KEY SECTORS IN INDIAN SMALL-SCALE INDUSTRIES

- AN EMPIRICAL ANALYSIS

by

Ashok K. Nigam

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Department of Economics
McGill University
Montreal, Canada

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ASHOK K. NIGAM - m A

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For my parents

ABSTRACT

This thesis examines the analytical issues involved in the promotion of small-scale industries in India. The contention of the thesis is that these industries have not been promoted in a rational manner. The thesis uses four methods to identify key sectors within the small-scale industries. A key sector is defined in terms of its impact on demand, employment, labour intensity and substitution possibilities between capital and labour. The demand linkage and employment linkage methods are analysed within an input-output framework. The other two methods are labour intensity and elasticity of substitution.

Each method identifies key sectors within small-scale industries. The key sectors identified under demand linkage are also significant when direct employment creation is considered. The labour intensity method indicates differences in ranking between rural and urban industries. The elasticity of substitution method did not provide useful results because of the nature of our data. These methods provide bases for promoting industries depending on the objectives of the central planner.

RESUME

Cette thèse examine les questions analytiques concernant le relancement des petites et moyennes entreprises en Inde. Elle part du postulat que la relance de ces entreprises (P.M.I.) n'a pas été faite de façon rationnelle. Quatre méthodes ont été utilisées pour identifier des secteurs-clés à l'intérieur de ces P.M.I. Un secteur-clé est défini en fonction de son impacte sur la demande ultime, l'emploi, la quantité de la main-d'oeuvre engagée et les possibilités de substitutions entre le capital et le travail. Les méthodes afférantes à la capacité de l'industrie de créer des emplois et une demande de ses produits sont analysées dans un tableau d'échanges industriels. Les deux autres méthodes concernent la dépendance de l'industrie d'une main-d'oeuvre considérable, et l'elasticité de substitution.

Chaque méthode identifie les secteurs-clés à l'intérieur des P.M.I. En effet, les mêmes secteurs-clés, à quelques exceptions près, se retrouvent tant sous les méthodes afférentes à la capacité de l'industrie de créer des emplois que sous celle de créer une demande des produits de l'entreprise. La méthode qui concerne la dépendance de l'industrie d'une main-d'oeuvre considérable indique l'existence de différences de classification entre les entreprises des milieux urbain et rural. Par contre, la méthode de l'élasticité de substitution ne donne pas de résultats utiles à cause de la nature de nos données. En général, les méthodes employées servent de

base au relancement des entreprises, mais le choix précis d l'une d'elles dépend de l'objectif dont le plannificateur central s'est fixé.

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CHAPTER I

INTRODUCTION

Small-scale industries have in most countries been singled out for specific government policies. This attention arises, firstly, due to the realisation that these industries have played an important role in the growth of developed countries and, secondly, due to the fact that, in the process of industrialisation, resources tend to be concentrated in large-scale industries in an attempt to meet demand and take advantage of economies of scale.

In the Indian context, the promotion of small-scale industries has been explicitly recognised in the Five Year Plans. These industries have also been singled out for specific but often ad hoc policies. Such ad hoc policies have imputed demands on these industries depending on the overall strategy of the planning process. An ideal example is the Second Plan strategy which, with its focus on heavy and large infra-structure industries, assumed that the demand for consumer goods and creation of employment opportunities could be left to the market mechanism operating in the small-scale sector (this strategy is outlined in greater detail below).

Part of the reason for not identifying and incorporating these industries independently in planning models lies in the difficulty of

defining it adequately and, further, models used in the formal plan frames do not provide for such identification. This non-incorporation is due to the fact that formal development models have tended to shy away from emphasizing a specific role for small industries (with the exception, perhaps, of Myrdal's approach, as will be seen later) and also in the Indian context, the models of planning have tended to follow the Harrod-Domar[1] type and more recently have combined this with detailed input-output techniques.[2]

As in most aspects of Indian economic literature, there is extensive research and writing on the various issues relating to the small-scale industries. Much of this research tends to start with a definition of the industries so as not to confuse the issues. We have avoided this approach on the grounds that, for an empirical study, the dimensions would in any case be defined by our data. A discussion of the definition is, however, incorporated in Appendix A. Instead of the definitional question we shall attempt to examine what, if any, guidance can be gleaned from development theories regarding the importance of this sector

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[1]The Harrod-Domar model as incorporated in R.F. Harrod, "An Essay in Dynamic Theory," Economic Journal, Vol. 49, March 1939, pp. 14-33, and E. Domar, "Capital Expansion, Rate of Growth and Employment," Econometrica, Vol. 14, April 1946, pp. 137-147.

[2]The current (Sixth) Five Year Plan has attempted such an approach. The first two Plans were essentially of a Harrod-Domar-Mahalanobis type while the following three Plans were in the Leontief framework. Consequently, the first approach tended to have the same demand and supply equations while the input output approach focussed essentially on demand by estimating targets thus ignoring the supply side. See, Government of India, Planning Commission, A Technical Note on the Sixth Plan of India (1980-85), 1981.

in the growth process.

A constant criticism of Indian writings on this subject has been their failure to provide any coherent, analytical framework.[3] The literature extensively deals with industries at a disaggregated level but rarely does it try to provide an overall framework. The development theories of relevance in the Indian context can be classed as the Harrod-Domar-Mahalanobis[4] type, dual-economy models and surplus-labour hypothesis, and Myrdal's theory of cumulative causation.

The early Indian models were clearly based on the thinking of the Harrod-Domar growth theory. Quite simply, this theory envisaged growth proceeding pari passu with capital accumulation with a given capital-output ratio. The model assumed a fixed capital-output ratio and a fixed savings ratio, the only ceiling to this growth was the labour supply at the given level of productivity, i.e. the growth of the labour force and the rate of labour saving technical progress. The Mahalanobis model adapted this thinking and viewed the planning process in terms of a two-sector model -- the consumer-goods sector and capital-goods sector. The logic was that a higher rate of investment would, in the short run, leave a lower volume of output for consumption but in the longer run it would result in a higher rate of growth of consumption.[5] By their very nature, small

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[3] An exception is the painstaking study by Kedarnath Prasad, Technological Choice under Developmental Planning (A Case of Small Industry in India), Popular Prakashan, Bombay, 1963. Originally submitted as a Ph.D. dissertation at Cambridge University.

[4] P.C. Mahalanobis' approach permeates the Second Plan. See, "The Approach of Operational Research to Planning in India," Sankhya, Vol. 16, December 1955, pp. 3-130.

[5] For a discussion on this early approach see K.N. Raj, "Growth Models in Indian Planning," Indian Economic Review, Vol. 5, 1960-61, pp. 242-261 and J.N. Bhagwati and S. Chakravarty, "Contributions to Indian Economic Analysis: A Survey," American Economic Review, Vol. 59, Supplement, September 1969, pp. 1-73.

industries have tended to grow largely in the consumer-goods sector with remarkably little development of ancillary units to the capital-goods sector. Though the small-scale industries did not feature prominently in the model frame and the allocation of resources to the consumer sector was given secondary importance, yet these industries were expected to meet the large demand for consumer goods and provide employment opportunities in the urban areas. Essentially, therefore, there was heavy reliance on these industries to iron out any bottlenecks in the growth process of the capital-goods sector as envisaged by the natural limits posed in the equilibrium growth path of the Harrod-Domar model.

The dual economy models have envisaged the economy in terms of the importation of capitalist methods into pre-capitalist society. Consequently, one sector becomes technically advanced and the other tends to remain pre-capitalist in that the responses to the market, profit-seeking and risk taking, are not positive. As a result, one needs to emphasize sectors individually. Even a cursory examination of the Indian scene suggests that entrepreneurs in India are profit-conscious and so would attempt to grow rapidly. Equally, however, such models have tended to emphasize that unemployment occurs in the labour-intensive sectors and, if these are village and small-scale industries, then we need specific policies to achieve a balance. Thus while on the one hand profit-seeking would place the industries in the capitalist sector, their labour intensive character (a highly debateable point) would mean their growth in pre-capitalist norms and, thus, require specific policies. These models consequently do not provide any guidance.

The surplus-labour hypothesis of Lewis[6] distinguishes two sectors

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[6]W.A. Lewis, "Economic Development with Unlimited Supplies of Labour," The Manchester School of Economic and Social Studies, Vol. 22, May 1954, pp. 139-191.

(capitalistic and subsistence) and concentrates on development in the capitalist sector for take-off. The model requires that there be unemployment. The small-scale industries are therefore expected to be labour-intensive and, though not expected to contribute to growth, should meet the present demand for consumer goods. The model is, however, too general to be of great assistance in analysis.

Myrdal's[7] theory of cumulative causation provides the closest rationale for small industries. Growth proceeds by way of cumulative movements with multiplier effects. To achieve this, one can provide either shocks to the economic and social fabric or one can strengthen the spread effects which transmit the original impulses throughout the economy by creating a class of entrepreneurs. Herein, lies the justification for small units. For while the overall approach of Indian planning is cast within the Harrod Domar and Leontief framework the specific focus on small units is then viewed in terms of either the absorption of unemployment or in terms of creating diffusion effects to strengthen the economic base. This view fits neatly into the conception of the Indian economy as being mixed and the controlled promotion of private enterprise with major large-scale industries coming under the purview of the government.

Besdies this theoretical rationale within the overall economic framework, the arguments have focused on three specific issues -- the "employment-creation and capital-saving" argument, the "decentralisation" argument and the "promotion of social and political virtues" argument.

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[7] G. Myrdal, Economic Theory and Underdeveloped Regions, Gerald Duckworth & Co., Ltd., London, 1957, p. 168.

Over and above these arguments, the sheer number of these industries in recent years has meant its recognition in the planning frame explicitly. On the basis of the most recent data available, it has been estimated that in the year 1979-80 the share of the village and small industries (VSI) in the contribution made by the manufacturing sector was around 49 percent in terms of gross value of output and 51 percent in terms of value added. In addition, these industries had offered employment opportunities to about 23.58 million persons compared to the 4.5 million in the large- and medium-industries sector. Exports of these industries accounted for more than one-third of the total exports of the country.[8] Table 1 provides an indication of the growth and size of this sector.

Two features are immediately apparent for our analysis: firstly, the immense size of the sector; and secondly, the categories of concern to us in this study. Not much needs to be said in justification of the rationale for examination of this sector insofar as the size is concerned. As regards the second aspect, our definition, as noted in the appendix, covers the entire sector. The census data used cover the registered sector and the sample data the unregistered sector[9] -- both of which are represented in the following table.

In Chapter II, we shall point to some aspects of Indian small-scale industries by way of a review of the literature and our rationale for identifying key sectors. The review will concentrate on the analytical

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[8]Government of India, Planning Commission, Sixth Five Year Plan (1980-85), 1981, p. 187.

[9]Industries in the registered sector are those which are covered by the Factories Act 1948. The data for these are obtained by annual surveys with the exception of small units which are covered by census data. The unregistered sector is covered by sample survey data.

Table 1

Estimated Levels of Output, Employment and Exports in Village and Small Industries

	Output (Rs. crores)		Employment (in Lakhs Person)		Exports (Rs. crores)	
	1973-74	1979-80	1973-74	1979-80	1973-74	1979-80
A. Traditional Industries						
1. Khadi	33	98	8.84	11.24	-	-
2. Village	122	314	9.27	18.21	-	-
3. Handlooms	840	1740	52.10	61.50	77	261
4. Sericulture	63	131	12.00	16.00	14	49
5. Handicrafts	1065	2050	15.00	20.30	195	835
6. Coir	60	86	5.00	5.59	16	30
Subtotal A	2183	4419	102.21	132.84	302	1175
B. Modern Small Industries						
7. Small-scale industries	7200	19060	39.65	64.60	538	1050
8. Powerlooms	1980	3250	10.00	11.00	-	-
Subtotal B	9180	22310	49.65	75.60	538	1050
C. Others	2237	4206	24.50	25.00	-	-
Total	13600	30935	176.36	233.44	840	2225

Source: Government of India, Planning Commission, Sixth Five Year Plan (1980-85), Table 12.1.

aspects discussed in the literature, and in our justification for identifying key sectors. We will review the nature of financing of these industries along with other government policies. We shall attempt, in this latter part, to show that the financing policy has been ad hoc, with no attempt to analyse the impact on the economy of varying the emphasis of one sector vis-ā-vis another. While the growth of these industries is determined by demand for their goods and the availability of resources, they are, nevertheless, influenced and can be influenced to a large extent by government policies geared to the promotion of certain industries vis-ā-vis others. If such key sectors within small-scale industries (on the basis of criteria outlined in Chapter III) can be identified, then their impact on development would be greater.

Chapters III and IV will deal with the four empirical techniques for identifying key sectors. By key sectors we shall mean those sectors which, in our definition, provide a basis for the concentration of funds and special assistance in the development process. These sectors will, therefore, be defined in terms of their impact on demand for other sector products, employment creation potential, labour intensity and the elasticity of substitution between capital and labour. A more precise definition will be offered in the introduction to the chapters and will also be apparent from the methodologies used.

Chapter III will utilize the static input-output framework. This framework has a number of limitations (as will be noted), some of which can be overcome by the use of dynamic input-output analysis and incremental co-efficients. In view of the immense problems in utilization and obtaining of static input-output data, it is too ambitious to call for dynamism in the analysis. Further, in the context of the Indian economy where the

problems and structural imbalances caused by the black or parallel economy are omnipresent, it is questionable that any dynamic input-output analysis would be capable of capturing the essential attributes. The answer must, in the short run, lie in the fuller utilization of available data.

The data base in many developing countries is questionable as regards its completeness and reliability. There is a circular argument involved. Since the data base is shaky, empirical work is limited and consequently no conclusions can be drawn from it. Guess estimates must therefore be used and again there is no cause for enhancing the data base or for using available data. As matters now stand, it has been noted[10] that while there is a formal framework for model building in Indian plans, often the estimates used are best guesses or based directly on political considerations. It is no doubt true that data are occasionally manipulated ex-ante to suit political considerations and that ex-post results are justified by reference to extraneous factors. Nevertheless, ex-post and survey results can generally be relied upon. We have not tried to shy away from the use of whatever data are available. Instead, we have used these data in the best manner possible, with a view to indicating their potential in the planning process and thereby suggesting the enhancing of their collection and the introduction of a greater degree of diligence. Each empirical test will clearly define the data base and its limitations. Chapter IV will define measures of labour intensity and elasticity of substitution and estimate these for the various sectors in small industry.

The final chapter will consolidate the results of our empirical test

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[10]This emerged in discussions with an official of the Central Statistical Office, India, and was noted in a parliamentary committee's review of the CSO.

and attempt to answer the question: are there sectors which, under each technique used and as defined, turn out to be key sectors, or does the identification depend on the objective in hand? If such sectors can be identified, then we shall attempt to discuss policy implications and gauge their impact.

CHAPTER II

SOME ASPECTS OF INDIAN SMALL-SCALE INDUSTRIES

The literature on the subject is varied but may be grouped into two broad categories: the first, dealing with analytical issues within the overall economic policy framework; and the second, dealing with a large number of publications of model schemes, project sheets, prospects for growth, fact sheets and investment appraisals published largely by the government. While the importance of the latter is recognised for an examination of individual industries, we shall concentrate on the analytical studies.

At the analytical level, two issues have been examined in depth. The first concerns the extent to which these industries should be given special treatment vis-à-vis large and medium-size industries. The interest arose because of the varying emphasis put on these industries in the Second Plan. Also, in an economy where there are a number of competing avenues for the limited financial resources, it is crucial that economists be able to provide some criteria and define exactly what goals they have in mind. Consequently, this raised the question of whether the scale of production was related to the efficiency of the industries.

