.

Capital is defined as value of an assembly of machinery/equipment/devices used for the operation of entrepreneurial activities. Machinery here means an implement or mechanical device used in the entrepreneurial activities.

Labor in this study relates to all persons engaged by the unit whether for wages or not, in the work connected directly or indirectly with the entrepreneurial activity and includes all administrative, technical and clerical staff as also labor in production of capital assets for factory's own use. It also includes all working proprietors and their family members who are actively engaged in the work of the unit even without any pay and the unpaid members of the cooperative societies who work in or for the unit in any direct and productive capacity.

Age of a firm is another relevant economic factor that determines the output of SSIs. The age of the firm is considered from the year of initial production of that firm till the year for which the survey was conducted.

For the present purpose of analysis, the following function is proposed:

$$Q = f(K, L, FA, Age) \quad \dots(1)$$

Output = f (capital, labor, fixed assets, age of firm)

which can be defined in simple linear equation form as:

$$Q_t = a + b.K_t + c.L_t + d.FA_t + e.Age_t \quad \dots(2)$$

where, a is the intercept, b, c, d and e are regression coefficients; U_t is a stochastic disturbance term and Q_t is value of output for the year 't'.

Keeping other independent variable constant $\Delta Q_t / \Delta K = b$ would show the marginal effect, i.e., one unit change in K will induce a 'b' unit change in Q_t . Prior to running a multiple linear regression on equation (2), efforts are made to compute the correlation coefficient among the variables, which is given in the form of correlation-matrix as under:

Table 3 reveals that the yearly output is serially and strongly correlated with the previous year's output of the firm respectively. Among the factors of production, fixed assets (FA) is strongly and positively correlated to output, whereas, capital (K) is not so strongly but still positively correlated to output, but labor (L) is weakly correlated to output. This aspect will be explained at a later stage and age of a firm is not significantly correlated to output of the firm for any year. Another important feature seen from Table 3 is that factors of production, K, L, FA are not so strongly correlated with each other. For example, value of coefficient of correlation between K and L is 0.22, K and FA is 0.23 and L and FA is 0.10. This ensures that it is possible to run a multiple regression as shown in equation (2) without much of the possibility of statistical error.

Table 3: Correlation Matrix

	Q_{01-02}	Q_{00-01}	Q_{99-00}	K	L	FA	Age
Q_{01-02}	1.00						
Q_{00-01}	0.97	1.00					
Q_{99-00}	0.89	0.93	1.00				
K	0.39	0.40	0.37	1.00			
L	0.11	0.12	0.13	0.22	1.00		
FA	0.87	0.91	0.99	0.23	0.10	1.0	
Age	0.007*	0.013*	0.018*	-0.03	-0.04	0.009*	1.0

Note: (i) Q_{01-02}, Q_{00-01} and Q_{99-00} are year wise value of output produced by SSI in respective years;
(ii) All values except marked*, are significant at 1% level of significance;

Assuming that equation (2) satisfies the assumptions of the classical linear regression model, the following regression by the Ordinary Least Square (OLS) method is obtained:

$$\hat{Q}_{01-02} = 201675.4 + 2.4K^* + 3879.0L + 0.43FA^* + 4876.7Age \quad \dots(3)$$

(t-statistic) (2.14) (12.5) (1.09) (3.00) (0.69)

$$R^2 = 0.16, n = 1830$$

* significant at 1% level.

R^2 is coefficient of multiple determination and 'n' is total number of observations.

This reveals that only capital and fixed assets are the statistically significant variables, which explain significantly the variations in output. The labor and age of firm are not found statistically significant. The low value of R^2 i.e., equal to 0.16 reveals that all the four independent variables K, L, FA and Age, combined together explain only 16% of variations in output. Table 4 shows the results for all the three years for the purpose of comparison. It reveals that labor also becomes insignificant for the year 1999-2000 but value of R^2 doesn't improve for the years 1999-2000 and 2000-01.

