

RURAL INDUSTRIES IN INDIA:

A STUDY OF SOME FACTORS AFFECTING THEIR PERFORMANCE

by

Anuradha Bapu Deolalikar

B.A. Brown University, Providence
(1975)

M.C.P. Massachusetts Institute of Technology, Cambridge
(1977)

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Signature of Author _____
Department of Urban Studies and Planning
October 21, 1982

Certified by _____
Dr. Alan Strout

Accepted by _____
Dr. Robert M. Fogelson
Chairman, PhD Committee

Rotch

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ABSTRACT

This thesis examined in a systematic manner the role of the various regional, economic and infrastructural factors in determining the performance of small industrial firms in the rural areas. The empirical analysis was based on a sample survey of 2015 firms, which were part of the Rural Industries Projects (RIP) program of the Indian government. The survey was conducted by the Planning Commission in 1974.

The behavior of the rural firms was described by a modified version of the standard profit-maximizing model. A set of empirically testable hypotheses relating the behavior of the firm to exogenous economic and non-economic factors was developed from the model of the firm, and from theories and proposals put forward by various authors in the literature on rural industrialization.

The behavior of the sample RIP firms was judged according to three performance criteria which were judged to be most pertinent to the RIP program: the labor-intensity of the firm, the level of capacity utilized by the firm, and the growth rate of the firm's output over time.

The regression equations used to test the hypotheses related to the firm's choice of its labor-intensity and capacity utilization, and to its growth rate could not include all the variables that affected the firm's behavior. However, we were able to test many of the important hypotheses.

Based on these tests we found that the sample RIP firms in the relatively developed regions had lower labor-intensities and higher growth rates than the other firms, but capacity utilization levels were similar for the two groups.

Our analysis showed that capacity utilization levels tended to be lower in regions where the base wage rates were higher. According to our criteria, the firms with a "local" orientation did not perform better than the firms without such an orientation. Seasonal firms had higher labor-intensities than year-round producers, but the two groups had similar growth rates and capacity utilization levels.

We found that firms which used electricity or diesel did worse than firms which used other sources of energy. Similarly, the performance of firms with larger capital assets was worse than that of firms with smaller capital assets. We also found that older firms had lower growth rates than younger firms.

The availability of adequate supplies of raw materials was confirmed to be a major determinant of capacity utilization, but the adequacy of the supply of electricity or diesel had no effect on capacity utilization.

We also found some sectoral differences in the performance of the sample RIP firms. In particular, after the other factors had been taken into account, the textiles firms performed worse than the other firms on the labor-intensity and capacity utilization criteria.

Thesis Supervisor: Dr. Alan Strout

Title: Lecturer, Department of Urban Studies and Planning

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An Indian, of course, does not thank her family members for their support -- it is her birth-right. In fact, I have asked Subodh and Anil, the resident economists of our household to take part of the responsibility for the mistakes in the thesis; the rest is mine alone.

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SELECTED IMPORTANT DATES

Independence Day	15 August 1947
Formation of the Planning Commission	March 1950
First Five-Year Plan	1 April 1951 to 31 March 1956
Second Five-Year Plan	1 April 1956 to 31 March 1961
Third Five-Year Plan	1 April 1961 to 31 March 1966
Interim Annual Plans	1 April 1966 to 31 March 1969
Fourth Five-Year Plan	1 April 1969 to 31 March 1974
Fifth Five-Year Plan (Draft)	1 April 1974 to 31 March 1979
Sixth Five-Year Plan (Draft)	1 April 1978 to 31 March 1983
First Industrial Policy Resolution	6 April 1948
Second Industrial Policy Resolution	30 April 1956

OFFICIAL EXCHANGE RATE

From 1966 to 1977 Rs. 7.50 = \$1.00

LIST OF ABBREVIATIONS

ADQRAWM (D)	Dummy variable which takes on the value 1 if the firm reported receiving adequate supplies of raw materials, 0 otherwise.
ADQPOWER (D)	Dummy variable which takes on the value 1 if the firm is a power user and received adequate supplies of power, 0 otherwise.
AGE	Age of the firm in 1974.
ANIMAL (D)	Dummy variable which takes on the value 1 if the firm belongs to the Animal Husbandry Industries sector, 0 otherwise.
ASSETS	Value of total fixed assets of the firm in Rs. '000 (1974).
CERAMICS (D)	Dummy variable which takes on the value 1 if the firm belongs to the Ceramics, Building Materials and Allied Industries sector, 0 otherwise.
CHEMICAL (D)	Dummy variable which takes on the value 1 if the firm belongs to the Chemical Industries sector, 0 otherwise.
DISTGROTH	District-wide average annual compound growth rate of agricultural output for 1962-1973.
ENGGNR (D)	Dummy variable which takes on the value 1 if the firm belongs to the Engineering and Allied Industries sector, 0 otherwise.
LOCRAWMKT (D)	Dummy variable which takes on the value 1 if the firm's market as well as the raw materials are wholly or mainly local, i.e., within the Project area, 0 otherwise.
POWUSER (D)	Dummy variable which takes on the value 1 if the main source of energy for the firm is electricity or diesel, 0 otherwise.
POWASSET	Interactive variable defined as POWUSER*ASSETS
SEASONAL (D)	Dummy variable which takes on the value 1 if the firm is a seasonal producer, 0 otherwise.

TEXTILE (D)	Dummy variable which takes on the value 1 if the firm belongs to the Textile Industries sector, 0 otherwise.
TOWNS	Index of urbanization in the region surrounding the firm, and is based on the number and size of towns in the Project area.

CHAPTER I

A GENERAL PERSPECTIVE

I.1 INTRODUCTION:

One of the major problems in developing countries is the continued poverty in their rural areas. While some of these countries, such as Brazil, Mexico, Pakistan and India have succeeded in establishing a modern industrial sector, this development has tended to be polarized at a few urban centers. This has created a "dual" system within the countries.

The inequity implied by this skewed development has become a major concern of many policy makers. In response, many developing countries are encouraging rural industrialization. This policy is usually based on the premise that neither the agricultural sector nor the urban-based industrial sector will be able to gainfully absorb all the rural labor force. Rural industrialization is seen as an effective strategy which can absorb this labor by creating non-farm employment. In this way, the burden on agriculture is reduced, rural-urban migration is checked and incomes are increased in rural areas.

The purpose of this thesis is to identify some of the systematic factors that determine the performance of rural industries. The study is based on India's rural industrialization experience, with particular reference to the Rural Industries Projects program of the Indian government.

Support for rural industrialization has been strong from organizations like the U.N. and the World Bank. The Expert Group Meeting on Industrialization in Relation to Integrated Rural Development,

organized by UNIDO in 1977, agreed that "there was a need for rural industrialization in developing countries, both to stimulate additional employment and income-generating opportunities and to help to provide basic needs for the rural population" (UN, 1978). These are not the only objectives of rural industrialization. A number of general developmental objectives are also attributed to the policy. Some of these are:

- reducing the income inequality between the urban and the rural areas and within the rural areas,
- reducing regional economic disparity,
- providing infrastructure and inputs for agricultural development,
- modernizing the rural sector, and
- reducing rural to urban migration.

Rural industrialization is seen to achieve these objectives through either one or both of the following processes:

- utilization of locally available resources to mainly satisfy non-local demand, and
- satisfaction of some local need using as many local resources as possible.

In the first case, rural industries by mobilizing rural resources (labor, raw materials, agricultural output, skills, etc.), create additional income-earning opportunities for the rural population. In the second case, not only do rural industries contribute to raising living standards by fulfilling local needs but also create more employment opportunities.

The need for generating non-farm employment in countries like India is indisputable. This is true even though, as Vyas and Mathai (1978) point out, Indian agriculture in the period between 1951 and 1971 underwent significant changes in favor of greater labor utilization. These changes included:

- increase in the cultivable area,
- increase in the area under irrigation which facilitated intensive as well as multiple cropping,
- greater use of high-yielding variety (HYV) of seeds and fertilizers,
- changes in the cropping pattern from less labor-intensive crops to more labor-intensive ones like tobacco, sugar cane, spices, potatoes, etc., and,
- increase in the number of small holdings where labor absorption for a unit of output is higher than on large holdings.

In spite of these favorable changes, the net impact on the employment situation in agriculture has been quite insignificant, because the increase in the rural labor force has been so large as to wipe out the effects of the employment generating factors.

Vyas and Mathai (1978) point out that, in the future, employment growth in agriculture can come only from extension of irrigation or increases in the use of HYV seeds and fertilizers, since the other factors are already on the decline. If the past experience is any guide, even the maximum efforts in the above directions may not be sufficient to absorb the additions in the rural labor force, because employment does not appear to grow as rapidly as output in agriculture.

Many regional studies have calculated the relationship between the growth of agricultural output and the growth of employment in agriculture. Vyas and Mathai (1978) report that the estimated elasticities show that employment has not grown at the same rate as output; a 1% growth in output has been associated with an increase in employment ranging only from 0.30% to 0.75%. The authors suggest that a realistic figure for India is 0.50% with the underlying assumption being that growth in output comes largely from increased irrigation and use of HYV seeds and fertilizers.¹ If this relationship continues to hold in the future, Indian agriculture will have to grow at a rate of 4% per year to just absorb the additional work force from agricultural households. However, the average past growth rate of Indian agriculture has been approximately 3% per year.

According to the Sixth Plan Draft, even with a more optimistic assumption of employment-output elasticity equal to 1, and an agricultural growth rate of 4%, agriculture will not be able to absorb all the rural labor force in the Plan period. It is in this context of limited employment opportunities in agriculture coupled with slow employment growth in the modern industrial sector, that rural industrialization can play an important role in India.

The role of rural industrialization in the development process has long been recognized in India. In fact, India's interest in this area dates back to the fight for Independence, when national leaders like Mahatma Gandhi stressed the need to support Indian industries, which

¹If agricultural growth occurs as a result of more mechanization, this figure will be even lower.

at that time were mainly rural. After Independence, the first Industrial Policy Resolution of 1948 assigned an important role to cottage and small-scale, decentralized industries.

As part of its industrial policy, the Indian government has started many programs and pilot projects in the rural areas of the country over the past 35 years. The aim of these has been to assist in the development of private industry -- both modern and traditional -- by extending help in the areas of credit, training, marketing, technical know-how, and raw materials acquisition. Efforts have also been made to remove the infrastructural constraints in the rural areas. Predominantly consumer goods industries have been encouraged.

The policy of rural industrialization has also played an important role in China's reconstruction. In 1949, with the downfall of the Nationalist regime, the new revolutionary government was faced with an underdeveloped agricultural sector. There was wide-spread unemployment, subsistence farming, heavy population pressure and inadequate infrastructure. The new leadership pushed for rural industrialization with the sole objective of serving agriculture. Consequently, rural industrialization activities included cement plants, chemical fertilizer plants, agricultural processing, agricultural machinery and equipment, iron and steel foundries and hydroelectric power generation plants (Perkins, et. al 1977). The development of all these activities has been with a clear view of making each region self-sufficient and self-reliant.

The cases of China and India show that considerable differences in objectives and approaches to rural industrialization exist. The Chinese planners have emphasized rural industrialization as a means to

achieve regional self-sufficiency. Indians, on the other hand, have stressed the employment objective.

I.2 SCOPE OF THE STUDY:

The actual performance of many rural industrialization programs has been far from satisfactory. This has been well documented in the case of India. A look at India's rural industrialization policies and programs suggests that an important reason for this failure may be the inconsistency between the desired goals and the programs and policies followed to achieve the same. The programs have been formulated on a largely ad hoc basis, without a thorough knowledge of the factors affecting their outcome.

The central objective of this thesis is to examine in a systematic manner the role of some of these factors in determining the performance of rural industries; the factors considered here are regional, economic and infrastructural. Such an understanding can provide the planner with some guidelines to be used in formulating effective policies and programs. It should be mentioned at the outset that while the wisdom of the policy of rural industrialization has been much debated, the objective of this thesis is not to examine the desirability of rural industrialization as compared to some other policy such as allocating most of the rural resources to agriculture alone.

The first major step in the analysis is the development of a conceptual framework for analyzing the relationship between various regional, economic and infrastructural factors and the performance of rural industries. In our case, the conceptual framework consists of a simple model of the behaviour of a privately-owned firm, and of a

set of hypotheses related to this model. In formulating these hypotheses we have also drawn upon the various theories and proposals related to rural industrialization which have been put forward by other writers.

The second step in the analysis is the selection of the criteria by which the performance of the rural firms is to be judged. Due to the multiplicity of the objectives of a rural industrialization program, the performance of the firms cannot be adequately judged by a single criterion. Consequently, we have selected three criteria which represent different aspects of the performance of the firms that we are interested in.

The final step in the analysis is to test the hypotheses formulated in the conceptual framework. We have used regression analysis for this purpose. This analysis is based on the data for 2,015 firms which are part of the Rural Industries Projects (RIP) program of the Indian government.

The RIP program was started in 1962-63 and has provided a big impetus to rural industrialization efforts in India. By 1974-75, the program had received approximately Rs. 252 million (US\$ 34 million approximately) from the central government; it had provided training to nearly 38,000 artisans; and had extended financial support to about 63,500 firms. The value of production of these firms for the year 1974-75 was nearly Rs. 965 million (US\$ 129 million approximately), with a total employment estimated at 284,000 workers (Gupta and Dasgupta, 1979).

The Indian Planning Commission has undertaken two evaluative studies of the RIP program -- one in 1965 and the other in 1974.

For the 1974 evaluation, the Commission conducted a sample survey the industrial firms and artisans in 26 of the 49 Rural Industries Projects in existence at that time. We have used these data in our empirical analysis.

I.3 ORGANIZATION OF THE STUDY:

The study is organized into seven chapters. Chapter II is the review and analysis of India's rural industrialization policies and programs since the beginning of its planning period. In Chapter III we present an overview of literature related to the role of various factors in determining the performance of rural industries. Chapter IV then draws from the literature survey in Chapter III and other theories to develop a conceptual framework for understanding the relationship between various regional, economic and infrastructural factors, and the performance of rural industries. Chapter V provides a statistical descriptive profile of the RIP firms on which our economic analysis is based. In Chapter VI, we present the regression analysis describing the relationship between the various explanatory variables and the performance of the firms on each of the three alternative criteria. Finally, in Chapter VII we have presented the conclusions and the recommendations for rural industrialization policies.

CHAPTER II

INDIA'S RURAL INDUSTRIALIZATION POLICIES AND PROGRAMS

This chapter describes and evaluates India's policies and programs for rural industrialization. The history of rural industrialization in India goes back to long before India's independence in 1947. This issue had figured prominently in the meetings of the Indian National Congress Party in the 1920s and 1930s.

This chapter has four sections. In the first section, we have outlined the policy toward rural industrialization; the second section describes some of the specific programs and institutions set up to implement the policies. The third section discusses in detail one specific program--the attempt to promote Khadi (hand-spun and hand-woven cloth). In the final section, we have described the Rural Industries Projects Program, which is the principal focus of this study.

II.1 POLICY TOWARD RURAL INDUSTRIALIZATION:

There has been considerable enthusiasm for rural industrialization in India, and this has led to numerous government programs dealing with various rural industries. However, there has not emerged an aggressively-implemented, comprehensive and coordinated strategy of rural industrialization based on a clear understanding of the conditions for rural industrialization and the type of rural industrialization to be pursued for development.

The interests in rural industries can be traced back to 1905. At this time, Lokmanya Tilak launched the "Swadeshi" (use of products made in one's own country) movement as part of the struggle for inde-

pendence. In response to Tilak's call, bonfires were lit in many cities in which people burned their imported goods, especially clothes.

This emphasis on Indian clothing was later institutionalized by Mahatma Gandhi, who made it almost obligatory for all those involved in the freedom movement to wear clothes made from handwoven khadi cloth. As Myrday (1971) points out, "Swadeshi was elevated to a moral principle."

Since India had only a few large-scale urban-based industries before independence, the Swadeshi movement was virtually synonymous with a policy of promoting rural industries at that time. However, as early as 1938, there had developed a clear split within the Indian National Congress Party over the course of its economic policy in the future. On the one hand, Mahatma Gandhi visualized India as a collection of largely self-sufficient village systems, with most of the industrial output coming from craftsmen and artisans using traditional as well as improved techniques of production. On the other hand, Pandit Nehru advocated a radical, socialist transformation of the economy through centrally planned, large-scale industrial development.

This rift was thought to be papered over in the Industrial Policy Resolution of 1948. This Resolution stated, in part:

Cottage and small-scale industries have a very important role in the national economy offering as they do scope for individual, village or co-operative enterprise, and means for the rehabilitation of displaced persons. These industries are particularly suited for the better utilization of local resources and for the achievement of local self-sufficiency in respect of certain types of essential consumer goods like food, cloth, and agricultural implements.

The First Plan (1951-1956) reflected some of the above sentiments. Dandekar and Rath (1971) have cited some of the measures that were taken to strengthen village industries and to protect them from the

competition of modern large-scale industries. For example, in April 1950, the textile mills were prohibited from producing certain varieties of cloth which were reserved for the handloom industry. In December 1952, the mills were not allowed to produce certain types of cloth in quantities more than 60% of their previous year's production. Further, an additional excise duty was levied on the cloth produced by larger mills in excess of their quotas. Money collected from this special cess was given to khadi and handloom industries. Other traditional industries were also similarly assisted. A number of Boards were created to look after individual industries such as coir, silk, and various types of handicrafts.

From the Second Plan (1956-1961) onwards, there was a dramatic shift in the economic policy towards heavy industrial development. This was clearly spelled out by Professor Mahalonobis:

The basic strategy would be to increase purchasing power through investment in heavy industries in the public sector and through expenditures on health, education and social services; and to meet increasing demand for consumer goods by a planned supply of such goods so that there would be no undesirable inflationary pressures....The greater the marketable surplus of consumer goods in the household or hand industries, the greater will be the possibilities of investments in heavy industries without any fear of inflation.... (1)

Apart from producing the consumer goods, the traditional village and small-scale industries were also expected to absorb labor with very little additional investment.

In brief, in the Second Plan, the role assigned to rural and small-scale industries was a corollary of the basic policy of growth through the accumulation of capital goods. Since the basic strategy was capital-intensive, it would create only a limited number of jobs

¹Cited in Dandekar and Rath (1971), p. 124.

and leave very few resources for consumer goods. The village and small-scale industries were expected to offset these deficiencies.

The Second Plan also explicitly discussed, for the first time, the development of modern small-scale industries. A panel of economists set up to advise the government in the formulation of the Plan recommended the development of a large number of small towns into industrial townships with planned provision for small-scale and light industries.

The Third Plan (1961-1966) stressed the need to improve worker productivity and to reduce production costs in the traditional rural industries. This would be done by providing technical assistance, better equipment and training to the firms, while simultaneously reducing the subsidies and protection granted to these industries (Planning Commission, 1961).

The Rural Industries Projects Program was started during the Third Plan, as a part of the broadening of the concept of rural industrialization to include modern small-scale industries. This Program is described in detail in a later section.

There were only minor changes in the policies toward rural industrialization till the formation of the Janata Government in 1977.

Rural industrialization was given a bigger boost in the Draft Sixth Plan (1978-1983) of the soon-to-be-dissolved Janata Government. According to the Statement on Industrial Policy announced in December 1977, the thrust of the new policy was on "effective promotion of cottage and small industries widely dispersed in rural areas and small towns" (Planning Commission, 1978b). To achieve this, six specific measures were suggested (Kurien, 1978):

- The modern large-scale industrial sector would be discouraged from producing those goods which could be produced by cottage and small-scale industries. The number of products reserved for the small sector were increased from 180 to 500.
- Within the small sector, special attention was to be given to the "tiny sector," i.e., enterprises with investment in machinery and equipment up to Rs. 0.1 million (\$13,500) and situated in towns with a population of less than 50,000 and in villages.
- Special legislation was to be introduced to protect the self-employed in cottage and household industries.
- Special arrangements for marketing of the products of the small sector were to be made by providing services such as product standardization, quality control, marketing surveys, etc.
- Technical change would be encouraged in the traditional sector industries.
- The focal point of development for small-scale and cottage industries was to be removed from large cities and State capitals to the District headquarters with the creation of a District Industries Centre in each District. This agency would deal with the requirements of all the small and village industries in the District.

The proposed new rural industrialization policy featured two administrative measures not attempted before. First was the creation of District Industries Centres to overcome the confusion caused by the proliferation of agencies and organizations for the development of different village and small industries. These centers were supposed to provide and arrange a package of assistance and facilities for credit,

raw materials, training, marketing, etc. for entrepreneurs. The centers were to establish close linkages with the Development Blocks on the one hand and with specialized institutions concerned with the development of small industries on the other at the state as well as the central level.

It was proposed initially to establish the District Industries Centres in most of the Districts already covered under the RIP program. The staff of RIP and the State Boards of Khadi and Village Industries would be trained and where necessary strengthened to deal with the problems of all rural industries within the District.

The second measure was the setting up of the special wing of the Industrial Development Bank of India (IDB) to deal exclusively with the credit requirements of the village and small industries sector. Its role was to coordinate, guide, and monitor the entire range of credit facilities offered by other financial institutions for the sector. Further, the nationalized banks under the direction of IDB were expected to earmark a specified proportion of their total loans for promotion of village and small industries.

The policy toward rural industrialization in the Sixth Plan did not become fully operational while the Janata Government was in power; and the policy has not subsequently received any attention in the successor Congress party's program. Consequently, the impact of the new administrative changes on rural industrialization remains untested.

Allocation of Resources:

We consider briefly the resources allocated to village and small industries. In Table II.1 we have presented the shares of the various

Table II.1: Percentage Shares of Various Sectors in Total Plan Expenditures

Sector	Actual Outlays				Estimates		Targets
	First Plan	Second Plan	Third Plan	Three Year Plan	Fourth Plan	Fifth Plan	Sixth Plan
Agriculture	14.8	11.7	12.7	16.7	14.7	12.7	14.8
Irrigation		9.2	7.8	7.1	8.6	9.6	10.7
Power	29.7	9.7	14.6	18.3	18.6	18.7	21.3
Village & Small Industries	2.1	4.0	2.8	1.9	1.5	1.5	2.0
(Share of predominantly rural based industries)	(80.0)	(60.5)	(52.5)	(45.6)	(58.6)	(56.8)	(57.7)
Organized Industry & Mining	2.8	20.1	20.1	22.8	18.2	23.1	19.7
Transport and Communication	26.4	27.0	24.6	18.5	19.5	17.3	15.7
Social Services etc.	24.1	18.3	17.4	14.7	18.9	17.1	15.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: H.H. de Haan, Rural Industrialization in India, 1980

Note: Percentages may not add up to 100 because of rounding.

sectors in total outlays under the various plans.

The share of village and small industries was the highest in the Second Plan, at 4% of the total expenditures. In the subsequent Plans, the share of these industries declined till the trend was to be reversed by the Janata Government in the Sixth Plan. However, the Sixth Plan proposed to allocate only 2% of the total expenditure to this sector, which was still below the First Plan level of 2.1%.

The above figures also include expenditures on small-scale industries in the urban areas. If we look at the share of the predominantly rural industries only, the declining trend is sharper.

From this discussion it is clear that rural industries have not figured prominently in the official policies of the Indian Government.

In Table II.2 we have presented the shares of the various sub-sectors within the village and small industries. Within the rural industries, the major emphasis has been on khadi and other traditional village industries.

An Assessment:

The success of the various rural industrialization efforts were, at best, limited. Particularly, the strategy of encouraging village industries, based on the assumption that these industries would create employment as well as meet the demand for consumer goods with very little capital investment was somewhat short-sighted. With the traditional techniques utilized in this subsector, it was incapable of creating a marketable surplus. In fact, according to Dandekar and Rath (1971), workers in most of these industries were unable to produce enough even for their own consumption and subsistence. As a result,

Table II.2:
Percentage Share of Plan Expenditures
on Sub-sectors in Village and Small Industries

Sub-sector	Fourth Plan		Fifth Plan		Sixth Plan
	Outlay Revised	Est. Expend.	Outlay 74-79	Est. Expend.	Outlay
1. Small-scale industry	32.3	28.1	37.5*	31.4*	38.7*
2. Ind. Estates	6.2	6.3	3.9	4.6	3.2
3. Khadi & Village	38.5	41.0	26.7	32.6	27.7
4. Handloom	9.1	11.7	18.7	20.8	19.9
5. Power looms	3.0	1.3	0.6	0.4	0.4
6. Sericulture	3.2	3.4	5.6	5.0	5.0
7. Coir	1.5	1.8	1.4	1.4	1.2
8. Handicrafts	2.8	2.5	5.6	3.9	4.0
9. RIP	3.1	4.0	--	--	--
TOTAL	100.0	100.0	100.0	100.0	100.0

* Includes the expenditures on the Rural Industries Projects (RIP) program.

Note: Percentages may not add up to 100% due to rounding.

Source: Planning Commission, Draft Fifth Five Year Plan (1974-79), Part II, Government of India, 1973, p. 161, 164.

Planning Commission, Draft Five Year Plan (1978-83), Government of India, 1978, p. 179.

the village industries had to be heavily subsidized. So the real cost to the economy was higher than had been expected.

The employment creation ability of village industries has also been questioned by many researchers. As compared to modern industry, village industries may require less capital per person employed but not necessarily less capital per unit of output. Banerji (1977) has shown that capital intensity (K/L ratio) of production increases as we move from the traditional small sector through the modern small sector to the organized medium and large sectors, both in terms of fixed capital and total productive capital (fixed and working capital together). However, at the same time, the output/capital ratio as well as the output/labor ratio are substantially lower in the traditional small sector as compared to the other two sectors.

The success of modern small-scale industries has also been questionable. While these industries got some benefits as a result of some official policies, most of the policies discriminated against these industries. The basic emphasis on import-substituting heavy industrialization denied the small-scale industries the chance to compete in international markets, as was the case in Taiwan and South Korea. Further, the allocation of key industrial inputs by the government made it difficult for small firms to compete with larger firms who were in a better position to understand (and manipulate) the maze of rules and regulations.²

The modern small-scale industry in many ways belongs to the same genre as large-scale industry--the most important difference being

²Bhagwati and Desai (1970), p. 303, provide several examples of the problems faced by small-scale industries.

that of scale of production and technology. Staley and Morse (1965), define modern small industry as that "which caters to the needs of the emerging modern economy, is progressive in outlook and adaptable to changing conditions, uses the results of modern science and invention in its production processes, and applies reasonably up-to-date ideas of organization and management in its business operations." These links with the modern economic sector are responsible for the small industries preference for location in more urbanized areas.

The rural industrialization policy in India has not given enough attention to the special needs of modern small industries--particularly when located in rural areas. We can point to two important disadvantages of a rural area for certain types of modern small industry. First, the small industries may have few or no linkages with the rural economy. Second, the infrastructures or support services required for modern industries may be inadequate.

Many of the items which are reserved for production in the small sector are not only inappropriate³ for the sector, but also very difficult to produce in dispersed rural areas. As Kurien (1978) points out, many of these industries are in the metals, chemicals and engineering sectors and are linked closely with the large-scale sector. They get their inputs from this sector and also supply their outputs to it. The other major group of commodities in the reserved list are the consumer goods like sewing machines, pressure cookers, toothpaste, and various electrical appliances (Datta, 1978). The markets for such com-

³Refer to Datta (1978) and Kurien (1978) for a discussion on the inappropriateness of some reserved list commodities for production in the small sector.

modities are almost exclusively in the urban areas. So encouraging the production of such intermediate and consumer goods in rural areas is bound to be fraught with difficulties. It has also been noted by researchers that such industries are technologically quite sophisticated and require a high level of infrastructures and industrial services. All these factors combine to make an urban location more desirable as has been observed from the location decision of many modern small industries.

II.2 PROGRAMS OF RURAL INDUSTRIALIZATION:

We shall briefly discuss here some specific programs created to promote the industrialization of rural areas since the First Plan. These programs are still in existence.