Another analytical issue concerns the debate in the literature regarding the choice of production techniques. This debate is indirectly relevant

since, in obtaining key sectors, we must also consider whether the real choice facing the central planner is the choice of techniques or the choice of industries. The argument runs on the lines that in a developing economy the choice is not dualistic but pluralistic. It is possible, under conditions of factor substitution, to associate different amounts of capital with different amounts of labour, and then an increase in output can be achieved by an increase in either input without reduction in the other. It is also contended, on the other hand, that we do not have the dichotomy suggested by the concept of capital-intensive and labour-intensive techniques of production but rather that, for efficient production the techniques available are fixed in the short and medium terms. The point, then, is to decide which industries should be given preferential treatment.

The second aspect of concern to us will be to provide some rationale for identifying key sectors, while at the same time reviewing other facets of the issue. In the development context, it is often considered that the objective is to generate productive employment. This emphasis on employment, as opposed to growth, arises from the evidence that in most developing countries the poor are not improving their lot. There has been a shift in the development attitude towards redistribution with growth[11] and basic needs[12] strategies. In this vein, the dichotomy between large vis-à-vis small-scale industries may well be a stumbling block, given the amount of resources already allocated in the Plans to the two sectors.

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[11]This strategy has been formalised by the World Bank and the Institute of Development Studies, Sussex (H.B. Chenery et. al.) in their study, Redistribution with Growth, Oxford University Press, London, 1974.

[12]Basic needs strategy was adopted by the International Labour Organization in 1976 and is outlined in D.P. Ghai, "The Basis Needs Approach to Development: Some Issues Regarding Concepts and Methodology," ILO, Geneva, 1977.

Considering this fact, therefore, it is the nature of financing of these industries which will be of importance. Once funds have been allocated, the question is which sectors in small industries should be promoted. The literature has tended to concentrate on sources-of-finance aspects, with virtually no attempt to identify sectors for special attention based on a logical theory founded in economics.

The plan of this review is to follow closely the thinking at the time of the Second Plan when many of the issues were discussed. It is also of necessity descriptive, with an attempt to draw conclusions from the debate. The descriptive nature is forced upon us due to the extensive work already done in this field and we cannot expect to reassess all aspects in a study of an empirical nature. At least one writer[13] on the subject has complained that the literature is:

(i) highly repetitious,

(ii) ignores questions of economic concern in favour of taxonomic concern,

(iii) its use of statistics is barbaric,

(iv) value judgments have frequently tended to obscure and directly interfere with sound analysis,

(v) area studies often contain data but do not conform to any general pattern.

In general, the studies have been of a fact-finding, fact-interpreting or descriptive nature. However, what is important about these studies is that they provide a useful background for developing-country analysis, as

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[13] See Douglas Fisher, "A Survey of the Literature on Small Sized Industrial Undertakings in India," in Bert. F. Hoselitz (ed.), The Role of Small Industry in the Process of Economic Growth, Mouton & Co., The Hague, 1968, p. 129.

virtually every aspect has been focused upon by these studies. This includes studies of an inter-disciplinary nature focusing on social aspects. We have avoided these sociological studies but their value is by no means diminished. It is hoped that the empirical aspect of the study will offer insights into the scope for a more thorough examination of small industries.

2.1 Review of the Literature

The Second Five-Year Plan and the Industrial Policy Resolution of 1956[14] set the stage for the identification of small-scale industries as a separate entity, though, as we have noted, not as part of the formal model frame. The Second Plan, incorporating the Mahalanobis-Feldman[15] approach, attempted to achieve a compromise between the viewpoint that small industry should be promoted for reasons of Gandhian virtues, with protection and direct assistance on the one hand, and the alternative view that these industries were a mere hindrance to the rapid growth and take-off envisaged by the Plan via concentration on heavy and infrastructure industries.

This led to an active debate in the literature attempting to assess relative benefits.[16] While in the policy sphere the role of small

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[14] Government of India, Planning Commission, Second Five Year Plan, 1956.

[15] This model was developed by Feldman in the 1920's and adapted by Mahalanobis. The original two sector model was developed into a four sector model which broke down total investment into three further sectors in addition to the capital goods sector: (1) factory production of consumer goods; (2) household production of consumer goods, including agriculture; and (3) the sector providing services such as health, education, etc. The small industry and indeed the entire economy was represented by these four sectors.

[16] For a summary of this and other aspects of the debate see, K.K. Subrahmanian and S.P. Kashyap, "Survey of Small Industry Research," Sardar Patel Institute of Economic and Social Research, Ahmedabad, 1972.

industries was being accepted as fundamental, what was subsequently done to promote them lacked direction and co-ordination. The Industrial Policy Resolution assigned a key role to these cottage and small industries; and due to its importance at the time, and in subsequent thinking, it is worth reproducing. The Resolution stated:

> "The government of India would...stress the role of cottage and village and small scale industries in the development of the national economy. In relation to some of the problems that need urgent solution, they offer some distinct advantages. They provide immediate large scale employment, they offer a method of ensuring a more equitable distribution of national income and they facilitate an effective mobilization of resources of capital and skill which might otherwise remain unutilised. Some of the problems that unplanned urbanization tends to create will be avoided by the establishment of small centres of industrial production all over the country.
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> The state has been following a policy of supporting cottage and small scale industries by restricting the volume of production in the large sector, by differential taxation or by direct subsidies. While such measures will continue to be taken wherever necessary, the aim of the state policy will be to ensure that the decentralized sector acquires sufficient validity to be self-supporting and its development is integrated with that of large-scale industry. The state will therefore concentrate on measures designed to improve the competitive strength of the small-scale producer. For this it is essential that the technique of production should be constantly improved and modernized, the pace of transformation being regulated so as to avoid as far as possible technological unemployment. Lack of technical and financial assistance of suitable working accommodation and inadequacy of facilities for repair and maintenance are among the serious handicaps of small-scale industries...."[17]

Most of the analytical and empirical research that followed was geared to examining the underlying postulates of the official policy. The resolution raised the following questions:

(i) the relative efficiency of modern small enterprises vis-à-vis

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[17]Second Five Year Plan, op. cit., p. 67.

large-scale units. This is in relation to large-scale employment potential claimed for this sector,

(ii) the extent to which there was a choice of techniques in the establishment of small units,

(iii) the nature of mobilisation of financial resources and its distribution,

(iv) the basis for reserving items for the small sector,

(v) the role of locational factors and the impact of industrial estates on the setting up of small units.

The efficiency of small-scale vis-à-vis large-scale industry was geared to considering the labour intensity of units. In this context, the intensity concept as used in the literature meant, in terms of capital, (i) the amount of capital required per worker, for a given technique, i.e., the capital-labour (K/L) ratio, or (ii) the amount of capital needed under a given technique for each unit of output, i.e., the capital-output (K/O) ratio. Labour intensity was defined in a similar way. It was certainly not necessary that both the definitions would give concurrent results. If we confine ourself to the narrow aim of employment, then the technique which is less capital-intensive in terms of the K/L ratio but more intensive in terms of the K/O ratio would create more employment per unit of capital but would result in less output. Thus, there is a likelihood of a conflict between employment and output.[18] We shall, therefore, now consider the interrelated aspects of labour intensity, scale and choice of techniques.

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[18] See F. Stewart and P. Streetan, "Conflicts between Output and Employment Objectives in Developing Countries," Oxford Economic Papers, New Series, Vol. 23, July 1971, pp. 145-168.

2.1.1 Scale and Efficiency

The fundamental aim of the studies in this area has been to try and establish empirically whether small-scale industries possess the virtues of capital-saving and employment creation that had been attributed to them in launching the Industrial Policy. The studies have focused on the inter-relationships between capital, labour, output and surplus.

Dhar and Lydall,[19] using aggregate data for a sample survey, compared the output-capital ratios for a number of homogenous industries of varying size and concluded that "...for factories which employ 20 or more persons output-capital increases with the size of the unit."[20] Dhar[21] studied 326 small manufacturers in the Delhi area and again concluded that the most capital intensive type of manufacturing establishment was the small factory using modern machinery and employing up to 50 workers. Thus for both registered and unregistered small enterprises, the position was noted to be unfavourable.

Sandesara[22] studied data over time, as opposed to Dhar's studies, which were conducted at a point in time. His study covered the period 1953-58 and examined a larger number of industries and for a number of relationships. His examination covered a wide range of relationships between size and output, wage and surplus per worker, and output and

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[19] P.N. Dhar and H.F. Lydall, The Role of Small Enterprises in Indian Economic Development, Asia Publishing House, Bombay, 1961.

[20] Ibid., p. 19.

[21] P.N. Dhar, Small Industries in Delhi: A Study in Investment, Output and Employment Aspects, Asia Publishing House, Bombay, 1958.

[22] J.C. Sandesara, "Scale and Technology in Indian Industry," Bulletin of the Oxford University Institute of Economics and Statistics, Vol. 28, August 1966, pp. 181-190.

surplus each per unit of capital. He found that there was no positive relationship between size (as measured by the number of persons employed) and capital intensity (capital per worker); size and output-capital ratio, and also size and the surplus-capital ratio were positively associated. In essence, therefore, his study concluded that:

> "...in general small units produce less output and leave less surplus, and that very often they also employ fewer persons each per unit of capital than large ones. In other words such virtues as are claimed or tacitly assumed for the small units on capital savings count are to be generally found precisely in large units."[23]

This surprising and critical conclusion, if correct, would mean discarding of the structure on which small industry policy was based. Both the approaches and inferences drawn by the above studies have been questioned. In these studies size was measured by employment levels, and so it is considered that this approach would take in sick and ailing large-scale units which were employing only a skeleton staff. The debate between Mehta[24] and Sandesara then centred around the validity of using the capital-labour ratio, as this did not take account of the level of capacity utilisation.

Small industries are especially prone to low levels of capacity utilisation because of a number of bottlenecks. Consequently, to examine them without adjusting for this factor would lead to misleading results. It is, however, not clear how any adjustments could be made for this

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[23] J.C. Sandesara, Size and Capital Intensity in Indian Industry, University of Bombay Publications, Economic Series No. 19, 1969, p. 69.

[24] B.V. Mehta, "Size and Capital Intensity in Indian Industry," Bulletin of the Oxford University Institute of Economics and Statistics, Vol. 31, August 1969, pp. 189-204, and response by J.C. Sandesara in the same journal, November 1969.

factor. None of the studies were sophisticated enough to take account of it. Capacity utilisation is a difficult concept.[25] Capacity can be defined in partly technical and partly behavioural terms. In their analyses, the use of capital-output ratio derived from a single observation at a point in time assumes that the degree of utilisation of the capital stock is uniform across all industries and that it will not change over time. The degree of utilisation is clearly important but due to the difficulties involved we too have been unable to take account of it in our empirical work but its importance is nevertheless noted.[26]

Mehta examined capital-labour, output-labour and output-capital ratios but his definition of small units was based on an employment-cum-investment criterion (small: fixed capital up to Rs 4 lakhs; medium: Rs 5-25 lakhs; large: over Rs 25 lakhs). He concluded that in almost all industries the capital-labour ratio increased with size. Additionally, labour productivity was also considered to increase with size but not in the same proportion as capital intensity. Consequently, output-capital ratio decreased with size.

These studies[27] provide an ideal example of the dubious use of

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[25] S.P. Gupta has tried to take account of the level of capacity utilisation and though not used by studies on the small sector is nevertheless an interesting approach. He defines installed capacity as the optimum output obtainable on purely engineering considerations when capital is associated with 2-1/2 shifts of labour a day. This definition is adjusted for different industries depending on their seasonal aspect or special production characteristics. See, Planning Models in India - with Projections to 1975, Praeger Publishers, New York, 1971, pp. 225-227.

[26] Small industries in India are estimated to be operating around 53 percent of installed capacity with wide variations across sectors. See, Government of India, Development Commissioner Small Scale Industries, Report on Census of Small-Scale Industrial Units Vol. I & II, January 1977, p. 29.

[27] Among other studies in this sphere are Baljit Singh, The Economics of Small-Scale Industries - A Case Study of Small-Scale Industrial (continued...)

statistics. They indicate the problems of definition and the inherent limitation of simple ratio techniques. Most of the studies were examining average ratios with little concern for marginal or incremental ratios. In addition, the broad industry classification has also been called into question. Industries produce differing products and this would vary with the scale of the operation. The nature of the capital equipment also tends to vary across the units. Some units may classify different items as capital, e.g. tools. The depreciation rates used would also affect the picture dramatically as would the cost base of the capital (original cost, replacement cost or current cost). Working capital too seems to have been ignored and this can alter the results significantly.[28] Studying broad macro co-efficients for such fundamental studies is also a severe limitation. Project or firm level data would perhaps have been more useful with adequate consideration being given to the different characteristics. The studies could also have examined products and their technology of production to assess scale economies that may be present.

The morass of information and its inadequate utilisation on all sides has left an inconclusive debate. It was, however, useful in indicating that small industries are not necessarily labour intensive and in fact the analysis should have been more detailed and sophisticated. None of the studies attempted to consider size and capital intensity in light of both

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[27](...continued) Establishments in Moradabad, Asia Publishing House, Delhi, 1961 and National Council for Applied Economic Research, Study of Selected Small Industrial Units, New Delhi, 1972. Both these studies calculate capital-labour-output ratios but are essentially involved in identifying bottlenecks in the growth of the units.

[28]P.N. Dhar in his study has shown that the ratio of working capital to total capital is high for small enterprises and studies on labour intensities have tended to include working capital. Mehta ignores working capital in his study while Sandesara has taken it into his capital base.

direct and indirect employment effects. de Vries[29] has shown, in simple terms, the consequences of considering both these employment aspects for 29 investment projects in Colombia as shown in Table 2.

Table 2

Capital Investment per Job Created
(1974 U.S. Dollars)

	Small 25-250	Medium 250-2000	Large 2000+
Direct Employment	4800	7200	8000
Direct and Indirect Employment	4200	4000	15000

Source: Barend A. de Vries, "Industrialization and Employment: The Role of Small and Medium Size Manufacturing Firms," International Bank for Reconstruction and Development, Reprint Series No. 116, 1978, p. 50.

The table indicates, that the indirect employment effects were positive for investment in small and medium-sized firms and hence the capital equipment per job (direct and indirect) was less than for direct employment only. He therefore arrives at the conclusion that small and medium-sized enterprises (as defined by the number of persons employed) have smaller investment per job than large enterprises. While this may not necessarily hold true in the Indian context it, nevertheless, underscores the need to consider both direct and indirect effects of industrialisation rather than the simple analysis conducted in the Indian literature on this aspect.

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[29] Barend A. de Vries, "Industrialisation and Employment: The Role of Small and Medium Sized Manufacturing Firms," International Bank for Reconstruction and Development, Reprint Series No. 116, 1978.

In conclusion, therefore we can only say that the debate was useful in raising a fundamental issue but that due to its lack of sophistication and varying data base was not conclusive. Nevertheless, it is clear that not all small industry is labour intensive and this conclusion is also borne out as a by-product of our analysis later. Further, we need to study small industry at both a disaggregated level (perhaps at plant level) and to consider both direct and indirect effects. Our study shall take account of this latter consideration. We now turn to the other analytical aspect of the literature centring on the choice of techniques.

2.1.2 Choice of Techniques or Choice of Industry

A very interesting debate was conducted in the literature concerning the choice of techniques.[30] The problem was posed in terms of the relationships of capital, labour, and output to surplus generated and technique of production. It was presented in both a theoretical form and in terms of testable hypotheses. The question was whether, at the level of choice of technology for a particular manufacturing process, a labour intensive technique was necessarily more efficient than a capital intensive one. Such a formulation of the problem was important since the promotion of labour intensive techniques should be justified on grounds of labour cost, capital cost, surplus generated and the products produced. The outcome of the debate was clearly important for small industry policy since it was regarded (now as we have seen by no means certain) that small industry was labour intensive. Also, an answer was required on the nature of technology therein as this had implications for the importation

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[30] For an early theoretical formulation of the problem see, A.K. Sen, Choice of Techniques: An Aspect of the Theory of Planned Economic Development, 3rd edition, Augustus M. Kelly, New York, 1968.

of technology and the production of capital goods for the small industries.