Using the techniques of stepwise regression, each factor of production is dropped one by one and then regression coefficients are estimated. By dropping variable 'Age', the equation (2) becomes:

$$Q_t = a + b. K_t + c. L_t + d. FA_t + U_{1t} \quad \dots(4)$$

By dropping FA the equation (4) becomes:

$$Q_t = a + b. K_t + c. L_t + U_{2t} \quad \dots(5)$$

And by dropping L, the equation (5) becomes:

$$Q_t = a + b. K_t + U_{3t} \quad \dots(6)$$

Table 4: Estimated Regression Coefficients for Three Years

\hat{Q}_t	\hat{a}	\hat{b}	\hat{c}	\hat{d}	\hat{q}	R^2	n
\hat{Q}_{01-02}	201,675.4 (2.14)	2.42* (12.5)	3,879.0 (1.09)	0.43* (3.00)	4,876.7 (0.69)	0.16	1,830
\hat{Q}_{00-01}	157,420.3 (1.82)	2.30* (12.9)	4,329.5 (1.33)	0.43* (3.29)	5,745.5 (0.88)	0.17	1,830
\hat{Q}_{99-00}	135,855.8 (1.65)	1.95* (11.53)	6,487.9* (2.1)	0.41* (3.28)	6,812.5 (1.10)	0.15	1,830

Note: (i) * significant at 1 % level; (ii) *t*-statistic in parenthesis.

Equations (4), (5) and (6) give the regression estimates and results, given in Table 5.

Stepwise regression suggests that by dropping the independent variables one by one, the value of R^2 almost remains unchanged. Similarly the statistical significance of the factors of production doesn't show any major change. This analysis suggests in a very limited sense that capital and fixed assets are two factors of production which are the major determinants of output in the case of SSIs in Meghalaya. Also linear regression model estimated by OLS does not fit well to the given set of statistics on SSI for the state. This motivates the researchers to explore the possibility of alternative forms and types of estimations, which can deliver better results.

The Lin-Log Model

Knowing that linear model doesn't fit so well to the data, the next attempt is made to fit lin-log (a type of semi-log) model to the SSIs data of the state. In this model the functional form is defined as:

$$Q_t = a + b \log K + c \log L + d \log FA + U_t \quad \dots(7)$$

Table 5: Estimated Regression Coefficients for the Year 2001-02

Linear Equation	\hat{a}	\hat{b}	\hat{c}	\hat{d}	R^2	n
$Q_{01-02} = a + bK + cL + dFA + U_{1t}$	251,021.4 (4.10)	2.41* (12.50)	3,818.80 (1.10)	0.43* (3.03)	0.16	1,830
$Q_{00-01} = a + bK + cL + U_{2t}$	258,326.6 (4.20)	2.75* (17.45)	4,251.49 (1.20)	-	0.15	1,830
$Q_{99-00} = a + bK + U_{3t}$	277,218.6 (4.66)	2.79* (18.73)	-	-	0.15	1,830

Note: (i) * significant at 1 % level; (ii) *t*-statistic in parenthesis.

The other factors of production remain unchanged the slope of coefficient, 'b' could be interpreted as:

$$b = \Delta Q_t / \Delta \log K$$

$$= \Delta Q_t / (\Delta K / K)$$

This states that absolute change in Q_t is equal to 'b' times the relative change in K . This would show 1% change in K that will induce a 'b/100' unit change in Q_t . The regression results of equation (7) could be presented as:

$$Q_{01-02} = -5856062 + 781856.5^* \log K + 1113539.0^* \log L + 514767.4^* \log FA \dots(8)$$

$$(-10.77) + (6.49) + (4.46) + (4.22)$$

$$R^2 = 0.11, n = 1762$$

* significant at 1% level.

All three factors of production K , L and FA are statistically significant but low value of R^2 i.e., 0.11 indicates that lin-log model also doesn't fit so well to SSI data for the state.

Log Linear or Log-Log Model

Either the log linear or log-log model is very popular in estimating production functions. A common specification of the functional form of this is the Cobb-Douglas production function. It has the following general form:

$$Q_t = A K_t^\alpha L_t^\beta \dots(9)$$

($A, K, L, Q_t > 0$)

A is efficiency parameter i.e., an indicator of the state of technology and α and β are elasticities of output with respect to capital and labor respectively. This function has following major characteristics:

- It is homogeneous to degree ($\alpha + \beta$);
- As a special case $\alpha + \beta = 1$, then it is linearly homogeneous;
- Its isoquants are negatively sloped throughout and strictly convex for positive values of K and L ; and
- It is strictly quasi concave for positive K and L .