Special Boards and Commissions:

We have already mentioned the creation during the First Plan (1951-1956) of various specialized Boards and Commissions to organize the village industries. The most important of these Boards is the State Khadi and Village Industry Board. It was established to revitalize the manual crafts and trades carried on in the rural areas. The industries which have benefitted most from this Board are khadi, village pottery, hand-made paper, and gur and khandsari (unrefined sugars), leather, carpentry and blacksmithy. The other Boards consisted of: Silk Board, Coir Board, Handloom Board and Small-Scale Industries Board. The policy instruments of these Boards consist of training of workers and entrepreneurs, provision of raw materials, creating marketing facilities, provision of credits, improvement in technologies and stimu-

lation of cooperatives.

Village Industries in Community Development Program:

In addition to setting up the Boards to promote village industries, an attempt was also made to include various village industry programs within the scope of the Community Development Program launched in 1952. The main activity included the establishment of production-cum-training centers with a view to improve the skills of artisans. These programs were organized at the community development block level. The main components of these efforts also consisted of credit provision to artisans, training, establishing common work-sheds and supplying improved tools at subsidized rates. The program organized training centers at the district level where, in addition to technical training, seminars and exhibitions were also conducted.

According to Vyas (1970), the impact of village industries programs under the Community Development Program on rural industrialization has been negligible. By the end of the Third Plan (1966), only about 3,200 village industrial units had started in about 1,500 blocks.

Small-Scale Industries Program:

As mentioned earlier, this program was started during the Second Plan (1956-1961) with the specific objective to decentralize and disperse small industrial units in rural areas. During the Fourth Plan (1969-1974), this program aimed at fuller utilization of capacity by small-scale industries, rapid growth of ancillaries and the modernization of selected industries. In the Fifth Plan, emphasis on the promotion of small units as ancillaries to large industries continued.

The Small-Scale Industries Program is implemented by Small Industries Service Institutes in collaboration with the National Small Industries Corporation. The various schemes for promoting small industries have included credit and raw material availability, supply of machinery on a hire-purchase basis, marketing, consultancy and training facilities. Further, by the end of the Fourth Plan, 124 commodities were reserved strictly for production in the small industry sector. The various state-level corporations also acquire lands, demarcate industrial zones and develop the land with some industrial facilities. In selecting such places, small towns have been favored.

Rural Industrial Estates:

The Industrial Estates Program was formulated in 1955 by the Small Scale Industries Board. The idea behind industrial estates is to provide land, buildings, and industrial services in one location for the entrepreneurs. Focusing of resources on a few selected locations has some advantages from the point of view of planners. For the entrepreneur, estates simplify the lengthy and complicated process of establishing a new enterprise, acquiring or constructing a new premise and starting production.

By 1967, there were 493 industrial estates in India. Of these, 177 were located in urban areas, 184 in semi-urban areas (with a population between 5,000 and 50,000) and 132 in rural areas (with population of 5,000 or less). Until the Third Plan, the Industrial Estates Program was mainly a state-sponsored program. Since then, it has been sponsored by cooperatives, private joint stock concerns, and in certain cases, by municipalities and other local government bodies.

Constructing a successful industrial estate is full of difficulties and the costs are very high. India's experiences with regard to rural industrial estates has been largely unsuccessful. According to a study by Sanghvi (1979), a high proportion of rural estates tend to be non-functioning as compared to the estates in urban and semi-urban areas. While 55% of the rural estates were non-functioning, only 14% and 17% were in this category in the urban and semi-urban areas. During the period 1968-1974, the proportion of non-functioning rural industrial estates increased from 41% to 69%.

The reasons for such poor performance by rural industrial estates are many. In general, it is clear that industrial estates by themselves are insufficient catalysts of development. They have to be supported by other types of assistance within a comprehensive policy of rural industrialization. Often the rural industrial estates have been located in areas which lack the basic supporting infrastructures like transportation, power and water-supply. Another important problem has been that these estates have imposed very high capital costs and overhead on the rural enterprises. All these problems have resulted in low occupancy rates.

II.3 THE KHADI PROGRAM:

We have seen earlier that India's rural industrialization policies have not been very effective in achieving their stated goals. A well-documented case of the failure of these policies is the khadi program of the Khadi and Village Industries Commission.⁴

⁴This discussion is based on Dandekar and Rath (1971).

The basis of the khadi program was the Ambar Charkha, an improved hand-spinning wheel developed during the First Plan. In accordance with the Second Plan policy decision to reserve the bulk of increased production of consumer goods to the village and small-scale industries, the Khadi and Village Industries Board proposed to manufacture and distribute 0.25 million Ambar Charkhas to spinners to be trained over a period of three months and to produce at the end of the plan period (1960-1961) about 400 million pounds of yarn for the production of 1500 million yards of cloth required to meet the estimated additional demand. The program was estimated to involve a capital cost of Rs. 325 million and offer employment to some 0.36 million spinners.

It was assumed that a spinner would produce half a pound of yarn every day at a proposed wage of Rs. 0.75 per day. However, the net worth of the spinners' labor was actually only Rs. 0.20. So the remaining three-fourths was to be met through government subsidy. Once the program started it was realized that the worker productivity was even lower than what was expected--in fact, it was a little over 1/3 pound a day.

In June 1956, the Government announced revised estimates of additional cloth that would be needed during the Second Plan period. It now allocated only 300 million yards to the khadi program. The Khadi and Village Industries Commission which had earlier proposed to produce 1500 million yards, asked for an even lower target of 60 million yards. To produce this quantity, it proposed the manufacture and distribution of 0.5 million spinning wheels. These revised program targets changed the ratio between the number of spinning wheels and the quantity of production. Under the original proposal, each wheel was expected to

produce yarn for 500 yards of cloth per year. However, according to the new revisions, each wheel was estimated to now produce yarn for only 120 yards of cloth. In 1960, the Khadi Evaluation Committee reported that the actual production per spinning wheel was less than 60 yards of cloth.

According to Dandekar and Rath (1971), the capital costs of the khadi program per unit of final product increased tenfold and the program became at least ten times as capital-intensive as an equivalent program in the modern spinning industry.

The employment effects of the program also turned out to be disappointing. According to the Khadi Evaluation Committee, about 0.28 million spinners were trained in the first three years of the Second Plan. However, only 0.25 million spinning wheels could be distributed. Moreover, about 40% of the wheels were inactive because of poor quality and inadequate repair services.

Dandekar and Rath report that the khadi program was also faced with marketing problems. The khadi yarn had to be sold to handloom weavers who were used to mill yarn. Consequently, they too had to be trained to use hand-spun yarn. In spite of much effort, all of the produced yarn could not be sold. Further, there was the problem of selling the hand-spun and hand-woven cloth. This was perhaps the most serious problem. In spite of large subsidies and rebates and the Government patronage, the cloth could not be sold.

In spite of the many obvious difficulties with the khadi program, it was carried on into the Third Plan. During this period, the spinning wheels and handlooms were remodeled and improved. Even with higher productivity, the cloth woven on the improved handlooms with the

yarn from remodelled spinning wheels could not compete effectively with the handloom cloth of mill-yarn and it is quite possible that the situation was worse compared to mill cloth. So, the production of the new khadi also had to be subsidized. Moreover, during the Third Plan period when improved spinning wheels were being introduced, the more traditional sets also continued to play an important role in the khadi program. Consequently, the burden of subsidy continued to rise.

The khadi program along with other village industries is still a major part of the rural industrialization strategy. During the Fourth Plan, production of both old and new khadi was pushed. It was estimated that all varieties of khadi increased from about 60 million sq. metres in 1968-69 to about 77.2 million sq. metres in 1972-73 (Planning Commission, 1973). The Fifth Plan proposed to introduce two spindle spinning wheels to replace the traditional sets and also six and 12 spindle wheels. The Sixth Plan admits that "on the whole, the progress (of Khadi and Village Industries) has not been up to expectations." (Planning Commission, 1978b.) It, therefore, proposed to review the existing organizational structure of the Commission and the State Boards. It also proposed to reorient khadi production to new varieties of cloth such as muslin khadi and a cotton-polyester khadi. Existing schemes for producing woolen and silk khadi were to be expanded.

The khadi program clearly illustrates the problems of sustaining an economically viable undertaking. The costs to the country of maintaining the viability of khadi in the face of severe competition from mass-produced cloth have been high. Nor have the benefits in terms of employment come close to the announced objectives of employment generation. The expectation clearly stated in the Second Plan that village

and rural industries would meet consumer demand has been far from fulfilled by the khadi industry. Not only did the consumer demand outpace the supply capacity of the low productivity sector, but it also was transformed into a demand for a different cloth. Moreover, in spite of the high subsidies that have gone into this program, the sector can barely provide subsistence to the workers.

Sen (1968) in his classic study on the choice of techniques of production in developing countries has evaluated the Ambar Charkha as a possible technique of cotton-spinning. The evaluation was based on the performance of the Ambar Charkha Programme in the first two five-year Plans. The conclusions were discouraging:

The Ambar Charkha programme is inflationary and is also likely to affect capital accumulation adversely. Far from creating any flow of surplus, it produces a flow of output value less than even its recurring costs. For the Ambar Charkha to have no inflationary results and no recurring adverse effect on the national capital stock, the workers would have to be paid Re. 0-1-8 (less than two pence) per 8-hour day, which is quite absurd. As a technological possibility, the Ambar Charkha seems to offer very little. (5)

II.4 THE RURAL INDUSTRIES PROJECTS PROGRAM:

From the experiences gained through the above mentioned programs, it became clear that any rural industrialization effort, to be successful, must offer a complete package of assistance. Yet another program, the Rural Industries Projects (RIP) program attempted to do this in a few selected areas. The idea was to overcome past disadvantages by concentrating the resources to provide a wider range of facilities and services.

⁵Re. 0-1-8 (old currency) would equal about Rs. 0.10 (new currency) at 1956 prices.

We will discuss this program in detail since it is the principal focus of this study. This program is a centrally-sponsored program. The Rural Industries Planning Committee set up by the Planning Commission in 1962 was responsible for formulating the program. The program was aimed at:

- diversifying the occupation structure of rural India,
- enlarging the employment opportunities in rural areas,
- raising income and living standards of rural communities, and
- stemming rural-urban migration.

Initially, in 1962-1963, 45 pilot projects were undertaken in different parts of India. In 1965, four more projects were selected around large-scale industrial complexes. Each project, on an average, covers an area with a population between 0.3 million and 0.5 million, i.e., 3-5 community-development blocks in each District (excluding towns with a population of more than 15,000). Six of the projects covered entire Districts. The initial 49 projects were designed to generate knowledge about effective techniques, methods and programs for promoting intensive development of village and small industries under different conditions. In 1970, all 49 project areas were extended to cover entire districts. During the Fifth Plan, 57 more projects were started.

The implementation and detailed content of each RIP program is left to the State Government. Each State has a State Advisory Committee for Rural Industrialization which ensures co-ordination between various State Government departments and non-official organizations. At the Project level, there is a Project Committee which is concerned with the explicit implementation of the program. The team in each

Project is headed by a Project Officer and has a Planning-cum-Survey officer, two to four economic investigators, two to four technical officers and supporting staff. This Project Committee is responsible for making industrial potential surveys of the area. It provides financial and technical assistance, marketing advice, assistance in procuring raw materials and also supplies blue prints and layout for plant and machinery. It brings the firms in touch with banks and other financial institutions.

The projects are funded by the Central Government as a centrally-sponsored Program. During the Third Plan period (1961-1966), a total of Rs. 48 million (\$6.4 million) was spent on the Project activities such as training programs, loans, marketing facilities, etc. By 1974-1975, the total spent on the Program was approximately Rs. 252 million. A little under half of this amount was spent for staffing, training, etc., while the remaining amount was given as loans to rural firms. According to the statistics collected by RIP authorities, by 1974-1975, nearly 38,000 artisans were trained in better techniques, and over 63,500 industrial units received financial support. The value of their production during the year 1974-1975 was about Rs. 965 million; and they were employing nearly 0.28 million persons. Earlier figures for 1973 indicate that of the 36,640 firms assisted by RIP, 40% were "modern" and they accounted for 75% of total investment, 76% of the production and 66% of employment.

The RIP Program was evaluated most recently in 1974 by the Planning Commission. The evaluation was based on 26 of the initial 49 projects. The conclusions of the evaluation are not very encouraging. The major conclusions are summarized below (Planning Commission, 1978a).

1. The Industrial Potential Surveys conducted by the Project staff did not satisfactorily evaluate the local economy or the potentialities of the region. Consequently, the units that came up had no relation to the presumed potential as depicted by the surveys.
2. There was inadequate commitment of the State Governments to the RIP Program. The Project officials were frequently changed, the Program was not integrated with the activities of other agencies supporting small and village industries and there was inadequate and inaccurate monitoring/feedback systems between the field and the policy making/funding levels of administration.
3. Several of the instruments had only a marginal impact. This was particularly true of schemes of technical assistance. Only about 6% of the firms reported any operational contact with the Project authorities for training, raw materials, or marketing support. Of all the programs, the most important was the credit and loan program which benefitted about 19% of the total units. However, most of the funds for the firms came from other institutions like banks, State financial corporations, etc.
4. Establishment and promotional costs per job varied a great deal from Project to Project and were generally rather high. Six out of the 26 Projects surveyed reported average costs at less than Rs. 3000 per job while about 9 projects reported costs of Rs. 10,000 or more.
5. A significant part of the funds were disbursed to towns with population of more than 15,000. These areas were supposed to have been explicitly excluded from the operation of the RIP programs.
6. A negligible fraction of the financial assistance went to rural

areas.

Conclusions:

The failure of programs like the khadi program or the decentralization of modern small industries cannot be remedied by mere organizational or administrative changes. The failure may be seen as one of inconsistency between objectives (of rural industrialization) and appropriate actions (programs to achieve particular objectives). All the desirable objectives have been attributed to the rural industrialization program without understanding the scope and limitations of what such a program can achieve in a developing country. Therefore, the most pertinent question to be resolved is what type of rural industrialization to encourage under different developmental conditions. Such an understanding can lead to the formulation of programs which have a better chance of success.

In the next chapter, we review the literature which considers various underlying factors and conditions conducive to rural industrialization.

CHAPTER III

A LITERATURE OVERVIEW

This chapter presents an overview of the literature related to rural industrialization and to the role of various factors in the performance of rural industries. The literature in this area tends to be unstructured and full of casual and general observations. Studies in small-scale industrial development and industrial decentralization offer some insights which can tangentially be related to rural industrialization. We have relied on such studies as well as some case studies in rural industrialization to identify some of the important factors related to the performance of rural industries. More systematic analytical and empirical work needs to be done before we can confidently identify the complex interaction of economic, infrastructural, institutional and locational factors that determine the performance of rural industrialization in developing countries.¹

In the following discussion, we have grouped the various factors into five categories. Each category is concerned with the relationship between one set of factors and the performance of rural industries. The five categories are related to: rural consumer incomes, regional

¹In his survey article, Fisher (1968) categorized the failures of the Indian literature on the small industry as follows: "the literature is highly repetitious; the literature ignores questions of economic concern in favor of those of taxonomic concern; the use of statistics is barbaric; value judgements frequently obscure and directly interfere with sound analysis; and area studies which often contain data, conform to no general pattern so that comparison is difficult, while general studies lack firm general data."

agricultural and industrial development, infrastructural availability in the area, size of the rural locality, and factors involving product choice for rural areas. Since the main focus of the studies reviewed is not always the relationship we are interested in, only the relevant parts of the studies are mentioned here.

III.1 RURAL CONSUMER INCOMES:

The most relevant literature for our purposes in this area concerns the relationship of rural incomes to consumer expenditure patterns. The consumption patterns are one of the many factors which determine the type of industries that could be located in the rural areas, other things being constant. We have considered two aspects of rural consumer incomes which affect consumption patterns; the first is the level of incomes and the second is the distribution pattern of these incomes.

Income Levels: Low incomes and a low proportion of monetized income limit the market for consumer products. As incomes rise, consumers spend an increasing proportion of the added incomes on non-agricultural goods and services. This stimulates consumer goods industries and creates opportunities for non-farm employment.

According to Ho (1979), the rise in Taiwan's rural consumer incomes in the period between 1956 and 1966 brought about an increase in the demand for non-food consumer goods. In the presence of other factors (which we discuss later) conducive to decentralized industrialization the increase in demand was met by the growth of rural industries. Ho points out that the manufacturing industries most

commonly found in the rural areas of Taiwan include knitting, apparel, tailoring, products of wood and bamboo, pottery, structural clay products, hand tools, agricultural implements, canning, and miscellaneous food manufacturing. As expected, Ho found that firms in these industries are smaller and more labor-intensive than manufacturing as a whole (though he does not indicate the magnitude of the difference).

Mellor (1976) has suggested that there is a strong positive relationship between rural incomes and the rural demand for non-farm goods. While only 21% of the incremental expenditure is allocated to non-food commodities in the lowest two deciles, 48% is so distributed in the sixth, seventh and eighth deciles. The share allocated to consumer durables and semi-durables is low in all income classes, but shows a large percentage increase as total expenditure rises. (The lowest two income deciles roughly correspond to landless agricultural labor. The sixth, seventh and eighth deciles correspond to land holdings of 5-10 acres.)

A rising demand for non-food goods as incomes rise is further borne out by various studies of expenditure elasticities for non-food commodities. Of particular interest are the expenditure elasticities computed for nine groups of commodities across all expenditure classes in rural India (Radhakrishna and Murty, 1978).

The following studies (Table III.1) reinforce the findings based on marginal budget shares. Expenditure elasticities of greater than unity for non-food items across all expenditure groups suggest that higher rural incomes can create a large demand for non-farm goods. While we do not yet have a full understanding of the expenditure patterns of the rural population on the various non-farm goods, it

appears that much of the demand is for simple consumer goods which can be produced by small-scale firms located within rural areas.

Table III.1:
Rural Expenditure Elasticities for Nine Commodity
Groups by Expenditure Classes

Group of Commodities	Size Group of Landholdings Corresponding to Expenditure Class (in acres)				
	Landless	0-1	1-5	5-10	10+
Cereals	0.954	0.827	0.583	0.460	0.343
Milk & milk products	1.962	2.245	2.222	1.701	0.728
Edible oils	1.527	1.247	0.968	0.783	0.985
Meat, fish, eggs	1.546	1.693	1.569	1.149	0.606
Sugar, Gur	1.363	1.655	1.537	1.379	0.803
Other food items	1.115	1.008	1.121	0.871	0.674
Clothing	0.823	0.644	1.468	1.541	1.044
Fuel, light	0.589	0.963	0.814	0.587	0.508
Non-food items	1.072	1.370	1.763	1.816	1.781

Income Distribution: While the level of consumer incomes determines the expenditure level of the consumers, the pattern of income distribution, to a large extent, determines the composition of aggregate consumer demand. This has been well illustrated by Mellor (1976) using two different income distribution patterns. In each case, he assumes that Rs. 2400 million is allocated among various consumption expenditure classes. In the first case, the distribution is skewed in favor of the owner-cultivators so that they get to spend 90% of the Rs. 2400 million while the labor class is allocated only the remaining 10%. In the second case, the situation is reversed with the labor class now spending 80% of the total, and the owner-cultivators, the remaining 20%.

According to Mellor's calculations, in the first type of income distribution, only 19% of the additional expenditure is allocated to foodgrains. In the second case, 39% was consumed as foodgrains. The increase in demand for milk and milk products is about 20% greater under such a distribution than it is under the alternate case. Similarly, the increment in demand for other foods like vegetables, fruit, eggs, etc. is 50% more. In the case of cotton textiles, the incremental demand actually declines by 16% in the distribution favoring the rich as compared to that favoring the poor. However, the increment in demand for woolens and other textiles is more than four times larger when the rich receive the bulk of the income. Also in this case the increase in consumption of consumer non-durables was twice as great for the rich as the poor.

Based on their research in various African and Asian countries, Johnston and Kilby (1975) observe that the differences in the composition of demand for consumer goods is the result of "the difference in the size distribution of income among rural households." They state that "where income is more or less evenly distributed over broad segments of the population, the result is large markets for comparatively simple goods." By contrast, when income is skewed in favor of a few large farmers, the resultant demand situation is one of small markets for expensive goods.

Johnston and Kilby give examples of the types of goods likely to be purchased by low and medium-income rural households as their incomes rise. These purchases include items like cosmetics, combs, brushes, plastic and leather sandals, cotton textiles, light fixtures, wooden furniture, and brick and paint for home improvement. On the other

hand, the authors observe that in the households of the large-scale mechanized farmers in the Indian and Pakistani Punjab, one often finds such consumer durables like air conditioners, cars, and television sets. On smaller farms, the authors found items like electric fans, bicycles and transistor radios.

Thapar's (1972) observations regarding industrial employment in Punjab and Haryana in the wake of Green Revolution makes the same point. Theoretically, the Green Revolution could have induced the expansion of local consumer goods industries, but this was not the case between 1966 and 1969. He suggests that this may be due to the income distribution pattern in the two states. The demand of the rich for such goods was already being satisfied and the additional demand that their higher incomes generated was for more sophisticated, urban-type goods. The increased incomes of the poor, on the other hand, could not generate adequate demand for even simple consumer goods.

Although none of the above studies are directly concerned with rural industrialization, they do provide us with an understanding of the relationship between rural incomes and rural consumption patterns. Such an understanding is useful in selecting the appropriate rural industries -- particularly those with the aim of satisfying local demands.

From the above discussion, it is clear that rural areas at different levels of development will demand a different mix of consumer goods and services. This means that a wide variety of production activities can be sustained in many of these areas. The more prosperous areas can, of course, support a bigger variety. Identifying existing or potential demand is an important factor in determining

the success of a rural industry. From the above studies, it can be said that in rural areas experiencing some growth in incomes, simple consumer goods and small-scale agricultural processing will have a local market. Whether the existence of a market presupposes production in that location is a separate question. A local market is neither a sufficient or a necessary condition for the production to take place in the rural area. Other conditions such as availability of raw materials, infrastructure, skills, etc., all play an important role in the outcome.

III.2 REGIONAL AGRICULTURAL AND INDUSTRIAL DEVELOPMENT:

In this section we consider the studies which throw some light on the relationship between the level of development in the region and rural industrialization. The studies are categorized according to two broad aspects of regional development -- agricultural development and industrial development.

Agricultural Development: Agricultural development has important indirect consequences for non-farm employment incomes. This linkage mechanism is three-fold: rural household demand arising from increased rural incomes, agriculture's own demand for industrial inputs and services, and the supply of raw materials of agricultural origin for agro-processing. We have already discussed the first case.

Rising agricultural production creates a demand for inputs such as fertilizers, machinery and pesticides. Greater volume of output also requires facilities such as storage and transportation and also makes it possible to develop agro-based processing industries. All

this entails various opportunities for the creation of non-farm employment.

Child and Kaneda (1975) have documented one example of the interaction between agriculture and manufacturing in West Pakistan. In the latter part of the 1960s, wheat and rice production rose very rapidly as a result of the adoption of HYV hybrid seeds. This led to a mushrooming of small-scale light engineering firms supplying durable goods inputs such as diesel engines, pumps, strainers and farm implements to agriculture.

Child and Kaneda sampled 173 of these firms from an estimated total of 533 firms. All of the firms were clustered around seven cities. While the larger, more diversified firms tended to be concentrated around Lahore, smaller firms were located around the smaller sized towns. The authors indicate that they were unable to find any firms located away from these seven cities, though there may have been some. While Child and Kaneda cite this agriculture led industrial development as an excellent example of spontaneous growth of relatively labor-intensive firms using local resources, the implications for rural industrialization are not very encouraging.

However, in the case of Taiwan, decentralized industrialization was facilitated by the presence of a highly commercialized and productive agricultural sector (Ho, 1980). Rural prosperity was responsible for the demand for materials and equipment inputs used in agricultural production.

The mutually reinforcing relationship between rural industries and agriculture in China is discussed at some length by Perkins et. al. (1977). The authors cite the efforts in the areas of large-scale

rural land development and water conservancy schemes in Hsi-yang and Yin counties as preconditions for the process of rural industrialization. In the case of Hsi-yang county, the farms were small and the soil was of very poor quality. Further, the crops were regularly washed away by rain flooding. Efforts involving massive applications of labor were made to transform the agriculture in the country. For example, much of the soil for upgrading the farms was brought down the mountainside with carrying poles and baskets. Large drainage tunnels to divert rain water were built by manually chipping large rocks and without any cement or much mortar.

In the case of Yin county, the problem was one of severe water shortage. The problem was solved by tapping the waters of the Chang river, many kilometers away. The project was carried out over the period 1960 to 1969 and resulted in the building of a 1500 km long canal network. The work put in was 40 million many days while the capitalcost was only 47 million yuan.

The above type of developments created a demand for cement. Availability of water made it possible to use chemical fertilizers. Greater use of water and fertilizers led to increased agricultural output which in turn raised the demand for labor to do the threshing, milling, and moving of surplus to market. This caused labor shortages in many parts and created the need for labor saving farm machinery. While this demand could have been satisfied through large-scale production in industrial centers, the Chinese policy of self-reliance as well as the inadequacy of China's rural transportation and marketing system led to the creation of small-scale factories in the rural areas.

Sigurdson (1977) also stresses the complementarity of agriculture and industry in China's rural industrialization policy. According to the author, the interaction between rural industry and agriculture in China starts with the premise that the rural industrial system is there to serve agriculture. The rural industrial sector provides the agricultural sector with agricultural inputs -- improved drainage and irrigation facilities, chemical fertilizers, and farm machinery. The mechanization of agriculture requires frequent maintenance and repair of farm machinery and equipment. This provides a further stimulus to rural industrialization.

It is obvious that not all rural areas in China can support the agricultural input industries. As Sigurdson (1977) points out, such industries tend to be small-scale heavy industries. In China, they are termed as "five small industries" and they supply agriculture with energy, cement, chemical fertilizers, iron and steel. Such industries can be located only in rural localities which are well endowed with coal, iron ore, limestone and other natural resources.

Papola and Misra (1980) in their study have considered the relationship between the extent of rural industrial activity and agricultural factors such as the structure of landholdings and the value of gross agricultural output per person. This study is one of the few which has explicitly examined the determinants of industrial activity in a village in India. The study was based on 72 village surveys conducted by Agro-Economic Research Centers in different parts of India. Besides agricultural factors, the authors have considered the effect of other locational and structural aspects of the villages. We discuss these in the relevant sections later on.

Three indicators are used to measure the extent of industrialization of villages: percentage of workers engaged in manufacturing, percentage of village income originating in manufacturing, and income per worker in manufacturing. The indicator to measure the structure of landholdings in a village was defined as "holdings smaller than five acres as a percentage of total holdings."

The study found no significant difference in terms of the proportion of workers engaged in manufacturing between villages with a smaller proportion of small holdings (as defined in the study) and those with a large proportion of such holdings. However, villages with a very high proportion of small holdings have a larger proportion of income coming from manufacturing. On the other hand, the income per worker from manufacturing is higher in the case of villages with smaller proportion of small holdings than those with a predominance of small holdings.

Papola and Misra further found that levels of agricultural development as measured by the value of gross output per person engaged in cultivation was not related consistently with the extent of rural industrial activity. In fact, the study found that villages with lower agricultural productivity had relatively higher income per manufacturing worker. The authors suggest that this result could imply that "low productivity of land obliges people in the village to seek manufacturing as a source of income."

Pescatore's (1971) observation regarding industrialization in Southern Italy suggests an entirely different aspect of agriculture, its topography, which can affect the location of industry. In Southern Italy there are many instances of successful industrializa-

tion occurring in regions which are well-suited for intensive agricultural use. One of the reasons given for this is that agricultural land suitable for intensive use occurs mostly in plains, river valleys, or in coastal belts. These same areas are also most suitable for industrial development. Very often, the infrastructure is already in place if agricultural development is under way.