In terms of labour cost, the question was the basis for its valuation. Sen[31] contended that from a social viewpoint labour should be valued at the increase in consumption due to additional employment even if the opportunity cost of labour was nil. The reasoning was that the employment of this previously rural labour in industries would provide a base for siphoning off some consumption through taxation and other means. Consequently, the cost of labour would be lower. This would have the further effect of associating different propensities to consume with different techniques. A technique which gives larger output per unit of labour is likely to cause those workers using it to have higher wages and higher consumption and higher savings depending on the relative propensities.

Capital cost too could not be measured in terms of physical cost of capital alone. The import intensity of a technique has implications for balance of payments and hence should be taken into account in the valuation of capital.[32] The gestation period of a technique would have implications for the reinvestment of the surplus. For a labour intensive technique the surplus generation may be lower hence reinvestment possibilities may be limited. Finally, as we have noted, the inclusion of working capital has important implications. In most small industry this is the predominant form of capital hence it cannot be ignored.

In terms of surplus generation, the important consideration was that

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[31] A.K. Sen, "On Choosing One's Techniques," The Economic Weekly, Vol. 8, July 1956, pp. 857-858 and "Labour Cost and Growth," The Economic Weekly, Vol. 8, September 1956, pp. 1159-1169.

[32] A.K. Sen, Choice of Techniques, op. cit., p. 59.

the promotion of labour intensive techniques on grounds of employment generation alone was to take a narrow view. One was surely interested in maximising output and any technique which produced enough for consumption of the numbers employed was clearly inferior to one which maximised the rate of growth of output. When considering a technique we should also consider direct and indirect reinvestible surplus.

Finally, the question of products produced was also important. Indeed, certain products may be associated with certain techniques only and so there really was no choice. Other products may have a multiplier effect by generating demand for other goods and so on. Quality of the products and its implications for exports need also to be taken into account for an economy which relies on the small sector for one-third of its total exports.

In summary, the theoretical debate clearly indicated the need for looking at the economy in a broader perspective and showed the shortcomings of partial analysis. For small industry policy, therefore, the question of what techniques should be promoted was not as simple as the concentration of the dichotomy between labour and capital intensive techniques may suggest. The debate also provided a number of testable propositions which were investigated in the literature. Before turning to a review of this aspect, it may be useful to consider the relevance of the capital controversy debate for the Indian studies.

The measurement of capital has never posed a problem to Indian studies apart from determining the true cost of capital in the theoretical literature.[33]

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[33] J.N. Bhagwati and S. Chakravarty argue that the true cost of capital has never been considered in the Indian empirical studies.

Indeed most studies have simply taken this in the form of investment in plant and machinery and working capital. The justification for using purely statistical figures is provided by Sen.[34] He points out that in the entire debate on the capital controversy, the attack on the neo-classical school was not concerned with the question of whether the techniques could be compared at a state of equilibrium or even whether the model could give reasonably good predictions. Instead, as Joan Robinson has often stated, the question was whether the model was sound within its own frame of reference and given its assumptions -- quite apart from the problems of measurement of capital. The problem lay in the assumption of a one commodity world. Sraffa has put the distinction between the theoretical and practical implications succinctly:

> "One should emphasize the distinction between two types of measurements. First, there was the one in which the statisticians were mainly interested. Second, there was the measurement in theory. The statisticians' measures were only approximates and provided a suitable field for work in solving index number problems. The theoretical measures required absolute precision...."[35]

Clearly, the Indian literature that developed on capital-labour intensities was more interested in the mundane statisticians' measures than the niceties of theory. To regard the issue as passé because of the problems of measurement of capital then switching and reswitching would be to misread the practical applications of economic theory. As Sen has aptly stated

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[34] A.K. Sen, Employment Technology and Development, Clarendon Press, Oxford, 1975, pp. 41-46.

[35] P. Sraffa, quoted in Sen, Employment Technology and Development, op. cit., p. 44.

> "To say that in a cheap labour economy there is a case for using less capital intensive techniques does not require one to become a card carrying member of the neo-classical club."[36]

As we have already seen, we need to consider these factors in light of a number of other theoretical problems. In the more 'mundane' literature what has proved problematical is how to measure capital and labour while accepting the lack of homogeneity. If investment in fixed capital is used, we need to decide whether it is original cost, depreciated cost (and at what rates) or replacement cost. Working capital too must be included.

Similarly, the labour measure would ideally be labour time especially when we are considering capacity utilization (though in a labour surplus economy capacity may well relate to the machine hours available) but again labour data problems would be immense. We may even question labour time where our aim is to maximize the number of persons employed (covering their basic needs) and under-employment of these persons is perhaps a more advanced stage of discussion. Data problems may therefore supercede any of the theoretical niceties even if 'statistician's' measures are used.

Accepting the use of statistician's measures of capital and labour ratios there appeared in the literature a number of tests of the propositions enumerated above. Key among this was the debate on spinning techniques as against weaving techniques.

It was contended that because the Ambar Charka was more labour intensive it should necessarily be preferred and because of labour surplus

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[36] Ibid., p. 45.

the effect on output foregone would be insignificant. Naqvi[37] showed that the Ambar Charka was inefficient in terms of both the capital-output and the labour-output ratios. Sen[38] also derived its productivity of labour, net value added per unit of output, the net surplus per unit of output, the capital output ratio and the rate of surplus per unit of output. He too came to the conclusion that concentration on the Ambar Charka -- a labour intensive technique -- would affect capital accumulation adversely and have inflationary effects. Bhalla[39] examined techniques in rice milling and hand pounding. He examined five hand pounding and three machine milling techniques and concluded that the former maximized only employment and not output or reinvestment.

These studies were quite valuable and instructive in dispelling the view that a labour intensive technique should necessarily be preferred in a labour surplus economy. To base the rationale for promoting small industry on grounds of its utilization of labour intensive techniques alone would mean that inefficiency could be promoted. There is conclusive evidence (given the analytical framework and its assumptions) that the choice of techniques leads to three possible objectives: employment maximisation, output maximisation and reinvestment of surplus. While a more labour intensive technique is appropriate on the first count, e.g. hand weaving and rice pounding, it is not suitable if one of the latter

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[37] K.A. Naqvi, "The Economics of Ambar Charka," The Economic Weekly, Vol. 8, July 1956, pp. 833-834.

[38] A.K. Sen, "A Short Note on the Ambar Charka," The Economic Weekly, Vol. 9, October 1957, pp. 1357-1358.

[39] A.S. Bhalla, "Choosing Techniques: Hand Pounding vs Machine Milling of Rice: An Indian Case," Oxford Economic Papers, New Series, Vol. 17, March 1965, pp. 147-157.

two criteria are the objectives of long run policy.

Discussion of key sectors in terms of employment potential, therefore, would be looking at the narrow goal of employment creation. But it is now generally accepted that the alleviation of unemployment[40] can be considered as a viable policy objective in itself despite its failure to maximise output. The advocacy of such a policy is based on the realisation that output and surplus maximisation policies have not led to either the redistribution of income or the provision of basic necessities. While the short run limitations of our analysis are recognised, the examination of key sectors in terms of employment potential (as we shall do) is by no means a redundant basis for small industry policy.

The problem of choice of techniques is a real one only if there are a number of techniques available -- a blue print as stated in the capital controversy debate. Quite often there is not a range of techniques but only one unique technique that is efficient and desired by manufacturers be they large or small. Thus, when we advocate the promotion of small-scale industries we are not necessarily making judgment on the techniques they should use but rather, in terms of our analysis, examining the already existing technological base. One would obviously like to generate

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[40]Much has been written on the unemployment problem in India. It is difficult to evaluate the level of unemployment, not least because of the problem of defining unemployment. The 1961 census found only 1.4 million people unemployed in the whole of India. Of these, 0.6 percent were in rural areas and amounted to less than 1 percent of the rural labour force. For urban areas the figure was 3.25 and 1.48 percent respectively for males and females. The national sample survey put the figure in 1961-62 as 1.27 of the rural labour force and 6.34 percent of the urban labour force. Unemployment in India is therefore only defined in terms of the problem at hand. The Sixth Plan estimates that within the age group 15-59 years, the number of unemployed in 1980 was 19.17 million on the basis of 'daily' status definition of unemployment. This is 8 percent of the labour force. For a discussion see Sen, Employment Technology and Development, pp. 115-134, and the Sixth Plan, pp. 203-215.

the maximum productive employment but equally what is sought is that by linkage effects the proliferation of such units would generate demand in other sectors -- in rural and semi-urban areas -- and hence assist in the semi-industrialisation of these areas.

In this context, it may well be that our interest should be in the choice of industries as opposed to choice of techniques. Ishikawa[41] has noted that the problem of the cottage sector is shortage of centralised investment. Contrasting the situation to the factory sector (the large sector), the study concludes that if funds are allocated exclusively to the factory sector, then unemployment and under-employment problems will become formidable since this sector cannot absorb the numbers that the cottage sector is capable of absorbing. The key question is, therefore, the choice of industries to which centralised (government) investment should be allocated or guided quite apart from the choice of techniques problem. It is hoped that our analysis would provide a basis for determining such key sectors.

2.1.3 Other Aspects

A host of other aspects have been considered in the literature. The Industrial Policy resolution cited the mobilisation of resources of capital and skill which might otherwise be unutilised as an advantage of small-scale industries. On this aspect, one needs to examine the response of small enterprises to the problem of savings and reinvestment. McCrory[42]

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[41] Shigeru Ishikawa, "Choice of Techniques and Choice of Industries," Hitotubashi Journal of Economics, Vol. 6, February 1966, pp. 13-44.

[42] Government of India, Ministry of Commerce and Industry, James T. McCrory, Small Industry in a North Indian Town: Case Studies in Latent Industrial Potential, 1956.

studied units in North India and found that, though these units did have a high propensity to save and reinvest, they were incapable of breaking the size barrier and expanding into large-scale units. Berna's[43] study came to the contrary conclusion, viz. that such units were able to break the size barrier. Again, there is no conclusive evidence on this aspect.[44]

Human capital formation, ancillary units and sub-contracting are also important considerations. The role of entrepreneurship in economic development with a mixed or non-socialist economy has always been emphasized. In the small sector in India this has taken on greater significance when answering questions such as (i) what factors determine the starting up of small industries? (ii) which categories of persons take the decisions? (iii) are decisions based on market information and a rational procedure or are they ad hoc? (iv) to what extent are decisions made by entrepreneurs responsive to public policy? (v) can entrepreneurship be attributed to any specific characteristic of the persons as in the case of England where Weber argued that the growth of the Protestant ethic was a key force in the industrial revolution -- in the Indian context this would be interpreted to mean an examination of caste factors and regional development patterns? (vi) finally, locational factors, and the question of whether certain areas are more progressive in fostering small units? While some of these aspects have been examined in the Indian case there is scope for more work in an attempt to understand social factors.[45]

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[43] James J. Berna, Industrial Entrepreneurship in Madras State, International Development Centre for Stanford University, Asia Publishing House, London, 1960.

[44] For a further review see K.K. Subrahmanian and S.P. Kashyap, op. cit., pp. 54-56.

[45] See E. Wayne Nafziger, Class Caste and Entrepreneurship, A Study of Indian Industrialists, East West Centre East West Technology Development Institute, The University Press of Hawaii, Honolulu, 1978.

Decisions to set up small industries are often made with inadequate knowledge of the long term demand for the products. The instability of such units is partly due to supply constraints but also due to the attempts of the small entrepreneurs to take advantage of any short term tax benefits that can be reaped. Such units would therefore tend to have a high mortality rate. Studying the 'human factor' in the growth of small industry, Christopher[46] notes, for Hyderabad and Secundrabad districts, that capital shortage and governmental red tape were together the most discouraging factors in starting small units. Further, as would be expected, the desire for economic gain and ambition were the paramount reasons for setting up the units.

Government policy in directing funds should not only be more responsive as regards which industries should be promoted but also attempt to ensure that a certain proportion of the profits are ploughed back into the enterprise. Tax incentives are in the form of a 35 percent investment allowance for the cost of acquisition of new plant and machinery, a depreciation allowance, and tax holiday of 6 percent on the total income of the enterprise. In addition, there is a 20 percent allowance on profits if the units are set up in backward areas. Contrasting this to a more developed country like the U.K. shows a wide disparity in the promotion of investment. In the U.K. such firms would get a 100 percent allowance on their plant and machinery in the first year and 25 percent per annum on the other items of fixed assets with even greater concessions for industries set up in development zones. A tax policy for promoting small units could not be differentially applied between small and large units

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[46] K.J. Christopher, "Socio-Psychological Factors Influencing the Starting of Small Industry Units," Indian Council for Social Science Research, Abstracts No. 1, 1970.

(as this would only result in large units forming themselves into smaller ones), but it could be used as a very effective tool in directing investment to those industries which are capable of having higher linkage effects in terms of either demand or employment generation.

The setting up on ancillary or sub-contracting units has also been examined though their growth is not impressive. In this context, the role such units have played has been emphasized in the Japanese model.[47] Ancillary development has been remarkably slow in India.

Sojiro Ueda's[48] study of 26 units in the automobile industry in Maharashtra in 1961 revealed five factors as being responsible for their slow growth. Firstly, since most units are privately owned they do not keep proper accounts, which is vital to their development. They were also owned by entrepreneurs who came from the merchant class and so were not accustomed to the techniques of running manufacturing units. Secondly, they accepted orders from many and different types of units as a result of which their production was complicated and inefficient. Thirdly, because of import duties on some of their supplies and lack of competition their costs are high and there was no attempt to rationalise them. Fourthly, the productivity of capital was low due to the low utilisation of their machinery and lack of access to borrowed money. Finally, the fact that own resources were used meant that the location of such industries in a person's own home or area led to it being far from the market and was therefore inefficient.

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[47] See Miyohei Shinohara, "A Survey of Japanese Literature on Small Industry," in Bert F. Hozelitz (ed.), The Role of Small Industry in the Process of Economic Growth, Moutor & Co., The Hague, 1968.

[48] Sojoro Ueda, "The Present Status and Problems of Ancillary and Sub-Contracting Industries in Maharashtra - India. Observations on the Automobile Industry," Institute of Research, Osaka Perfectual Government, 1961.

In a more empirical analysis Basu et. al.[49] identified various inputs as being impediments to the growth of ancillary industries. Their survey concentrated on four impediments: finance, raw materials, power, labour and combinations thereof. Table 3 indicates that raw materials and finance form the single significant impediment to the growth of ancillary units. India has also not followed the example of certain South Asian countries in attracting foreign capital to set up sub-contracting units.

Our review of other aspects of small-scale industries was intended to provide some indication of factors which need to be considered. However, most of these studies have been of a fact-finding nature and though not directly related to our study do serve to emphasize the point that small industry policy has been based on sample surveys with no attempt to broaden the coverage or provide useful guidelines.

2.2 Rationale for Key Sector Identification

In an economy where investment resources are scarce, which actively pursues a planned pattern of development, where the capital markets are imperfect and social and political inequities prevail, it is of prime importance that economists are able to provide some guidelines for the allocation of funds. The market may not be able to provide an efficient allocation in the presence of the above distortions.

It has generally been asserted that key sectors play an important role in initiating and sustaining economic development. Moreover, where the government is involved in spending over Rs. 1780 crores in the Sixth

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[49] S.K. Basu, A. Ghogh and S. Ray, Problems and Possibilities of Ancillary Industries in a Developing Economy, World Press, Calcutta, 1965.