Taking logarithms of both sides of equation (9) and adding an error term, it can be expressed into the following econometric formulation:

$$\text{Log } Q_t = \text{Log } A + \alpha \text{Log } K_t + \beta \text{Log } L_t + U_t \quad \dots(10)$$

A is considered as efficiency parameter i.e., an indicator of the state of technology. By changing only K keeping L constant we get:

$$\begin{aligned} \alpha &= \Delta (\text{Log } Q_t) / \Delta (\text{Log } K_t) \\ &= K_t / Q_t \cdot \Delta Q_t / \Delta K_t \end{aligned}$$

Therefore, α is proportionate change in Q_t divided by the proportionate change in K_t . This is the elasticity of output with respect to capital. In a similar manner, β is the elasticity of output with respect to labor. Thus, the regression coefficients in a log-log model are simply the respective elasticities, which are constant.

The other interesting feature of this model is that if estimated elasticities are such that

$$\hat{\alpha} + \hat{\beta} > 1 \text{ it is increasing returns to scale}$$

$$\hat{\alpha} + \hat{\beta} = 1 \text{ it is constant returns to scale}$$

$$\hat{\alpha} + \hat{\beta} < 1 \text{ it is decreasing returns to scale}$$

The cross industry data of SSIs of the state of Meghalaya are fitted to equation (10), and the regression results using these data are given in the following form:

$$\text{Log } \hat{Q}_{01-02} = 3.22 + 0.41 \text{ log } K^* + 0.46 \text{ log } L^* \quad \dots(11)$$

$$(t\text{-statistic}) \quad (47.9) \quad (24.6) \quad (12.8)$$

$$R^2 = 0.44 \quad n = 1760$$

* significant at 1% level.

From equation (11) we see that for SSI sector in the state, the output elasticity of capital (α) and labor (β) are 0.41 and 0.46 respectively. In other words, holding the labor input constant, 1% increase in capital would increase 0.41% of output and keeping capital constant, 1% increase in labor would increase 0.46% of output.

Adding the output elasticities ($\alpha + \beta$) is equal to 0.86, which gives the value of the returns to scale parameter. As is evident for the year 2001-02, the SSI sector is characterized by decreasing returns to scale as $\alpha + \beta$ is equal to 0.86, which is less than 1. However, the extent of decreasing returns is quite small.

From a purely statistical viewpoint, the estimated line fits the data reasonably well and certainly better than linear and semi-log functions fitted earlier. The R^2 value 0.44 means that about 44% of the variation in the (log of) output is explained by (log of) labor and capital. Both labor and capital were found significant at 1% level. For the purpose of comparison, Table 4 states the results of estimated regression coefficients for three consecutive years.

The SSI sector is subdivided into three sub-groups representing distinctive types of industries; namely manufacturing, processing and assembling, repair and maintenance and services. The Cobb-Douglas production function i.e., log-log model is separately fitted for these three types of SSIs for the three years (Table 6).

\hat{Q}_t	Log A	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha} + \hat{\beta}$	R^2	n
\hat{Q}_{01-02}	3.22 (47.9)	0.41 (24.6)	0.46 (12.8)	0.86	0.44	1,760
\hat{Q}_{00-01}	3.24 (48.8)	0.40 (24.40)	0.47 (13.24)	0.87	0.44	1,760
\hat{Q}_{99-00}	3.23 (48.1)	0.39 (23.02)	0.47 (12.93)	0.86	0.44	1,760

Note: (i) * significant at 1 % level; (ii) t-statistic in parenthesis.

The SSIs representing manufacturing sector (Table 7) too, reveal decreasing returns to scale. Output elasticity of capital (α) is greater than output elasticity of labor (β). This shows that capital could be slightly more productively employed in these types of SSIs in Meghalaya.

\hat{Q}_t	Log A	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha} + \hat{\beta}$	R^2	n
\hat{Q}_{01-02}	3.0 (36.3)	0.46 (22.5)	0.39 (8.83)	0.85	0.45	1,235
\hat{Q}_{00-01}	3.1 (37.0)	0.45 (22.1)	0.41 (9.2)	0.86	0.45	1,235
\hat{Q}_{99-00}	3.1 (36.9)	0.44 (21.2)	0.40 (8.9)	0.84	0.43	1,235

Note: (i) * significant at 1 % level; (ii) t-statistic in parenthesis.