A productive agriculture can be a basis for rural industrialization in that it supplies the industrial sector with raw materials to be processed. Agro-processing industries are often suggested as suitable for rural areas. Mellor's (1976) calculation for India show that nonfoodgrain agricultural commodities as a broad class comprise about 35% of incremental expenditure in all income classes except the lowest. This indicates that dairying, poultry farming, edible oil production, etc. can be sustained in many rural areas. Ho (1979), in his Taiwan study, points out that a productive agricultural base provided the raw materials for the emergence of a number of food-processing industries in the rural areas. The key industry in the food-processing sector was the canning of vegetables and fruit. In rural China also, increased agricultural productivity was responsible for rural agro-processing of agricultural produce to satisfy local as well as non-local demand (Sigurdson, 1977).

Industrial Development: We know from industrial location theory that new industrial development tends to occur where industry has located in the past because of industrial linkages, economics of agglomeration, etc.

Vyas (1970) has attempted to establish whether there exists any links in the pattern of growth in agriculture, modern small-scale industry and large-scale industry in the State of Gujarat (India). A rank correlation of districts arranged according to agricultural development, development of small-scale industries (as measured by the employment and fixed capital investment) and development of large-scale industries (measured as above) showed a large and statistically significant relationship between large-scale industries and small-scale industries. However, the correlation between agricultural development and small-scale industries was very small and statistically insignificant. The implications of this finding, according to Vyas, suggest that there is a closer integration of the small rural industry with urban centers rather than the agricultural hinterland.

The study by Child and Kaneda (1975) mentioned earlier also suggests a relationship of this nature in West Pakistan. Although the growth of small-scale light engineering firms supplying agricultural inputs was in response to agricultural growth, the firms were all located around seven large cities. To understand why this was the case, the authors cite the example of the hundred firms in their sample which were the most innovative. These firms produced diesel engines, using a 1924 vintage English engine as a prototype. Location-wise, these firms were split nearly equally between the major metropolitan city of Lahore and the smaller town of Daska. Given the nature of the product, the firms had no choice but to buy critical inputs such as coke, pig iron, and forged steel crankshafts from large-scale industrial firms or commercial importers in Lahore.

The smallest firms in Child and Kaneda's study were those producing strainers, which are used to filter the water at the bottom before it is pumped up the tube-well. According to the authors, the strainers are constructed entirely by manual labor using iron strips, rivets, hammers, and coir string. Clearly, such firms would be highly suitable for location in rural areas as they utilize local raw materials and are labor-intensive. However, Child and Kaneda found that these firms were also located around the seven cities along with the other firms in the sample.

One aspect of the process of industrialization -- that of subcontracting -- has been often mentioned as a way to encourage the growth of small-scale industries and employment creation in the developing countries. According to Paine (1971), Japan's case in this regard has some important lessons for the developing countries. She has shown that subcontracting by large-scale, high-wage, capital-intensive firms to low-wage, small, labor-intensive firms as an important way of absorbing the outflow of labor from agriculture during the interwar period and then again in the postwar period when wartime destruction created a serious unemployment problem. However, the author has not indicated the extent to which the subcontracting firms were located in rural areas.

Paine has described in detail how subcontracting in Japan led to a pattern of small-scale, labor-intensive industrialization. Most important of all, subcontracting, by making labor-intensive techniques more viable, led to an increase in the number of small-scale, labor-intensive firms. In general, according to Paine, "processes subcontracted were not those subject to increasing returns and for

which high productivity capital-intensive techniques could not be utilized." Consequently, the small, labor-intensive firms could take over such production very effectively.

Further, subcontracting "increased employment opportunities without holding back output." Paine points out this was due to a lower overall manufacturing K/L ratio as a result of subcontracting. Subcontracting created a secondhand capital market and brought about a more "optimal utilization" of the available capital. In the intermediate phase of Japanese development, with capital scarce, there was a bias against small firms in the capital market. However, with secondhand machinery now available to the small-scale sector, it could expand its employment as well as the output. At the aggregate level, total output was higher with the available capital stock spread more widely and increased employment.

Although the above study does not consider the locational aspects of subcontracting firms, it is possible to identify industries which can subcontract successfully to rural firms. As a rule, subcontracting is seen to be feasible in industries where parts of the production can be carried out by labor-intensive techniques. One illustrative example is that of the industrial diamond cutting industry in India. For many years, the cutting and polishing of diamonds for industrial use has been subcontracted out to firms in rural areas of Surat district.² This is a fairly high precision, labor-intensive skilled task, which

²Information received from Mr. Allushah of Vedchi Intensive Area Scheme, Surat District, Gujarat. One of the activities of this scheme is to find entrepreneurs for this rural industry.

can be performed by small firms located in workshops. It is estimated that about 250,000 persons may be involved in this activity.

Employment generation is not the only attractiveness of subcontracting for rural areas. Given the difficulties that many rural firms face in marketing and procuring raw materials, subcontracting may be a good solution. The patron firm takes on these functions.

The above studies would suggest that there are many advantages to firms located in rural areas where agricultural and industrial development have started. Rural industries cannot exist in a vacuum; they do have important backward and forward linkages with agriculture as well as industry. A rural industrialization program which can take advantage of these linkages is likely to be more effective than one which does not.

III.3 INFRASTRUCTURAL AVAILABILITY:

The development literature in general attributes to infrastructure an important role in the process of industrialization. However, there are not adequate studies which show the extent to which different types of rural infrastructure such as credit, transportation, electrification, and communication play a role in the location decision of rural firms or their level of performance.

We shall begin this discussion with the issue of credit supply for the development of rural industries. The availability of long and short-term credit is considered critical for such development. Consequently, supply of credit has received a high priority in rural industrialization programs. To take the Indian case, credit is made available to local entrepreneurs at highly subsidized rates not only through

various authorities concerned with rural industrialization programs, but nationalized banks have been directed to make funds available to small rural enterprises by setting up extension branches in rural areas. For example, as we have seen in the last chapter, a large part of the effort of the Rural Industries Program has been directed towards coordinating the loan funds from various financial institutions.

However, some of the programs for making long-term credit available to small industries have not been very effective. A study of 147 small-scale firms spread all over India, observed that the majority of the firms were operating below 50% of their installed capacity (NCAER, 1972). An important factor cited by the small industrialists for such poor performance was the inadequacy of the institutional facilities for provision of long-term credit. The major complaint in this connection was the long delays involved in getting loans. As a result of such delays, the firms reported that either the demand had slackened off or the competition had become so stiff that they had problems in selling their products. To avoid these types of problems, many small industrialists in the study were forced to borrow at high interest rates from non-institutional sources.

Although the policy of making low-interest credit easily available to small firms is considered a crucial part of most small-scale industries programs, many observers feel that this policy may defeat the employment-creating ability of these firms. Morawetz (1974) has summarized this argument in his review paper. According to this point of view, small firms tend to face less distorted factor prices than do large firms. Wage legislation is often not heeded by small firms and so the wages they pay are lower than those found in the large-scale

industry sector. At the same time, capital costs are higher for the small firms since subsidized credit and other capital subsidies are available to large firms. Consequently, small firms tend to use more labor-intensive techniques. Providing the small firms with credit at the same rates as those available to large firms may actually encourage the small firms to utilize more capital-intensive techniques.

According to Paine (1971), small firms in Japan were forced to use labor-intensive techniques because the economic situation they faced was different from the one faced by the large firms. Paine points out that capital was more expensive and less available to small firms. Large firms obtained most of the loans made by various financial institutions and they were also charged lower interest rates. On the other hand, their labor costs were very much lower than the large firms. Based on Japan's experience with labor absorption by small firms, the authors suggests that one way of achieving the same in LDCs is by "pricing and allocating credit so as to prolong the existence of labor-intensive techniques."

Although the above discussion is concerned with small-scale firms, it is quite relevant to rural firms since the factor prices they face are also expected to be similar to those faced by the small firms.

We next consider the role of other infrastructure in the process of rural industrialization. Ho (1979) has argued that a major contributing factor for industrial decentralization in Taiwan (which in turn made rural industrialization possible) was the well-developed and evenly distributed economic infrastructure and human capital in the rural areas. Rural electrification had begun early in Taiwan, and by 1960, electricity had reached 70% of its farm households. Western

Taiwan, where the farms and the rural population are concentrated, has a very well developed transportation system which connects it by rail to Taiwan's most important ports and industrial centers. The density of paved highways and feeder roads was 214.5 km per thousand sq. km in 1972, very high in comparison to other developing countries (HO, 1979). According to Ho, "in the colonial period Taiwan's transportation system helped agriculture's commercialization and development, and in the 1960s, when rapid industrialization began, it helped to transmit industrial growth from the major urban centers to the smaller towns and the surrounding countryside." In 1958, Taiwan adopted an "outward-looking" developing strategy to take into account its comparative advantage, that of cheap labor. As a result of well-developed infrastructure, particularly transportation system, much of the growth in industry took place in rural areas, the main source of labor in Taiwan.

In the case of South Korea, the development of rural infrastructure was comparatively inadequate at the time when Korea emphasized export policy (Ho, 1980). Consequently, only the major cities were able to take advantage of the opportunities posed by the new policy and subsequent concentration of industrialization was inevitable.

In the Indian study mentioned earlier, Papola and Misra (1980) have also considered the relationship between the availability of transportation and the level of industrial activity in their sample villages. Two modes of transportation are considered in the analysis -- railway and road. The authors found that proximity of the village to a railway station showed no relationship with the percentage of its workers engaged in manufacturing. However, the percentage of village income

originating in manufacturing as well as income per manufacturing worker in a village were found to be negatively related to proximity to a railway station. The authors explain the first result by stating that most of the village industry units do not use the railway as a mode of transporting materials and products. However, they are unable to propose a possible explanation for the second result.

In the case of road transportation, Papola and Misra find no clear relationship between the availability of road and the percentage of workers engaged in manufacturing. However, according to the authors, availability of roads seemed to show a significant difference in terms of income from manufacturing. In the case of villages with a road, 9.86% of the income was from manufacturing. The percentage in the case of villages with a road within 2 km was 0.87 and for the villages with a road farther than 2 km, this percentage was 3.89. Income per worker in manufacturing for the same three cases was estimated at Rs. 2,912.40, Rs. 2,051.92 and Rs. 930.49 respectively.

Besides considering the relationship of transportation availability with the rural industrial activity, Papola and Misra have considered the effect of proximity to an urban area on three indicators of rural industrial activity. The authors consider the proximity to an urban area as important because of its potential as the source of materials and markets. However, we have included this result for discussion under "infrastructure availability" because we feel that an urban area located close to a village may be a reasonable proxy for the availability of other types of infrastructures and facilities such as better communications, banking, access to relevant government officials, etc. The study found that all three indicators of rural industrializa-

tion (percentage of workers in manufacturing, percentage of income from manufacturing, and income per worker in manufacturing) showed a consistent decline as the distance between the village and nearest urban area increased. However, as mentioned earlier, these relationships should be treated with caution as they are based on simple correlations.

So far, we have only considered infrastructural requirements in general, and not according to the specific needs of different industries. However, it should be clear that the infrastructural requirements will differ from industry to industry. Some industries may be heavy users of the transportation system while others may be more dependent on the availability of energy. The Stanford Research Institute (SRI) study (1968) of India throws some light on the issue of infrastructural requirements of various industries. The study's sample of industries was categorized into high, medium and low users of different infrastructures. The study also calculated location quotients for various industries for different size categories of cities. Based on this type of information, it is possible to suggest the type of industry and also the infrastructure required for different sized towns.

We can consider here the study's findings regarding power and transportation use by some industries. With regard to power, processing industries (rice and flour milling, processing of edible oils, starch processing, cold storage, etc.) have very high power requirements (high intensity of use as well as high connected load). Power consumption is also quite high for industries such as light structurals, sugar machinery, nuts and bolts, rubber footwear, utensils, textile finishing and textile power looms. Industries which showed low power use were the

high precision and skill oriented industries such as optics, electric lamps, and scientific instruments; and those producing cast iron pipes crushers and expellers, non-electric household equipment, hand pumps, casting of sewing machine parts, general purpose machine tools, and power driven pumps. Assembling hurricane lanterns, canning and preservation of fruit and vegetables, drugs and pharmaceutical production are also very low users of power as they involve many manual operations.

The SRI study was able to reveal certain patterns of demand for transportation among its 673 sample firms located in 18 cities. The demand refers to the industry's demand for both intra-city and inter-city transportation (inter-city being road transportation, while inter-city being both road and rail). The demand was calculated in terms of tonnage of raw materials and finished products moved. It was observed that flour and rice mills, cold storage, edible oils, textile processing, and some other industries were heavy users of transportation. In general, these industries have a low value added. They are direct raw material consuming industries. Consequently, transport costs are high. As a result, these industries often tend to be located near the source of the raw material or the center of consumption.

On the other hand, auto parts, utensils, hand tools, precision machine tools, electric motors, storage batteries, and surgical instruments industries are not transport oriented. Transport costs in the total cost of production are much lower than they are in the above mentioned industries. Transportation of the finished product is also much easier as it is not perishable.

According to the SRI study, rail transportation is mostly used by the metal and machinery industries. For example, conduit pipes, cast

iron pipes, metal utensils, hurricane lanterns, hand tools, and sugar machinery use rail transport for more than 60% of their tonnage. These industries use bulky raw materials such as pig iron, coke and sheet metal. An exception in this category are major agricultural implements which are distributed by rail transport to rural areas. The rural areas in India are better served by road than by the rail system.

Knowing the importance of infrastructure in the process on industrialization, the question still remains as to how we can minimize the effect of inadequate rural infrastructure in many LDCs. The literature has a major gap in this regard.

III.4 SIZE OF LOCALITY:

It is well understood in the industrial location literature that the size of the town or city is an important factor in the location of any industrial firm. The size determines the benefits the firm can enjoy from agglomeration economies and it also is one determinant of potential market size. In this discussion, we define size in terms of population, since we have already considered the income aspect earlier. For these reasons any manufacturing activity requires a certain minimum threshold of population to make it viable. We would also expect that this threshold will differ according to the type of activity proposed. There is not much work done at present with respect to the size of rural centers which can support different types of manufacturing. There is a large body of literature available on the related subject of market towns and service centers.

The study by Papola and Misra (1980) has examined the relationship between village size and the extent of its industrialization. They had expected the larger villages to show greater industrialization as measured by their three indicators. This hypothesis was based on the assumption that "a larger population would provide a larger local market." However, the results showed that the percentage of workers engaged in manufacturing actually declined as the village size increased. A similar negative relationship was observed between the size of the village and the other two indicators -- the share of village income from manufacturing, and the yearly income per worker from manufacturing.

The authors provide two possible explanations for this relationship. First, as many of the village industries were traditional artisan type catering to local demand, a few persons in each craft were considered to be adequate in each village irrespective of its population size. Second, the average size of the villages in the study sample was thought to be too small to see the expected relationship. The authors argue that "it seems necessary to have a minimum size of village before it could sustain a sizeable industrial activity." Further, they add, "most of the villages studied are far below this threshold population -- and the extent of industrial activity does not, therefore, show any consistent and logical relationship with the population size."

The SRI study mentioned earlier did a location quotient analysis showing the relative dispersion/concentration of each study vis-a-vis the population distribution in centers of different sizes. Since this analysis dealt with urban centers, centers smaller than 20,000 were

not considered. Even so, a town of 20,000 is quite small and often retains certain rural characteristics. Moreover, the Rural Industries Program had included towns with 15,000 population within its area of operation. Later as the Program proceeded, it was observed that some rural industries were locating in centers with population between 15,000 and 25,000. Given this, the results of the SRI study for towns with populations of 20,000 do have some value in identifying appropriate industries for small semi-urban towns.

According to this study, there was a very high incidence of dairy, bakery, sugar, beverages, rope making, cotton ginning, footwear, wood paper, glass and pottery firms in the small towns in U.P. In general, these industries had a location quotient below 1 in other size centers, further signifying a strong orientation to small centers. In neither State was technologically advanced industrial activity associated with the small urban centers.

The SRI study also showed that there were some industries which were widely dispersed in different size groups. These were flour and rice milling, ice making, cold storage, clay products, repair of motor vehicles, castings and forgings of different sizes, nonferrous metal products, and beverage producers. While some of these activities are services and hence need to be located in the area of consumption, the others involve high transport costs. Consequently, such activities tend to locate in all size centers.

On the basis of data on small unregistered industrial firms in Gujarat state, Van der Veen (1973) has also indicated the tendency of certain types of firms to cluster in a given size of town. Industry groups which were of relatively greater importance in the smaller towns

(with population of 49,999 or less) were those in the food processing industries, the non-metallic mineral products group, and the wood, paper, leather, rubber group. This observation also suggests that industries relying on inputs from agriculture, mining and forestry tend to be located in the less urban areas.

There is a need for similar studies for more rural towns. Understanding the relationship between the size of the locality and the manufacturing activity it can support will help us to better define what we mean by rural areas and rural industrialization. There is much confusion regarding this issue in India as well as in other LDCs, and this had led many a rural industrialization program to fail because it was too ambitious in what it proposed to produce in villages. In fact, it may just not be possible to industrialize small villages. For example, in its attempt to encourage rural industries in its rural development program (PIDER), Mexico delineated villages between sizes ranging from 300 to 3,000 people (Sigurdson, 1978). However, in Mexico, according to Sigurdson, industrial activities and services are usually found in towns with a population greater than 3,000. So rural industries set up in villages of under 3,000 are bound to suffer from a lack of adequate facilities and services necessary for industrialization.

III.5 FACTORS RELATED TO PRODUCT CHOICE:

In this section we will look at the literature concerning appropriate product choice for developing countries and factors such as choice of technology and scale economies involved in this choice. However, some of the generalizations can be extended to production in rural areas since the basic underlying assumptions regarding the economic and

and technological conditions are similar.

The type of goods selected for production in rural areas will significantly determine the performance of rural firms. Products differ in their "characteristics," that is, the needs they fulfill. A single product can have many "characteristics" and hence can satisfy a variety of needs. According to Morawetz (1974),³ this nature of many products points to the possibility of "removing of 'excess' of 'redundant' characteristics from existing products, and to the possibility of developing new products which are more 'appropriate' to the needs of low-income consumers, and to the factor-endowments of poor countries." Morawetz cites the evidence from studies in Puerto Rico and Venezuela which suggest that with industry output held constant, an intra-industry move towards production of goods using the abundant factors intensively had important macro employment implications. However, the author points out that in both of the above studies, it is unclear whether goods which are appropriate in the factor-use sense are also appropriate in the consumption sense.

Arguments for appropriate product choice for developing countries seem to be based on the idea that a production strategy based on simple, mass consumption goods is employment generating as well as "equity" oriented. This is basically the approach supported by the ILO in its articulation of a "basic needs strategy." The industrial component of the basic needs basket includes items like processed foods, clothing, footwear, construction materials, bicycles, matches, soaps, domestic

³Refer to Lancaster (1966) and Stewart (1972, 1973) for a discussion of the theory of intra-industry product choice. Morawetz (1974) offers an overview of the theory.

utensils, low-cost furniture, etc. (U.N., 1978). According to the U.N. Study, the production of many of these products require simple technologies and organizational skills. However, neither this study nor any other that we have reviewed offers any empirical estimates of the exact employment impact of increasing the production of so-called "appropriate goods."

Apart from the above considerations of "characteristics" of goods, product choice should depend on the availability of various technologies and resources. Technologies vary widely not only between different types of products, but also in the production of the same product. Sen (1968) points out that a number of alternative techniques are available to a developing country, with the factor-proportions varying widely from technique to technique. For example, in the case of weaving cloth, techniques vary from "primitive throw-shuttle" handlooms to advanced automatic powerlooms.

In discussions about the choice of technology for developing countries, it is proposed that they utilize "intermediate" or "appropriate" technologies. It is believed that the ability of these countries to cope with unemployment depends on the adoption of such technologies which make the optimum use of available resources. They are seen to fall between the two extreme technologies -- the traditional, labor-intensive techniques and the modern, sophisticated techniques. Such a technology, for the same amount of capital investment is expected to produce more output than the traditional and provide more employment than the sophisticated.

According to Schumacher (1973) "the intermediate technology would also fit much more smoothly into the relatively unsophisticated environ-

ment in which it is to be utilized. The equipment would be fairly simple and therefore understandable, suitable for maintenance and repair on the spot. Simple equipment is normally far less dependent on raw materials of great purity or exact specifications and much more adaptable to market fluctuations than highly sophisticated equipment. Men are more easily trained, supervision, control, and organization are simpler; and there is far less vulnerability to unforeseen difficulties."

Such technologies would appear to be well suited for rural industrialization, particularly when considered in the light of such goals as reducing unemployment, stimulating local entrepreneurship, and maximizing the use of local resources. However, in spite of all the interest generated by these types of technologies, there are inadequate instances in the literature of their successful applications. In fact, the Indian case of khadi production by Ambar Charkha discussed earlier shows that such technologies, in practice, may fail to create enough employment or produce output which can compete against more modern technologies, in spite of heavy subsidies.

Viable rural production also depends on whether or not scale economies are important in that industry. Almost as a rule rural industries in LDCs are fairly small in size. The products for small-scale production have to be those which do not have economies of scale in production. In Taiwan, small firms are so dominant because the products they produce do not have any significant scale economies (Ho, 1980). When economies of scale exist, larger firms will be in a better position to undercut smaller firms within the industry; their supply prices will be lower. But there is a limit to the advantages that economies of scale can confer to large firms. If markets are fragmented

by distance, transport costs restrict the ability of large firms to be competitive with local producers. In this sense some small firms in rural areas can have a natural protection.

Large markets and economies of scale in marketing are also responsible for large scale production of many consumer goods. Staley and Morse (1965) in their classical study on small-scale industries suggest that industries serving small total markets show a predominance of small enterprises. In the Taiwan and Korea study (Ho, 1980) it was observed that small markets were indeed an important factor favoring small-scale firms in many industries. Since rural firms tend to be small, it seems appropriate that they undertake production of products which have limited markets. Small markets could be the result of a specialized product or because the total market, although large, is widely dispersed as a result of topography, poor transportation links between regions or lack of marketing networks. Under such conditions even a large producer finds it difficult to take advantage of outlying rural areas.

Based on the above literature survey, we can conclude that there have been very few attempts at defining and empirically verifying systematic hypotheses regarding the various factors that affect the performance of rural industries. In the next chapter we have formulated such a set of hypotheses.

CHAPTER IV

THE PERFORMANCE OF RURAL FIRMS: SOME HYPOTHESES

In the last chapter we saw that many researchers have discussed the role of different factors in the process of industrialization in LDCs without specifically linking these factors to the question of the performance of rural firms. In this chapter we will identify some of the important factors that affect the performance of rural firms.

The first step in our analysis will be to define the criteria by which the performance of the rural firms will be judged. Since these normative criteria will vary from program to program, we will discuss a number of criteria in general, and, in Chapter VI, select three of them as most relevant for the Rural Industries Projects (RIP) program.

The second step in our analysis will be to outline a behavioral model of the rural firm, which will predict how the firm responds to changes in its external economic environment. These predictions will be in the form of empirically testable hypotheses.

The hypotheses generated in the second step will be related to those aspects of the firm's behavior to which we will apply the performance criteria defined in the first step. In this way, we will develop a set of hypotheses about the factors that affect the performance of rural firms.

This chapter has three sections. In the first section we discuss the performance criteria; in the second section we develop the model of the firm's behavior; and in the third section, we present the empirically testable hypotheses.

IV.1 A DISCUSSION OF THE PERFORMANCE CRITERIA:

In any rural industrialization program there will be many participants who will directly or indirectly be affected by the program. Consequently, a discussion about the performance of the program is bound to be a subjective matter depending on the point of view of the different participants.

For example, from the point of view of the national or state government, the rural industrialization program may be seen as an instrument for bringing about regional growth or development. These authorities are thus likely to consider those programs successful which generate savings, or exploit local resources to reduce the region's dependence on some scarce imports.

From the point of view of a particular community or village, global economic and social objectives may be of less concern than some immediate need. For instance, the community may be more interested in the employment and income generating aspects of rural industrialization.

On the other hand, private rural entrepreneurs are most likely to be interested in their profits. Thus the firms would like to be supplied subsidized inputs and cheap credit regardless of the impact this may have on the feasibility of the program from a broad societal point of view.

Some groups related only indirectly to the rural industrialization program may also have some expectations about it. For example, urban firms which fear competition from subsidized rural firms would probably want the program to remain small in terms of output. Cash-crop farmers might consider the program successful only if the rural firms are of the agro-processing type which can buy the farmers' crops; food-crop

farmers might look favorably on the program if the rural firms can supply them with agricultural inputs and services.

The multiplicity of objectives of rural industrialization programs makes it necessary to consider a number of alternate criteria by which to judge such programs. We discuss six criteria in this section; of these, only the first three have been used in the econometric analysis.

As an alternative to considering the six criteria separately, it is possible to use the technique of social cost-benefit analysis to evaluate the rural industrialization program. Such an analysis will indicate whether the program overall is socially desirable or not. However, we are interested in the various determinants of the performance of the individual firms. This is best done by analyzing each objective separately.

Employment Generation:

One of the commonly-stated objectives of rural industrialization programs is to create employment. Our first criterion of appraising such programs is related to this objective.

The total number of jobs created by a program is one indicator of its effectiveness. However, this can be a misleading indicator because the number of jobs generated depends, to a substantial extent, on the size of the program. In view of this, we have selected the total cost of creating a job as the first criterion.

In a program which consists of privately-owned firms producing a variety of goods, it seems appropriate to select the labor-capital ratio of each firm as the desired measure of cost of creating a job. Clearly,

a high ratio of workers to fixed assets is warranted in LDCs where capital is scarce.

Note, however, that high labor-intensity by itself does not imply that a firm is using its resources efficiently. We have seen earlier that high labor-intensity in the Indian Khadi industry has been accompanied by very low levels of output per unit capital as well as per unit labor. Further, Banerji (1977) found similar relationships for many traditional village industries in India. These industries include leather processing, processing of cereals and pulses, carpentry, production of khadi, unrefined cane sugar, soaps, oils, etc.

Capacity Utilization:

Our second criterion for evaluating the performance of rural firms is the level of capacity utilization. Since most developing countries are faced with the problem of capital scarcity, effective use of existing capital is certainly a desirable characteristic of all industrial firms, not just rural firms.

Note that the levels of capacity utilization found most profitable by private firms need not coincide with the socially desirable levels. Hence, our criterion can be used to distinguish firms whose private decisions are consistent with social goals from those whose decisions are not consistent.

Growth of the Firm:

The need for fresh jobs in the rural areas is obvious. Firms which have high growth rates hold out the promise of absorbing further additions to the work-force, while firms which grow slowly are unlikely to

hire new workers. Further, a high growth rate indicates the ability of the firm to innovate and to respond to the demand for its products.

From this point of view, the growth rate of the firm is a useful criterion for assessing the performance of the firm. At the same time, it should be recognized that firms with low growth rates may already be providing employment to a substantial number of workers, so such firms should not be considered "failures."

Private Profitability:

The private profitability of rural firms is not necessarily indicative of the firms' effectiveness in meeting overall social goals, which is given by the social benefit-cost ratio. However, a firm which is not profitable will not be self-sufficient and will require government subsidies and support. Since such subsidies would imply a tendency towards deficits in the government budget or new taxes on some other part of the economy, the authorities may be interested in sponsoring those firms which require low levels of support -- provided the firms satisfy the other objectives.

If rural industries were profitable on their own, there would be little need for government intervention to promote them. Rural firms may not be profitable due to internal factors such as lack of experience on the part of the entrepreneurs or due to external factors such as poorly functioning markets or infrastructural problems. Hence, it appears inevitable that some form of official support would be required in the early stages of rural industrialization.

The rationale for initial support to rural firms is akin to the "infant-industry" argument advanced for import-substituting heavy

industries. The experience of these industries underlines the need for ensuring that rural firms shake off this dependence and become self-sustaining. Some indicators of a firm's progress towards attaining private profitability are: the rate of return on the capital invested, the ability to cover the capital invested, the ability to cover variable costs, to service and repay loans, and to reinvest profits.