Table 3

Major Input Impediments to Setting Up of Ancillary Industries

	No. of Units	% of Total Units
Finance	14	7.18
Raw Materials	27	13.85
Labour	1	0.51
Power	5	2.56
Finance and Raw Materials	45	23.08
Finance and Power	5	2.56
Finance and Labour	2	1.03
Finance, Raw Materials and Power	16	8.21
Finance, Raw Materials and Labour	13	6.67
Raw Materials and Power	9	4.62
Raw Materials and Labour	4	2.05
Raw Materials, Labour and Power	10	5.13
Power and Labour	2	1.02
Finance, Raw Materials, Labour and Power	19	9.74
No Impediments	18	9.23
Not Available	5	2.56
Total	195	
Total Raw Materials	150	76.92
Total Finance	114	58.46

Source: S.K. Basu, A. Ghosh, and S. Ray, Problems and Possibilities of Ancillary Industries in a Developing Economy, World Press, Calcutta, 1965, Table 9.11, p. 122.

Plan[50] public sector outlay on village and small-scale industries (covering the categories in Table 1), the basis on which these funds are allocated requires some predetermined aim and a clear analysis of the problem.

The need to set priorities is provided by the method of the Indian planning procedures. The plan is only a broad policy framework. Once the total allocation of funds has been decided upon there is the need to sub-divide these into the various sectors to achieve the policy objectives. In providing a rationale for key sector identification we shall focus on the following aspects:

(i) employment generation

(ii) examination of sources of finance for small industry

(iii) basis for reservation of items for production in the small-scale sector.

2.2.1 Employment Generation

> "In the Sixth Plan, it is proposed that wherever clear alternatives for production of goods and services are available, labour intensive techniques and processes must be preferred provided that productivity is not unduly affected.... The employment impact of various programmes would be carefully considered and other things being equal, programmes/projects with higher employment potential would be given preference."[51]

So one does not need to look far for a rationale on grounds of

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[50] Sixth Plan, op. cit., p. 190. This is 11.86% of the total public sector plan outlay for industry and minerals. The allocation for small-scale industries and industrial estates only is Rs. 616 crores.

[51] Sixth Plan, op. cit., p. 207.

employment promotion. While the Plan states the need to promote labour intensive techniques, it does not provide either a criterion for determining which techniques or the industries/projects to be promoted. Nevertheless, the concept of identifying sectors is prevalent through the Plan's thinking. Indeed in terms of employment generation the Plan recognises that encouragement would have to be given to village, cottage and small industries. It also envisages the need to promote exports of this sector and to this end it recognises the need to import technology for export oriented and key industries.[52]

If we are somehow able to rank industries in a logical manner then it would be possible both to promote productive employment and to direct private funds via tax incentives to those industries which are capable of generating employment. The industries must in the long run be profitable and self-sustaining for it is impossible for the government to finance them on a continuous basis. But the government can in certain cases assist these key industries on a selective basis where the social benefits are larger.

2.2.2 Financing of the Small Industries

Lack of adequate finance has always been a major problem for these industries. Though this problem is interlinked with that of quality, marketability and supply constraints, credit availability can be the single most important bottleneck to their development. Small industries do not have easy access to the capital markets because they are mostly organised on a proprietary or partnership basis and are of small size. Institutional

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[52] Ibid., p. 261.

sources of finance are also often denied to them to a large extent because of the small surpluses they generate being incapable of meeting the repayment of loans. Even though the government has a large public sector outlay for this sector, the sector has relied largely on private sources of finance as indicated by Table 4.

Table 4

Approximate Share of Various Sources in the Financing of Small Industries in India

Source	Percent in 1957	Percent in 1961
Internal funds	88.0	81.0
Private non-banking	3.6	6.6
Banking sources -- including state banks	7.3	6.5
Government sources -- including state banks	1.1	5.9
	100.0	100.0

Source: R.W. Davenport, Financing of the Small Manufacturer in Developing Countries, McGraw-Hill, New York, 1967, p. 21.

The moneylenders have been a major private source. They often tend to charge exhorbitant rates of interest. In Surat they were reported to charge 6 percent and in Madras 6 to 24 percent in the late 1950's.[53] These rates do not seem high but there is a danger of harsher terms if dependency on moneylenders is complete. A more recent study of 199 sample units in Kerala indicated a slight shift towards institutional borrowings. That pattern is shown by Table 5 below. In using the figures for Kerala

[53]Quoted in R.W. Davenport, Financing of the Small Manufacturer in Developing Countries, McGraw Hill, New York, 1967, p. 24.

Table 5

Pattern of Financing of Small-Scale Industries in Kerala - 1970

	Percent of Total Borrowings
Institutional Borrowings	
All government agencies	11.0
Commercial banks	27.0
Cooperatives	0.6
Total	38.6
Non-Institutional Borrowings	
Indigenous banks	4.3
All other	29.1
Sundry creditors	28.0
Total	61.4

Source: Adapted from M.A. Oommen, "The pattern of financing of small-scale industries in Kerala," Journal of the Indian Institute of Bankers, Vol. 43, July-September 1972, Table II, p. 331.

it must be noted that, historically, the contribution of banks there has been significant. This may not be true across other states.[54] What is important, though, is the growing ability of the government to influence the funding of the sector and thus be able to influence the overall expenditure in this sector.

Reliance on moneylenders and indigenous bankers (those who accept deposits and engage in a variety of banking activities but are not classified or registered as banks) has been an important feature of small industry especially in the rural areas. The attractiveness of moneylenders

[54] There is a recent extensive survey of the financing of this sector conducted by the Reserve Bank of India. The survey was examined but is available in India for limited circulation only.

lies in the fact that they give prompt, flexible and informal service. As a consequence of the parties being acquaintances or being introduced by a known intermediary, the collateral is often left in the borrower's possession. The other advantage arises from the sheer misallocation and non-availability of institutional sources of finance. The nationalisation of banks was expected to lead to greater funding of small industries.[55] But experience seems to suggest that banks take a number of months to process loans, and there is the persistent handicap of the need for influence in order to obtain bank loans.

The distribution of institutional sources of finance has also tended to be unguided. Perhaps the closest one can get in assessing the distribution of funds on an all India basis is that suggested by the National Sample Survey 1968-69[56] and is noted in Table 6 below.

Table 6

Percentage Distribution of Total Outstanding Loans in Rural and Urban Areas by Sources of Loan 1968-69

	Rural	Urban
Government	14.69	43.63
Banks	5.42	9.55
Private	42.63	28.97
Co-operative Societies	5.71	3.50
Others	31.55	14.35
	100.00	100.00

Source: Government of India, Tables with Notes on Small-Scale Manufacture in Rural and Urban Areas, National Sample Survey, 23rd Round, July 1968-June 1969, No. 205, 1975, pp. 33 and 57.

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[55] M.C. Shetty, "Preparation for Financing Small Industry," Economic and Political Weekly, Vol. 3, December 13, 1969, pp. 1921-1925.

[56] Government of India, National Sample Survey Organization (continued...)

As the table indicates, the pattern of funding between rural and urban districts is remarkably different, with the former continuing to rely much more on private sources. In 1968-69 the rural sector tapped private sources for 43 percent of its funds, as compared with 29 percent for the urban areas. The total number of enterprises involved, however, was 65 million in rural districts and 20 million in urban areas; hence when considering any shift in the pattern of financing, the rural sector has an immense influence on the all India picture.[57]

Among the institutional sources of finance have been the following:

(i) low-interest term financing under the State-Aid-to-Industries Act;

(ii) State Finance Corporations;

(iii) commercial banks

Low-interest finance under the State-Aid-to-Industries Act originated in 1922 in Madras state and was a consequence of the recommendation of the Industrial Commission of 1916. During the planning period, this acquired greater significance and was the main channel for government assistance. This aid, however, was not reserved specifically for small units, so there was an element of competition with large units. As a result, screening of applications poses a problem, particularly because small units do not keep proper accounts or often come with poorly formulated

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[56](...continued) Some Results on Small Scale Manufacture in Rural and Urban Areas, No. 205, 1975 and Tables with Notes on Small Scale Manufacture in Rural and Urban Areas, No. 218, 1976. The National Sample Survey, 23rd Round, July 1968-June 1969.

[57]For another view on the distribution of bank credit see G.A. Pai, "Regional Distribution of Bank Credit," Economic and Political Weekly, Vol. 4, October 10, 1970, pp. 1691-1699.

ideas for their investment projects.

Since screening is often done by local officers, there is room for both the use of influence and bribes. The basis of the loan is then seldom a detailed knowledge of the financial conditions or viability of the project. Viability studies are rarely conducted, so evaluation of the collateral is the main consideration. No detailed field studies have been done recently but McCrory[58] reports on the problem of one small industrialist with access to a loan. He was approached by both an elected representative and a loan official offering to arrange the loan. The elected representative offered help on the condition that he got a 10 percent commission and the official's condition was that the borrower made his relative a partner. Such instances are all too common in India and could be an important 'leakage' in industrial financing, though there is no estimate of its size.

The trend in the loans made under This Act (Table 7) shows a decline in its significance towards the mid-1970's when they seemed to be replaced by the State Finance Corporations.

The State Finance Corporations were established shortly after independence and took over the administering of loans by the State-Aid-to-Industries Act in most states. The extent of lending by these corporations to small industries and the incidence of default (to gauge the success of this source of finance) is shown in Tables 8 and 9.

There are no readily available figures on what proportion of lending by the SFC's was to small-scale units but in 1971-72 about 95 percent

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[58]Quoted in R.W. Davenport, op. cit., p. 28.

Table 7

Loans by State Governments to Small-Scale Industries
State-Aid-to-Industries Act

Year	Amount (Rs. crores)	Year	Amount (Rs. crores)
1956-57	1.89	1969-70	3.48
1960-61	3.04	1970-71	7.09
1965-66	3.71	1971-72	8.60
1966-67	3.43	1972-73	3.63
1967-68	3.06	1973-74	2.81
1968-69	3.22	1974-75	1.81

Source: Government of India, Development Commissioner, Small-Scale Industries, Government of India, Handbook of Statistics 1977, p. 155.

Table 8

Loans Disbursed by State Financial Corporations to Small-Scale Units

As At	No. of Units	Amount Disbursed (Rs. lakhs)
30 June 1976	28,833	28,305.66
30 Sept. 1976	29,357	29,079.58
31 Dec. 1976	31,356	31,416.42
31 Mar. 1977	32,738	33,305.35

Source: Government of India, Development Commissioner, Small-Scale Industries, Handbook of Statistics 1977, Table 5.8.2, pp. 156-157.

Table 9

Credit Guarantee Schemes for Small-Scale Industries

As at end of	(1) Guarantees Outstanding (Amount)	(2) Advances Under Default (Amount)	(3) Claims Paid on Account of Invocation of Guarantee (Cumulative)	(4) Col. 3 as Percentage of Col. 3	(5) Col. 4 as Percentage of Col. 4
1965-66	4970	18	9	0.4	0.2
1966-67	6306	30	10	0.5	0.2
1967-68	11107	36	11	0.3	0.1
1968-69	20905	79	15	0.4	0.1
1969-70	61871	123	20	0.2	0.03
1970-71	74684	589	25	0.8	0.03
1971-72	86387	1352	36	1.6	0.04
1972-73	103632	1905	60	1.8	0.06

Source: R.B.I. Bulletin, quoted in D.G. Borkar, "Some Aspects of Lending to Small-Scale Industries," The Journal of the Indian Institute of Bankers, Vol. 44, April-June 1973, p. 142.

of the units financed by them and about 80 percent of the amount sanctioned was to small industries.[59] Since default on loans is often considered a major factor in the problem of financing such units, it is necessary to consider the extent to which loans so far granted have resulted in defaults by such units.

Claims paid under guarantee clauses have slowly crept up but the percentage of claims to advanced is on average around 1 percent for the period. It is often contended that the aim of lending money would be to ensure that bad debts are kept to a minimum and that the borrower is able to service the interest and capital on time. The overall record on this seems respectable, and we need, therefore, ask the question of not only

[59] D.G. Borkar, "Some Aspects of Lending to Small-Scale Industries," The Journal of the Indian Institute of Bankers, Vol. 44, April-June 1973, p. 141.

whether the loans to the small industries can be repaid but also whether they are being channelled in the right direction.

One of the major expectations, following the nationalisation of banks, was that they would be used as instruments of government policy in combatting unemployment. Small industries and agriculture had been neglected by commercial banks in their pursuit of less risky large-scale enterprises. The failure of the post-nationalisation period to have had sufficient impact on the small sector prompted the government to emphasize a new industrial policy resolution in December 1977.[60] This resolution again called for the dispersion of small industrial units and the reservation of items for exclusive production in the small sector.

While the resolution was useful in reiterating government support, it again lacked any thrust. A working group set up in 1978 was more forthright in its recommendations on channelling credit. It made two points, viz. that banks should concentrate on the implementation of self-employment schemes in areas for which development plans are ready and that district credit plans should be elaborated to indicate the link between employment and development schemes.[61] By encouraging units which are employment-oriented, banks can be expected to fulfill the objectives set out for them by the governments. Again, however, the question of how banks are expected to know which units are likely to generate employment in comparison to others competing for loans is left unanswered.

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[60] Government of India, Development Commissioner, Small-Scale Industries, Report 1978-79, Small Industries Development Organization.

[61] M. Ramaswamy, "Social Responsibilities of Banks," The Journal of the Indian Institute of Bankers, Vol. 50, April-June 1979, pp. 89-96.

To provide the infrastructure for the provision of loan facilities the industrial policy of 1977 set up two specific measures. Firstly, the creation of District Industries Centres (DIC's). The DIC's were supposed to replace the proliferous schemes, agencies and organisations which tended to confuse rather than assist. The DIC's would deal with all aspects of small industries -- economic investigations of the district's raw material and other resources, supply of machinery and equipment, provision of raw material, arrangement for credit facilities, effective set-up of marketing, a cell for quality control, and research and development.

Secondly, the Industrial Development Bank of India was to set up a separate wing for dealing exclusively with small industries and should earmark a certain proportion of loans for them.

By March 1980, 382 DIC's were sanctioned. However, the Sixth Plan notes that the DIC's have not made a very significant impact, particularly in the traditional industries sector.[62] Therefore, there is a search for alternative institutional structures.

In summary, our review of the financing of small-scale industries suggests that the role of government financing is gradually increasing and the government has an ability to influence the purpose to which its loans are put. At the same time there has been the lack of a coherent policy to channel the funds into specific sectors largely because of a lack of understanding of the economic structure of the small sector. While the aim of policy has always been to promote employment, it has

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[62] Sixth Plan, op. cit., p. 191.

lacked any machinery for either identifying employment opportunities or a framework in which to assess the alternatives.

2.2.3 Reservation of Items for Small Industries

Indian policy on the promotion of specific small-scale industries has been incorporated in the phrase "...whatever can be so produced will be produced...." As a result, the aim has been to set up a list of items which can be produced by the small industries and regard this as an efficient means of promoting these industries. Government purchases for stores will then be made exclusively from these industries whenever possible.

The basis for reservation of items and stores purchasing policy have therefore also been ad hoc. No consideration is necessarily given to whether there would be economies of scale in the production of certain goods. There is scope for inefficient production and for blatant and unjustifiable protection. The Sixth Plan recognises the limitations in this area and hence states:

> "For want of adequate follow up and positive support, the policy of support has been negative in character. No worthwhile attempt has been made to forecast demand for the reserved items and ensure that adequate capacity created to meet the likely demand and/or prevent supply demand imbalances."[63]

The plan goes on to accept that this policy may have had no effect on the growth rate of reserved items. In addition, there is an implicit recognition to identify products for promotion. It states:

> "...Endeavour would be to pursue a policy of positive support in respect of those items which

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[63] Ibid., p. 195.

offer maximum growth and employment potential."[64]

At present there are 834 items reserved for exclusive production in the small-sector and an equally large number of items for exclusive purchase from this sector. So a key sector analysis is in that sense being recognised but without any rational base.