As it was in the case of manufacturing industries, the service sector SSIs (Table 8) are also showing decreasing returns to scale. But output elasticity of labor (β) is invariably higher than the output elasticity of capital (α) for all the three years. This reveals that labor could be more productively employed in service sector rather than manufacturing SSIs.

**Table 8: Estimated Regression Coefficient for Service Sector SSIs
for the Years 1999-2000, 2000-01 and 2001-02**

\hat{Q}_t	Log A	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha} + \hat{\beta}$	R^2	n
\hat{Q}_{01-02}	3.91 (38.5)	0.46 (8.85)	0.58 (11.32)	0.80	0.40	509
\hat{Q}_{00-01}	3.91 (38.1)	0.22 (8.51)	0.58 (11.20)	0.80	0.39	509
\hat{Q}_{99-00}	3.97 (36.9)	0.20 (7.31)	0.59 (10.89)	0.79	0.35	509

Note: (i) * significant at 1 % level; (ii) t-statistic in parenthesis.

The log-log regression equation for the repairing and maintenance component of SSIs is given below:

$$\hat{Q}_{01-02} = 5.69 - 0.21K + 0.84L \quad \dots(12)$$

(2.9) (-0.39) (0.85)

$$R^2 = 0.06 \quad n = 16$$

This equation reveals strange results. Firstly, value of R^2 is very low. Secondly none of the regression coefficients of independent variables are statistically significant. The possible reasons for this type of behavior may be because of low number of observations and inconsistency in the statistic provided by this segment of SSIs. Under these circumstances, it would be appropriate to drop the results of this sub-group of SSIs at length from the domain of further discussion.

Major Findings and Conclusions

All indicators of industrialization reveal that economy of Meghalaya is a simple economy where emergence of small scale sector in a significant manner has begun from the last thirty years only. The large and medium scale industries are yet to develop in the state.

It emerged from stepwise linear regression that capital and fixed assets are the two important inputs, which explain the variations in SSIs output in a significant manner. The SSIs are showing decreasing returns to scale. The reason for decreasing returns to scale is not surprising as the nature of manufacturing industries are dominated by household goods industries and agro-based industries are under sole proprietorship. The minimum size for efficiency in these industries tends to be relatively small. To identify the output determinants log-log function fitted better than linear and lin-log models. Estimates of capital and labor are both significant and size and fixed investments are not statistically significant. Capital and labor both play almost equally important roles in production of additional output in SSIs.

Output elasticity of capital ($\hat{\alpha}$) of manufacturing sector is higher than $\hat{\alpha}$ of services sector. Output elasticity of labor $\hat{\beta}$ of services sector is higher than $\hat{\beta}$ of manufacturing sector. This shows higher capital share than labor in the output of manufacturing sector. Similarly lower capital share than labor in output of services sector. The reason for decreasing returns to scale is not surprising as the nature of manufacturing industries are dominated by household goods industries and agro and forest-based industries. The minimum size for efficiency in these industries tends to be relatively small. It is most likely that Meghalayan economy is passing through a preliminary stage of 'industrialization', where the full advantage of technology and economies of scale are not being utilized by the existing SSIs.

It then appears that so far unexploited source of growth, scale economies, technology applications, research and development could become the key factors for the further growth of economy of Meghalaya in future. From this point of view, it is recommended to develop the industries in the state, which lead to the full exploitation of these factors that are very much relevant for industrialization and balanced economic development of the state's economy.

It is evident that the number of SSIs are growing in the state in a significant manner. Meghalaya's economy has begun to join the process, which is known as preliminary stage of 'industrialization'. At this stage, it is not possible to take full advantage of technology and economies of scale by the existing SSIs and the economy at large. As a result in the present form this sector is not in a position to contribute to the growth of state economy in a big way. It then appears that unexploited sources, scale economies, positive-externalities, technology applications and research and development could become the key factors for the further growth of the economy of Meghalaya. It is recommended to develop additional industries in the state that lead to the full exploitation of economies of scale and technical advances to lead the state to a solid, stable and sure progress.©