Local Resources Mobilization:

Many rural industrialization programs lay a heavy stress on local resource mobilization. This is seen most prominently in China's rural industrialization program. As we have pointed out in the literature survey, the rural industries in China are geared toward utilizing locally available resources to serve agriculture's modernization needs. Some of these industries also produce consumer goods, again mainly for their communes or brigades.

Local resource mobilization is very important in China because its objective is to attain commune and brigade level self-sufficiency. Under such circumstances, the performance of the rural industries may be judged on their "extent of local orientation."

Local resource utilization is also an important consideration in India. However, rural firms are not seen as instruments to achieve village self-sufficiency and therefore, are not encouraged to use only those materials which are available locally. Nor are the firms encouraged to produce only for the local consumers. In view of this, at least in the case of India, local resource utilization cannot be considered as a major objective; it is only a desirable characteristic of rural firms.

Income per Worker from Rural Non-farm Employment:

The employment objective of various rural development programs presumes that the employment will provide at least an acceptable level of income to the workers. It is clear that not all types of rural industries can provide equally lucrative employment. We can point to India's experience with khadi production; in the literature survey, we saw that Sen (1968) calculated the real income to weavers per 8-hour day as absurdly low.

In a perfectly competitive labor market, the wage rate is the same across all industries. However, if there are any differences in the skills requirements, the wage rate is likely to be different across industries.

The above criteria should be viewed as different aspects of a rural firm's performance. Although these are all desirable characteristics, not all rural firms, whether in different programs or in the same program, will exhibit them. Depending on the objective of a program, the policy should be to encourage those characteristics which will help in achieving the objectives.

Summary and Conclusion:

We have outlined six criteria to evaluate the performance of rural firms. These criteria are not necessarily consistent with each other. For example, the growth rate of highly labor-intensive firms may be low. Further, the weights attached to the different criteria will tend to vary from country to country, or even from program to program in the same country.

IV.2 THE MODEL OF THE FIRM:

The behavioral model outlined below is a modified version of the standard static profit-maximizing model of the firm used extensively in microeconomic theory. Our model describes how the firm chooses its labor-intensity and capacity utilization levels in response to the external conditions it faces. A similar analysis of the growth rate of the firm's output would require the development of a dynamic model, which is beyond the scope of this study.

The production function of the firm shows the combinations of various inputs that can be used to produce various levels of output. In the simplest case of the standard model there are only two factors of production, usually capital and labor, and the production function can be written as: $Q = Q(K^*, L^*)$. Here K^* is a measure of the flow of capital services (e.g., machine hours), L^* is a measure of the flow of labor services (e.g., work hours), and Q is the output. We will denote the stock of capital and labor by K and L , respectively.

The firm is assumed to be a price-taker: the price of the output as well as the factor prices are exogenous to the firm. Given these prices, the firm chooses K^* and L^* to maximize profits, subject to the constraints imposed by the production function.

This standard model can be algebraically written as:

$$\text{Maximize } \Pi = pQ(K^*, L^*) - wL^* - rK^* \quad (1)$$

where p is the price of the output, w is the wage and r is the cost of capital. The optimal values of K^* and L^* are found by setting equal to zero the partial derivatives of Π with respect to K^* and L^* ; this will give two simultaneous equations whose solution will give K^* and L^* as functions of the exogenous p , w , and r ; the nature of these

functions will depend on the production function itself.

This model represents the long-run decision-making behavior of the firm, e.g., before the firm has installed any machinery or other fixed assets. Once the firm has acquired its capital stock, changes in this stock can take place only over time. In the short-run version of this model, the capital stock is taken as fixed, and the firm chooses the levels of the other inputs.

The Modified Model:

The standard model described above does not consider any questions related to capital utilization. Few firms use their capital stock on a 24-hours-a-day basis, but the standard model does not explain why the firm leaves capital idle.

Winston (1974) has put forward two reasons for idle capital. First, the capital stock is not used continuously because of adversities and unexpected events, i.e., "plants are often idle because something went wrong ex post." According to Winston, this could either be a product-demand-adversity or some adversity on the input supply side. In the first case, contrary to expectations ex ante, the firms are faced with deficient demand and so have to leave their capital idle. In the second case, capital is left idle because of some unanticipated shortage of inputs.

The second reason for idle capital is intentional or ex ante. In other words, the firm installs capital even though it knows that the capital will be idle. According to Winston, this could be due to either product demand variations or due to rhythmic changes in input

prices. Firms may anticipate that demand will grow over time and so install excess capacity to take advantages of future economies of scale. Or firms may wish to have the capacity to meet the peaks of a fluctuating level of demand. On the supply side, there may be systematic changes in input prices -- such as higher wages at night -- which make it unprofitable to use the capital stock continuously.

On the basis of this analysis, Winston has defined the following concepts related to capacity utilization: "Maximum capacity" is the level of output associated with using the capital stock continuously, excluding the time for maintenance. "Full capacity" is the firm's intended level of utilization which is based on the normal working schedule. Thus full capacity is less than or equal to maximum capacity. "Excess capacity" is the difference between full capacity and the actual level of utilization. In principle, the actual level could be larger than full capacity (as in a period of unexpected jump in demand), so that excess capacity can be negative.

We have incorporated capacity utilization into the standard model of the firm along the lines suggested by Abel (1981).

Let L and K represent the number of workers and the stock of capital. The flow of labor services and capital services is given by $L^* = \beta L$ and $K^* = \beta K$, where β is an index of utilization which is assumed, for simplicity, to be the same for both labor and capital. This index of utilization is bounded by the lower limit of zero and the upper limit of "maximum capacity." Further, we include M in the model to represent an aggregate measure of raw materials used by the firm. Now the production function of the firm can be written as:

$$Q = Q(\beta K, \beta L, M) \quad (2)$$

Note that the production function will be different for firms in different industries.

Following Abel (1981), let s be the nominal scale wage rate. This hourly rate is used as the base in calculating the actual hourly wage earned by the worker. The actual wage depends on how much "overtime" the worker puts in. This relationship is made explicit by setting the actual hourly wage equal to $sw^*(\beta)$, where $w^*(\beta)$ is an increasing function of β . In other words, the hourly wage earned by the worker depends on the base wage rate s and on the index of utilization β .

With this formulation, the total wage payment per employee is found by multiplying the actual hourly wage by the index of utilization, i.e., by $sw^*(\beta)\beta$. Further, the total wage bill is given by $sw^*(\beta)\beta L$, where L is the number of workers.

Note that the nominal wage scale rate s is an exogenous variable, but the actual hourly wage is endogenous because it depends on β . However, the nature of the wage function $w^*(\beta)$ is given to the firm.

The long-run problem of the firm is to choose K , L , M , and β to maximize profits. Let m represent the unit cost of raw materials. The long-run problem can be written as:

$$\begin{array}{l} \text{Maximize} \\ K, L, M, \end{array} \quad \Pi = pQ(\beta K, \beta L, M) - sw^*(\beta)\beta L - rK - mM \quad (3)$$

By setting equal to zero the first partial derivatives of Π with respect to K , L , M , and β we get four simultaneous equations in the four decision variables.¹ The simultaneous solution of these equations will give the endogenous variables K , L , M , and β as functions of the exogenous

¹Since β has an upper bound, the maximization problem should include this constraint, but we have not considered this in this discussion for simplicity's sake.

variables p , r , m , and s ; the nature of these functions will depend on the nature of the production function, and of the wage function $w^*(\beta)$.

The equations which show the optimal values of the endogenous variables K , L , M , and β as functions of the exogenous variables are "reduced-form" equations. These reduced-form equations show the net effect of the exogenous variables on the endogenous variables, after the underlying interactions between all the variables have been taken into account.

In the standard model, the ratio of the marginal products of capital and labor is equal to the exogenous relative prices of capital and labor. Further, if the production function is homothetic, i.e., the isoquants are radial "blow-ups," this result implies that the capital-labor ratio depends only on the relative factor prices.

In our model, only the nominal scale wage rate s is exogenous, while the actual hourly wage rate is endogenous since this depends on the level of utilization β . In other words, the relative factor prices of capital and labor facing the firm are endogenous. Of course, the ratio r/s is exogenous as in the standard model. Note that the value of β itself depends on all the exogenous variables in our model.

Even though the relative factor price ratio is endogenous, it will still be true that in equilibrium the ratio of the marginal product of capital to labor will be equal to the relative factor price ratio. This result follows directly from the cost-minimizing assumption about the firm's behavior.

The immediate consequence of the above result is that the ratio of the marginal products depends on all the exogenous variables (via β), and not just on the ratio r/s . In turn, the capital-labor ratio will

depend on all the exogenous variables. This result will hold even if the production function is homothetic.²

There is a simple interpretation for this result. The firm can adjust to changes in the price of the output or in the input prices by changing the planned utilization rate or the levels of the various factors. In general, the firm will adjust both as well as the labor-capital ratio.

The Short-run Model:

In the short-run version of this model, the capital stock K is fixed, but the firm is assumed to be free to vary L , M , and β . Hence, the short-run problem can be written as:

²We can see this clearly for a two factor constant returns to scale Cobb-Douglas production function, which is a special case of a homothetic function. The firm's problem is to maximize profits, which are given by:

$$p\beta K^a L^{1-a} - sw^*(\beta)\beta L - rK$$

The first derivatives with respect to K , L , and β can be written as:

$$a p \beta (K/L)^{a-1} - r = 0 \tag{i}$$

$$(1-a)p\beta (K/L)^a - sw^*(\beta)\beta = 0 \tag{ii}$$

$$L \{ p(K/L)^a - s(w^* + \beta w^*) \} = 0 \tag{iii}$$

By dividing (i) by (ii), we can derive:

$$\frac{a}{1-a} \frac{L}{K} = \frac{r}{sw^*(\beta)\beta} \tag{iv}$$

This shows that the labor-capital ratio depends on r , s and β . From (iii) we can see that β itself depends on p , s and the labor-capital ratio. The simultaneous solution of the non-linear equations (iii) and (iv) would give the reduced form equation in which the labor-capital ratio would be a function of p , r , and s .

We have shown that even in this special case, the labor-capital ratio depends on all the exogenous variables, and not just the exogenous factor prices.

$$\begin{array}{l} \text{Maximize} \\ L, M, \beta \end{array} \quad \Pi = pQ(\beta \bar{K}, \beta L, M) - sw^*(\beta) \beta L - mM - r\bar{K} \quad (4)$$

As in the long-run model, we can form three simultaneous equations in the endogenous variables L , M , and β by setting the first partial derivatives of Π equal to zero. The solution of these equations will give L , M , and β as functions of p , m , and s with the nature of the functions depending on the production function and the wage function. These are the reduced-form equations in which we are interested.

In this formulation, we have assumed that it is possible to use a varying number of workers with the given capital stock in the short-run. Winston (1974) has defined the elasticity of factor service substitution as the measure of ease with which the workers can be varied, and has cited empirical evidence from developing countries which suggests low but non-zero values for this elasticity.

As in the long-run model, we can state some results about the nature of the reduced-form equations without an explicit comparative-static analysis.

First, the labor-capital ratio will depend on all the exogenous factors, not just on the relative factor prices. This result holds whether or not the long-run production is homothetic. The reason is that the number of workers can be changed while the capital stock is fixed in the short-run. Suppose there is an unexpected increase in the price of the output; in the short-run the firm may meet the implied increase in demand by increasing L so that the labor-capital ratio may rise.

Second, the response of the labor-capital ratio to changes in the exogenous variables may not be the same in the short-run and the long-

run. In the example above, the firm may increase the labor-capital ratio in the short-run in response to the output price rise. However, in the long-run, the firm may choose to install new capacity, so that the firm's labor-capital ratio falls, perhaps to below even the original long-run level.

Third, the firm can respond in the short-run to external changes by varying L or β or both. In general we expect that the firm will vary both; the degree of change in L and β will depend on the elasticity of factor service substitution and the nature of the wage function. Thus the firm has to make a joint decision about the labor-capital ratio and the level of capacity utilization.

Some Modifications:

In the above analysis we have assumed that the firms want to maximize profits and that their managers are able to make the correct decisions to attain this goal. However, as Lecraw (1979) has pointed out, there are several reasons why firms may not behave according to these assumptions.

First, the above model is deterministic; once uncertainty is introduced, the model has to be modified so that the firm maximizes expected (in the sense of mathematical expectation) profits rather than profits. While theoretically this is only an extension of the model, in practice there is a complication. In order to maximize expected profits, the firm has to have an idea about the nature of uncertainty, i.e., the firm has to know the probability distribution of the uncertain variables. Since this knowledge is subjective, different firms might make different decisions about the endogenous variables even if all the

the firms face the same exogenous variables. These differences would reflect the subjective assessments that firms make about the uncertain variables.

Second, even within the deterministic framework, firms may not set the endogenous variables strictly in accordance with the functions derived from the model. Firms may simply behave according to some sort of "satisficing" rules, as suggested by Simon (1959), rather than the profit-maximizing motive. Simon used the term "satisficing" to describe the behavior he observed in manager and workers in a firm. According to this behavior, the owners and the workers of the firms were satisfied so long as the performance of the firm was above some "satisfactory" level.

Third, according to Leibenstein's theory of X-efficiency, there may exist within a firm "inert areas" which result in nonmaximizing behavior. These "inert areas" are caused due to imperfect information, lack of control, and incomplete contracts associated with the organizational and operational aspects of the firm.

Fourth, Lecraw has cited Wells' (1973) study of the decision making by managers of firms about the choice of technology. He found that there is a tradeoff between profits and the satisfaction of using modern, fast, capital-intensive technology. Some managers may be biased towards capital-intensive techniques even if they are inappropriate.

Lecraw's (1979) own analysis of 400 firms in twelve industries in Thailand found evidence of "technical" inefficiency (resource waste by firms) as well as of "price" inefficiency with firms choosing labor-capital ratios not in accordance with the profit-maximizing model.

Conclusions:

In this section we have developed a modified version of the standard profit-maximizing model of the firm which provides a theoretical framework for analyzing the performance of the rural firms. Given the static nature of the model, it is not possible to link the growth rate of the firm to this model. However, the model deals explicitly with the firm's choice of its levels of labor-intensity and capacity utilization. We have seen that the broad exogenous variables that determine these two levels are the nature of the production function, the price of the output, the price of capital, the price of raw materials, the nominal wage scale rate, and the nature of the wage function.

We noted that the firms may not behave exactly as predicted by the model, because some of the assumptions made in the model may not hold true. In particular, the model is deterministic while the firms have to deal with many uncertainties. Further, the desire or the ability of the managers to maintain profit-maximizing behavior may not be as complete as assumed by the model. Finally, the model does not consider the institutional factors which affect the firm's behavior.

We can conclude that the model helps in identifying some of the major systematic forces which explain the level of the firm's labor-intensity and capacity utilization, but the exact behavior of the firm will depend greatly on the subjective and random biases and assessments of the firm's managers, as well as on the institutional environment facing the firm.

IV.3 SOME HYPOTHESES REGARDING THE BEHAVIOR AND PERFORMANCE OF THE FIRMS:

In this section we discuss various hypotheses regarding the factors that affect the behavior of rural firms; as discussed earlier, our interest is in those aspects of the firm's behavior which are linked to our performance criteria. The hypotheses are grouped into three categories: region related hypotheses, firm related hypotheses, and infrastructure related hypotheses.

Our hypotheses are linked, insofar as possible, to the model of the firm developed in Section IV.2. In this model we have isolated the exogenous variables which determine the endogenous variables. In the following hypotheses we consider several factors which directly affect the level of the exogenous variables, and through them, indirectly affect the level of the endogenous variables.

Region Related Hypotheses:

The rural areas of a country are not a homogenous entity -- they differ in their attributes. Some rural areas clearly have a higher developmental potential than others, i.e., they may have a more fertile agricultural land or some other valuable resource.

The region related hypotheses say that the performance of a rural industry will be influenced by the characteristics of the region in which it is located. Note that we are not interested in the factors that are responsible for the particular characteristics of the region such as level of development or the regional occupational diversity, but with the effects of these characteristics on the performance of rural industries.

We expect to see exogenous regional differences in the level of demand (equivalently, the price of the output), the prices of the inputs, and the types of goods produced. In our hypotheses we have considered directly the effects of exogenous regional differences in the wage rates; to analyze the effect of the other differences we have characterized the region surrounding the firm by two indices. These indices are the level of agricultural development, and the level of urbanization and industrialization. We expect that these regional attributes will have similar effects on the performance of the rural firms.

Agricultural Development:

We have already seen from the literature survey that there is a general consensus regarding the positive effect of agricultural development on the overall performance of rural industries.

Agriculturally developed regions can sustain industrial activity with both backward and forward linkages to agriculture. As agriculture develops and modernizes, it requires manufactured inputs such as fertilizers and equipment. Many rural firms are in a position to supply agriculture with a variety of farm equipment and implements. As agriculture mechanizes, the need for associated service industries such as repair, maintenance, storage and transportation also increases. Increased agricultural output can also stimulate agro-processing industries which process crops such as sugar-cane, cotton, tobacco, etc., into finished or semi-finished products for consumption. Finally, the higher incomes resulting from agricultural development

generate a demand for relatively more "sophisticated" consumer goods and services which may also be met by the local rural industries.

For the reasons discussed above, we expect that many of the goods produced in the agriculturally developed regions will be quantitatively different from the goods produced in the other regions. In terms of our model, these qualitative differences can be represented as differences in the nature of the production functions. In particular, we expect that the production functions for these goods imply, *ceteris paribus*, higher capital-intensity than for the goods produced in other regions.

Apart from the exogenous differences in the nature of the goods produced, there may also be regional variations in the level of demand. We expect that the effect of these variations will be, *ceteris paribus*, that the level of capacity utilization will be higher in agriculturally developed regions than in other regions.

It is unlikely that agricultural growth would hinder rural industries in any way; hence we expect that the effect of agricultural development on growth rates, private profitability, and the incomes per worker will be also positive. To the extent that the firms in the agriculturally developed regions are agro-processors, there will be some beneficial effects on local resource mobilization.

Industrialization and Urbanization:

Urbanization and industrialization indicate different types of development patterns. However, both the processes are indicative of a region's modernization. Consequently, it is likely that the effect of both these processes on rural industrialization will be positive,

because the rural firms will be able to take advantage of the infrastructure and services already in place. In other words, the rural firms will be able to benefit from the external economies generated by industrialization or urbanization.

We expect that the effect of both these processes on the performance criteria of the rural firms will be the same as that of agricultural development. First, the rural firms located in or near industrialized or urbanized regions will tend to be less labor-intensive than the firms located in the other regions. The basis for this hypothesis is that the firms in the developed regions are likely to be producing relatively capital-intensive goods and services, i.e., the production functions of these goods are different from those of the goods produced in relatively less developed regions.

Second, the rural firms located in the industrialized or urbanized regions are likely to have higher capacity utilization levels than the firms in the other regions. The basis for this hypothesis is primarily that the level of demand in the developed regions is likely to be higher than in the other regions.

Third, we expect the rural firms in the relatively developed regions to have higher growth rates, higher income per worker and greater likelihood of private profitability than the firms in the other regions. As before, these hypotheses cannot be linked to the model we have used. The basis for these hypotheses is the general consensus that economic development of the region is, at least initially, likely to generate external economies which will help the rural firms. However, we do not expect the rural firms in the developed regions to be different in their use of local resources from the firms in the other regions.

Some Implications:

The above set of hypotheses implies that, *ceteris paribus*, the firms located in underdeveloped and isolated areas are likely to be poor performers in comparison to similar firms located in more developed regions. Since it is the underdeveloped regions that most need alternate income generating opportunities, it becomes very important to select industries which are able to grow -- or at least survive -- under the conditions imposed by the underdeveloped areas. We can speculate on the type of rural industries which are suitable for these areas.

It is clear that firms located in more isolated areas will have to depend much more on locally available resources -- both human and natural. It is possible for official policy to "push" such areas into development by trying to bring in from outside the necessary materials to encourage existing traditional artisan enterprises to become "viable." This might not only make them over-capitalized, but since the support systems (such as roads, power, etc.) are poor, the attempt may not succeed. The "forced" activity will not be feasible for appreciable periods since its links to the outside are very tenuous. The smallest breakdown in the link can cause big delays and work stoppages. Moreover, if the demand conditions in the region remain unchanged, the attempts to modernize existing activities may be fruitless.

The choice of industrial activities for these rural areas may be rather limited. Perhaps the most feasible non-farm activity that may be encouraged here could be related to indigenous arts and crafts which have a specialized market outside. However, the promotion and sale of

these goods require tremendous marketing efforts on the part of the authorities.

Regional Wage Rates:

While we expect that wages within an industry will be approximately equal, we expect that regional differences in wages may persist. The persistence of such differences reflects the lack of integration of labor-markets, based on transportation costs, lack of information or unwillingness to leave one's community. In terms of the model developed earlier, these differences are reflected in the differences in the nominal scale wage rate, s .

We expect the firms facing higher exogenous wage rates to economize on labor, i.e., their labor-intensities will be lower than of the firms which are located in relatively low-wage regions.

We expect the capacity utilization levels for the firms in the relatively high-wage regions to be lower than for the firms in the relatively low-wage regions, since the latter firms will find it easier to boost capacity utilization by hiring more workers assuming all other factors are the same.

We do not expect any a priori effect of differences in the wage rates on the growth rates of the firms, private profitability or resource mobilization. Obviously, income per worker will be higher in the relatively high-wage regions than in the low-wage regions.

Firm-Related Hypotheses:

While exogenous regional variations will affect the performance of the rural firms, we expect that the nature of the firm will also

be an important determinant of this performance. In this set of hypotheses we have considered the effects of the size of the firm, seasonality of the firm's production schedule, age of the firm, the source of the firm's raw materials, and the location of the firm's major market. firm's raw materials, and the location of the firm's major market.

These characteristics of the firm are linked to the model in Section IV.2 in a different way than the characteristics of the region considered earlier. For example, each firm's managers have to decide whether to produce on a seasonal or year-round basis, which implies that the seasonality of the firm's production schedule is an endogenous variable. However, some of the firms choose to be seasonal and others choose to be year-round producers because of the exogenous differences in the opportunities faced by the two groups. In this way, the endogenous choice of seasonality represents the exogenous differences which ultimately determine the performance of the firms.

Scale of Production:

The scale of production is an endogenous variable whose value will be chosen by the firm. However, many small firms, in spite of credit programs, may have difficulty in borrowing at the relatively low interest rates available to larger firms. Thus relative factor prices may vary according to the scale of production. However, we expect that once the scale of production goes beyond a threshold level, the relative factor prices facing the firms are likely to stay the same.

It is the possibility of differences in the exogenous relative factor prices that lead us to expect that smaller firms will be more labor-intensive than larger firms, but this effect will tend to become

unimportant as the scale of production rises beyond some threshold.

We expect larger firms to have lower capacity utilization levels than smaller firms. Since we consider the supply advantages that small firms may have separately, the argument here is related primarily to exogenous demand factors. Ceteris paribus, a smaller firm is more likely to find the demand level needed to keep utilization levels high.

We also expect that small firms will have higher growth rates than large firms. Large firms, in general, have already experienced growth and have stabilized. The small firms, on the other hand, still have the potential to expand. The life cycle phenomenon of a firm says that most firms start small, that some grow, and then stabilize at some level. As the firm matures, it may contribute very little to new growth, either in employment or output.

We cannot make any "a priori" predictions about the differences between small and large firms with regard to their profitability or their propensity to use local resources.

Finally, with regard to income-generating capacity of small vs. large firms, we expect that the income per worker will be lower in the small firms. Smaller firms tend not to be registered as factories in India, as such do not have to abide by the minimum wage laws or other labor benefits. Further, output per worker will tend to be higher in large firms because of their higher capital intensity.

Seasonality of the Firm:

Some rural firms operate only during part of the year. Some examples of this phenomenon are certain types of agricultural processing (sugarcane processing, vegetable oil extraction, etc.) and some pro-

duction activities which are season dependent (brick-making in the rural areas can be carried out only in the dry season).

Our model of the firm is a single-period static model which makes it difficult to directly incorporate seasonal considerations into the analysis. However it is fairly straightforward to see that some firms face systematic and large fluctuations in the prices of their raw materials (in the brick-making example above, the cost of using the kilns is low only during the dry season) while other firms do not face such fluctuations. Generalizing from our model's results, we can say that the utilization level will be low in the period when the raw material prices are high, and vice versa. In particular, in some situations the raw material prices will be so high that the utilization level will drop to zero -- the firm will become a seasonal producer.

Consider now the effect of these rhythmic fluctuations on the capital-intensity of the firm. Once the capital is installed, it will have to lie idle in the high phase of the input price fluctuations. This is clearly a strong incentive for the firm to keep its fixed assets low, and its variable costs relatively high. In other words, the firm will try to produce in the season by applying a large quantity of labor to a rather modest amount of capital. To the extent that this is possible, we expect seasonal firms to be more labor-intensive than year-round producers.

We further expect that the seasonal firms, at least during their operational period, will be at higher capacity utilization rates than the regular firms. The reasoning is similar to the one proposed before; the seasonal firms, in trying to maximize their output within a short period resort to multiple-shifts operations, thus utilizing

their production capacity quite intensively. However, their capital lies idle when the activity period ends. Whether this can legitimately be considered as a case of underutilization of capacity is questionable. If capacity utilization is defined in terms of output, we may find that the seasonal firms may be doing quite well.

On the third criterion of growth rate, we do not expect any particular differences between seasonal and regular firms. Both categories of firms will be influenced by demand factors about which we can have no "a priori" expectations. However, it may be possible to be more precise if we were to identify the specific seasonal on regular industry and the demand elasticities for its product.

Similarly, we have no reasons for expecting any significant differences in the private profitability of the seasonal and the regular firms. On the last two criteria, that of mobilization of local resources and income per worker, again we do not expect any substantial differences.

Age of the Firm:

The performance of a rural firm could also be influenced by its stage in the life cycle. Since this variable cannot be incorporated into the static model constructed in the earlier section, our hypotheses cannot be linked to that model.

We expect the age of the firm will have a significant effect on only one of the six performance criteria: the growth rate of the firm. Our hypothesis is that as the firms become older, there will be a tendency for the growth rate to decline mainly because younger firms tend to be more innovative and flexible than older ones.

The age of the firm is not expected to have any effect on the other performance criteria. The exception may be that very young firms have low utilization rates and low profitability as a result of their total inexperience.

Source of Raw Material:

Local resource mobilization is an objective of some rural industrialization programs, but it still seems useful to ask whether local resource use will affect the performance of the firm according to the other criteria.

We must distinguish between situations in which the firms choose to use local resources on a cost-minimizing basis and situations in which firms use local resources in deference to social objectives. If firms use local resources to meet social objectives, then this may result in the prices of their raw materials being, *ceteris paribus*, higher than otherwise. This would have adverse effects on capacity utilization and the incomes of the workers but not on any other criteria. If firms choose to use local resources on a cost-minimizing basis, we expect no effects on any of the other criteria.

Location of Market:

As with raw materials, the market for the firm's product could be either local, regional or even foreign. The effect of this location on the performance of the firm as measured by the six criteria is discussed below.

We will first consider the effect of the market location on the firm's labor-intensity. We do not expect a predominant effect of

local vs. non-local markets. Rural firms producing for the local market are likely to manufacture simple consumer goods. From the literature, we have seen that such goods are relatively more labor-intensive. However, we cannot assume that the firms selling their products outside are necessarily producing sophisticated goods which require capital-intensive techniques. These products may also be fairly simple, such as pottery, handicrafts, leather goods, unrefined sugar, etc.

With regard to capacity utilization, we can expect that firms producing for local markets will have lower rates than those producing for non-local markets. This is because, ceteris paribus, local market implies limited demand. This could lead to excess capacity in the firms. The limited market size argument also leads us to expect that the growth rates and the income per worker will also be lower for the firms producing for the local areas. Note that issues related to availability of transportation are discussed separately.