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[64] Ibid., p. 195.

CHAPTER III

EMPIRICAL INVESTIGATIONS I

3.1 Definition of a Key Sector

The concept of key sectors has permeated the literature largely out of the realisation that in an economy with scarce capital resources some attempt must be made to concentrate those resources in sectors where their impact will be most 'beneficial'. What is regarded as 'beneficial' is a centre of controversy and hence has led to considerable debate on issues such as the employment output trade off and choice of technology. The question has always been how to determine the optimum allocation of resources when the maximisation of a number of objectives -- growth, employment, output -- are involved.

In the end, it may well boil down to the promotion of the objective function of the planner, and this may be dictated by political factors. There, nevertheless, exists a need to identify the key sectors, since the large and increasing unemployment in the Indian economy brings to the forefront the examination of the employment potential of production both within the existing techniques of production and the existing structure of industry. This is required within the overall context of the industrial sector, but also at a disaggregated level with the small industries if these industries are to be the focus of specific government assistance.

Besides all the rationales already discussed, another rationale in a dynamic setting is the concept of 'linkage' as formulated by Hirschman. This views development not as a process of balanced growth where every activity expands in line with every other but rather as a process where expanding one activity will induce progress in every other activity. Development is not viewed as a series of alternatives. Instead, public investment should be in "efficient sequences that tend to maximise 'induced' investment decisions."[65]

To this end it may be considered necessary to classify industries and projects in accordance with whatever criteria the planner considers important. It is obvious that there cannot be one unique criterion which is all encompassing. Various benchmarks will need to be used and attempt will have to be made to see if they provide non-conflicting results.

Two basic techniques can be outlined for identifying key sectors. Firstly, one could rely on input-output analysis based on the Leontief open static model (the components of final demand are exogenous to the basic inter-industry matrix, and analysis can be done only on the assumption of the constancy of the technical co-efficients) to examine the direct and indirect demands of one sector in relation to its interdependence with other sectors and thus arrive at a criterion for identifying key sectors in the economy. Within this framework, two alternative methods are available[66] viz.

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[65] A.O. Hirschman, The Strategy of Economic Development, Yale University Press, New Haven, 1958, p. 98.

[66] As used by B.R. Hazari, "Empirical Identification of Key Sectors in the Indian Economy," The Review of Economics and Statistics, Vol. 52, August 1970, pp. 301-305. An alternative technique would be that used by Chenery-Watanabe in H.B. Chenery and P.G. Clark, Inter Industry Economics (Chapter 8), John Wiley and Sons, New York, 1964.

(i) defining key sectors in the technological manner of Rasmussen[67] and Hirschman[68]

(ii) assigning weights to each sector in accordance with the preference function of the planner.

In the latter method, the weights used can be centrally determined by the decision makers or be based on the final demand of a particular sector in relation to total final demand as utilised by Hazari.[69]

In the absence of detailed final demand for the small sector (this is virtually impossible as any survey would be unable to distinguish whether the demand was for a good produced in the small sector or otherwise), one has to confine oneself to the former method. While the adoption of weights may be more realistic, in practice, it would by nature be arbitrary. On the other hand, definition in a technological manner alone means that each sector occupies equal weight. Instead, we shall use labour coefficients to identify those sectors which are potentially capable of generating greater employment.

In our input-output framework, we define key sectors as those which have a high backward and forward linkage. When considered along with labour co-efficients, the ranking of the sectors is in relation to the highest employment creation per rupee of final demand, or the one which has the highest total employment using the sectoral wage rates.

The second technique used in the literature has been that based on

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[67] P.N. Rasmussen, Studies in Intersectoral Relations, North Holland Publishing Company, Amsterdam, 1956.

[68] Hirschman, The Strategy of Economic Development, 1958.

[69] B.R. Hazari, op. cit., p. 301.

broad economic aggregates. Here the inter-relationships such as employment generated within the industry or activity, export orientation, labour intensity and import reliance of the sectors have been used as guiding principles. It would be virtually impossible to find that all or even some of the sectors on the basis of the above qualifications would be pointing in the same direction. However, a key sector in this sense would be one which provides a high level of employment in absolute terms, is labour intensive (however defined -- and there is no agreement on this concept), export oriented and has low reliance on imports for its production. Our techniques will focus on measures of labour intensity and elasticity of substitution between capital and labour.

It is certainly not imperative that both these techniques should give identical results. Nevertheless, the adoption of both techniques provides a basis for comparison and assessment of their relative merits (though not the results) and at the same time provides some guidelines for policy. The lack of homogeneous data for both techniques makes comparability difficult. The problem of homogeneity lies in the fact that the data used for the 'input-output' analysis and the sectors detailed there may not correspond with those in the census and sample surveys used for 'broad aggregates analysis'. Such problems have always plagued economic analysis in India, and researchers have tended to shy away from the use of whatever data are available. In our analysis, this limitation of data is recognized; hence the conclusions for each technique will be within its own frame of reference.

3.2 The Input-Output Framework

The use of the input-output framework for identifying key sectors

relies on the recognition of the interdependence among industries. This framework focuses on the demand that a particular sector imposes on the goods from its input supplying sectors. In the case of employment, for example, there is a twofold effect: the direct employment generated as a result of the increase in one unit of demand for the i^{th} sector; secondly, the indirect employment generated by the i^{th} sector as a result of its demand for goods from its input supplying sectors.[70] The implication is that to maximise employment through the choice of products mix the planner should attribute as high an importance as feasible to sectors with higher employment creation per rupee of final demand.

In that respect, one makes no apology for concentrating on employment alone as a criterion given the current disillusionment with questions of employment-output trade-offs and the increasing focus on redistribution with growth, basic needs and the alleviation of unemployment as prime movers for development.

In addition to the employment factor, it may also be desired to learn the relationship between final demand and the structure of total output. Given the set of assumptions, the input-output framework would also assist in giving the pattern of flows of inter-industry transactions so that for the i^{th} industry $X_i = F_i + \sum_{j=1}^{m} b_{ij}X_j$; where X_i is the value of the total output of the i^{th} sector; F_i is the final demand of that sector and b_{ij} is the value of the purchase by the j^{th} sector of the output of

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[70] The idea of the employment multiplier is attributed to R.F. Kahn though is much older and is implicit in Walras' equilibrium analysis and Quesnay's tableau. Khan identified the distinction between inter industry and employment effects. R.F. Kahn, "The Relation between Home Investment and Unemployment, Economic Journal, Vol. 41, June 1931, pp. 173-198.

the i^{th} sector per rupee of total output of the j^{th} sector.[71] Thus, this sort of formulation could be used to identify sectors by output levels.

Developing this concept, one could identify key sectors as Rasmussen has suggested, and as implicit in Hirschman's thesis of the importance of the backward and forward linkages.[72] Rasmussen's formulation is purely technological. The level of final demand is not important as it provides a technological relationship per unit of final demand. 'Backward linkage', therefore, would be the demand that an industry generates for its input supplying industries as a result of a unit increase in final demand for its products, and 'forward linkage' is the demand for output that it generates for its customer industry as a result of a unit increase in its demand. Industries can then be ranked in terms of the demand that they create for other industry products and also generate themselves.

Focus on demand alone does not give an idea of the employment creating potential. But it is obvious that the total employment impact as a result of the expansion in the i^{th} industry's output will be higher the less dependent an economy is on imports and the greater the reliance on domestically produced goods.

To obtain a more comprehensive picture, however, account would need to be taken of the consumption generated as a result of increased

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[71] J. Krishnamurty, "Indirect Employment Effects of Investment," in A.S. Bhalla (ed.), Technology and Employment in Industry, International Labour Office, Geneva, 1975, p. 63.

[72] An attempt to test the Hirschman hypothesis i.e. whether countries that favoured high linkage sectors had a better record of growth than countries that did not has been made by P.A. Yotopoulos and J.B. Nugent, "A Balanced Growth Version of the Linkage Hypothesis: A Test," Quarterly Journal of Economics, Vol. 87, May 1973. For a subsequent debate on their procedure see the same journal, 1976, pp. 308-343.

employment within the sector. The consumption pattern will depend on whether the industries are largely urban or rural, the extent of employment of wage labour and household labour and the relative consumption propensities of each. Savings of the sector are then of only incidental importance, since in this case we would be interested in employment and demand rather than reinvestment and growth. A more comprehensive picture requires a dynamic framework and would mean the abandonment of the static input-output framework while at the same time losing the rigorous mathematical analysis.

3.2.1. The Methodology

The input-output framework provides a basis for key-sector identification in the manner noted above. In this section we shall outline the basic mathematics behind this framework and show how Rasmussen has adopted this in order to give some indicators of key sectors.

The simple Leontief system is described by a set of simultaneous linear equations as:

$$X_i = \sum_{j=1}^{m} x_{ij} + F_i \qquad (i = 1, 2, \ldots m)$$

where

X_i = gross output of the i^{th} industry

X_{ij} = output of the i^{th} industry as input in the j^{th} industry

F_i = output of the i^{th} industry available for outside consumption or final demand

In tabular form this means the following set of equations:

Industries to (j's) 1	2	3 ...	m	F	Total gross output
from (i's)					
1	$x_{11} + x_{12} + x_{13} \cdots x_{m} + F_1$				$= X_1$
2	$x_{21} + x_{22} + x_{23} \cdots x_{2m} + F_2$				$= X_2$
3	$x_{31} + x_{32} + x_{33} \cdots x_{3m} + F_3$				$= X_3$
-	- - - ...	-	-	-	
-	- - - ...	-	-	-	
m	$x_{m1} + x_{m2} + x_{m3} \cdots x_{mm} + F_m$				$= X_m$

Row-wise addition of all the inter-industry demands (x_{ij}'s) and the final demand F_i gives the corresponding gross output X_i. Column-wise, we obtain the input structure of each of the industries. For example, in industry 2, x_{12} amount of product 1, x_{22} amount of product 2 and so on, will be used to produce X_2 amount of output.

By dividing the column entries of a particular industry by the gross output figure of the corresponding industry, we obtain the input-coefficients of that industry. Considering industry 2, we obtain x_{12} as an input coefficient of product 1 in industry 2. This coefficient is denoted as a_{12}. Similarly for all the other industries. We would then obtain a matrix of all input coefficients as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ - & - & & - \\ - & - & & - \\ a_{m1} & a_{m2} & \cdots & a_{mm} \end{bmatrix}$$

For the purpose of our analysis we would interpret this as follows:

$$AX + F = X$$

hence $(I-A)X = F$

where

A = matrix of the input coefficients

X = vector of gross output

F = vector of final demand

therefore

$$X = (I-A)^{-1} \quad F$$

The $(I-A)^{-1}$ matrix is the Leontief inverse. If we have the matrix of the input coefficients A we can obtain this inverse.

3.2.2 Demand Linkage - Method 1

To use this concept for identifying key sectors we turn to Rasmussen's analysis.[73] If we regard the elements of the $(I-A)^{-1}$ matrix as being equal to Z then, following Rasmussen, the model shows us that the output from industry i must be increased by Z_{ij} units if the final demand for the products of industry j is to be increased by one unit.

The sum of the column elements of the matrix $(I-A)^{-1} = Z$ are therefore

$$\sum_{i=1}^{m} Z_{ij} = Z_j$$

which is interpreted as

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[73] P.N. Rasmussen, op. cit., Chapter 8.

> "the total increase in output from the whole system of industries needed to cope with an increase in the final demand for the products of industry j by one unit."[74]

Similarly the sum of the row elements would be

$$\sum_{j=1}^{m} Z_{ij} = Z_i$$

and is interpreted as

> "the increase in output in industry no i needed to cope with a unit increase in the final demand for the product of each industry."[75]

Therefore if we average we obtain

$$\frac{1}{m} Z_j \qquad (j = 1, 2, \ldots m)$$

and this is an estimate of the direct and indirect increase in output to be supplied by an industry chosen at random if final demand for the product of industry j increases by one unit.

Similarly $\frac{1}{m} Z_i$ $(i = 1, 2, \ldots m)$ is an estimate of the increase in output to be supplied by industry i if final demand for the product of an industry chosen at random is increased by one unit.

To make comparisons across industries, Rasmussen normalizes these to obtain what he calls the indices of the powers of dispersion.

$$\frac{1}{m^2} \sum_{j=1}^{m} \sum_{i=1}^{m} Z_{ij} = \frac{1}{m^2} \sum_{j=1}^{m} Z_j = \frac{1}{m^2} \sum_{i=1}^{m} Z_i$$

and the powers of dispersion are:

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[74] Ibid., p. 133.

[75] Ibid., p. 133.

$$U_j = \frac{\frac{1}{m} Z_j}{\frac{1}{m^2} \sum_{j=1}^{m} Z_j} \quad (j = 1, 2, \ldots m) \text{ - Backward Linkage}$$

$$U_i = \frac{\frac{1}{m} Z_i}{\frac{1}{m^2} \sum_{i=1}^{m} Z_i} \quad (i = 1, 2, \ldots m) \text{ - Forward Linkage}$$

The significance of these indices lies in the values of the U_j and U_i. For example, if $U_j > 1$, then according to the function Z_j it would mean that for an industry chosen at random that industry will need a comparatively large proportionate increase to cope with a unit increase in the final demand for the products of industry j.

This is to say, industry j draws heavily on the system of industries (backward linkage), and vice-versa for $U_j < 1$. Stated in another way, this is the extent of expansion caused in all other industries.

Similarly, $U_i > 1$ means that other industries draw heavily on this i^{th} industry. In other words industry i will have to increase its output more than other industries for a unit increase in demand for the other industry chosen at random. This would then approximate Hirschman's forward linkage.

Consequently, an industry which has both a high backward and forward linkage ($U_j > 1$ and $U_i > 1$) would be classified as a key sector. Those with only $U_j > 1$ or $U_i > 1$ would also be of interest in studying the structure.

The powers of dispersion suffer from the problem of averaging and bias towards end values. Rasmussen therefore derives the 'coefficient of variation' as follows:

$$V_j = \sqrt{\frac{\frac{1}{m-1}\sum_{i=1}^{m}\left(Z_{ij} - \frac{1}{m}\sum_{i=1}^{m} Z_{ij}\right)^2}{\frac{1}{m}\sum_{i=1}^{m} Z_{ij}}} \qquad (j = 1, 2, \ldots m)$$

$$V_i = \sqrt{\frac{\frac{1}{m-1}\sum_{j=1}^{m}\left(Z_{ij} - \frac{1}{m}\sum_{j=1}^{m} Z_{ij}\right)^2}{\frac{1}{m}\sum_{j=1}^{m} Z_{ij}}} \qquad (i = 1, 2, \ldots m)$$

These show the extent to which an industry draws evenly on the system of industries or creates output for other industries in response to increases in their demand. Consequently, for a more thorough analysis, a key sector would be one which not only has U_j and V_i greater than 1 but also has low coefficients of variation.