References

1. Acs Z J and David B A (1989), "Entrepreneurial Strategy and the Presence of Small Firms", *Small Business Economics*, Vol. 1, No. 3, pp. 193-213.
2. Ahmad N (1987), *Problems and Management of Small Scale and Cottage Industries*, Deep and Deep Publications, New Delhi.
3. Audretsch D B (2002), "The Dynamic Role of Small Firms: Evidence from the US", *Small Business Economics*, Vol. 18, No. 1-3, pp. 13-40.
4. Bari M A (1987), "Industrialization Development in Assam", in Mali D D and Deka P (Eds.), *Industrial Development in North East India*, Omsons Publications, pp. 55-68, Guwahati.
5. Berry A and Mazumdar D (1991), "Small Scale Industry in the Asian-Pacific Region", *Asian Pacific Economic Literature*, Vol. 5, No. 2, pp. 35-67.

6. Berry Albert, Rodriguez Edgard and Sandee Henry (2002), "Firm and Group Dynamics in the Small and Medium Enterprise Sector in Indonesia", *Small Business Economics*, Vol. 18, No. 1-3, pp. 141-161.
7. Bhavani T A (2002), "A Study of Technological Change in the Small Enterprises of a Developing Nation", *Institute of Economic Growth*, Delhi.
8. Dutta A and Singh M K (2003); "Contribution of Small Scale Industrial (SSI) Sector in the Indian Economy", *The ICFAI Journal of Applied Economics*, Vol. II, No. 4, pp. 79-94.
9. Eyo and Clement I B (1989), *Public Policy and the Development of Small Scale Industries in Nigeria: A Policy Analysis Perspective*, p. 227, Howard University.
10. Fisher I M (1969), "The Existence of Aggregate Production Function", *Econometrica*, October, pp. 553-579.
11. <http://arunachalpradesh.nic.in/glance.htm> (visited July 4, 2004)
12. <http://manipur.nic.in/ataglance.htm> (visited July 4, 2004)
13. <http://mizoram.nic.in/about/glance.htm> (visited July 4, 2004)
14. <http://tripura.nic.in/kt3.htm> (visited July 4, 2004)
15. <http://www.laghu-udyog.com/ssiindia/definition.htm> (visited July 4, 2004)
16. http://www.sikkiminfo.net/events_that_led_to_sikkim.htm (visited July 4, 2004)
17. <http://www.smallindustryindia.com/ssiindia/statistics/economic.htm> (visited July 4, 2004)
18. Jhanwar R S (1992), *Small Scale and Cottage Industry in India: Problems, Government Policy, Measures for Development*, Deep and Deep Publications, New Delhi.
19. Johnson P (1989), "Employment Change in the Small Business Sector: Evidence from Five Manufacturing Industries", *Small Business Economics*, Vol. 1, No. 4, pp. 315-323.
20. Kamanta J (1967), "On Estimation of the CES Production Function", *International Economic Review*, Vol. 8, No. 2, pp. 180-189.
21. Kimura F (2002), "Subcontracting and the Performance of Small and Medium Firms in Japan", *Small Business Economics*, Vol. 18, No. 1-3, pp. 163-175.
22. Krongkaew M (1988), "The Current Development of Small and Medium Scale Industries in Thailand", *Asian Development Review*, Vol. 6, No. 2, pp. 70-95.
23. Luken R and Stares R (2005), "Small Business Responsibility in Developing Countries: A Threat or An Opportunity?", *Business Strategy and the Environment*, Vol. 14, No. 1, pp. 38-53.
24. Mali D D (1987), "An Approach to Development of SSI in North Eastern Region", in Mali D D and Deka P (Eds.), *Industrial Development in North East India*, Omsons Publications, pp. 33-41, Guwahati.