Infrastructure Related Hypotheses:

Modern industries depend on the availability of infrastructures such as transportation, power, marketing and storage facilities, banking and credit services for their smooth running. In this set of hypotheses, we have considered the effect of transportation, power and credit availability on the performance of the rural firms.

Availability of Transportation:

The provision of cheap and reliable transport for people and goods can be said to be a basic requirement for rural industries. The more remote and isolated a location, the more difficult is the supply of

raw materials, the more limited the market horizon, and the greater the problem of obtaining adequate supplies of inputs and essential services. This is particularly true for industries which are not entirely based on local inputs and dependent on only local markets.

Besides facilitating the transfer of physical quantities, the transportation system can facilitate the flow of information regarding new techniques, markets, new products, and new laws and regulations concerning manufacturing to the rural areas.

Given the role that transportation plays in the industrialization process, we expect that its availability will have a positive effect on the rural firm's performance as measured by capacity utilization, growth rates, private profitability, local resource mobilization and income per worker. However, we do not expect that transportation availability on its own will have any effect on the firm's labor-intensity.

Availability of Power:

Availability of some form of motive power, particularly electricity has often been cited as an important factor in the industrialization process. Without the use of power, it is extremely difficult to improve productivity. In Japan, the introduction of electricity in small factories enabled labor productivity to increase and this gave rise to a persistent growth in these factories. For example, in the weaving industry, a shift from hand and treadle looms to power looms relied upon electrification. Without this change, many of the smaller plants would have disappeared during the 1920s.

From the long-run point of view, the firm decides whether or not to use power on the basis of the price of power and the values of the other exogenous variables. However, if power is available to all the firms at the same price, the use of power by only some firms is a reflection of exogenous differences in the production functions of the various groups of firms.

Clearly, the power-using firms will tend to be less labor-intensive than manual firms. We also expect that higher incomes per worker will be found in power-using firms as compared to manual firms. There are probably no differences between manual and power-using firms with regard to the other criteria.

For power-using firms we must also consider whether or not they are receiving adequate and timely supplies of power. We expect that firms which get adequate and reliable supplies will have higher capacity utilization rates, income per worker and profitability than firms receiving inadequate or irregular supplies. However, we do not expect any effect on the labor-intensity of the power-using firm.

Availability of Credit:

Supply of credit has received a high priority in rural industrialization programs. The credit need for industrial investment is of two types: initial capital outlay (risk capital) to supplement the equity capital available through friends and family, and working capital.

In the following hypotheses we examine the effect of making credit available to rural firms. The effect is seen for the six performance criteria.

With respect to the labor-intensity criteria, we expect that rural firms which receive credit will be less labor-intensive than similar firms which receive no credit. This is because of the fact that easy availability of capital tilts the relative factor price in favor of capital intensity. This argument has received support in the literature, as we saw earlier.

We expect that the firms receiving credit will have higher capacity utilization than those who do not. This reflects the notion that by receiving such credit, the firm is able to have the working capital to buy inputs. An adequate supply of inputs and raw materials is one of the factors determining higher capacity utilization.

Similarly, we can also expect that the firms receiving credit will experience higher growth rates compared to those who do not receive such credit. The credit received may be for further expansion in the firm, implying higher growth rates. Higher capacity utilization and growth rates in credit receiving firms lead us to expect higher income per worker in these firms.

Finally, we do not expect credit availability to have any effect on the firm's private profitability and its use of local resources.

Conclusion:

The above hypotheses lend themselves to empirical verification. Such verification and establishment of systematic relationships are much needed in the area of rural industrialization. We have taken a step in this direction by testing some of the hypotheses using data from the RIP program in India. In spite of the data constraints

involved in such research, we have been able to test a number of important hypotheses.

In the next chapter, we present a profile of the firms in the RIP program, with the results of testing the hypotheses presented in Chapter VI.

CHAPTER V

PROFILE OF THE RURAL INDUSTRIES PROJECTS PROGRAM

In this chapter we will provide a profile of 2015 Rural Industries Projects (RIP) program firms surveyed by the Planning Commission in 1974. The sampling methodology is described in the appendix to this chapter.

This profile will describe the firms in terms of several key characteristics, such as the types of goods produced, the sources of their raw materials, the size of the firm, etc. We will also consider the three performance criteria: labor-intensity, capacity utilization, and growth rate--which are analyzed in the next chapter.

Some of the firms surveyed by the Planning Commission did not report the relevant data. As a result, the data for several variables is available for less than 2015 firms; in some cases, the data are missing for a large number of firms. Consequently, the sample number of firms used in the regression analysis (in Chapter VI) is not the same for the three regression equations. We have taken account of this fact in describing the firms by presenting the relevant figures for the appropriate sub-samples as well as for the full sample.

This chapter is divided into four sections. The first section is a brief discussion of the geographical distribution of the sample firms. In the second section we have described the type of goods produced by the firms as well as the nature of production. In the third section, we have presented some economic characteristics such as the value of output and assets. The final section is a description of the values of the three performance criteria and their relationship to some of the characteristics discussed in the first three sections.

V.1 GEOGRAPHICAL DISTRIBUTION OF THE FIRMS:

The 2015 RIP firms in the full sample were distributed in 17 States and 26 Projects. There were three Projects in Bihar, Madhya Pradesh and Uttar Pradesh each, and two Projects in Karnataka and West Bengal each. Each Project was located in a separate District, and covered three to five Development Blocks in that District.¹

In Table V.1 we have presented the distribution of the firms by State. The firms were spread all over India. The plurality of firms were in Bihar, which had 14% of the firms, followed by Uttar Pradesh and West Bengal with approximately 11% each of the firms.

All the firms from Jammu and Kashmir and from Manipur had to be left out from all the three sub-samples. While this does make the sub-samples unrepresentative of the full sample to some extent, there was no recourse because the firms in these two States did not provide the information on many variables. In this context, we should note that these two States are different from the others in many ways. Jammu and Kashmir State has a special constitutional status, while Manipur achieved Statehood as late as 1971.

Apart from the exclusion of Jammu and Kashmir and of Manipur, the three sub-samples were similar to the full sample, though Uttar Pradesh was somewhat under-represented while Bihar and Maharashtra were somewhat over represented.

¹ A District is an administrative unit. There are approximately 375 Districts in India, so that on the average there are approximately 2 million people in one District. A District is divided into 5-8 units known as talukas or tehsils; each of these talukas is further divided into Development Blocks. These Blocks are not administrative units; rather the intent is to include economically homogenous areas within a Block.

Table V.1

Percentage Distribution of RIP Sample Firms by State, 1974

State	Full Sample	Labor-intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
Andhra Pradesh	4.5	5.3	5.2	6.6
Assam	4.1	5.9	5.9	6.2
Bihar	14.1	20.7	20.9	21.2
Gujarat	2.8	2.4	2.4	2.8
Himachal Pradesh	1.7	2.1	2.1	3.1
Jammu & Kashmir	2.6	0.0	0.0	0.0
Kerala	6.0	5.4	6.0	7.5
Madhya Pradesh	7.4	7.9	7.8	10.5
Maharashtra	9.9	16.2	16.1	9.9
Karnataka	7.1	7.2	7.3	5.7
Orissa	3.2	3.2	3.1	4.7
Punjab	3.0	2.2	2.4	1.8
Rajasthan	4.0	4.7	4.6	5.2
Tamil Nadu	2.3	1.9	1.8	2.8
Uttar Pradesh	11.3	5.6	5.5	4.4
West Bengal	10.5	9.3	9.0	7.5
Manipur	5.6	0.0	0.0	0.0
All States	100.0	100.0	100.0	100.0
Sample Size	2015	680	714	707

Note: The three sub-samples are based on the firms included in the regression analysis in Chapter VI. Percentages may not add up to 100 because of rounding.

Summary:

The sample RIP firms were spread over all parts of India. However, the firms in Jammu and Kashmir and in Manipur did not provide all the relevant information needed for the regression analysis in Chapter VI.

V.2 PRODUCT AND PRODUCTION CHARACTERISTICS:

The Planning Commission has classified the RIP firms into eight industrial sectors, primarily according to the nature of the raw materials used by the firms. We have followed this classification in discussing the firms. However, there are substantial variations among the firms in a given sector, as will become apparent from the discussion.

Nature of Goods Produced:

From Table V.2 we can see that the largest proportion (27%) of the RIP sample firms were in the Agricultural Processing sector. Some of the activities that fall within this sector are flour and rice milling, oil crushing, cotton-ginning, production of gur and khandsari (unrefined sugars), making of coir and fibre products, tobacco processing, tea processing, and fruit and vegetable preservation and canning. The firms in this sector tended to be concentrated in Uttar Pradesh and Maharashtra; together, these two States accounted for approximately 30% of the Agricultural firms, while only 21% of all the firms were in these States.

The second largest sector was the Engineering sector, with about 21% of the firms. This sector was also heterogeneous; it included production of oil filters, rolling shutters, hand pumps, tin containers, water taps, steel, furniture as well as activities such as blacksmithy,

Table V.2

Percentage Distribution of Sample RIP Firms by Sector, 1974

Sector	Full Sample	Labor-intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
Agric. processing	27.4	29.7	29.7	37.3
Forest	17.6	0.0	0.0	0.0
Animal Husbandry	4.7	10.1	9.7	6.4
Ceramics	5.5	14.3	14.1	9.3
Textiles	15.7	17.8	18.1	19.8
Chemicals	3.4	7.8	8.1	6.8
Engingeering	21.2	20.3	20.3	20.4
Miscellaneous	4.5	0.0	0.0	0.0
All Sectors	100.0	100.0	100.0	100.0
Sample Size	2014	680	714	707

Note: The three sub-samples are based on the firms included in the regression analysis in Chapter VI. Percentages may not add up to 100 because of rounding.

radio assembly, electroplating, bicycle repairs, and welding. Bihar and West Bengal accounted for about 32% of the firms in this sector, though these two States had only about 25% of all the firms.

Approximately 18% of all the firms were in the Forest Produce-based sector. The goods produced by firms in this sector included wooden toys, packing cases, matches, hand-made paper, bullock carts, Ayurvedic (indigenous) medicines, and cane and bamboo products. Manipur and Karnataka had about 27% of the firms in this sector, though these two States had only about 13% of all the firms.

The Textiles sector had nearly 16% of all the firms. The products made in this sector included carpets, wicks, hosiery, surgical bandages; activities such as handloom weaving, powerloom weaving, yarn spinning, dyeing and painting of textiles, tailoring and sericulture are also included in this sector. West Bengal and Assam had about 26% of the firms in this sector, though these two States had only about 16% of all the firms.

The Ceramics sector had about 5% of all the firms. The goods produced by the firms in this sector were bricks, cement pipes, pottery, glass products, marble products; some of the firms were engaged in stone carving and crushing. The firms in this sector tended to be concentrated in Andhra Pradesh and Madhya Pradesh. Together, these two States accounted for about 27% of the firms in this sector, though they had only about 12% of all the firms.

The Animal Husbandry sector also had nearly 5% of all the firms. The activities of the firms in this sector include bee keeping, dairying, leather tanning, poultry farming, fish canning, bone crushing, and fisheries. Nearly 32% of these firms were in Kerala and Maharashtra,

though these two States had only 16% of all the firms.

The smallest sector was Chemicals, with only 3% of all the firms. Some of the products made by the firms in this sector were soap, hair oil, tooth paste, dyes, boot polish, candles, paints, distilled water, insecticides, and plastic and rubber goods. Bihar and Karnataka accounted for 29% of these firms, while the share of these two States in all the firms was about 21%.

Approximately 5% of the firms could not be classified according to the above seven sectors. These firms were grouped together under the Miscellaneous category. The goods produced by these firms included musical instruments, ice cream, spectacle frames, lenses, handicrafts, and paper bags.

From the above description it is clear that the sample firms in the RIP program produced a vast array of goods and services. This appears to be in contrast to the situation in China where, as seen in Chapter III, the rural firms are tied closely to agricultural production.

In the three sub-samples, all the firms in the Forest and Miscellaneous sectors had to be left out. None of the Miscellaneous firms reported the value of their fixed assets (as discussed in a later section), which is an important variable in our analysis; while 11% of the Forest firms did provide this information, some other data were not available for them. Apart from this exclusion, there is some under-representation of the Engineering firms and some over-representation of the ceramics firms in the three sub-samples.

Ownership:

Nearly 87% of the firms were owned by individuals, and another 10%

were partnerships. Only 2% of the firms were co-operatives, as shown in Table V.3. This pattern was also found in the firms included in the three sub-samples.

According to the Planning Commission (1978a), approximately 50% of the units were owned by fresh entrepreneurs who had no experience either as owners or as workers before they started their firms as part of the Rural Industries Projects Program. Of the group that had some experience, nearly one-third were artisans, and about one-fifth were retailers.

Registration:

Industrial firms registered under the Factories Act are usually taken to comprise the organized industrial sector in India. The registered firms face greater government regulation, particularly with respect to labor relations, but they also have relatively easier access to inputs whose allocation is influenced by government policies. A firm which employs ten or more workers with electricity, or twenty or more workers without electricity must be registered.

Only 10% of the firms were registered under the Factories Act, as shown in Table V.4. This is an indication that most of the firms were small. This pattern was also observed in the three sub-samples. Note that less than 5% of the firms in the Textiles and Animal Husbandry sectors were registered, while nearly 15% of the Chemical firms were registered.

Age of the Firm:

The average age of the firms in the sample at the time of the survey was 5.4 years, while the standard deviation was 2.5 years. From

Table V.3:

Percentage Distribution of Sample RIP Firms by Ownership, 1974

Type of Ownership	Full Sample	Labor-intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
Self-owned	87.0	85.6	85.0	87.7
Partnership	9.5	10.0	10.4	9.1
Co-operative	1.9	2.1	2.2	1.3
Miscellaneous	1.6	2.4	2.4	2.0
All Types	100.0	100.0	100.0	100.0
Sample Size	2003	680	714	707

Table V.4:

Percentage Distribution of Sample RIP Firms by Registration, 1974

Registration as a Factory	Full Sample	Labor-intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
Registered	10.2	13.1	13.5	11.6
Not Registered	89.8	86.9	86.5	88.4
All Types	100.0	100.0	100.0	100.0
Sample Size	2001	679	713	706

Note: A firm employing ten or more workers with electricity, or twenty or more workers without electricity must be registered as a Factory. The three sub-samples are based on the regression analysis in Chapter VI. Percentages may not add up to 100 because of rounding.

Table V.5 we see that all three sub-samples also had the same average as well as standard deviation.

Table V.5:

Age of Sample RIP Firms, in Years in 1974

	Full Sample		Labor-intensity Sub-sample		Utilization Sub-sample		Growth Sub-sample	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Age of Firm	5.4	2.5	5.4	2.5	5.4	2.5	5.3	2.4
Sample Size	1264		401		419		707	

Seasonality:

From Table V.6 we can see that about 90% of the firms operated on a year-round basis, while the other 10% of the firms produced on a seasonal basis only. Nearly 70% of the seasonal firms were in the Agriculture and Ceramics sectors. These firms were engaged in activities such as making bricks and lime, vegetable oil extraction, rice hulling, and gur making.³ The three sub-samples were representative of the full sample in this context.

Source of Energy:

As shown in Table V.6 about 44% of the firms relied mainly on electricity or diesel; these sources of energy are usually associated with

³See Planning Commission (1978a), p. 57.

Table V.6:

Percentage Distribution of Sample RIP Firms

By Seasonality and Source of Energy, 1974

Characteristics	Full Sample	Labor-intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
1. Seasonality				
Year-round Producers	90.5	85.4	85.3	89.1
Seasonal Producers	9.5	14.6	14.7	10.9
All Firms	100.0	100.0	100.0	100.0
Sample Size	2000	680	714	707
2. Source of Energy				
Power Users	43.8	30.1	31.0	46.2
(Electricity)	(41.9)	(29.4)	(30.1)	(45.1)
(Diesel)	(1.9)	(0.7)	(0.8)	(1.1)
Non Power Users	56.2	69.9	69.0	53.7
(Coal)	(9.9)	(20.0)	(19.6)	(12.9)
(Manual)	(45.6)	(49.0)	(48.6)	(40.0)
(Animal)	(0.3)	(0.7)	(0.7)	(0.3)
(Miscellaneous)	(0.3)	(0.1)	(0.1)	(0.6)
All Firms	100.0	100.0	100.0	100.0
Sample Size	2007	680	714	707
3. Energy Adequacy for Power Users				
Not Adequate	42.5	36.1	34.8	36.0
Adequate	57.5	63.9	65.2	64.0
All Firms	100.0	100.0	100.0	100.0
Sample Size	876	205	221	325

Note: The three sub-samples are based on the regression analysis in Chapter VI. Percentages may not add up to 100 due to rounding.

modern industry. Approximately 46% of the firms relied mainly on manual labor, and another 10% used coal.

We have classified the firms which used electricity or diesel as "power-users," and the rest of the firms as non power-users. For all practical purposes, the power-users in our sample were electricity users. Electricity is produced and sold in India by public-sector enterprises; it is often in short supply, but unlike other inputs, it cannot be easily obtained in the "open" market during periods of shortages.

Power-users were under-represented in the labor-intensity and capacity utilization sub-samples, while coal users were over-represented. The growth sub-sample is representative of the full sample.

There was considerable variation in the firms across sectors in the type of energy used. Only 1% of the Animal Husbandry firms and 8% of the Textile firms were power-users; in contrast, 73% of the Agricultural firms and 56% of the Engineering firms were power-users.

Energy Adequacy:

The problems faced by firms in getting adequate electricity are confirmed by the data in Table V.6; nearly 42% of the power-using firms complained about the inadequacy of the supply of electricity or diesel. There was considerable variation in the firms across sectors in the supplies in all the three sub-samples.

Location of Markets:

Where the firms sells its output is an important indicator of how localized the firm's production is. The problems and opportunities faced by a firm catering to the local market are different from those

faced by a firm with an outside orientation.

In general, we expect rural firms in the LDCs to sell their products in the nearby markets. This is true in our sample. From Table V.7 we see that nearly two-thirds of the firms marketed their goods entirely for the local markets in the Project area. Only 7% of the firms shipped their goods to markets entirely outside the Project area. From the available information, we cannot say where these distant markets were located -- within the State, within India, or outside India. The rest of the firms had markets both within and outside the Project area. Corresponding data is presented in Table V.7 for the three sub-samples.

There was some variation across the industrial sectors with respect to market location. A large majority of the firms in the Animal Husbandry, Ceramics and Forest sectors (85%, 73% and 71% respectively) were marketing all their products within the Project areas only. In the case of firms in the Textile sector, a relatively large proportion, 23%, had their markets entirely outside the Project area.

Raw Materials Source:

An often mentioned objective of rural industrialization strategies is to utilize locally available resources. It is interesting to see the extent to which the firms in our sample realized this objective. From Table V.7 we see that only 42% of the firms used entirely local raw materials. A substantial number, 24%, of the firms relied on raw materials available only outside the Project area. The three sub-samples were representative of the full sample.

A relatively high proportion of the firms in the Ceramics and Agricultural sectors (65% and 62%) used solely locally available raw ma-

Table V.7:

Percentage Distribution of Sample RIP Firms
By Market Location and Raw Materials Source, 1974

Characteristics	Full Sample	Labor intensity Sub-sample	Utilization Sub-sample	Growth Sub-sample
1. Market Location				
Wholly Local	65.0	65.7	64.8	66.0
Mainly Local	15.5	16.6	17.2	17.2
Wholly Outside	6.9	11.9	5.7	4.4
Mainly Outside	12.6	5.7	12.2	12.4
All firms	100.0	100.0	100.0	100.0
Sample Size	1305	680	714	429
2. Raw Material Source				
Wholly Local	41.9	43.4	43.3	44.4
Mainly Local	14.7	14.1	13.9	13.5
Wholly Outside	24.3	23.8	24.2	23.9
Mainly Outside	19.1	18.7	18.6	18.2
All Firms	100.0	100.0	100.0	100.0
Sample Size	1309	680	714	423
3. Firm Orientation				
"Local" Orientation	49.3	51.6	51.4	51.7
"Non-local" Orientation	50.7	48.4	48.6	48.3
All Firms	100.0	100.0	100.0	100.0
Sample Size	1287	680	714	416

Note: Local refers to the Project area. The three sub-samples are based on the firms included in the regression analysis in Chapter VI. Percentages may not add up to 100 due to rounding.

terials. In contrast was the Textile sector where about 59% of the firms received their raw materials entirely from outside.

"Local" Orientation:

We have classified a firm as having a "local" orientation if both its raw materials sources and market location were wholly or mainly local, i.e., within the Project area. From Table V.7 we can see that approximately 50% of the firms had such a local orientation.

From Table V.8 we can see that there was a clear pattern connecting market location and raw material source. Firms which sold their output locally tended to use entirely local raw materials, while firms which sold their output outside the Project area tended to get their raw materials from outside also. For example, of all the firms which sold entirely locally, about 50% used only local raw materials; on the other hand, of all the firms which sold entirely outside, about 59% used raw materials entirely from outside the Project area.

Summary:

The sample RIP firms were engaged in a wide variety of activities. The largest proportion -- a little over a quarter -- were agro-based, and about one-fifth of the firms were engineering oriented. The rest of the firms used forest-based produce; or produced and worked with textiles; or produced ceramics and allied goods; or were involved in animal husbandry; or worked with chemicals, in that order.

Nearly all the firms were owned by individuals or partnerships. Approximately 50% of the owners had no prior experience before they started their RIP firms; of those who had some experience, most of the

Table V.8:
Relationship Between Market Location
and Raw Material Source of the Sample Firms

Market Location of Firms	Raw Materials Source of Firms				Total Number of Firms
	Wholly Local	Mainly Local	Wholly Outside	Mainly Outside	
Wholly Local	414	115	136	165	830
Mainly Local	54	52	46	50	202
Wholly Outside	53	18	49	45	165
Mainly Outside	16	5	16	53	90
Total Number of Firms	537	190	247	313	1287

Note: Local refers to the Project area. The data are from the full sample.

owners were either artisans or retailers.

Only 10% of the RIP firms were large enough to be registered under the Factories Act.

The average age of the firms in 1974 was 5.4 years.

Nearly 90% of the firms were operating on a year-round basis, of the seasonal firms, most were in the Agricultural and Ceramics sectors.

Approximately 44% of the firms were "power-users," i.e., they used electricity or diesel. Some 46% used mainly manual labor, while 10% relied on coal.

Nearly two-thirds of the firms sold their products wholly or mainly within the Project area; about 55% of the firms got their raw materials wholly or mainly from the Project area. Firms which sold their output locally tended to use entirely local raw materials.

V.3 ECONOMIC CHARACTERISTICS:

In this section we present the data related to employment generation, fixed assets, and value of output. We will also discuss the labor-intensity, growth rate and capacity utilization of the firms included in the analysis.

Employment:

From Table V.9 we see that the average firm employed 7.1 workers in 1974. However, there was a wide variation as indicated by the standard deviation of 12.9. The firms in the labor-intensity and utilization sub-samples tended to be larger in size; the average employment in a firm was 9.7 and the standard deviation was also larger at 17.2.

Table V.10 shows that there was a fairly wide variation across industrial sectors in terms of average number of workers employed. The average size of a firm in the Ceramics sector was 15.6. The smallest firms seemed to be in the Animal Husbandry sector, where the average firm had 3.9 workers.

The composition of the workforce is presented in Table V.11. For the average firm, household workers accounted for about 20% of the total workers. However, firms in the Animal Husbandry sector used the highest proportion of household labor. On the average, approximately 40% of the labor used in these firms came from the household. On the other

Table V.9:

Employment, Assets, and Output of the Sample RIP Firms

	Full Sample		Labor-intensity Sub-sample		Utilization Sub-sample		Growth Sub-sample	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
1. Total Workers in 1974	7.1	12.9	9.7	17.2	9.7	17.2	7.0	12.8
Sample Size	1916		680		679		677	
2. Fixed Assets, Rs. '000, in 1974	26.2	73.1	30.5	79.9	31.5	79.4	29.7	83.5
Sample Size	1277		680		714		707	
3. Output, Rs. '000 in 1972	54.5	145.0	77.1	173.66	79.4	173.7	50.5	132.5
Sample Size	2011		678		712		707	

Note: The three sub-samples are based on the firms included in the regression analysis in Chapter VI.

Table V.10:
Output, Employment, and Assets per Firm by Sector
of the Sample RIP Firms

Sector	Output		Workers		Fixed Assets	
	Rs. '000 in '72		in 1974		Rs. '000 in '74	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Agriculture	67.0	186.4	6.9	14.6	36.3	89.2
Forest	57.8	134.9	7.4	11.5	10.8	16.7
Animal Husbandry	17.9	32.9	3.8	2.4	4.5	9.1
Ceramics	68.1	163.6	15.6	22.6	30.0	94.9
Textiles	21.7	50.0	5.7	10.3	8.7	25.0
Chemicals	92.4	173.0	8.2	13.9	43.3	100.6
Engineering	64.0	148.0	6.7	10.7	35.3	76.9
Miscellaneous	28.3	94.6	6.3	10.9	N.A.	N.A.
All Firms	54.5	145.0	7.1	12.9	26.2	73.1

Note: The data are from the full sample. N.A. indicates Not Available.

hand, firms in the Ceramics sector, employed only 13% of their labor from within the household.

Table V.11:

Hired and Household Worker Employment per Firm by Sector

Sector	<u>Average Number of Workers per Firm</u>		
	Total	Hired	Household
Agriculture	6.9	5.6	1.5
Forest	7.4	6.0	1.5
Animal Husbandry	3.8	2.3	1.5
Ceramics	15.6	13.5	2.1
Textiles	5.7	4.1	1.6
Chemicals	8.2	6.1	1.8
Engineering	6.7	5.3	1.5
Miscellaneous	6.3	5.0	1.3
All Firms	7.1	5.6	1.5

Note: The data are from the full sample.

In Table V.12, we have presented the percentage distribution of employment according to skill and type of worker. We found that the work force was mainly comprised of males (83%), with women and children contributing only about 17% of the workers. The majority of the workers, about 60%, were skilled, about 11% were managerial and the remaining 30% were unskilled. In a more detailed sector analysis, we found that firms in the Textile, Animal Husbandry, Forest, Miscellaneous, and

Engineering sectors had a higher than average proportion of skilled workers, with the figures being 90%, 88%, 80%, 80%, and 75% respectively.

Table V.12:
Percentage Distribution of Employment
By Skills and Type of Worker

Type of Worker	Nature of Skill			Total
	Skilled	Managerial	Unskilled	
Male	49.7	10.8	22.3	82.8
Female	9.0	0.2	5.5	14.7
Children	0.8	N.A.	1.7	2.5
All Workers	59.5	11.0	29.5	100.0

Note: The data are from the full sample.

Fixed Assets:

From Table V.9 we see that the 1974 value of the fixed assets of the average firm was Rs. 26.2 thousand (US\$ 3.5 thousand at the official exchange rate). The assets included the value of land, buildings, machinery and other assets owned by the firms.

The average firm in the RIP program was small in terms of its assets. We have seen earlier that only 10% of the firms were large enough

to require registration under the Factories Act. A comparison with other small-scale firms confirms that the sample RIP firms had very low levels of assets. The Annual Survey of Industry reported that, in 1965, the average value of fixed assets in small-scale industries registered under the Factories Act was approximately Rs. 70 thousand.⁴ Further, the NCAER Study (1972) of 147 small-scale units spread over 22 industries groups found that, in 1969-70, the average value of fixed assets was about Rs. 340 thousand. Given the high rate of inflation experienced by the Indian economy over the ten years from 1965-1974, there can be no doubt that the average value of fixed assets of the Rural Industries Projects firms in 1974 was quite small.