3.2.3 Employment Linkage - Method 2

In addition to the demand-linkage basis of classification, we shall use the employment-creation criterion for ranking industries within the input-output framework. In this respect, we shall identify key sectors by their direct and indirect employment creating potential. To rank industries by their total employment potential, we need both a fully articulated matrix and labour co-efficients. To obtain this, we assume zero final demand for all industries other than the chosen one, for which we assume final demand. Then, if l_i is the direct labour co-efficient,

($l_i = \frac{W_i}{X_i}$ where W_i is the wages of the i^{th} sector and X_i the gross output)

we can express the function as

$$\begin{bmatrix} e_1 & & 0 \\ & e_2 & \\ 0 & & e_m \end{bmatrix} \begin{bmatrix} a_{11} & & a_{1m} \\ & \ddots & \\ a_{m1} & & a_{mm} \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ \\ 0 \end{bmatrix} = \begin{bmatrix} e_1 a_{11} \\ \\ e_m a_{m1} \end{bmatrix}$$

This function means that to increase final demand of sector 1 by 1 rupee, $e_1 a_{11}$ rupees worth of labour would be required directly and $\sum_{i=2}^{m} l_i a_{11}$ rupees worth would be required indirectly. If W_i is the wage rate of the i^{th} sector, the direct and indirect employment created would be $\sum_{i=1}^{m} \frac{l_i a_i}{w_i}$ out of which $\frac{l_1 a_{11}}{w_1}$ would be direct employment and $\sum_{i=2}^{m} \frac{l_1 a_{1j}}{w_1}$ would be indirect employment created.[76]

Before proceeding with our analysis of the above two methodologies for small industry, we need to outline the nature of our data and the manner in which they have been adapted for our purposes.

3.3 Data Base

To conduct our application of the above models, we have used the input co-efficients -- the a_{ij}'s defined earlier -- as produced for the small-scale sector for 1959 by P. Venkatramaiah.[77] The table provided by him is representative of Maharashtra only, but insofar as the structure of the industries here may be regarded as typical we may get some guidance

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[76] J. Krishnamurty, op. cit., p. 65 and B.R. Hazari and J. Krishnamurty, "Employment Implications of India's Industrialisation, Analysis in an Input-Output Framework," The Review of Economics and Statistics, Vol. 52, May 1970, pp. 181-186.

[77] P. Venkatramaiah, "Flow Co-efficients for the Small-Scale Sector Industries," in P.N. Mathur and R. Bharadwaj (ed.), Economic Analysis in Input-Output Framework - with Indian Empirical Explorations, Vol. I, 1967.

on key sectors.

The essential consideration is that the data are for the small-scale sector and not for the whole economy and there is only one of its kind published so far. It is important that in such an analysis every attempt must be made to consider these industries separately as the large-scale industries may bear little resemblance in its structure to the small industries.[78] The differences in these industries arise from the fact that often the number of products produced in the small industries sector are fewer. The products bear little resemblance. There is a different product mix and the quality differs. Production methods and organisation are very different thus affecting the input structure. Further, within one industry the small units may specialise in different products than large-scale units. All these factors point to the need to use a separate data base from that used for large-scale industries.

In the context of Indian data collection, there is little systematic collation of data for small-scale inter-industry structures. When input-output tables are, however, constructed they are based on returns from both large and small industries separately. There is a strong case for keeping these industries separate though the amalgamation is brought about chiefly due to the difficulty of distinguishing them in final demand.

The chief consideration is, therefore, not in the fact that the small industry data now available should not be analysed due to their possibly incomplete coverage, but rather that a greater attempt will be made at analysing these data and collecting them in useful formats.

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[78]For a discussion see P.N. Mathur and R. Bharadwaj, op. cit., pp. 230-231.

Input-output data, by their very nature are difficult to collect and compile for a nation like India, where vastness and lack of adequate administrative machinery, coupled with the immense costs, are prohibitive factors. Nevertheless, a number of tables have been compiled on an all-India basis. The inter-industry tables prepared so far are listed in Table 10.

Table 10

Input-Output Tables Constructed in India

Year	Constructed By	Number of Sectors	Price[1]
1951-52	Indian Statistical Institute	36	Producer
1953-54	Indian Statistical Institute	36	Producer
1959	Planning Commission	29	Producer
1960-61		32	Producer
1963	Gokhale Institute	84	Purchaser
1964-65	Planning Commission	*[2]	*[2]
1968-69	Planning Commission	60	Producer
1973-74	Planning Commission	60	Producer

[1]The data for the tables is generally collected at 'purchaser prices. It is then converted to 'producer' prices by taking out the trade margin, railway-transport margin and 'other transport' margin components.

*[2]Not known. Used by B. R. Hazari, "Empirical Identification of Key Sectors in the Indian Economy," The Review of Economics and Statistics, Vol. 52, August 1970, p. 303.

Source: P. Venkatramaiah and L. Argade, "Changes in Input-Output Coefficients and their Impact on Production Levels," Artha Vijuana, Vol. 21, March 1979, p. 57.

The process of inter-industry table preparation is clearly quite advanced for a developing country like India bearing in mind all the problems enumerated above. These tables have been used for the preparation of Indian Five Year Plans. However, what is essential from our point of

view is, firstly, the extent to which the statistical data base we use can be justified and, secondly, the effect of using data for 1959 to draw conclusions for industry in the 1980's.

On the first aspect, one can only examine in detail the basis for the 1959 table prepared by Venkatramiah. The matrix presented to us is on the Planning Commission classification of groups. Each Planning Commission sector comprises of a number of subgroups. Consequently, the input co-efficients of the subgroups which make a Planning Commission sector are weighed with their outputs to arrive at a Planning Commission sector.

In the absence of output data, Venkatramiah has used employment figures for Maharashtra as weights to combine subgroups. This biases our results to Maharashtra's industry structure and so we need to assume that the industry structure for the state is fairly representative of other states. This may not be too rigid an assumption, since much policy and research in India has, of necessity, been based on sample studies.

The 1959 table prepared by Venkatramaiah is for a 106 x 65 industry matrix -- 106 producing sectors and 65 manufacturing sectors. This presents the familiar problem of a rectangular matrix. The literature has extensively discussed two aspects relevant to our analysis, viz., the problem of aggregation of products and industries and, secondly, the aggregation of the inverse of the input co-efficient matrix. Aggregation of products and industries has posed a problem in the construction of the tables because of the observation that different degrees of aggregation give different results. As noted by Morgenstern, "As there are, as would normally be the case, many dozens of rows and some are combined and others are not, or some can be combined in equally plausible (or implausible)

ways, there is always a different influence upon the activities that were left undisturbed."[79] This is really a fundamental problem in input-output analysis; and since the data presented to us have already been aggregated, we have not attempted any further aggregation. Instead, the interesting feature of the table is the number of empty rows and columns. This indicates the lack of interdependence of the sectors.

In view of these problems, and of the need for a square matrix for obtaining the inverse, we have:

(i) selected those industries for which there are input industries

(ii) selected those industries which, though not a manufacturing unit, are major consumers of small industry output.

By rationalizing the data in the above manner, we have obtained a 27 x 27 matrix for inversion (Appendix B provides the inverse -- the sector names are as for Table 11). One major sector which had to be omitted was the chemical industries sector because of lack of sufficient information.

The second aspect concerns the rationale for using 1959 data to arrive at present day results. The question here is the possible change in the structure of industries and final demand. As an economy develops, it could be expected to incorporate various technological innovations, and hence the mode of production of various products is likely to alter. The question is whether there has been a fundamental change in the Indian economy. The next question is the change in the pattern of final demand,

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[79] "Aggregation in Input-Output Model," in O. Morgenstern (ed.), Economic Activity Analysis, J. Wiley & Sons, New York, 1954.

and thereby in the nature of processing of primary products and in the type of products themselves.

The latter question is much easier to answer intuitively as it is only to be expected that final demand would have altered substantially over the years. But since we are assuming increases per unit of final demand we shall not be plagued by this problem. The only study which has attempted to gauge the nature and magnitude of the two factors -- technological and demand changes -- is that by Venkatramaiah and Argade.[80] Their study concludes that "...by the 1960's the Indian economy had developed a sound and sophisticated industrial base," further that technological changes were less important than final-demand changes. Their analysis was conducted by way of a comparison of the input-output tables for different years.

Given the difficulty in obtaining current data, even the Sixth Five Year Plan of India is based on the tables prepared for the year 1968-69. The most recent tables, released in October 1982, are those for the structure in 1973-74. However, even these tables seem to acknowledge that there is little change in the structure of the Indian economy from the previous period 1968-69.[81]

While some changes would no doubt have occurred, the procedures used would yield useful results if the data continued to be segregated between large and small sector industries.

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[80] P. Venkatramaiah and L. Argade, "Changes in Input-Output Coefficients and their Impact on Production Levels, Artha Vijnana, Vol. 21, March 1979, pp. 56-65.

[81] Government of India, Central Statistical Organization, Input-Output Transactions Tables 1973-74, p. 16.

Instead of an analysis of different base years, we have examined the effect of using a key-sector analysis for large and small industries separately. For this we have calculated demand linkages on a 36 x 36 matrix provided by Gupta,[82] which has small and large industries listed separately. This matrix was first converted into a flow co-efficient matrix, using the procedures already outlined for obtaining the a_{ij}'s and then the inverse was calculated (the inverse is listed in Appendix C -- the sector names are as for Table 14). The results provide another basis for assessing the impact on the key sectors when considered in relation to the entire economy.

To obtain our labour co-efficients and wage rates for the employment linkage, we have used census data.[83] Various sectors have been combined to arrive at a close approximation of the sectors in the input-output listing for the 27 x 27 matrix. The sectors aggregated are listed in Appendix D, and the labour coefficients in Appendix E.

3.4.1 The Results - Demand Linkage

Table 11 indicates the backward (U_j) and forward (U_i) linkages in the 27 small-scale industries-classification, with their corresponding co-efficients of variation. On the basis of our analysis, three sectors emerge (in Table 12) as those which have both a high backward and forward linkage and could thus be classed as key sector.

These three sectors also emerge as key sectors in Hazari's analysis

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[82] S.P. Gupta, op. cit., Table 11.4, Inter-industry Transactions Table 1955/56.

[83] Census of Small-Scale Industrial Units, op. cit., pp. 72-86.

Table 11

Backward and Forward Linkages for 27 Small-Scale Industries

		U_j	V_j	U_i	V_i
1.	Other iron and steel	0.6927	4.53	1.2639	2.75
2.	Non-ferrous metals	3.5610	5.07	6.5253	31.85
3.	Non-ferrous products	2.8198	4.08	0.7341	4.06
4.	Light ferrous products	1.0425	3.26	0.7984	3.76
5.	Special industrial machinery	1.1034	3.17	0.5731	5.20
6.	Other electrical equipment	0.8467	3.63	0.5731	5.20
7.	Automobile equipment	0.8082	3.68	0.5731	5.20
8.	High precision products	1.1089	3.65	0.7747	5.20
9.	Fertilizers	0.5801	5.13	0.5731	5.20
10.	Petroleum and coke	0.5731	5.20	0.7041	4.21
11.	Glass	0.9597	3.83	0.7175	5.13
12.	Structural clay products	0.7002	4.27	0.6057	4.91
13.	Other non-metallic minerals	0.7291	4.27	0.6554	4.75
14.	Wood manufactures	0.7033	5.08	0.9270	3.88
15.	Beverages and tobacco	0.8143	3.37	0.5731	5.20
16.	Oils and fats	0.6071	4.89	0.5731	5.20
17.	Preservatory canning	0.7519	3.98	0.5731	5.20
18.	Other textiles	0.8201	4.76	0.7566	5.18
19.	Manufacture of textiles n.e.c.	0.6194	4.96	0.6227	4.94
20.	Rubber tubes and tyres	0.7064	4.20	0.5731	5.20
21.	Leather tanning	1.0386	5.14	1.6553	3.57
22.	Leather and other products	1.1584	3.42	0.5748	5.18
23.	Paper and its products	1.5429	5.00	1.9609	3.97
24.	Other industrial products	0.9919	3.32	0.5770	5.17
25.	Coal mining	0.5731	5.20	0.8654	3.45
26.	Printing, publishing and stationery	0.5731	5.20	0.7333	4.03
27.	Generation and transport of thermo electric power	0.5731	5.20	0.9631	3.03

Table 12

Key Sectors for Small-Scale Industries on Demand Linkage Basis

	U_j	U_i	V_j	V_i
Non-ferrous metals	3.56	6.53	5.1	31.9
Leather tanning	1.04	1.66	5.1	3.6
Paper and its products	1.54	1.96	5.0	3.9

of the entire economy so in that sense both reinforce our results and at the same time indicate sectors in which the structure of large and small-scale industries are similar. The co-efficient of variation (V_i) for non-ferrous metals is however an anomaly and would seem to suggest that this industry does not necessarily increase its output in response to increases in demand in other industries. This may be because of the small industries buying non-ferrous metals from the large-scale industries instead. Also there are certain sectors in Hazari's[84] analysis which show up as key sectors but are not complemented by our analysis viz. cotton yarn (other textiles would be the closest in our classification); iron and steel (other iron and steel in our analysis) and rubber.

Table 13 indicates the sectors with high backward or forward linkages only. This shows that there are a greater number of sectors with a high backward linkage, and again the result is plausible. In small industry, we would normally expect low forward linkages as these industries are generally engaged in the production of goods for direct consumption.

For our examination of the large- and small-scale industries separately, but in the same fully articulated matrix, we calculated the linkages for the 36 sectors, and these are listed in Table 14. Though the breakdown of the sectors is limited, it nevertheless shows that in an overall framework no small industry emerges as a key sector (i.e. one with both high backward and forward linkages). It tends to be subsumed in the overall inter-industry structure hence we can only get limited guidance. The key sectors which emerge in the large-scale manufacturing sector are shown in Table 15.

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[84] B.R. Hazari, op. cit., p. 303.

Table 13

Sectors with High Backward or Forward Linkages for Small-Scale Industries

Backward	U_j	V_j
Non-ferrous metals	3.56	5.1
Leather tanning	1.04	5.1
Paper and its products	1.54	5.0
Light ferrous products	1.04	3.3
High precision products	1.11	3.7
Sepcial industrial machinery	1.10	3.2
Leather and other products	1.16	3.4
Forward	U_i	V_i
Non-ferrous metals	6.53	31.9
Leather tanning	1.66	3.6
Paper and its products	1.96	3.9
Other iron and steel	1.26	2.8

Table 14

Demand Linkages for Large and Small Industries

		U_j	V_j	U_i	V_i
Primary Production					
1.	Agriculture	0.6663	5.71	2.2403	1.97
2.	Plantation	0.7528	4.75	0.8420	4.25
3.	Animal husbandry, fishing, forestry	0.9341	4.26	1.4144	2.69
4.	Coal mining and coke making	0.7978	4.66	1.3758	2.76
5.	All other mining	0.6995	5.26	1.2690	2.89
Large-Scale Manufactures					
6.	Iron and steel	1.1406	4.03	1.5582	3.07
7.	Non-ferrous metals	1.4051	3.41	1.2950	3.68
8.	Engineering	1.1989	3.42	1.0280	3.81
9.	Chemicals, etc.	1.070	4.36	1.8993	2.63
10.	Cement, etc.	1.0325	3.52	0.6820	5.32
11.	Other building materials and wood manufacture	0.9460	3.80	0.6574	5.46
12.	Food, drnik, tobacco, oil	1.1459	3.70	0.9508	4.25
13.	Cotton textiles	1.1314	4.10	1.2226	3.84
14.	Other textiles	1.1623	4.13	0.0979	5.28
15.	Jute and other fabrics	1.1532	3.65	0.8801	4.62
16.	Glass and ceramics	1.0073	3.59	0.6296	5.74
17.	Leather and rubber	1.1899	3.11	0.7233	5.07
18.	Paper, printing and stationery	1.0848	3.91	0.8415	5.03
19.	Electricity generation and transmission	0.9319	3.96	0.8266	4.43
Small-Scale Industries					
20.	Metal and metal working	0.9618	3.74	0.6583	5.42
21.	Building materials and wood manufacture	0.7758	4.60	0.6583	5.21
22.	Textile and textile products	1.1347	3.32	0.6560	5.46
23.	Food, drink, tobacco, oil	1.1839	3.31	0.6338	5.76
24.	Glass and ceramics	0.9022	3.98	0.6094	5.87
25.	Leather and leather products	1.1535	3.26	0.6159	5.99
26.	Other products, miscellaneous	1.2264	3.36	0.9952	4.09
Other Activities					
27.	Railways and communications	0.9856	3.87	1.0763	3.32
28.	Other transport	1.0866	3.45	0.9740	3.68
29.	Trade and distribution	0.7269	5.12	2.9472	1.27
30.	Banks, insurance and cooperations	0.7948	4.56	0.7128	5.08
31.	Professional services, institutions, etc.	0.7476	4.78	1.0207	3.48
32.	Construction	1.1400	3.13	0.5967	6.00
33.	Residential property	0.6325	5.66	0.5967	6.00
34.	Public administration	0.5966	6.00	0.6128	5.84
35.	Defence materials	1.6294	2.57	0.6831	5.59
36.	Unclassified: large scale	0.8343	4.30	0.6820	5.23

Table 15

Key Sectors for Large-Scale Manufacturing Industries

	U_j	V_j	U_i	V_i
Iron and steel	1.1406	3.4	1.5582	3.1
Non-ferrous metals	1.4051	3.4	1.2950	3.7
Engineering products	1.1989	3.4	1.0280	3.8
Chemicals	1.070	4.4	1.8993	2.6
Cotton textiles	1.1314	4.1	1.2226	3.8

The last three sectors in Table 15 do not emerge as key sectors in Hazari's analysis. The key sectors under Hazari's analysis using similar techniques are listed in Table 16.