25. Mancuso J R (1984), *How to Start Finance and Manage Your Own Small Business*, Revised Edition, Prentice Hall Press, New York.
26. Mathew P M (1999), *Small Enterprises and Regional Development Challenges and Choices*, Kanishka Publishers, New Delhi.
27. Meghalaya Industrial Policy 1987 and 1997, Department of Industries, Government of Meghalaya, pp. 10-11.
28. Ministry of International Trade and Industry (1993), "Small Business in Japan", White Paper, Ministry of International Trade and Industry, Tokyo.
29. Ministry of Small Scale Industries (2004), Third All India Census of Small Scale Industries 2001-02, Development Commissioner (SSI), Government of India, New Delhi.
30. Nath H K (1998), "Relative Efficiency of Modern Small Scale Industries in India: An Inter State Comparison", Seminar paper (based on my M.Phil.dissertation at the Jawaharlal Nehru University, New Delhi, India.) presented at the Texas Camp Econometrics III held at Lago Vista in 1998.
31. Neog A K (1988), "Role of Industry in Economics", (Projection for 2000 A.D.) in Pankaj Thakur (Ed.), *Development Strategy for India's North East*, Span Publications Private Limited, pp. 139-163, Calcutta.
32. Nugent J B and Yhee S J (2002), "Small and Medium Enterprises in Korea: Achievements, Constraints and Policy Issues", *Small Business Economics*, Vol. 18, No. 1-3, pp. 85-119.
33. Phillips B D and Kirchoff B A (1989), "Formation, Growth and Survival: Small Firm Dynamics in the US Economy", *Small Business Economics*, Vol. 1, No. 1, pp. 65-74.
34. Quf A M and SED Ahmed (1989), "Planning for Small Scale Industries in Less Developed Countries: A Systematic Approach", University of Pennsylvania, p. 319.
35. Rao M G and Rao M M (1993), "Labor Turnover in Small Firms: A Case Study", in Rao M M (Ed.), *Human Factor in Small Industry*, Discovery Publishing House, New Delhi.
36. Regnier P (1993), "The Dynamics of Small and Medium-sized Enterprises in Korea and Other Asian NIEs", *Small Business Economics*, Vol. 5, No. 1, pp. 23-36.
37. Sandesara J C (1988), "Small Scale Industrialization: The Indian Experience", *Economic and Political Weekly*, Vol. XXIII, No. 13, pp. 640-654.
38. Sato Y (1989), "Small Business in Japan: A Historical Perspective", *Small Business Economics*, Vol. 1, No. 2, pp. 121-128.
39. Schwalbach J (1989), "Small Business in German Manufacturing", *Small Business Economics*, Vol. 1, No. 2, pp. 129-136.
40. Seth A (1995), "Cost-Efficiency of Small Manufacturing Enterprises: Implications for Employment Policy", *Economic and Political Weekly*, M-130.

41. Shah A (1994), "Inter-Firm Scalar Linkage in India: A Class Within the Small Scale Industry", *Small Business Economics*, Vol. 6, No. 3, pp. 237-247.
42. Staley E and Morse R (1965), *Modern Small Industry for Developing Countries*, International Student Edition, McGraw-Hill, Tokyo.
43. Storey D J (1994), *Understanding the Small Business Sector*, Routledge, London.
44. Storey D J and Johnson S G (1990), "A Review of Small Business Employment Data Bases in the United Kingdom", *Small Business Economics*, Vol. 2, No. 4, pp. 279-299.
45. Tambunan T (1992), "The Role of Small Firms in Indonesia", *Small Business Economics*, Vol. 4, No. 1, pp. 59-77.
46. UNIDO (1969), *Small Scale Industry*, UNIDO Monographs on Industrial Development, No.11. United Nations, New York.
47. Vepa R K (1980), *Mao's China—A Nation in Transition*, Abhinav Publication, New Delhi.
48. Vepa R K (1983), *Small Industry: The Challenge of Eighties*, Vikas Publishing House Pvt. Ltd., New Delhi.
49. Vepa R K (1997), "Small Can Be Beautiful: Recommendations on Small Enterprises", *Economic and Political Weekly*, Vol. XXXII, No. 27, pp. 1581-1583.
50. Vepa R K (1998), *Modern Small Industry in India: Problems and Prospects*, Sage Publications, New Delhi.
51. Vivarelli M (1991), "The Birth of New Enterprises", *Small Business Economics*, Vol. 3, No. 3, pp. 15-223.
52. Wagner J (1995), "Firm Size and Job Creation in Germany", *Small Business Economics*, Vol. 7, No. 6, pp. 469-474.
53. Wiboonchutikula P (2002), "Small and Medium Enterprises in Thailand: Recent Trends", *Small Business Economics*, Vol. 18, No. 1-3, pp. 211-224.
54. www.webindia123.com (visited July 4, 2004)
55. Yamawaki H (2002), "The Evolution and Structure of Industrial Clusters in Japan", *Small Business Economics*, Vol. 18, No. 1-3, pp. 121-140.

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