While the average firm was small, there was considerable variation in the value of the assets owned by firms, as indicated by the high standard deviation of 73.1. This variation can be seen directly by comparing the average value of assets across the different industrial sectors.

The smallest firms were in the Animal Husbandry and Textiles sectors, with average assets of Rs. 4.5 thousand and Rs. 8.7 thousand, respectively. In contrast, the firms in the Chemicals and Agriculture sectors were very large, with average assets of Rs. 43.3 thousand and Rs. 36.3 thousand, respectively. Note that none of the firms in the Miscellaneous sector reported the value of their fixed assets.

Output:

From Table V.9 we can see that in 1972 the average value of the

⁴Reported in NCAER (1972), p. 18.

output was Rs. 54.5 thousand (US\$ 7.3 thousand at the prevailing exchange rate). As in the case of workers employed and fixed assets, there was substantial variation in the value of output across the firms.

The level of output was quite low. A comparison is provided by looking at the firms surveyed by the NCAER (1972); these 147 firms had average sales of Rs. 1.3 million in 1969-70.

As is the case for workers and assets, the smallest firms were in the Animal Husbandry and Textiles sectors, with average outputs of Rs. 17.9 thousand and Rs. 21.7 thousand, respectively. The highest average value of output was for firms in the Chemicals sector, at Rs. 92.4 thousand; this sector also had the highest average value of assets.

A comparison of the full sample with the three sub-samples (from Table V.9) brought out some interesting results. The growth sub-sample was representative of the full sample. However, the average firms in the labor-intensity and utilization sub-samples was larger than the average firm in the full sample; this comparison was valid for workers, assets and output. We can conclude that many of the smaller firms did not provide all the relevant data.

Summary:

The average RIP firm had 7.1 workers and fixed assets of Rs. 26.2 thousand in 1974; the average value of the output was Rs. 54.5 thousand in 1972. These figures indicate that the sample RIP firms were small, even by the Indian standards for small-scale industries.

The firms in the Animal Husbandry and Textiles sectors were the smallest in terms of employment, assets and output; firms in the Chemicals and Ceramics sectors were the largest.

V.4 PERFORMANCE CRITERIA

In this section we describe the labor-intensity, capacity utilization, and the growth rate of the RIP firms. These three variables are the criteria used to evaluate the performance of the firms. We also consider the differences in the values of these variables according to some of the characteristics discussed in the earlier sections, such as the source of their raw materials.

Labor-Intensity:

We have defined the labor-intensity of the firm as the ratio of the number of workers to the value of the fixed assets, measured in Rs.'000.

From Table V.13 we can see that, on the average, the RIP firms had 5.4 workers per Rs.1000 of fixed assets. This is an extremely high level of labor-intensity; at the prevailing exchange rate it is the equivalent of approximately US \$25.00 per worker. However, the high value of the standard deviation indicates that there was a large spread in the labor-intensity of the different firms. In this situation, the median is also a useful statistic for describing the average firm.

The median value of 0.71 for the labor-intensity was sharply lower than the arithmetic mean. This implies that there were a few firms with very high labor-intensities which have made the arithmetic means large. The median implies that the value of fixed assets per worker was approximately US\$ 185.00.

Irrespective of whether we use the arithmetic mean or the median, the sample RIP firms were clearly highly labor-intensive, even in

Table V.13

Labor-Intensity, Growth Rate and Capacity Utilization
of the Sample RIP Firms, 1974

Criterion	Full Sample			Corresponding Sub-Sample		
	Median	\bar{X}	SD	Median	\bar{X}	SD
1. Labor-intensity						
Workers/Rs.'000						
Assets	0.71	5.37	24.2	0.83	8.25	32.0
Sample Size		1220			680	
2. Annual Average						
Compound Growth						
Rate of Output	0.04	0.07	0.37	0.04	0.07	0.29
Sample Size		1257			707	
Percentage Distribution of Firms						
3. Capacity Utilization						
100% Use		27.0			24.5	
75-99% Use		17.0			17.9	
50-74% Use		38.1			40.3	
25-49% Use		15.2			14.3	
0-24% Use		2.7			2.9	
All Firms		100.0			100.0	
Sample Size		1991			714	

Note: The sub-sample data are for the sub-sample corresponding to the performance criterion. Percentages may not add up to 100 because of rounding.

comparison with other Indian small-scale industries. For example, the NCAER Survey (1972) found that its sample of firms had fixed assets Rs. 6.4 thousand per worker, equivalent to about US\$ 850 per worker, in 1969-70⁵.

The labor-intensity was higher in the sub-sample than in the full sample. We have seen earlier (Table V.5) that power-users were under-represented in the sub-sample, and the higher labor-intensity in the sub-sample is consistent with this. We had also seen (Table V.9) that the smaller firms were under-represented in the sub-sample. This suggests that the smaller firms were not necessarily the most labor-intensive. This was confirmed by the low correlation coefficient of -0.07 between labor-intensity and assets (for all the 1220 firms for which the data were available).

The labor-intensity of the RIP firms varied greatly across industrial sectors. From Table V.14 we see that the highest labor-intensity was in the Ceramics sector, with 24.2 workers per Rs.'000 of assets. In this connection, we note that nearly 53% of the Ceramics firms were seasonal; about 90% of them marketed their products wholly or mainly within the Project area; approximately 80% bought their raw materials wholly or mainly from within the Project area; and about 49% relied on coal as the main source of power. However, the average ceramics firm was not smaller than the overall average firm, in terms of output, workers and assets.

The lowest labor-intensity was in the Forest and Engineering sectors, with 1.3 and 1.6 workers per Rs. 1000 assets on the average,

⁵ NCAER (1972), p. 55

Table V.14

Labor-Intensity, Growth Rate and Capacity Utilization by Industry

Sector	Labor-Intensity Workers/Rs. '000 Assets		Annual Average Compound Growth Rate of Output		Level of Capacity Utilization Percentage of Firms					All Firms
	\bar{X}	SD	\bar{X}	SD	100% Use	75-99% Use	50-74% Use	25-49% Use	0-24% Use	
Agriculture	5.0	25.4	0.05	0.28	22.1	17.6	38.4	19.4	2.5	100.0
Forest	1.3	1.5	0.04	0.26	29.9	17.2	39.7	11.8	1.4	100.0
Animal Husbandry	4.8	8.5	0.03	0.13	25.8	20.4	38.7	6.5	8.6	100.0
Ceramics	24.2	57.5	0.05	0.27	33.9	11.0	35.8	18.4	0.9	100.0
Textiles	3.0	4.8	0.07	0.27	31.1	19.2	36.4	11.9	1.3	100.0
Chemicals	6.5	33.8	0.33	1.10	20.6	10.3	47.1	19.1	2.9	100.0
Engineering	1.6	2.9	0.10	0.36	28.3	16.4	36.1	15.0	4.3	100.0
Miscellaneous	N.A.	N.A.	0.02	0.31	25.6	16.7	40.0	16.7	1.0	100.0
All Firms	5.4	24.2	0.07	0.37	27.1	17.0	38.1	15.2	2.7	100.0

Note: The data are from the full sample. Percentages may not add up to 100 because of rounding. N.A. indicates Not Available.

respectively. Since most of the Forest firms did not report their assets, the labor-intensity figure of 1.3 may be misleading. Hence, we consider the Engineering firms as having the lowest labor-intensity. In this connection, we note that only 3% of the Engineering firms were seasonal; about 78% of them marketed their products wholly or mainly within the Project area; only 38% bought their raw materials wholly or mainly from within the Project area; and about 54% relied on electricity as the main source of power.

The labor-intensity also varied greatly according to some of the characteristics of the firms. We can see from Table V.15 that the average labor-intensity of seasonal producers was as high as 19, in contrast to the low value of 4 for year-round producers. Even more strikingly, the average labor-intensity in power-using firms (who use electricity or diesel as the main fuel) was merely 0.4. Further, firms which had a "local" orientation (who bought their raw materials and sold their goods wholly or mainly within the Project area) had a higher average labor-intensity than firms without such an orientation. Note that the firms within each of the above categories were also heterogeneous, as indicated by the high standard deviations.

Growth Rate:

We have measured the growth of the firm by the annual average compound growth rate of output since the establishment of the firm. The nominal value of the output has been deflated by the Wholesale Price Index.

From Table V.13 we can see that on the average, the RIP firms grew at 7% per year. This is a very high growth rate in comparison

Table V.15

Labor-Intensity and Growth Rates of Sample RIP Firms
by Select Characteristics

Characteristics	Labor-Intensity Workers/Rs. '000 Assets		Annual Average Compound Growth Rate of Output	
	\bar{X}	SD	\bar{X}	SD
Year-round Production	3.9	18.2	0.07	0.38
Seasonal Production	18.9	52.6	0.05	0.21
Power-Users	0.4	0.7	0.10	0.44
Non Power-Users	8.5	30.6	0.05	0.27
Wholly Local Markets	8.1	33.3	0.10	0.20
Mainly Local Markets	9.4	30.6	0.11	0.29
Wholly Outside Markets	4.4	12.5	0.33	1.17
Mainly Outside Markets	2.4	10.4	0.21	0.46
Wholly Local Raw Materials	11.4	41.1	0.10	0.29
Mainly Local Raw Materials	6.9	19.3	0.14	0.27
Wholly Outside Raw Materials	4.9	21.5	0.19	0.64
Mainly Outside Raw Materials	2.3	9.7	0.14	0.33
'Local' Orientation	11.1	38.8	0.10	0.23
'Non-local' Orientation	3.8	16.9	0.17	0.05
All Firms	5.4	24.2	0.07	0.37

Note: The data are from the full sample. Local refers to the Project area.

with the rest of the Indian economy; from 1964-65 to 1973-74, the overall index of industrial production rose only at 3.6% per year.⁶

Since there was a very wide spread in the growth rates of the firms, the median is also a useful indicator of the typical firm. The median growth rate was only 4%, which is similar to the growth rate of industrial production.

Thus we conclude that there were some very fast growing firms which boosted the mean growth rate. It would not be appropriate to characterize the typical RIP firm as having high growth rates without qualifications.

The firms in the growth equation sub-sample were representative of the full sample in terms of their growth rates.

The Chemicals firms had much higher growth rates than the other firms, with an astonishingly high average growth rate of 33% per year. The Engineering firms had the second-highest growth rates, with a mean value of 10% per year. In contrast, the Animal Husbandry firms had an average growth rate of 3% only.

From Table V.15 we see that there were differences in the growth rates according to some other characteristics of the firms. However, these differences were not so large as the differences in the labor-intensity according to these characteristics. More importantly, we observe that if a particular characteristic tended to make a firm relatively more labor-intensive, it also tended to make the firm have a lower growth rate. In other words, high growth firms were relatively capital intensive.

⁶ Mellor (1976), p. 8

Capacity Utilization

The RIP firms reported their levels of capacity utilization according to the categories shown in Table V.13. We have classified firms whose utilization of the productive capacity was 75% or more as having high utilization levels. According to this classification, approximately 44% of the RIP firms had high utilization levels. It is worth noting that a little over a quarter of the firms reported full use of their productive capacity. Further, less than one fifth of the firms reported using less than 50% of their capacity. From these figures we conclude that the firms have been fairly successful in utilizing their productive capacities.

The distribution of firms according to their levels of utilization was similar in the full sample and the capacity utilization sub-sample.

From Table V.14 we see that the distribution of firms according to utilization levels was fairly similar for all the industrial sectors. The Textiles firms had done the best on this score, with nearly 50% falling in the category of high utilizers. Only 30% of the Chemicals firms fell in this category. This poor performance is surprising because the Chemicals firms also had the fastest average growth rates.

From Table V.16 we can see that the capacity utilization levels were similar for seasonal and year-round producers. In contrast, the other two performance indicators -- the average labor-intensity and the average growth rate -- differed significantly for seasonal and year-round producers.

There was a difference between the capacity utilization of power-using and non power-using firms; approximately 50% of the non power-users fell in the high utilization category while only 37% of the

Table V.16

Percentage Distribution of the Sample RIP Firms by Capacity Utilization Levels by Select Characteristics

Characteristics	Capacity Utilization Levels					All Firms
	100%	75-99%	50-74%	25-49%	0-24%	
Year-Round Production	27.1	16.9	38.3	15.2	2.5	100.0
Seasonal Production	28.0	18.5	36.0	13.2	4.2	100.0
Power-Users	21.9	15.4	40.7	18.9	3.1	100.0
Non Power-Users	31.3	18.4	36.0	12.0	2.4	100.0
Wholly Local Market	27.2	15.7	39.4	15.0	2.7	100.0
Mainly Local Market	22.3	17.8	37.6	16.8	5.5	100.0
Wholly Outside Market	18.0	13.5	48.3	16.9	3.4	100.0
Mainly Outside Market	17.6	21.2	40.6	19.4	1.2	100.0
Wholly Local Raw Materials	28.3	13.2	40.6	16.3	1.7	100.0
Mainly Local Raw Materials	21.5	25.3	36.1	13.6	3.7	100.0
Wholly Outside Raw Materials	22.7	18.3	36.9	18.9	3.2	100.0
Mainly Outside Raw Materials	26.0	16.4	44.0	11.2	2.4	100.0
'Local' Orientation	25.9	15.5	40.1	16.1	2.4	100.0
Non 'Local' Orientation	23.5	18.1	40.3	15.5	2.6	100.0
All Firms	27.1	17.0	38.1	15.2	2.7	100.0

Note: The data are from the full sample. Local refers to the Project area. Percentages may not add up to 100 because of rounding.

power-users qualified for this classification. We had earlier seen that non power-users had higher labor-intensities but lower growth rates than power-users.

Capacity utilization rates were approximately the same for firms with and without a local orientation. We had earlier found that the firms with a local orientation had higher labor-intensities but lower growth rates than the firms without such an orientation.

Summary:

The performance of the sample RIP firms surveyed by the Planning Commission was good according to the labor-intensity and growth rate criteria, and fair according to the capacity utilization criterion.

The Ceramics sector had the highest labor-intensity, the Chemicals sector had the highest growth rate, and the Textiles sector had the highest proportion of the firms in the high utilization category. Thus, no single sector dominated the others on all counts. The Ceramics sector did better than the average according to the labor-intensity and capacity utilization criteria; the Chemicals sector did better than the average according to the labor-intensity and growth rate criteria; and the Engineering sector did better than the average according to the growth rate and capacity utilization criteria.

Seasonal firms had much higher labor-intensities and somewhat lower growth rates than year-round producers, but the patterns of capacity utilization were similar for these two categories.

Power-using firms had much lower labor-intensities, significantly higher growth rates and lower capacity utilization rates than non power-using firms.

Finally, the firms with a local orientation had much higher labor-intensities and significantly lower growth rates than the firms without such an orientation, but the patterns of capacity utilization were similar for these two categories.

In the next chapter we will analyze the determinants of the firms' performance according to the three criteria discussed above, and test some of the hypotheses put forward in Chapter IV.

APPENDIX
METHODOLOGY FOR THE SAMPLE SELECTION
OF THE RIP FIRMS

The sampling procedure employed by the Planning Commission in selecting the 2015 firms involved both purposive and random sampling. The selection of the Rural Industries Projects was purposive, while the selection of the firms within these Projects was made randomly.

Of the 49 Projects in existence at the time of the survey, 26 Projects were selected as under:

- a) Seven Projects were chosen for a comparative analysis with an earlier study.¹
- b) All four Projects set up near the large scale industrial projects of Durgapur, Bhilai, Ranchi and Bhadravati were included in the sample.
- c) Fifteen Projects were selected from the rest, so as to ensure that each state had at least one Project, and that Projects with different levels of official expenditure were represented.

After the 26 Projects were selected, a two-stage sampling procedure was used to select the 2015 firms.

The first stage involved the selection of towns/villages having RIP firms. All such towns/villages were arranged in descending order of the number of RIP firms. The towns were then divided into four

¹Programme Evaluation Organization, "Report on Evaluation of Rural Industries Projects," 1967.

strata, with each stratum having (approximately) 25% of the firms. From each stratum, two towns/villages were selected at random, without replacement and with the probability of picking a town proportional to the number of firms located there. In some cases, one or two of the strata consisted of only one or two towns. In such cases, all the towns/villages in the stratum were selected.

The second stage of sampling consisted of selection of the firms. Complete enumeration lists of the firms in the selected towns were prepared. These firms formed the sample universe. All the firms were classified according to eight industrial sectors. Thirty percent of the firms in each stratum were then selected in proportion to their share of the various industrial sectors in the total number of firms.

CHAPTER VI

ECONOMETRIC ANALYSIS

In this chapter we report the results of testing some of the hypotheses proposed in Chapter IV. The methodology used is multiple regression analysis.

Due to data limitations, we have not been able to consider all the relevant variables that affect the performance of rural industries. In particular, we have not been able to consider factors related to entrepreneurship and institutional framework. Often we have had to use broad proxies for the more specific factors of interest. However, we are still able to establish systematic effects of certain important factors on the performance of rural industries. From the viewpoint of policy making, an awareness of any systematic relationships between various broad factors and the outcome of rural industries is an important step towards formulating more effective rural industrialization policies.

We have selected three of the performance criteria for the regression analysis; these are the labor-intensity, the level of capacity utilization, and the growth rate of the firm. Lack of data did not permit us to consider private profitability of the firm. The criterion of local resource mobilization and income per worker do not appear to be critical considerations in the context of the Rural Industries Projects (RIP) program.

As noted in Chapter V, all the firms surveyed by the Planning Commission could not be included in the econometric analysis because some of the information was not available for all the firms. Conse-

quently, the same firms are not analyzed for the three criteria, although there is a high degree of overlap.

The three sub-samples are fairly representative of all the firms in the full sample; we have noted the exceptions in Chapter V. The fact that we do not have the same firms in the three sub-samples does not seem important for our analysis or the conclusions we can draw from it. Our interest is in identifying the factors which explain the performance of the firm, as measured by the three criteria; we are not trying to determine an interdependent system of a firm's performance.

This chapter has four sections. In the first three sections, we have presented the regression results for the three selected criteria, while the last section is an overview of the results.

VI.1 LABOR-INTENSITY OF THE FIRMS:

As noted earlier, the labor-intensity of the firm has been measured as the number of workers per Rs. 1000 of fixed assets. A better measure of labor-intensity would be based on the total number of person-hours worked, but these data are not available. At any rate, our definition does allow us to measure the amount of capital required (by the firm) to employ one worker.

Three versions of the estimated labor-intensity equation are presented in Table VI.1. All the variables representing the hypotheses to be tested are included in Equation 1; in particular, this version includes dummy variables representing the industrial sectors. In Equation 2, we have dropped all the variables whose coefficients are statistically insignificant (at conventional confidence levels) in Equation 1. This version can be viewed as a test of the hypothesis

that all variables found individually insignificant are also jointly not significant, i.e., problems such as multicollinearity are not responsible for the low t-ratios associated with these variables in Equation 1.

In the third version of the labor-intensity equation we have excluded the dummy variables for the industrial sectors. This version reflects the notion that there is considerable heterogeneity within the industrial sectors. However, in Chapter V we have seen that there are marked differences in the average labor-intensity across industrial sectors, and it seems appropriate to take account of this in the analysis.

Since the explanatory variables included in the equation are predetermined, at least in the short-run, the equation has been estimated by ordinary least squares.

We discuss now the effect each of the explanatory variables has on the labor-intensity, and also the overall reliability of the estimated equations.

The explanatory power of the included variables is fairly low, as indicated by the R^2 value of 0.11. While low values of R^2 are fairly common with cross-section data, the implications are still quite important. If all of the key factors that affect labor-intensity systematically are included - we believe this is the case in our equations - as explanatory variables, then, by definition, a low R^2 implies that a substantial amount of variation in the labor-intensity is caused by factors which tend to be random in nature. An example may be that of an entrepreneur wanting to be "modern" and so using more sophisticated, capital-intensive technologies.

We have tried to check whether the explanatory variables are more successful in broadly classifying the firms according to high and low labor-intensities of the firms. For this purpose, we have split the sub-sample (of 680 firms) into high and low labor-intensity groups according to the median value in the sub-sample. Using this definition, we have created a binary variable which takes on the value 1(0) if the firm is in the high (low) labor-intensity category.

This binary variable created above cannot be directly used as the dependent variable in an ordinary least squares regression equation. As explained in the appendix to this chapter, an appropriate technique is to specify a logit equation and estimate it by maximum likelihood methods. The regression coefficients estimated in this way can be used to calculate the probability that a firm will belong to the high (low) labor-intensity category.

We have classified the prediction as correct if the estimated probability for a firm in the high (low) labor-intensity category is greater (equal to or less) than 0.50. According to this rule, the estimated equation correctly classifies 84.4% of all the firms, 89.7% of all the low labor-intensity firms, and 791.% of the high labor-intensity firms.¹ Clearly, the explanatory variables are quite suc-

¹ The estimated equation is
INDEX = 1.99 -0.29* LOCRAWMKT +0.85*SEASONAL
-1.32*POWUSER -0.17*ASSETS +0.00*POWASSET
+0.00*DISTGROTH +0.14*DISTWAGE -0.03*TOWNS
-0.12*ANIMAL +0.03*CERAMICS -0.22*TEXTILE
-0.84*CHEMICAL -0.57*ENGGNR.

The interpretation of INDEX and the estimated coefficients is given in the appendix to this chapter.

Table VI.1

Determinants of Labor-Intensity

Dependent Variable: Workers/Rs.'000 Fixed Assets

Explanatory Variable	Equation 1		Equation 2		Equation 3	
	Coeff.	T-Ratio	Coeff.	T-Ratio	Coeff.	T-Ratio
INTERCEPT	22.95*	4.10	19.07*	6.65	17.44*	3.67
LOCRAWMKT (D)	2.54	0.98	excluded		4.85*	1.97
SEASONAL (D)	5.83 ⁺⁺	1.53	6.09 ⁺⁺	1.60	12.92*	3.75
POWUSER (D)	-13.41*	-4.15	-13.04*	-4.12	-12.47*	-4.13
ASSETS	-0.23*	-3.43	-0.24*	-3.65	-0.21*	-3.10
POWASSET	0.23*	3.28	0.24*	3.43	0.21*	3.00
DISTGROTH	-0.88 ⁺	-1.87	-1.01*	-2.25	-0.92*	-1.96
DISTWAGE	-1.59	-1.21	excluded		-1.60	-1.24
TOWNS	-0.31 ⁺⁺	-1.54	-0.35 ⁺	-1.80	-0.26 ⁺⁺	-1.32
ANIMAL (D)	-9.19*	-2.01	-8.89*	-2.04	excluded	
CERAMICS (D)	9.33*	2.22	10.79*	2.68	excluded	
TEXTILE (D)	-8.17*	-2.17	-7.99*	-2.27	excluded	
CHEMICAL (D)	-1.60	-0.32	excluded		excluded	
ENGGNR (D)	-6.17**	-1.73	-5.30	-1.63	excluded	
Observations	680		680		680	
R ²	0.11		0.11		0.09	
F-Ratio	6.54*		8.23*		8.05*	

Note: (D) indicates a dummy variable. * and ** indicate statistical significance at, at least, the 5% and 10% level, respectively, for a two-tailed test, + and ++ indicate statistical significance at, at least, the 5% and 10% level, respectively, for a one-tailed test.

successful in classifying the firms into high and low labor-intensity categories.

'Local' Orientation of the Firm (LOCRAWMKT):

This is a dummy variable which takes on the value 1 only if both the firm's markets and raw materials are wholly or mainly local, i.e., within the Project area. We had postulated separate hypotheses for markets and raw materials, but we have combined them here because in both cases we expected that local orientation would have no effect on the labor-intensity.

The regression equation confirms our combined hypothesis; the results are similar when separate dummy variables for markets and raw materials were included in the equation. Note, however, that we have seen earlier (Table V.15) that the average labor-intensity of the firms with a local orientation is much higher than the average labor-intensity of the firms without such an orientation.

When the dummy variables for the industrial sectors are excluded (Equation 3), the coefficient of LOCRAWMKT is positive and statistically significant at the 5% confidence level. This change can be taken as an indication that local orientation has no effect on labor-intensity, once sectoral considerations are taken into account. In particular, the Ceramics firms have the highest average labor-intensity, and nearly 78% of them have a local orientation (in both the full sample and the sub-sample). Further, when LOCRAWMKT is excluded but the industry dummy variables are retained (Equation 2), the coefficient of CERAMICS goes up, and its standard error declines.

Clearly, there is a high degree of overlap between local orientation and being a Ceramics firm. Our results show that after the effect of being a Ceramics firm is taken into account, a local orientation by itself has probably no direct influence on the labor-intensity of the firm.

Seasonality (SEASONAL):

This dummy variable takes on the value 1 if the firm is a seasonal producer, rather than a year-round producer. Our hypothesis was that seasonal producers would be more labor-intensive than year-round producers.

This hypothesis receives some support from the estimated equation; the coefficient is positive, and statistically significant at the 6.5% confidence level in a one-tailed test. A one-tailed test is justified in this case because our alternative to the null hypothesis of no effect is unidirectional.

We have seen earlier (Table V.15) that the average labor-intensity of seasonal firms is much higher than the average labor-intensity of year-round producers. This difference is more marked than the difference between local and non-local firms. Just as in the case of local orientation, there is a high degree of overlap between seasonality and being a Ceramics firm; more than 50% of the seasonal producers in the sub-sample are in the Ceramics sector.

When the industry dummy variables are excluded from the regression (Equation 3), the coefficient of SEASONAL and its t-ratio both increase dramatically. We interpret this change as showing that the effect of

seasonality is larger when sectoral considerations are not taken into account.

We conclude that seasonality by itself is responsible for only part of the observed large difference between the average labor-intensity of seasonal and year-round firms; much of this difference is due to sectoral differences.

Type of Energy Used (POWUSER):

This dummy variable takes on the value 1 if the main source of energy for the firm is electricity or diesel. As indicated in Chapter IV, we have interpreted the fact that only some firms use these modern forms of energy as an indication of exogenous differences in the nature of the production functions.

The results are consistent with the hypothesis that firms using either electricity or diesel are more capital-intensive. The coefficient of POWUSER is negative and statistically significant at the 1% confidence in all the three versions of the equation.

This variable has also been included in the regression equation in an interactive form with the size of the firm, as discussed below.

Size of the Firm (ASSETS):

The size of the firm is measured by its total fixed assets (including land, buildings, machinery and equipment) in Rs.'000. As indicated in Chapter IV, there is a possibility that the factor prices for large firms are different from those faced by small firms. We expect larger firms to have a lower labor-intensity. However, this effect is expected to become unimportant after a threshold size is reached.

Note that the variable ASSETS is in the denominator of the dependent variable. However, the inclusion of the same variable on both sides of the regression does not create any problems of "spurious correlation." Such problems arise only when the hypothesis to be tested does not necessarily imply that the variable be included in this way. In our case, it is legitimate and important to ask whether the labor-intensity changes as the capital stock increases. In particular, in the standard model the labor-intensity is the same for all levels of capital stock if the production function is homothetic. In brief, it is legitimate and desirable to include ASSETS as an explanatory variable.

The estimated coefficient is negative and statistically significant at the 1% confidence level, which confirms our hypothesis.

This result is supported by the observations made by other researchers about the relationship between the scale of production and the labor-intensity of the firm. A comparative study of the employment and growth potentials of rural industries, small-scale industries (modern), medium scale and large scale industries in India has shown that labor capital ratio declines as we move from rural to large-scale industries (Banerji, 1977).

'Interactive' Effect (POWASSET):

This variable represents the interactive effect between POWUSER and ASSETS. It is defined as POWUSER*ASSETS. If we consider the signs and sizes of the coefficients of the three variables - POWUSER, ASSETS, and POWASSET - we get the following result:

- power-using firms have lower labor-intensities than non power-using firms;
- larger non-power using firms have lower labor-intensities than smaller non power-using firms;
- larger power-using firms have similar labor-intensities as smaller power-using firms, as the sum of the coefficients of ASSETS and POWASSET is not significantly different from zero.