Table 16

Key Sectors Using 1964-65 Input-Output Tables
(Hazari's Analysis)

	U_j	U_i	V_j	V_i
Metal products	1.0626	1.3629	5.8	4.2
Iron and steel	1.0780	1.8788	6.5	5.6
Non-ferrous metals	1.1704	1.3860	5.6	6.2
Rubber	1.3090	1.3090	5.2	6.3
Leather	1.1704	1.2782	5.2	5.1
Animal husbandry	1.0395	1.3245	5.9	5.5
Vegetable oils	1.3167	1.7480	5.8	5.1
Cotton yarn	1.0626	1.2397	6.2	5.6
Petroleum products	1.3965	1.5169	5.8	3.8
Paper and paper products	1.0395	1.4245	6.3	4.7
Miscellaneous chemicals	1.0241	2.3408	6.3	2.6

Source: B.R. Hazari, "Empirical Identification of Key Sectors in the Indian Economy," op. cit., p. 303.

A number of interesting conclusions emerge from the various results. Firstly, it is clear that an examination of small industry needs to be

conducted quite independently of large-scale industry. In our 27 x 27 matrix the interdependence is within the small industries alone. Though these industries do not draw heavily on other sectors (as indicated by the large number of empty rows and columns) their interdependent nature is of interest in itself. This interest arises because of the need to promote a more specialized policy whereby the small-scale industries can, wherever possible, generate demand for other industry products. Also if the industries in the small-scale sector are not dependent on each other then one would need to examine the other sectors (medium and large) to ascertain possible demand and supply bottlenecks to the small-scale industries' growth.

Secondly, when we use input-output tables compiled in different forms and for different levels of aggregation the results can vary substantially. Here one is really speaking of the shortcomings of the input-output framework. For instance, it is well known that in an input-output table the alteration of the position of the sectors (rows and columns) affects the input coefficients and consequently the results.

Other shortcomings of this framework are the assumptions of fixed coefficients; that a given product is supplied by only one sector; no joint products; constant returns to scale and the equivalence of products and industries. The static input-output framework is essentially a photograph of the economy. These shortcomings are, however, not so severe as to render the framework to be valueless. In fact, for an economy which needs to plan in blocks of years the input-output framework is the only one available to encompass the entire economy. Planning has been essential since large economies, like India, suffer from a number of constraints -- capital shortage, uncertainty of agricultural yields, balance of payments

and supply-demand mismatches.

3.4.2 The Results - Employment Linkage

Table 17 presents the direct, indirect and total wage bill per rupee of final demand. This means that if for a sector there is a unit increase in its final demand, then there is a consequent increase in its wage bill. Normalizing this over Rs. 10 lakhs of final demand and using the sectoral wage rates we obtain the employment created in the sector (Table 18) -- direct, indirect and total.

On this employment linkage basis, the top five sectors in terms of total employment creation are listed in Table 19 below.

These top five sectors (with the exception of non-ferrous products) also have a high percentage of direct employment in total employment. To study the direct and indirect employment implications, Table 18 has been re-analysed below in terms of direct employment in the 90-100 percent range and compared with the key sectors on the demand-linkage basis. This is shown in Table 20 below.

Table 20 indicates that all three key sectors under the demand linkage show up as significant sectors in terms of direct employment range, though not necessarily so in their ranking by total employment creation. In terms of total employment creation the top five sectors are structural clay products, glass, non-ferrous metals, other non-metallic miscellaneous products and non-ferrous products. With the exceptions of other non-metallic miscellaneous products, all these are also in the top ranking when the wage rate factor is excluded and the wage rate per rupee of formal demand is considered (as shown in Table 17).

Table 17

Direct, Indirect and Total Wage Bill per Rupee of Final Demand for Small-Scale Industries

		Direct	Indirect	Total	Ranking
1.	Other iron and steel	0.09326	0.01599	0.10923	17
2.	Non-ferous metals	0.25480	0.01715	0.27195	3
3.	Non-ferrous products	0.0466	0.17371	0.22031	4
4.	Light ferrous products	0.05705	0.06806	0.12511	13
5.	Special industrial machinery	0.1403	0.04681	0.18711	7
6.	Other electrical equipment	0.0406	0.02596	0.06656	23
7.	Automobile equipment	0.1202	0.02842	0.14862	11
8.	High precision products	0.16991	0.03682	0.20673	6
9.	Fertilizer	0.0231	0.00121	0.02431	27
10.	Petroleum and coke	0.0651	-	0.0651	24
11.	Glass	0.24108	0.03339	0.27447	2
12.	Structural clay products	0.3291	0.01595	0.34505	1
13.	Other non-metallic minerals	0.13328	0.02144	0.15472	9
14.	Wood manufacture	0.12013	0.00262	0.12275	14
15.	Beverages and tobacco	0.0342	0.03777	0.12197	15
16.	Oils and fats	0.0941	0.006	0.1001	19
17.	Preservation and canning	0.0582	0.02354	0.08204	22
18.	Other textiles	0.13706	0.00942	0.14648	12
19.	Manufacture of textiles n.e.c.	0.07659	0.00854	0.08513	21
20.	Rubber tubes and tyres	0.0932	0.02123	0.11443	16
21.	Leather tanning	0.05376	0.00239	0.05615	26
22.	Leather and other products	0.0728	0.03591	0.10871	18
23.	Paper and its products	0.19727	0.00997	0.20624	5
24.	Other industrial products	0.11906	0.05642	0.17548	8
25.	Coal industry	0.0651	-	0.0651	24
26.	Printing, publishing and stationery	0.1571	-	0.1571	10
27.	Generation and transport of thermo electric power	0.099	-	0.099	20

Table 18

Direct, Indirect and Total Numbers Employed per Rs. 10 Lakhs of Final Demand for Small-Scale Industries

		D.E.	I.E.	T.E.	D.E./ T.E.	Ranking by Total Employment
1.	Other iron and steel	50	9	59	84.75	21
2.	Non-ferrous metals	125	8	133	93.40	3
3.	Non-ferrous products	25	95	120	20.83	5
4.	Light ferrous products	35	42	77	45.45	15
5.	Special industrial machinery	58	19	77	75.32	15
6.	Other electrical equipment	19	12	31	61.29	25
7.	Automobile equipment	63	15	77	81.82	15
8.	High precision products	87	19	106	82.08	8
9.	Fertilizer	13	1	14	92.86	27
10.	Petroleum and coke	37	-	37	100.00	24
11.	Glass	175	24	199	87.94	2
12.	Structural clay products	442	21	463	95.46	1
13.	Other non-metallic minerals	105	17	122	86.07	4
14.	Wood manufacture	87	2	89	97.75	11
15.	Beverages and tobacco	58	26	84	69.05	13
16.	Oils and fats	105	7	112	93.75	6
17.	Preservation and canning	50	20	70	71.43	18
18.	Other textiles	78	5	83	93.98	14
19.	Manufacture of textiles n.e.c.	55	6	61	90.16	20
20.	Rubber tubes and tyres	55	12	67	82.09	19
21.	Leather tanning	27	1	28	96.43	26
22.	Leather and other products	62	31	93	66.67	10
23.	Paper and its products	107	5	112	95.54	6
24.	Other industrial products	67	32	99	67.68	9
25.	Coal mining	37	-	37	100.00	23
26.	Printing, publishing and stationery	87	-	87	100.00	12
27.	Generation and transport of thermo electric power	45	-	45	100.00	22

D.E.: Direct Employment
I.E.: Indirect Employment
T.E.: Total Employment

Table 19

Top Five Sectors for Small-Scale Industries on the Basis of Employment Linkage

	Total Employment Numbers	D.E./T.E. %
Structural clay products	463	95.46
Glass	199	87.94
Non-ferrous metals	133	93.40
Other non-metallic minerals	122	86.07
Non-ferrous products	120	20.83

D.E.: Direct Employment
T.E.: Total Employment

Table 20

Sectors in 90-100 Percent Direct Employment Range

Sector	Ranking by Total Employment	Key Sector on Basis of Demand Linkage
Non-ferrous metals	3	Yes
Fertilizer	27	No
Petroleum and coke	24	No
Structural clay	1	No
Wood manufacture	11	No
Oil and fats	6	No
Other textiles	14	No
Manufacture of textiles n.e.c.	20	No
Leather tanning	26	Yes
Paper and its products	6	Yes
Coal mining	23	No
Printing, publishing and stationery	12	No
Generation and transport of thermo electric power	22	No

In summary, therefore, our investigations using the input-output framework provide two bases for ranking industries. There is some similarity in the key sectors on the demand linkage and direct employment creation basis. However, in selecting industries for promotion we need to consider whether we intend to generate an increase in output through demand linkage or to promote employment. The central planner would consider different industries in each case.

CHAPTER IV

EMPIRICAL INVESTIGATIONS II

4.1 Definition of Key Sectors

Identification in terms of industry aggregates can be as broad and wide-ranging as the objectives of the central planner. Labour intensity has often been used as a basis for ranking industries. We shall examine this and also estimate the elasticity of substitution between capital and labour.

The definition of key sectors in terms of labour intensity and elasticity of substitution depends on the ranking of industries. A sector which is highly labour intensive relative to others for each rupee of investment would be ranked higher than one which utilises greater capital. When examining elasticities of substitutions we would be interested in a sector which, at the margin, provides a greater degree of flexibility insofar as labour can be substituted for capital with no adverse effects on output. This would again provide a basis for ranking industries.

4.2 Labour Intensity - Method 3

Measures of labour intensity and their use for ranking industries have

been one basis for identification of key sectors. It is necessary, therefore, to be able to define labour intensity and, more importantly, to recognise its limitations. In the Indian context, the concepts of capital-labour, capital-output ratios have been used without adequate discussion of their limitations.

Various measures of labour intensity can be used: Labour-output coefficient (L/C); value added per worker (V/L); the share of wages in value added (WL/V); the capital coefficient (K/V or K/O); and the capital-labour ratio (K/L). One instantly recognises that if so many methods exist then the rankings will differ. Since our aim in promoting a labour intensive technique is to generate productive employment some consideration has to be given to efficiency and cost minimisation.

In order to use the various measures above it is necessary to assume that capital is a binding constraint and that labour is homogeneous. The capital-labour (K/L) ratio can then provide a static ordering of industries by the degree of direct labour intensity. The use of the indicators will depend on the assumptions about techniques of production, factor market behaviour, and level of aggregation. As Bhalla[85] notes, these techniques are more appropriate for use with project or plant level data. Essentially, what is required is data which are not far removed from plant level but at the same time are comprehensive enough to reflect the overall economy.

The labour coefficient (L/O or L/V) is a functional relationship

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[85]A.S. Bhalla, "The Concept and Measurement of Labour Intensity," in A.S. Bhalla (ed.), Technology and Employment in Industry, International Labour Office, 1975, p. 33.

between the input of labour and the output of a commodity. Lary[86] has used the inverse of this index (V/L) as a measure of labour intensity. The merits of this measure are that it involves the flow of capital services rather than a stock, and so is more relevant to the theory of production functions. Secondly, it incorporates both human skill and capital differences. Finally, it avoids the problem of measurement of capital.

Alejandro[87] has used the share of wages in value added (wL/V) as a measure of labour intensity. This index suffers from the simplifying assumption that there are perfect factor markets. In practice, the influence of wage legislation and the role of trade unions can distort factor prices and the share of wages in value added. In addition, this measure assumes that the elasticity of substitution of labour for capital is greater than unity for if the elasticity is unity then the relative share of wages in value added will always remain the same. If it is less than unity then as the K/L ratio increases the share of wages rises, and vice versa if it is greater than unity. Thus as Bhalla[88] points out, a process that permits substitutability, and could thus potentially be run labour intensively, may be observed to have a low wage share if the elasticity is greater than unity and it is in fact operated in a capital intensive manner.

The capital coefficient (K/V or K/O) is a much used but highly

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[86]Hal. B. Lary, Imports of Manufactures from Less Developed Countries, National Bureau of Economic Research, Columbia University Press, New York, 1968.

[87]Carlos F. Diaz. Alejandro, "Industrialisation and Labour Productivity Differentials," The Review of Economics and Statistics, Vol. 47, May 1965, pp. 207-214.

[88]A.S. Bhalla, op. cit., p. 24.

discredited measure of labour intensity. Firstly, differences in the durability of capital and time patterns of output yields need to be taken into account. Secondly, the valuation of capital raises theoretical problems. Finally, changes in the numerator and denominator need not necessarily take place in response to technological factors but rather output increases may be due to the application of better methods to existing plant or fuller utilisation of plants. This indicator, though used by Leontief[89] in his pioneering study, has been highly criticised.[90]

The most commonly used indicator of labour intensity is the capital-labour ratio (K/L). Essentially, this reflects the degree of mechanisation. However, this too fails to take account of the variations in capacity utilisation across industries. Further, the K/L ratio represents capital intensity if it is a ratio of investments in fixed capital and in working capital to the flow of labour working in it. Again, capital measures fail to distinguish between investment in physical and human capital. Consequently, any substitutions of physical capital for human capital are ignored.

Despite the various problems with these measures they have, nevertheless, been used in economic analysis of projects and industries. If industries

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[89] W.W. Leontief, Studies in the Structure of the American Economy, Oxford University Press, New York, 1953.

[90] See for example, E. Borukhov, "The Capital-Output Ratio, Factor Intensity and the Input of Capital," Economia Internazionale, Vol. 19, May 1966, pp. 222-234. He criticises Leontief's use of this measure on grounds of the stock-flow concept of capital. It is not possible to relate an input of a piece of capital which is expected to be productive for a number of years to its output for one year. The proper way is to compare it by discounting the value of the output in later years. Capital intensity as a stock concept can be measured and used for comparison with another industry only if both industries buy their factors from the same market.

could be ranked by their degree of labour intensity then they would provide a guide for the central planner.[91] Since none of the indices are in themselves pure, we need to be cautious in interpreting our results. In order to use the various measures, we have calculated the essential ones and then considered the extent to which the ranking of industries is similar. This has been done by the calculation of the Spearman's coefficient of rank correlation for the various combinations. The measure that seems to fit best with the others has then been selected.