Agricultural Development in the Region (DISTGROTH):

We have used the District-wide average annual compound growth rate of agricultural output for 1962-73 as an indicator of the level of agricultural development in the region. While this growth rate is clearly not the ideal index of agricultural development, other available indices such as the fertilizer used per acre or the extent of the spread of irrigation also have some drawbacks. For example, the need for irrigation may vary from crop to crop or from region to region.

Consistent with our hypothesis, the coefficient of DISTGROTH is negative and statistically significant at the 3.5% confidence level with a one-tailed test. When the three variables with very low t-ratios in Equation 1 are excluded, the t-ratio of DISTGROTH rises (Equation 2). We conclude that agricultural development tends to lower the labor-intensities of the firms.

An interpretation of this result must take into account the fact that a number of social, economic, and political forces are at play in a region experiencing agricultural growth. In our regression equation, we see the net effects of all these forces, which makes it difficult to point to a particular factor as being the cause of our result.

Keeping this caution in mind, we may suggest that regions experiencing agricultural growth may be more conducive to the development of somewhat more technologically sophisticated rural industries either because they can provide the necessary infrastructures for such production or it may be that their demand is for more modern products (consumer as well as agricultural inputs). Such products have been shown to be less labor-intensive than simple consumer goods.

Wage Level in the Region (DISTWAGE):

We have used the average daily wage rate of unskilled field labor in the District (in 1971-72) as an indicator of the exogenous base wage rate faced by the firms. The data for better indicators - such as the wage rate for skilled workers like blacksmiths - are available for only a few of the Districts covered in our study; data for a more recent year are also not available.

The hypothesis that the firms facing higher wage rates would have lower labor-intensities is not confirmed by our estimated equation. While the sign of the coefficient of DISTWAGE is negative as expected, the associated t-ratio is quite low; the coefficient is statistically significant only at an unacceptable 11.5% confidence level for a one-tailed test. The result is similar when the industry dummy variables are excluded (Equation 3).

This hypothesis has strong roots in economic theory, provided that the firms behave as cost-minimizers. Further, the hypothesis is likely to retain its validity even if the firms behave only approximately (but not strictly) as cost minimizers. The cost-minimizing assumption is supported in our other hypotheses. So it may be that DISTWAGE is not a good proxy for the base wage rate faced by the firms.

However, as seen in the next section, the hypothesis linking DISTWAGE to capacity utilization is confirmed, which is an indication that DISTWAGE is a good proxy.

Urbanization Level in the Region (TOWNS):

This variable is an index of the level of urbanization in the region immediately surrounding the firms, and is based on the number and size of towns in the Project area. We had put forward the hypothesis that the firms in more urbanized regions would have lower labor-intensities than the firms in less urbanized regions.

The estimated coefficient is consistent with our hypothesis. The coefficient of TOWNS is negative and statistically significant at the 6.5% confidence level with a one-tailed test. When the three variables with low t-ratios are excluded (Equation 2), the coefficient is significant at the 3.5% confidence level with a one-tailed test.

The interpretation of this result is similar to that for agricultural development (DISTGROTH), and the remarks made there are applicable here.

Industrial Sectors (ANIMAL, CERAMICS, TEXTILE, CHEMICAL, ENGGNR):

These dummy variables take on the value 1 if the firm belongs to the particular industrial sector. Note that none of the firms in the Forest and Miscellaneous sectors could be included in the analysis, chiefly because very few of them reported the value of their assets. The base sector for the five industry dummy variables is Agriculture.

The coefficients of ANIMAL and TEXTILE are negative and statistically significant at the 5% confidence level for a two-tailed test. The implication is that the firms in these two sectors have lower

labor-intensities than the firms in the Agricultural sector. On the other hand, the coefficient of CERAMICS is positive and statistically significant at the 3% confidence level for a two-tailed test, so that the Ceramics firms have higher labor-intensities than the Agricultural firms. The coefficient of ENGGNR is negative and statistically significant at the 8.5% confidence level in Equation 1, and at the 10.5% confidence level in Equation 2, which is a weak indication that these firms have lower labor-intensities than the Agricultural firms. The Chemicals firms are similar to the Agricultural firms.

These results are consistent with our intuitive expectations, based on the nature of the goods produced by the firms in the various sectors (see Chapter V, Section V.2).

An Analysis of the Residuals:

Since the estimated equation's explanatory power is low, we have analyzed the residuals (defined as the actual minus fitted labor-intensities) to check if they are linked to some omitted qualitative explanatory variables.

One such possible variable is the difference in the general level of efficiency in the use of public and private resources in the different States. While there is no well-defined index to measure these differences, our judgement is that Gujarat, Kerala, Maharashtra, Karnataka, Punjab and possibly Tamil Nadu are "efficient" States, and Assam, Bihar, Orissa, Rajasthan, Uttar Pradesh and possibly West Bengal are "inefficient" States.

We have classified the residuals which fall in the highest and lowest deciles as extreme positive and extreme negative deviants, with

Table VI.2

Percentage Distribution of RIP Firms by Extreme
Residuals from the Labor-Intensity Sub-Sample

State	Sub-Sample	Extreme Positive Residuals	Extreme Negative Residuals
Andhra Pradesh	5.3	8.8	11.8
Assam	5.9	8.8	1.5
Bihar	20.7	11.8	8.8
Gujarat	2.4	2.9	1.5
Himachal Pradesh	2.1	2.9	0.0
Kerala	5.4	13.2	2.9
Madhya Pradesh	7.9	5.9	7.4
Maharashtra	16.2	11.8	23.5
Karnataka	7.2	2.9	4.4
Orissa	3.2	10.3	11.8
Punjab	2.2	11.8	0.0
Rajasthan	4.7	1.5	8.8
Tamil Nadu	1.9	1.5	1.5
Uttar Pradesh	5.6	2.9	0.0
W. Bengal	9.3	2.9	16.2
All States	100.0	100.0	100.0
Sample Size	680	68	68

Note: Residuals are calculated from Equation 1 in Table VI.1 by subtracting the fitted value from the actual value. Percentages may not add up to 100 because of rounding.

the deciles calculated from the algebraic values of the residuals. Our interest is in seeing whether there is any difference between the shares of "efficient" and "inefficient" States in these extreme deviants.

In Table VI.2 we have presented the shares of the various States in the sub-sample as well as in the extreme deviants. The residuals are from Equation 1 in Table VI.1.

It is not possible to discern any systematic link of a State's efficiency to its share in the extreme residuals. Gujarat, Kerala, and Punjab are over-represented in the extreme positive deviants, but this is true for Orissa, Rajasthan and West Bengal also. Further, Bihar, Madhya Pradesh, Karnataka, Tamil Nadu and Uttar Pradesh are under-represented in both groups of extreme residuals. Clearly, the possible omission of a State-related efficiency index is not responsible for the low explanatory power of the equation.

Summary and Conclusion:

While the explanatory power of the estimated equation (as measured by R^2) is low, the explanatory variables used are capable of correctly classifying most of the firms into high and low labor-intensity categories (in the logit equation). Most of the hypotheses presented in Chapter IV are supported by our analysis; the major exception is that we could not confirm the hypothesis linking the exogenous wage rate to the labor-intensity.

VI.2 UTILIZATION OF PRODUCTION CAPACITY:

The data for capacity utilization classify the RIP firms into five levels: 0-24%, 25-49%, 50-74%, 75-99%, and 100% utilization.

We have assigned the values 1 to 5, respectively, to these levels of utilization.

As explained in the appendix to this chapter, the use of ordinary least squares when the dependent variable (the level of utilization) is discrete is not totally appropriate because the calculated t-ratios do not have their usual interpretation.

One possible alternative to the ordinary least squares method is to redefine the dependent variable to make it binary, and estimate a logit equation. While this alternative has some theoretical advantages, it too is not entirely appropriate. One practical problem is that some information is lost in classifying the firms into two groups according to 'high' and 'low' utilization levels.

We have dealt with this dilemma by estimating both logit and ordinary least squares equation.

To create the dependent variable for the logit equation, we have classified a firm in the 'high' utilization category if its utilization level is at least 75%. Approximately 42% of the firms come under this category in the sub-sample; the dependent variable takes the value 1 for these firms. The rest of the firms are in the 'low' utilization category, and the dependent variable takes the value 0. In the ordinary least squares equation, the dependent variables takes on the values 1 to 5, as described earlier.

For the logit equation, we have calculated the proportion of firms correctly classified by the equation by using the following rule: a firm is correctly classified only if the estimated probability for a firm in the high (low) utilization category is greater (equal to or less) than 0.50.

Table VI.3

Determinants of Capacity Utilization

Explanatory Variable	L O G I T				O L S	
	Equation 1		Equation 2		Equation 3	
	Coeff.	T-Ratio	Coeff.	T-Ratio	Coeff.	T-Ratio
INTERCEPT	0.022	0.05	0.115	0.033	3.717*	19.29
LOCRAWMKT (D)	-0.381*	-2.12	-0.342*	-2.05	-0.159 ⁺⁺	-1.87
SEASONAL (D)	0.321	1.23	excluded		0.257*	2.06
ADQRAWN (D)	1.228*	6.95	1.233*	7.18	0.678*	8.32
POWUSER (D)	-0.505 ⁺⁺	-1.60	-0.438*	-2.08	-0.213 ⁺⁺	-1.45
ADQPOWER (D)	0.012	0.04	excluded		0.059	0.40
ASSETS	-0.010**	-1.67	-0.011**	-1.74	-0.004**	-1.74
POWASSET	0.009	1.54	0.009	1.65	0.003	1.52
DISTGROTH	-0.023	-0.71	excluded		0.002	0.16
DISTWAGE	-0.191**	-2.01	-0.222*	-2.52	-0.167*	-3.92
TOWNS	0.001	0.08	excluded		0.003	0.54
ANIMAL (D)	0.023	0.07	excluded		0.126	0.82
CERAMICS (D)	-0.190	-0.07	excluded		-0.034	-0.25
TEXTILE (D)	-0.427	-1.63	-0.448*	-2.05	-0.114	-0.93
CHEMICAL (D)	-0.543	-1.52	excluded		-0.091	-0.56
ENGGR (D)	-0.289	1.17	excluded		0.064	0.54
Observations	714		714		714	
Proportion/R ²	0.68		0.66		0.15	
F-Ratio	N.A.		N.A.		8.26*	

Note: (D) indicates a dummy variable. N.A. indicates Not Applicable. Proportion indicates the proportion of firms correctly classified by the logit equations. * and ** indicate statistical significance, at, at least, the 5% and 10% level, respectively, for a two-tailed test; + and ++ indicate statistical significance at the 5% and 10% level, respectively, for a one-tailed test. The t-ratios in the logit equations are asymptotically valid while the t-ratios in the OLS equation are, strictly speaking, not valid.

Three versions of the estimated equation are presented in Table VI.3. All the variables representing the hypotheses to be tested are included in Equation 1, which is a logit equation. In Equation 2, which is also a logit equation, we have dropped all the variables whose coefficients are statistically insignificant (at conventional confidence levels) in Equation 1. The ordinary least squares version of Equation 1 is presented as Equation 3.

Note that the t-ratios reported in the logit equations are asymptotically valid, while the t-ratios in the ordinary least squares are, strictly speaking, not valid.

The logit equation correctly classifies 76% of the low utilization category firms, 56% of the high utilization category firms, and 68% of all the firms. The figures are approximately the same when the variables with low t-ratios in Equation 1 are excluded from the regression (Equation 2). This suggests that the excluded variables probably do not help much in explaining the level of capacity utilization.

'Local' Orientation of the Firm (LOCRAWMKT):

We had put forward the hypothesis that the firms with a local orientation would tend to have lower capacity utilization rates than the firms without such an orientation. This hypothesis is confirmed by the negative sign of the coefficient of LOCRAWMKT; the coefficient is statistically significant at 3.5% confidence level. The results are similar in Equation 2, and the coefficient is negative in Equation 3 also. Note that the proportion of the firms in the high utilization category is approximately the same for the firms with and without a local orientation in both the full sample (see Table V.16) and the sub-sample.

Seasonality (SEASONAL):

We expected seasonal firms to have higher capacity utilization levels, at least during the season when they are active. However, this hypothesis is not supported by the estimated equation. While the coefficient of SEASONAL is positive as expected, it is significant only at an unacceptable 11% confidence level with a one-tailed test. The coefficient is positive and significant at the 5% level in the ordinary least squares equation, but this t-ratio is not theoretically reliable.

Note that the distribution of the firms according to high and low utilization levels is approximately the same for seasonal and year-round producers in the full sample (Table V.16). In the sub-sample, however, nearly 53% of the seasonal firms are in the high utilization category, while only 41% of the year-round firms fall in this category.

We conclude that if seasonality has any effect at all on the level of utilization, it is likely to be that seasonal producers have higher utilization levels than year-round producers.

Adequacy of Raw Materials (ADQRAWM):

This is a dummy variable which takes on the value 1 if the firm reported receiving adequate supplies of raw materials. The estimated coefficient is positive in all the equations, and the t-ratios are large; the coefficient is significant at the 1% level in all the equations.

The results support the hypothesis that an adequate supply of raw materials tends to keep capacity utilization levels high. Further, the estimated coefficient of ADQRAWM is large compared to the coefficients of the other dummy variables. This once again underlines the importance of raw materials.

This result should be seen in light of other studies which have shown that small industries in India are particularly materials intensive (Van der Veen, 1973). This could be because of the technology used as well as the product choice. For example, in rice milling, even with only 50% capacity utilization, variable costs including the price of paddy constitute as much as 96% of the total operating costs. Variable costs would be a higher percentage of total costs at higher capacity utilization. In cases where the variable costs form such a large proportion of total costs, decline in average costs as a result of increasing capacity utilization are insignificant, and so do not offer an incentive to do so. This is especially true when prices of these materials rise and shortages occur. Under these circumstances, small firms lower variable costs by underutilizing their capacity.

In this connection, we must note that some firms may not be able to afford high-priced raw materials in times of shortages because the firms are themselves inefficient. If that is the case, alleviating the shortage by government policies may involve implicitly subsidizing inefficient or uneconomical firms.

Type of Energy Used (POWUSER):

We had put forward the hypothesis that power-users would have similar capacity utilization levels as non power-users. However, we find that power-users tend to have lower utilization levels than non power-users. When the variables whose associated t-ratios are low in Equation 1 are excluded, we see (Equation 2) that the negative coefficient of POWUSER is statistically significant at the 4% confidence level for a two-tailed test. The coefficient is also negative in the other two equations.

Note that in both the full sample and the sub-sample the proportion of firms in the high utilization category is lower for power-users than for non power-users.

In this result, we have not distinguished between power-using firms which receive adequate supplies of power and those who do not receive adequate power. This is seen in the next variable. The interactive effect of power use and the size of the firm is discussed later.

Adequacy of Power (ADQPOWER):

This dummy variable takes on the value 1 only if the firm is a power-user and reported receiving adequate supplies of power; it takes on the value 0 if the firm is either not a power-user or a power-user not getting adequate power. With this definition, in conjunction with POWUSER, non power-using firms form the base for power-users, and within the power-using group, those not receiving adequate supplies form the base.

We would expect adequate supplies of power to raise the capacity utilization rates, but this hypothesis is not confirmed by the estimated equation. While the coefficient of ADQPOWER is positive, the t-ratio is very low and the coefficient is not statistically significant at any reasonable confidence level.

In brief, we have found that power-using firms have lower utilization rates than non power-using firms, and this result holds whether or not the power-using firms receive adequate power supplies.

Size of the Firm (ASSETS):

The coefficient of this variable is negative and statistically significant at the 9% confidence level. This result is consistent with our hypothesis that smaller firms are likely to have higher utilization levels than larger firms.

We consider next the interactive effects of the size of the firm and the type of energy used.

'Interactive' Effect (POWASSET):

As in the labor-intensity equation, this variable is the product of POWUSER and ASSETS. The coefficient of POWASSET is positive but not statistically significant at any reasonable confidence level. More importantly, the null hypothesis that the sum of the coefficients of ASSETS and POWASSET is equal to zero cannot be rejected. In other words, the overall coefficient of the size of the firm for power-users is not different from zero.

On considering the coefficients by POWUSER, ADQPOWER, ASSETS and POWASSET together, we get the following results:

- power-using firms have lower utilization rates than non power-using firms, irrespective of the adequacy/inadequacy of power supplies;
- larger non power-using firms have lower utilization rates than smaller non power-using firms;
- larger power-using firms have similar utilization rates as smaller power-using firms.

Agricultural Development in the Region (DISTGROTH):

We had expected agricultural development to have a positive effect on the level of capacity utilization. However, this hypothesis is not supported by the estimated equation. The coefficient of DISTGROTH is negative - contrary to our hypothesis - but not statistically significant at any reasonable confidence level. We conclude that agricultural development has no effect on utilization levels.

Wage Level in the Region (DISTWAGE):

We had put forward the hypothesis that higher wage levels would tend to reduce utilization levels. This hypothesis is confirmed by our analysis. The coefficient of DISTWAGE is negative and statistically significant at the 5% confidence level. The result is similar in Equation 2.

Urbanization Level in the Region (TOWNS):

Our hypothesis was that increasing urbanization would tend to raise capacity utilization levels. However, our analysis does not support this hypothesis. The coefficient of TOWNS is small, but the associated t-ratio is very small and the coefficient is not statistically significant at any reasonable confidence level.

Industrial Sectors (ANIMAL, CERAMICS, TEXTILE, CHEMICAL, ENGGNR):

As in the labor-intensity equation, none of the firms in the Forest and Miscellaneous sectors could be included in the analysis. The Agricultural sector forms the base for the industry dummy variables.

We had seen earlier (Table V.14) that the patterns of capacity utilization are fairly similar for all the industrial sectors. The

present analysis confirms this similarity, with one major exception.

We had seen that the Textiles sectors have the largest proportion of the firms in the high utilization category. Our analysis here shows that the Textiles sector is different from the others, but being in the Textiles sector reduces the likelihood of high utilization. The coefficient of TEXTILES is negative and it is the only one that is statistically significant, at the 5% confidence level in Equation 2.

An Analysis of the Residuals:

As in the previous section, we have classified the largest (in absolute value) residuals as extreme deviants. The top and bottom deciles, formed according to the algebraic values, constitute the extreme positive and negative residuals, respectively.

In the logit equation, the dependent variable is either 0 or 1; the fitted probabilities lie between 0 and 1, so the residuals lie in the range from -1 to 1. Unlike in an ordinary least squares equation, these residuals need not add up to zero.

We had earlier classified Gujarat, Kerala, Maharashtra, Karnataka, Punjab and Tamil Nadu as "efficient" States, and Assam, Bihar, Orissa, Rajasthan, Uttar Pradesh and West Bengal "inefficient" States. If this classification is valid, and if capacity utilization increases with the level of efficiency, then we would find efficient (inefficient) States over-represented in the extreme positive (negative) deviants.

Table VI.4 shows the shares of the States in the sub-sample and in the extreme deviants. The residuals are from Equation 1 in Table VI.3.

Table VI.4

Percentage Distribution of RIP Firms by Extreme Residuals
from the Capacity Utilization Sub-Sample

State	Sub-Sample	Extreme Positive Residuals	Extreme Negative Residuals
Andhra Pradesh	5.2	5.6	5.6
Assam	5.9	11.3	2.8
Bihar	20.9	18.3	9.9
Gujarat	2.4	1.4	2.8
Himachal Pradesh	2.1	1.4	0.0
Kerala	6.0	1.4	1.4
Madhya Pradesh	7.8	9.9	8.4
Maharashtra	16.1	12.7	26.8
Karnataka	7.3	5.6	18.3
Orissa	3.1	5.6	1.4
Punjab	2.4	11.3	0.0
Rajasthan	4.6	8.5	4.2
Tamil Nadu	1.8	2.8	2.8
Uttar Pradesh	5.5	2.8	1.4
W. Bengal	9.0	1.4	14.1
All States	100.0	100.0	100.0
Sample Size	714	71	71

Note: Residuals are calculated from Equation 1 in Table VI.3 by subtracting the fitted probability from the actual value (0 or 1). Percentages may not add up to 100 because of rounding.

Among the efficient States, only Punjab is over-represented in the extreme positive deviants, while Gujarat, Maharashtra and Karnataka are over-represented in the extreme negative deviants. Among the inefficient States, only West Bengal is over-represented in the extreme negative deviants, while the other States are over-represented in the extreme positive deviants. This pattern does not suggest that the exclusion of a State-related efficiency index is responsible for the low explanatory power of our equation.

In both the labor-intensity and capacity utilization equations Assam and Punjab are over-represented in the extreme positive deviants and under-represented in the extreme negative deviants. In other words, our estimated equations tend to under-predict the labor-intensity and capacity utilization in Assam and Punjab. A similar analysis shows that our equations tend to over-predict the labor-intensity and capacity utilization in Maharashtra and West Bengal.

Summary and Conclusion:

The logit equation correctly classifies about two-thirds of the firms into high and low utilization categories. Most of the hypotheses put forward in Chapter IV are confirmed by our analysis; the major exception is that agricultural development or utilization appear to have no effect on capacity utilization.

VI.3 GROWTH RATE OF THE FIRMS:

The growth rate of the firms has been defined in Chapter V as the average annual compound growth rate of (deflated) output.

As for the labor-intensity regression, three versions of the estimated growth rate equation have been presented in Table VI.5. Equation 1 has all the variables representing the hypotheses of interest, including the industry dummy variables. In Equation 2, we have dropped all the variables whose coefficients are not statistically significant (at conventional confidence levels) in Equation 1. Finally, Equation 3 includes all the variables in Equation 1 except for the industry dummy variables. Note that we had excluded four (of the five) industry dummy variables in Equation 2.

All the three versions have been estimated by ordinary least squares. The explanatory power of the three versions is approximately equal. This is a strong indication that the variables excluded from Equations 2 and 3 are either highly collinear with the included variables or are truly irrelevant in explaining the growth rate.

The explanatory power of the estimated equations is low, with an R^2 value of only 0.08. As in the labor-intensity analysis, we have tried to check whether the explanatory variables are more successful in classifying the firms into high and low growth rate categories than at explaining the actual growth rate.

We have assigned the firms above the median growth rate the value 1 and the firms below (or equal to) the median rate the value 0. The binary variable created in this way is the dependent variable in a logit equation which has the same explanatory variables as Equation 1.

For our purposes, the estimated equation correctly classifies the firm if the predicted probability for a firm in the high (low) growth rate category is greater (equal to or less) than 0.50. According to this rule, the logit equation correctly classifies 64.2% of

the firms, 62.0% of the low growth rate firms, and 66.3% of the high growth rate firms.² Clearly, the explanatory variables are quite successful in classifying the firms into high and low growth rate categories, though not as successful as the variables in the comparable labor-intensity equation.

Seasonality (SEASONAL):

We had expected that there would be no difference between seasonal and year-round producers with respect to the growth rate. This hypothesis is supported by analysis. The coefficient of SEASONAL is negative, but the associated t-ratio is very small, and the coefficient is not statistically significant at any reasonable confidence level. The result is similar when the industry dummy variables are excluded.

We had seen earlier (Table V.15) that seasonal firms have slightly lower growth rates than year-round firms in the full sample. This difference is also found in the firms in the sub-sample. However, our analysis indicates that this observed difference is not statistically significant.

Type of Energy Used (POWUSER):

We had put forward the hypothesis that the type of energy used by the firm would have no effect on the growth rate. This hypothesis is supported by the estimated equations. The coefficient of POWUSER is

² The estimated equation is
INDEX = 0.83 -0.15*SEASONAL -0.21*POWUSER +0.006*ASSETS
-0.002*POWASSET +0.07*DISTGROTH +0.02*TOWNS -0.23*AGE
-0.44*ANIMAL +0.32*CERAMICS -0.16*TEXTILE +0.90*CHEMICAL
+0.24*ENGGNR

The interpretation of INDEX and the estimated coefficients is given in the appendix to this chapter.

Table VI.5

Determinants of Growth Rate

Dependent Variable: Annual Average Compound Growth Rate of Output.

Explanatory Variable	Equation 1		Equation 2		Equation 3	
	Coeff.	T-Ratio	Coeff.	T-Ratio	Coeff.	T-Ratio
INTERCEPT	-0.18*	4.50	0.16*	5.86	0.18	5.41
SEASONAL (D)	-0.016	-0.40	excluded		-0.021	-0.61
POWUSER (D)	-0.018	-0.64	excluded		-0.020	-0.85
ASSETS	0.0002	0.28	0.0006*	4.63	0.0003	0.44
POWASSET	0.0004	0.50	excluded		0.0003	0.36
DISTGROTH	0.009 ⁺	1.80	0.009 ⁺	1.80	0.009 ⁺	1.82
TOWNS	-0.008	-0.47	excluded		-0.0005	-0.29
AGE	-0.023*	-5.24	-0.023*	-5.35	-0.023*	5.41
ANIMAL (D)	-0.031	-0.63	excluded		excluded	
CERAMICS (D)	-0.001	-0.02	excluded		excluded	
TEXTILE (D)	0.001	0.03	excluded		excluded	
CHEMICAL (D)	0.073	1.58	0.079**	1.89	excluded	
ENGGNR (D)	-0.014	-0.50	excluded		excluded	
Observations		707		707		707
R ²		0.08		0.08		.08
F-Ratio		5.11*		15.05*		8.19*

Note: (D) indicates a dummy variable. * and ** indicate statistical significance at, at least, the 5% and 10% level respectively for a two-tailed test; + and ++ indicate statistical significance at, at least, the 5% and 10% level respectively for a one-tailed test.

is negative, indicating that the firms using electricity or diesel have lower growth rates than other firms. However, the coefficient is not statistically significant at any reasonable confidence level. The result is similar when the industry dummy variables are excluded.

In the full sample (Table V.15) the growth rate of power-using firms is nearly twice that of non power-using firms; the difference is less marked in the sub-sample. However, our analysis indicates that this difference is not statistically significant.

Size of the Firm (ASSETS and POWASSET):

We consider these two variables together. POWASSET is merely the product of ASSETS and POWUSER, and would help in differentiating between power-users and non power-users in analyzing the effect of size on the growth rate. We have seen above that the coefficient of POWUSER is statistically insignificant.

The coefficient of both ASSETS and POWASSET is positive and statistically insignificant; in contrast, the coefficients had the opposite signs in the labor-intensity equations. Further, collinearity between ASSETS and POWASSET becomes a problem in this equation; the correlation between the estimated coefficients is -0.99. Clearly, we are unable to differentiate meaningfully between power-users and non power-users in analyzing the effect of size on the growth rate.

In Equation 2 we have dropped the variable POWASSET but retained ASSETS. The coefficients of ASSETS is approximately equal to the sum of the coefficients of ASSETS and POWASSET in Equation 1. This is further confirmation that it is not possible to separate power-users from non power-users in this equation due to multicollinearity.

The estimated coefficient in Equation 2 is positive and statistically significant at the 1% confidence level for a two-tailed test. This result, properly interpreted, is consistent with the hypothesis that smaller firms grow faster than larger firms.

At any given point in time - such as the year of the Planning Commission survey -- firms can be relatively large for one of two reasons. First, the firm could have started out on a big scale with no growth in the subsequent years. Second, the firm could have started out small, experienced rapid growth, and so become large.

If most of the firms are large because of the first reason, there will not be a positive relationship between past growth rates and current scale of production. Such a relationship will exist only if most of the firms which are large now started out as small firms. Since we do find such a relationship, we conclude that smaller firms grow faster than larger ones.

Agricultural Development in the Region (DISTGROTH):

We expect agricultural development in the region to give a boost to the growth rates of the firms. Consistent with this hypothesis, the coefficient of DISTGROTH is positive and statistically significant at the 4% confidence level for a one-tailed test. The coefficient and the associated t-ratio are approximately the same in all the three versions of the equation.

Urbanization Level in the Region (TOWNS):

We had put forward the hypothesis that greater urbanization would lead to higher growth rates, but this is not supported by the estimated equation. The coefficient of TOWNS is negative, but not statis-

tically significant at any reasonable confidence level. Hence we can conclude that the level of urbanization in the area around the firm has no identifiable effect on the growth rates of the firms.

Age of the Firm (AGE):

We had expected younger firms to grow faster than older firms, and this hypothesis is supported by our analysis. The coefficient of age is negative and statistically significant at the 1% confidence level. The result is the same in all the three versions of the estimated equation.

Industrial Sectors (ANIMAL, CERAMICS, TEXTILE, CHEMICAL, ENGGNR):

As before, the base for these industry dummy variables is the Agricultural sector.

The estimated coefficients indicate that the industrial sectors are fairly similar with regard to the growth rates. The only exception is the Chemicals sector, where the firms have higher growth rates than the Agricultural firms. The coefficient of CHEMICALS is positive and statistically significant at the 6% confidence level for a two-tailed test. We had seen earlier (Table V.14) that the average growth rates of the Chemicals firms is much more above the overall average growth rate in the full sample; a similar pattern can be seen in the sub-sample.

An Analysis of the Residuals:

As in the earlier sections, we have identified the extreme positive and negative residuals as those falling in the top and bottom deciles.

As in the earlier two sections, we investigate the possibility that the low explanatory power of our estimated equation is due to the exclusion of a State-linked qualitative index of efficiency. If this is

Table VI.6

Percentage Distribution of RIP Firms by Extreme
Residuals from the Growth Rate Sub-Sample

State	Sub-Sample	Extreme Positive Residuals	Extreme Negative Residuals
Andhra Pradesh	6.6	4.3	7.1
Assam	6.2	4.3	2.9
Bihar	21.2	12.9	10.0
Gujarat	2.8	4.3	5.7
Himachal Pradesh	3.1	8.6	0.0
Kerala	7.5	7.1	25.7
Madhya Pradesh	10.5	18.6	17.1
Maharashtra	9.9	12.9	12.9
Karnataka	5.7	4.3	7.1
Orissa	4.7	2.9	2.9
Punjab	1.8	2.9	0.0
Rajasthan	5.2	4.3	8.6
Tamil Nadu	2.8	0.0	0.0
Uttar Pradesh	4.4	5.7	0.0
W. Bengal	7.5	7.1	0.0
All States	100.0	100.0	100.0
Sample Size	707	70	70

Note: Residuals are calculated from Equation 1 in Table VI.5 by subtracting the fitted value from the actual value. Percentages may not add up to 100 because of rounding.

indeed the case, then we would expect "efficient" States to be over-represented in the extreme positive deviants, and "inefficient" States to be over-represented in the extreme negative deviants.

Table VI.6 shows the shares of the States in in sub-sample and in two groups of extreme deviants. The residuals are from Equation 1 in Table VI.5.

Among the States which we have classified as efficient in the use of public and private resources, Gujarat, Maharashtra, and Punjab are over-represented in the extreme positive deviants, but Gujarat, Kerala, Maharashtra and Karnataka are over-represented in the extreme negative deviants. Similarly, among the States which we have classified as inefficient, only Rajasthan is over-represented in the extreme negative deviants, while Uttar Pradesh is over-represented in the extreme positive deviants.

Clearly, the above pattern does not suggest that the low explanatory power of our estimated equation is due to the exclusion of a State-linked index of efficiency.

One interesting result which emerges from our analysis is that Punjab is over-represented in the extreme positive deviants and under-represented in the extreme negative deviants in all the three equations. The implication is that the firms in Punjab tend to perform better on all the three criteria than predicted by our estimated equations.

Summary and Conclusion:

The logit equation correctly classifies about two-thirds of the firms into high and low growth rate categories, though the R^2 in the ordinary least squares equation is low. Most of the hypotheses put forward in Chapter IV are supported by the analysis.

VI.4 AN OVERVIEW:

In the previous three sections we have reported the results of testing the hypotheses for each performance criteria. In this section we provide an overview of the results.

The low explanatory power of the ordinary least squares equation for labor-intensity and growth rate is a cause for some concern. However, the success of the logit equations in correctly classifying the firms into high and low performance categories indicates that the explanatory variables used do broadly influence the dependent variables. Further, the low explanatory power is partially due to the extremely large variability in the value of the dependent variable; most likely some entrepreneur-specific factors or other factors which cannot be systematically identified or quantified are responsible for the extreme values.

The region related hypotheses presented in Chapter IV are supported, or at least not contradicted by our analysis. The firms in the relatively developed regions have lower labor-intensities and higher growth rates than the other firms, but the patterns of capacity utilization are similar for the two groups. We have used the growth rate of agricultural output and the level of urbanization as indicators of regional development.

We found that capacity utilization levels tend to be lower in the regions where the base wage rates are higher. However, we could not confirm the hypothesized effect of the wage rate on labor-intensities.

We found that, according to our criteria, the firms with a 'local' orientation do not perform any better than the firms without such an orientation, once the sectoral effects have been taken into account.

In particular, localized firms have lower levels of capacity utilization than non-localized firms.

Seasonal firms have higher labor-intensities than year-round producers, but the two groups have similar growth rates and patterns of capacity utilization.

The firms which use electricity or diesel have lower labor-intensities and capacity utilization levels than the firms which use other sources of energy, with the growth rate similar for the two groups. At the same time, the larger firms are inferior to the smaller firms according to the three performance criteria. However, once a firm is a power-user, further increases in the capital stock do not have any negative effect on labor-intensities or utilization levels. Also, the adequacy of the supply of electricity or diesel does not appear to be a major consideration in determining the capacity utilization levels.

The availability of adequate supplies of raw materials is confirmed to be one of the major determinants of the level of capacity utilization. While this is an obvious result, it should be interpreted carefully. There is always the possibility that the firms which complain about inadequate supplies are inefficient, and hence cannot afford to pay the market price of raw materials. This possibility must be considered in each case before any action is taken to step up the supplies of raw materials.

We found that older firms have lower growth rates than younger firms, while the age of the firm is not a relevant consideration for the other two criteria. In conjunction with the earlier results, this finding makes a strong case for emphasizing the role of young,

small and non power-using firms in rural industrialization.

There is substantial difference in the labor-intensities of the firms in the various industrial sectors, but the capacity utilization levels and the growth rates are fairly similar across the sectors.

The firms in the Agricultural sector form the base in our analysis. In comparison, the only difference in the Animal Husbandry firms is that their labor-intensities are lower than the base. The only difference for the Ceramics firms is that their labor-intensities are higher than the base. The Textiles firms, however, have both lower labor-intensities and utilization levels than the base. The Chemicals firms have higher growth rates while the Engineering firms are similar to the base firms. Clearly, the Textiles firms tend to be inferior to the Agricultural firms.

APPENDIX

LOGIT REGRESSION ANALYSIS

In this appendix we have outlined the need for and relative advantages of estimating logit regression equations. Further details can be found in Amemiya (1981) or Pindyck and Rubinfeld (1980).

When the dependent variable is discrete in nature, one of the major assumptions of the ordinary least squares technique cannot be satisfied; this is the assumption that the error term is normally distributed. Since the normal distribution is continuous, it is incompatible with a discrete dependent variable. The failure to satisfy the assumption means that the customary t-ratios do not have their usual interpretation. However, if the ordinary least squares technique is used with a discrete dependent variable, the estimated coefficients will be unbiased, provided that the other assumptions are satisfied.

A further complication arises when the discrete dependent variable is binary, with values of 0 or 1. The value 1 is usually assigned by the analyst to the dependent when a particular event of interest occurs; e.g., the firm belongs to the high performance category. Correspondingly, the value 0 means that the event did not occur.

In such a situation, a natural interpretation of the fitted value of the dependent variable is that they indicate the probability that the event will occur. However, with the ordinary least

technique, there is no presumption that the fitted values will lie between 0 and 1.

The above two complications are not present with the logit technique. The starting point of this technique can be taken as the creation of a new variable, which we have called INDEX. This variable is continuous and can take on any value from minus infinity to plus infinity.

INDEX is linked to the explanatory variables, in the same way as in the ordinary least squares analysis. For example, if X and Y are the two explanatory variables, and e the error term, we can write $INDEX = a + bX + cZ + e$. Since we do not have any observed values for INDEX, this equation cannot be directly estimated.

The variable INDEX is linked to the probability of the event occurring by a given theoretical distribution. The two commonly used distributions are the cumulative normal and logistic. If the cumulative normal distribution is used, the analysis is said to be probit; if the logistic distribution is used, the analysis is said to be logit.

From an a priori point of view, there is little difference between probit and logit analysis since the cumulative normal and logistic distribution resemble each other closely. However, the computational effort is much less for the logistic distribution, and this is the major reason for its popularity.

When INDEX takes on the value minus infinity in logit analysis, the associated probability of the event occurring is 0; when INDEX is equal to 0, the probability is 0.5, and when INDEX is equal to plus infinity, the probability is 1. Thus the fitted probability

is guaranteed to lie between 0 and 1. Formally, the link between the probability and INDEX is:

$$\text{Probability} = \frac{1}{1 + \text{Exp}^{-\text{INDEX}}}$$

Since there are no observed values of INDEX, the logit equation is estimated by Maximum Likelihood methods. In brief, the procedure searches for the values of a, b, and c which generate those values of INDEX and the associated probabilities which are most compatible with the actual 0 or 1 values of the dependent variables. In practice, this is a non-linear iterative procedure.

The t-ratios associated with the coefficients estimated above are asymptotically valid. Note that the variables are linked linearly to INDEX, which means that they are linked non-linearly to the probability. Hence the coefficients show the actual changes in INDEX when the explanatory variable change, but the coefficients show only the direction of change in the probability.

CHAPTER VII

SUMMARY AND CONCLUSIONS

This chapter has three sections. The first section summarizes India's rural industrialization experience and the characteristics of the sample firms in the RIP program. In the second section we have summarized the results of our empirical analysis, and drawn some policy recommendations from them. Finally, in the third section, we have presented some ideas for further research.

VII.1 Rural Industrialization in India;

India's policy towards rural industries has to be seen in the context of its policy toward large-scale modern industries. Since 1947, official policy has stressed large-scale industries as the main source of growth for the economy. However, it was recognized that the emphasis on heavy industries would not lead to the creation of new jobs or the production of consumer goods in adequate quantities. This role was assigned to small-scale industries in the urban areas and cottage industries in the rural areas.

In the First Five Year Plan (1951-'56), a strong effort was made to preserve and promote the industries already in existence in the rural areas. For example, textile mills were prohibited from expanding their output of the varieties of cloth which could be produced by hand-looms. Some provisions were also made for supplying raw materials to the village industries, and for training the workers in better techniques.

The thrust of the policy embodied in the early years can be clearly seen from the khadi industry. Khadi was one of the major symbols of Indian nationalism in the fight for independence from the British; after independence in 1947, it was expected that khadi's role would not be diminished.

The Khadi and Village Industries Commission was set up to promote the cause of khadi. Among its other activities was the revitalization of various crafts and trades in the rural areas. However, khadi was its major concern. The Commission realized that the country's need for cloth could not be met by the existing handlooms. An improved design, called the Ambar Charkha, was developed. The Commission proposed to manufacture and distribute 0.25 million Charkhas, which would provide employment to 0.36 million spinners, and produce 1,500 million yards of cloth during the Second Five Year Plan (1956-'61). Soon, these targets were revised downwards substantially: the Commission would distribute only 500,000 Charkhas, which would produce only 60 million yards of cloth.

In practice, only 250,000 Charkhas were distributed during the Second Plan, of which about 40% were inactive because of their poor quality and inadequate repair services. The target of output per Charkha was revised downwards from 500 yards of cloth per year to 120 yards, but in 1960, the Khadi Evaluation Committee reported that the actual output was only 60 yards.

In his analysis of the Ambar Charkha, Sen (1968) found that even after making generous assumptions about worker productivity, the income per worker would be absurdly low. Further, the authorities found it

difficult to sell even the khadi that was produced, in spite of large subsidies and rebates.

While the failure of the khadi program to create either employment or consumer goods is clear, the program has continued through the Plans. Some attempts are being made to improve the technique, and to introduce new varieties of cloth such as cotton-polyester khadi.

By the beginning of the Third Plan in 1962, the concept of rural industrialization was broadened to include modern small-scale industries. As part of this change, the Rural Industries Project (RIP) program was started. These Projects were expected to provide a complete package of assistance to local entrepreneurs who wished to set up modern industries in the rural areas. However, the aim of the policy remained the same as before: to create employment and produce consumer goods.

As part of the RIP program, 49 Projects were started in different parts of the country in the 1960s, and 57 Projects were added in the 1970s. While this program is centrally financed, the implementation and the detailed content of each Project is the responsibility of the State government. At the Project level, a Project committee approves financial and provides technical assistance, marketing advice, aids in getting raw materials, and also supplies blue prints and layout for plant and machinery.

A major change in the rural industrialization policy came with the formation of the Janata government in 1977. One of the innovations was to decentralize the administration of the various programs by creating District Industrial Centres, which would deal with the requirements of all the small and village industries in the District. Other substantive

changes were to give special attention to "tiny" firms, and to increase the number of products reserved for small-scale firms.

None of these policies became fully operational before the Janata government lost power in 1980. The Congress government elected at that time has not made any efforts to implement these policies.

In contrast to India, the aim of rural industrialization policy in China has been to serve agriculture, and to help communes and brigades achieve a considerable measure of self-sufficiency.

In China, the rural industries that serve agriculture are called "five small industries" and they supply agriculture with energy, cement, chemical fertilizers, iron and steel. In India, these inputs are exclusively produced by the large scale sector.

Taiwan's experience has been different from both India's and China's. In Taiwan, rural industries came up as a response to a highly commercialized and productive agricultural sector. By 1960, electricity had already reached 70% of the farm households, the rural areas were well connected to the major cities, and the rural population was mostly literate. When Taiwan adopted an export-oriented strategy, one of the key industries that sprang up in the rural areas was the canning of vegetables and fruit.

Characteristics of the Firms:

In this section we will summarize the main characteristics of the sample RIP firms surveyed by the Planning Commission. The survey collected data on 2015 firms started as part of the RIP programs in the 1960s.

We note first that the performance of these firms was good according to the labor-intensity and growth rate criteria used in this study. Based on the median values, the average firm had fixed assets of Rs. 1,400 (US\$ 185.00) per worker, and an annual average compound growth rate of output of 4%; the mean values of the labor-intensity as well as the annual compound growth rate of output were much higher than the median values. The capacity utilization of these firms was also fair. Approximately 44% of the firms used at least three-quarters of their productive capacity, and only one-fifth of the firms used less than 50% of their capacity.

The firms participating in the RIP program were mainly involved in the production of consumer goods, though some of them produced inputs for agriculture or other industries.

In the next few paragraphs, we summarize some of the main points of our data used in the econometric analysis. The data were for 2015 firms from 26 of the 49 projects started in the 1960s as part of the RIP program. The data were collected in 1974 by the Indian Planning Commission.

The largest proportion (28%) of the sample firms was in the agricultural sector; these firms were engaged in activities such as flour and rice milling, oil crushing, and producing gur and khandsari (partially refined sugars). Approximately 21% of the sample firms were in the engineering sector, and they were engaged in activities such as blacksmithy, making steel furniture and agricultural implements, and automobile servicing. The forest sector, which included carpentry, bullock-cart production, making cane and bamboo products, and producing Ayurvedic (indigenous) medicines, had about 18% of the firms.

The next largest sector was textiles; here the firms were involved in activities like handloom weaving, yarn spinning, tailoring, and embroidery. The firms in the ceramics sector formed around 8% of the sample. These firms made products like ceramic pottery, bricks, earthenware, and cement pipes. The animal husbandry sector had about 5% of the firms which were engaged in activities such as processing of hides, poultry farming, dairying, and bee-keeping.

The chemicals sector was the smallest; it had only 3% of the firms. Some of the products made by these firms were soap, cosmetics, hair oil, dyes, and varnishes. Finally, about 5% of the firms were involved in miscellaneous activities such as printing, book-binding, toy making, and paper-bag making.

Most of the sample firms were small. Only 10% of the firms were large enough to require registration under the Factories Act; in the textiles sector, this figure was only 1%. The average value of the total assets of the firms was only Rs. 26,000 (US\$ 3,000 at the 1974 exchange rate); the value ranged from Rs. 8,700 for the textile sector to Rs. 43,000 for the chemical sector. The average value of the output for all the firms (in 1972-'73) was Rs. 54,500; the range was from Rs. 17,900 for animal husbandry firms to Rs. 92,400 for chemical firms.

The average numbers of workers employed by the firms was 7.1, of which about 21% were household workers. The range was from an average of 3.8 workers in the animal husbandry sector to 15.6 workers in the ceramics sector.

In spite of the small size of the firms, about 42% of them used electricity, and 2% used diesel. In the agricultural sector, about 70% of the firms used electricity, while in the animal husbandry and

textile sectors more than 90% of the firms were manual.

An overwhelming majority (80%) of the firms sold their output either wholly or mostly within the Project area. The least localized firms in this respect were in the textile sector (70%), while the most localized were in the animal husbandry and ceramics sectors (89%). In contrast, only 57% of all the firms bought their raw materials wholly or mostly from the Project area; the range was from a low figure of 15% for chemical firms to a high of 76% for agricultural firms.

VII.2 Empirical Results and Policy Implications:

In this section, we summarize the results of our econometric analysis, and draw some policy conclusions on their basis.

We have evaluated the sample RIP firms according to three criteria: the labor-intensity of the firm, the level of capacity utilization, and the growth rate of the firm. The specific measures used are proxies for the cost of creating a job, the effective use of scarce resources, and the dynamism of the firm respectively.

From the regression analysis we could estimate the effects of only those systematic factors which we were able to quantify. Inevitably, our analysis did not take into account institutional, entrepreneurial or other firm-specific factors, which may have a very powerful influence on the performance of the rural firm. The low explanatory power of the ordinary least squares equations suggests that these other factors which we excluded may be the crucial determinants of the "exact" performance of the rural firms. Consequently, a better understanding of the firm-specific factors is essential before making any strong policy recommendations about the nature of rural industrialization to be

pursued. This suggests that macro-level analysis like ours could benefit greatly from complementary micro-level case study approach of firms under different conditions. This approach can capture the qualitative factors that cannot be captured in the other approach. We will discuss this in the next section.

With the above qualification, our analysis does indicate that the explanatory variables included in the study were quite successful in classifying the rural firms into high and low performance categories. As such the results of the analysis suggest some broad policies that can be pursued advantageously by policy-makers. We now discuss these policies.

The cost of creating a job will be a major determinant of the effectiveness of any program whose goal is employment generation. Our analysis provided some support for the hypothesis that firms located in relatively developed rural areas tend to have fewer jobs per unit of capital than firms located in less developed areas.

On the basis of this result, we can conclude that rural industrialization programs may maximize the jobs created with given resources by emphasizing the less developed regions. Often, these are also the areas where the need for jobs is the greatest. However, we must also consider the performance of the firms in the less developed regions according to the other criteria. While we found no effect of the location on capacity utilization levels, we did find that firms in the less developed regions tended to grow slower than firms in the more developed regions. Hence, any recommendation to emphasize the less developed regions must be accompanied with the qualification that such a policy may lead to low growth rates.

In calculating the cost of creating a job we have considered only the fixed capital required by the firm. If we were to include the cost of extending the infrastructure to the less developed areas as well, this cost might well show a substantial increase.

For the above result, we have considered the level of agricultural development and urbanization as indicators of regional development. We next looked at the effect of the level of wages in the region. We could not find any effect of the wage level on the labor-intensity, but economic theory suggests very strongly that higher wage levels will be associated with lower labor-intensities. We did find support for the hypothesis that the firms in the high wage regions have lower capacity utilization levels than the firms in the low wage regions. This result also suggests that there is some advantage to locating firms in the less developed regions.

In examining the effects of the type of energy used and the scale of production, we found that smaller and manually operated firms did better than the larger and power-using firms according to all our criteria. Further, once the firms were large enough to be power-using, additional increases in the scale of production had very little effect on the labor-intensities or levels of capacity utilization. Hence, we suggest that it is sound policy to promote smaller and manually operated firms, but not try to restrict the scale of production of the firms which use electricity or diesel.

We found that seasonal firms had higher labor-intensities than year-round producers, though the two groups had similar growth rates and capacity utilization levels. This result suggests that it may be

relatively easier to generate supplemental employment rather than full-time employment.

In the analysis we found that the firms which used mainly local raw materials and/or served mainly local markets did not have higher labor-intensities than the other firms. Finally, there was no effect of localization on the growth rate. This suggests that unless there is a significant benefit according to some criteria not considered by us, there does not appear to be any justification for insisting that rural firms both use local raw materials and serve local markets.

We found that an adequate supply of raw materials helped firms to achieve higher levels of capacity utilization. While this is fairly obvious, policy makers should carefully investigate the efficiency of the firms which complain about inadequate supplies. The reason is that inefficient firms are likely to find it difficult to pay the going market price for raw materials, and their complaints may be nothing more than indicators of the firms' inefficiency.

Our analysis showed that younger firms tended to grow faster than older firms, but the age of the firm had no effect on labor-intensities or capacity utilization levels. These results indicate that policy makers should try to encourage the development of new firms in the rural areas. However, there may be substantial social overhead costs associated with the promotion of new firms, which we have not taken into account here.

Our results show that there were some differences in the firms in the various industrial sectors, after the other factors had been taken into account. In comparison with the (base) agricultural processing firms, we found that the ceramics firms had higher labor-intensities,

while the animal husbandry and textiles firms had lower labor-intensities; the textiles firms had lower capacity utilization levels, the chemical firms had higher growth rates; and the firms in the sectors not explicitly mentioned were similar to the base firms. These results strongly suggest that the textiles firms are less suitable than the others for rural industrialization programs. It is worth repeating that this recommendation is based on the differences that remain after the other explanatory factors had been taken into account, since the textiles firms tended to be both small and non-power-using -- characteristics which we found desirable earlier.

We would not test any hypotheses about the effect of credit facilities due to lack of data. However, Morawetz's and Paine's argument against providing subsidized credit is persuasive: such credit tends to make firms choose relatively capital-intensive techniques. In view of this, if the authorities find that rural industries are not attracting local entrepreneurs because of the high cost of credit, the inducements given to the entrepreneurs should not distort factor prices. A simple example of such an inducement is an output-linked subsidy, or an exemption from taxation.

VII.3 Suggestions for Further Research:

Our analysis has been shaped by the nature and extent of the data available to us from the survey conducted by the Planning Commission, though we did gather district-level data from other sources. Our suggestions for further research fall into three groups. We first discuss ways to improve the type of data collected by the Planning Commission; next, we suggest field-oriented micro-level case studies

which would complement the theoretical/statistical analysis possible with the Planning Commission data; finally, we indicate avenues for further research as suggested by the given state-of-the-art in the area of rural industrialization.

The Planning Commission data were inadequate in many respects. For example, we were not able to analyze an important economic aspect of the firm's performance -- their private profitability. As mentioned earlier, the private profitability of the rural firms is not necessarily indicative of their effectiveness in meeting overall social goals. However, it is indicative of their ability to become independent of governmental subsidies and support, and should therefore be of interest to policy-makers.

Based on the limitations faced in working with the Planning Commission data, we can suggest some additional data that could be collected for a more rigorous evaluative study of rural firms.

A valuable addition to the survey would have been the inclusion of data on the rural firms' use of various raw materials, and details regarding their production and sales. The Planning Commission survey provided information on the broad industry group that the firm belonged to, but these categories covered a widely heterogeneous mix of products. Information on what these products are, and the raw materials required to produce them is essential to understanding the production structure of the rural firms. In addition, we need to know the cost of the various raw materials.

The Planning Commission data were inadequate from the point of view of analyzing the firms' linkages with the rest of the economy. The performance of the rural firms is dependent on the other sectors

in the economy, but we did not have any clear information on this; the data on District growth rates and wage levels also came from sources other than the Planning Commission survey. We would like to know where exactly the raw materials used by the firms came from; who the users of their products are; how much they are dependent on local labor, entrepreneurship, and capital. Further, information should be collected on the channels (co-operatives, wholesale agents, retailers, etc.) through which the firms receive their input and sell their output. This type of information would be helpful in identifying where and how bottlenecks develop.

Although a great deal of emphasis has been placed on the need for different types of infrastructure for the development of rural industry, we were unable to verify the extent of this need because of lack of data. This inadequacy of data could have been overcome by questioning the firms about the nature of their use of the transportation system, communications and banking facilities, and other industrial services such as work-sheds, storage, etc.

Another area in which the data collected by the Planning Commission were inadequate concerns the question of the installed capacity of the rural firms. We are not sure of the basis on which the firms estimated their capacity utilization levels, and at what level of efficiency of operation. Since the estimates given by the entrepreneurs are likely to be rough, great care should be taken in formulating the questions regarding the capacity installation and utilization of the firms.

In analyzing the performance of the rural firms, we cannot underestimate the role of the entrepreneur. There was some attempt in the Planning Commission survey to collect information about entrepreneurs,

but many of the responses were unreliable. For example, the reported age of the entrepreneur ranged from 3 to 87 years. Perhaps, these are the ages of the person in whose name the firm is registered to overcome legal problems. However, the surveyor should be aware of such inconsistencies in the information supplied by the respondents.

We discuss now the desirability of field research involving case studies of individual rural firms. We have already seen that our theoretical/statistical analysis could not identify all the factors that affect the behavior or performance of rural firms. We believe that the qualitative factors we could not capture could be identified through case studies of firms under different conditions.

These case studies should concentrate on the institutional, entrepreneurial, and firm-specific variables excluded in our analysis. For example, we believe that the quality of support services available to the rural firms from public officials as well as from other private firms is likely to have an important effect on the level of capacity utilization and the growth rate of the firm.

The choice of the labor-intensity of the firm, we believe, depend to a large extent on the susceptibility of the entrepreneurs to be influenced by non-economic forces, such as the desire to be "modern."

The above examples illustrate the institutional and firm-specific factors that need to be analyzed by questioning the entrepreneurs and the public officials connected with the rural firms. This questioning should be open-ended in the sense that the respondents' view on what affects the behavior of the firms should be given at least as much prominence as the surveyor's desire to test some a priori qualitative hypotheses.

A topic that we have not touched at all in our analysis is that of rural entrepreneurship. Innovative and creative entrepreneurship would appear to play a critical role in how the rural firm adapts to and functions effectively in a rural environment. At present, there is hardly any systematic work done in this area. We need to understand how the rural entrepreneur makes location and production decisions so that we can channel them into the desirable directions.

We also need to know more about how the availability of credit and subsidies affect rural industries. Like most rural development programs, rural industrialization programs seem to lay a heavy emphasis on credit. Given the reservations regarding easy credit for small scale industrial development (Morawetz, 1974 and Paine, 1971), we need to examine this issue more closely in the case of rural industries.

Similarly, there is the question of transportation and other infrastructures needed for rural industrialization. The literature too is inadequate in this area. From the policy-making point of view, it is important to know the level of infrastructure to provide for rural industrialization.

A very important issue on which more research needs to be done is that of the threshold population size required for rural industrialization. As we saw in the literature survey, there is much confusion regarding this relationship. We need to know whether there is a threshold population size for different products. This will avoid a lot of waste that now exists in trying to force rural industries to locate in what may be inappropriate size villages.

One of the most relevant areas for future study is that of "appropriate" product choice for the different rural areas. The literature

in the area of product choice at present is in the context of developing countries is general. For rural areas we need to know: products and their "characteristics" (needs fulfilled), the technology choice involved in their production, and their demand elasticities.

Finally, there is a need to consider the other aspects of the performance of the rural industries which we discussed earlier. Economic viability of, and income per worker from rural industries should be important considerations of any rural industrialization program.

Without further research in the areas outlined here, we will not be able to fully explain the complex interaction of the economic, locational, infrastructural and technical factors that determine the performance of rural industries in the developing countries.

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