4.2.2 Elasticity of Substitution - Method 4

The elasticity of substitution is considered in relation to capital and labour. This is based on the assumption that capital is the predominant constraint. The following estimation equations have then been used.[92]

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[91] A word of caution needs to be made here. Dudley Seers has pointed out that, "...the question to pose about any technique is whether it is the most appropriate one for a country where there is massive unemployment. Sometimes the most modern technique is the most appropriate: it may be capital saving as well as labour saving." See, "New Approaches Suggested by the Colombian Employment Programme," International Labour Review, Vol. 102, October 1970, p. 382.

[92] D.B. Gupta, "Government Policies and Programmes of Rural Industrialisation with Special Reference to the Punjab Region in Northern India," International Labour Office, World Employment Program Research Working Paper WEP2-37/WP5, June 1980, p. 20.

$$\log (V/L) = a + \log w \qquad (1)$$

$$\log (V/K) = a + \log r \qquad (2)$$

Therefore,

$$\log L = a + b \log r - \sigma \log w \qquad (3)$$

where

V = the value added and is obtained by substracting input costs from the gross value of output without making adjustments for depreciation costs

w = wage rate

L = number of workers

K = historic market value of machinery and equipment

r = rental charge per unit of capital and is equal to V - wL

Estimating σ in equation (3) therefore gives us the elasticity of substitution.

4.3 Data Base

To obtain labour intensity measures we have used the 1972 Census of Small-Scale Industries published in 1977 for the registered sector.[93]

For the unregistered sector, we have used the National Sample Survey[94] for both the rural and urban sectors. Though these data are for different years, it is assumed that the structure of industry has not changed dramatically. Table 21 gives the employment coverage of these two surveys.

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[93] Census, op. cit., pp. 72-86.

[94] National Sample Survey, op. cit., various pages.

Table 21

Employment Coverage by Census and Sample Data for Small-Scale Sectors

		1972 Census Data[11] Registered (000's)	1968-69 Sample Data[22] Unregistered (000's) Rural	Urban
1.	Food products	131.220	1,395	210
2.	Beverages	4.577	829	348
3.	Hosiery and ready-made garments	75.346	2,743	1,335
4.	Tobacco	-	786	383
5.	Wood products	94.703	1,335	318
6.	Paper products, printing, etc.	89.146	6	61
7.	Leather and leather products	31.775	472	143
8.	Rubber and plactic products	81.690	11	1
9.	Chemicals	159.013	358	114
10.	Glass and ceramics	202.269	1,067	156
11.	Basic metals industries	109.626	28	31
12.	Metal products	200.060	502	199
13.	Machinery and parts	145.333	214	46
14.	Electrical and electronic parts	65.908	2	22
15.	Transport equipment	83.492	75	18
16.	Miscellaneous	40.025	467	348
17.	Repairing, servicing and job work	38.995		
		1,653.178	9,967	3,733

Sources: [11] Government of India, Development Commissioner, Small-Scale Industries, Report on Census of Small-Scale Industrial Units, Vol. I & II, January 1977.

[22] Government of India, National Sample Survey Organization, Tables with Notes on Small-Scale Manufacture in Rural and Urban Areas, The National Sample Survey, 23rd Round, July 1968-June 1969, No. 218, 1976.

It shows that approximately 1.6 million people were employed in the registered sector and 13.7 million in the unregistered sector. It also gives a breakdown by sectors and an indication of the sectors which, in

terms of absolute numbers, provided the most employment.

For labour intensity calculations, capital includes investment in plant and machinery and working capital. Labour data for the registered sector are provided by the census. However, for the unregistered sector, the labour employed -- household and hired -- has been calculated for a 30-day period as the sample was for that period. The labour figure is for man-days of labour. For consistency, the value added figure is also for a 30-day period and is as stated by the Survey data. Since we are interested in the ranking of the sector, this approach does not introduce any bias.

For elasticities of substitution, we have used the census data. For each product and industry we have calculated the necessary attributes for each unit in each industry classification. The various activities in the 16 sector classification of industries then provide a basis for comparison. The 16 sectors have been classified in accordance with the manner in which they are aggregated in the census.

4.4 The Results

Our ranking of sectors by their labour intensities for the registered and unregistered (rural and urban) sectors are listed on Tables 22 and 23 along with the Spearman's coefficient of rank correlation. The rank correlations have been calculated in order to see which of the three measures of labour intensity fits best with other measures. In each case it appears that the capital-labour ratio is the best single measure to be used. Consequently, using the K/L ratio alone the top five sectors which emerge as the most labour intensive are listed in Table 24.

Table 22

Labour Intensity Rankings* - Registered Sector

	Industry	K/L	K/V	V/L
1.	Food products	2	3	3
2.	Beverages	7	8	9
3.	Hosiery and ready-made garments	6	6	11
4.	Wood products	3	5	4
5.	Paper products, printing, etc.	12	12	7
6.	Leather and leather products	5	1	15
7.	Rubber and plastic products	16	16	10
8.	Chemicals	9	3	14
9.	Glass and ceramics	1	2	1
10.	Basic metal industries	15	13	13
11.	Metal products	8	10	5
12.	Machinery and parts	11	9	12
13.	Electrical and electronic products	13	7	16
14.	Transport equipment	14	15	8
15.	Miscellaneous	10	11	6
16.	Repairing, servicing and job work	4	14	2

Spearman Coefficient of Rank Correlation

(i) K/L & K/V = 0.71
(ii) K/L & V/L = 0.58
(iii) K/V & V/L = -0.05

*Rankings are done in such a way that an increase in numbers implies a decrease in labour intensity.

Source: Constructed from Report on Census of Small-Scale Industrial Units, Vol. I & II, various pages.

Table 23

Labour Intensity Rankings* - Unregistered Sector

		Rural			Urban		
		K/L	K/V	V/L	K/L	K/V	V/L
1.	Food manufacturing industries except beverage industries	21	22	20	18	19	17
2.	Beverage industries	14	14	11	11	6	18
3.	Tobacco manufacturers	8	10	5	3	2	11
4.	Manufacture of textiles	5	9	4	7	11	1
5.	Manufacture of footwear except rubber footwear	3	6	6	12	18	7
6.	Repair of footwear	2	2	9	1	1	10
7.	Manufacture of weaving apparel except footwear	19	16	16	8	7	9
8.	Manufacture of made up textile goods except weaving apparel	9	11	8	4	5	8
9.	Manufacture of wood and cork except manufacture of furniture	4	4	11	9	12	4
10.	Manufacture of furniture and fixtures	13	5	19	5	4	15
11.	Manufacture of paper and paper products	1	1	1	10	16	5
12.	Printing, publishing and allied industries	23	23	21	23	21	21
13.	Manufacture of leather and leather and fur products except footwear	11	19	2	14	8	19
14.	Manufacture of rubber products	20	18	22	17	13	22
15.	Manufacture of chemical and chemical products	16	17	13	22	23	6
16.	Manufacture of products of petroleum and coal	7	3	13	2	3	2
17.	Manufacture of non-metallic mineral products	6	7	7	6	9	3
18.	Basic metal industries	15	20	3	19	22	12
19.	Manufacture of metal products except machinery and transport equipment	10	12	10	15	15	14
20.	Manufacture of machinery except electrical machinery	18	15	18	21	20	20
21.	Manufacture of electrical machinery, apparatus, appliances and supplies	22	21	23	20	17	23
22.	Manufacture of transport equipment	17	13	17	13	10	15
23.	Miscellaneous manufacturing industries	12	8	15	16	14	13

continued...

Table 23 continued...

Spearman Coefficients of Rank Correlation

	Rural	Urban
K/L & K/V	+0.74	+0.89
K/L & V/L	+0.79	+0.59
K/V & V/L	+0.56	+0.24

*Rankings are done in such a way, that an increase in numbers implies a decrease in labour intensity.

Source: Constructed from National Sample Surveys, Nos. 205 and 218, various pages.

Table 24

Top Five Labour Intensive Sectors

Registered

1. Glass and ceramics
2. Food products
3. Wood products
4. Repairing and servicing
5. Leather and leather products

Unregistered

	Rural	Urban
1.	Manufacture of paper and its products	Repair of footwear
2.	Repair of footwear	Manufacture of products of petroleum and coke
3.	Manufacture of footwear except rubber footwear	Tobacco products
4.	Manufacture of wood and cork except manufacture of furniture	Manufacture of made-up textile goods except wearing apparel
5.	Manufacture of textiles	Manufacture of furniture and fixtures

The rankings show the differences that prevail between the registered and unregistered sector and even within the unregistered there is considerable difference between rural and urban areas.

For the registered sector we have another benchmark in that we can compare the results with the elasticities of substitution calculated and listed on Table 25. These are comparable because the data for each are obtained from the census. All the results presented in Table 25 are significant at the 5 percent level. Appendix F gives the results of the remaining sectors which were not significant at the 5 percent level.

Only two sectors have an elasticity greater than one, and this indicates that at the, margin, they provide greater opportunities for substitution of labour for capital. Both these sectors -- glass and ceramics, and food products -- are also key sectors under our labour intensity calculations.

The remarkably low number of industries with substitution possibilities suggests that, within the registered sector, the industries are generally capital intensive. Indeed, an examination of Appendix F indicates the limited degree of substitution possibilities that prevail. This would tend to add weight to the view in the literature which contends that small industry production methods are not necessarily labour intensive -- at least in the registered sector.

In summary, therefore, our results using broad economic aggregates provide a basis for ranking industries but this fails to take account of indirect effects. Nevertheless, in view of the paucity of data and as a quick analysis these techniques can serve as a useful basis for ranking industries.

Table 25

Estimates of Elasticity of Substitution for Registered Small-Scale Industries

Sector	Elasticity of Substitution
Food products	1.17
Chemicals	0.76
Wood products	0.79
Glass and ceramics	0.40

All the results above are stastically significant at the 5 percent level.

CHAPTER V

SUMMARY AND CONCLUSIONS

The literature on small-scale industries in India is perhaps the most extensive for any country. The preceding chapters have examined analytical as well as policy questions in this field.

At an early stage the Indian planning process had acknowledged the importance of small-scale industries in the process of economic growth. However, none of the planning models had identified these industries separately, so policies towards the promotion of these industries were generally ad hoc. The Second Five Year Plan and the Industrial Policy Resolution of 1956 set out the expectations for these industries within the framework of the entire economy. The small-scale industries were expected to provide large-scale employment opportunities, to meet the demands for consumer goods and to be capital-saving.

This raised two fundamental questions. The first concerned the relationship between the scale of the industries (large, medium or small) and their efficiency. Efficiency in this sense was intended to refer to the implications for capital-saving and labour-intensity. The second question was concerned with the type of techniques that should be adopted by these industries and the implications of this choice for employment, output and re-investible surplus.

The questions on the scale of the industries and their efficiency were concerned with the inter-relationship between capital, labour, output and surplus. On the one hand, the evidence suggests that small-scale industries produce less output, leave less surplus and often employ fewer persons per unit of capital than large-scale industries. These industries are, therefore, inefficient under all these criteria. The conflicting evidence suggests that small-scale industries are labour-intensive. The debate on this aspect has been inconclusive, largely because of the simplistic utilisation and varying interpretation of the data. Problems arose because of the concentration on simple ratio analysis (capital-output ratio in most cases), on the different bases for measuring capital (working capital being omitted in most cases) and the omission of indirect effects on employment and output.

The choice of techniques debate was more intricate insofar as it considered the true cost of capital, the cost of labour, and the implications for re-investible surplus. It was considered that when techniques are compared, the cost of capital should not be measured in terms of the physical cost of capital alone. In fact, the import intensity of a technique had implications for the balance of payments and this additional cost must be taken into account. One would also need to consider the gestation period of a technique since this would affect the reinvestment of the surplus generated.

In terms of labour cost, the criteria should take account of the increase in consumption due to additional employment. This implied that the employment of previously rural labour in industries would provide a base for siphoning off some consumption through taxation and other means, so that the cost of labour would be lower than simply its wage cost. In a

similar manner, the surplus generated by a technique may not be the only consideration, since in the long run we may be more interested in the rate of growth of surplus. In view of all these considerations, therefore, the choice of which technique to be adopted by small-scale industries is not a simple one. In fact, a technique which is preferable on grounds of its labour intensity may be inferior to one which maximises long run output and leads to the re-investment of the surplus generated. This contention has been tested empirically in India in relation to the Anbar Charka and hand-pounding of rice. The conclusion is that a more labour intensive technique may not necessarily be preferred in a labour surplus economy.

The above analytical aspects failed to consider indirect effects on employment and the implication for the demand for output of other industries as a result of the choice of techniques. Indeed, we have argued that a major consideration should be the choice of industries to promote after taking account of direct and indirect effects on employment and output. Our contention has been that in the financing of the small-scale industries, in employment promotion and in the policy of reserving items for exclusive production by the small-scale industries no rational policy has been followed.

The small-scale industries are increasingly relying on institutional sources of finance - at least in urban areas. Various institutional sources have emerged to allocate central government funds totalling Rs. 1780 crores in the Sixth Plan public sector outlay. Despite the sound areas of stated policy, the strategy has failed to identify sectors and industries which should be promoted on a rational basis. Employment creation has been a key consideration but which sectors create more employment and so

could be regarded as key sectors, has not been examined. Instead, the policy has been to reserve items for exclusive production by the small-scale industries. Government purchases are then made exclusively from these small industries. This form of protection is not based on a rational economic policy, and, indeed, the Sixth Five Year Plan has recognised its failure. However, in the absence of a more fruitful approach, the list of reserved items continues to grow.

In order to provide a rational basis for promoting small-scale industries, our empirical investigations used four methods to identify key sectors. Two methods emerged from the input-output approach and the other two methods calculate labour intensity and the elasticity of substitution between capital and labour.

The input-output analysis is based on the recognition of the inter-dependence of industries. Consequently, in using this approach we are able to consider both the direct and indirect effects on employment and output. The first method in this approach focused on the backward and forward linkages created by an industry. The linkage concept was adopted from Hirschman[95] and the method of estimating these is based on Rasmussen's[96] technique. Backward linkage was defined as the demand that an industry generates for its input supplying industries as a result of a unit increase in formal demand for its products and forward linkage was the demand for output that it generates for its customer industry. Industries with a high backward and forward linkage were then classed as 'key' industries on the demand linkage basis. To calculate these linkage indices we used the

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[95] A. O. Hirschman, The Strategy of Economic Development, 1958.

[96] P. N. Rasmussen, Studies in Intersectoral Relations, 1956.

flow co-efficient matrix for 27 small-scale industries as provided by Venkatramaiah.[97] The inverse of this matrix provides the basis for using Rasmussen's analysis. Backward linkages are obtained by the summation of the row elements of the Leontief inverse matrix and then normalising these. In a similar manner, the forward linkage was obtained by using the column elements.

It was recognised that data problems can be immense. However, we have attempted to use the available data in the most useful manner. Though the data are for 1959, its use can be justified, based on the evidence of Venkatramaiah and Argage,[98] that by the 1960's the Indian economy had developed a sound industrial base. Their analysis was based on the comparison of a number of input-output tables constructed in India. In fact, by indicating the potential of this technique we would suggest the compilation of data in this direction.

As an indication of the importance of considering small and large-scale industries separately, we calculated the demand linkages for a 36 x 36 matrix comprising large, small and other industries. On this basis no small-scale industry emerges as a 'key' sector. The results for the entire economy when compared with Hazari's analysis were similar.

The second method within the input-output framework identified 'key' sectors on the basis of the direct and indirect employment generated. To obtain direct and indirect employment figures, we not only needed a

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[97] P. Venkatramaiah, "Flow Co-efficients for the Small-Scale Sector Industries," in P.N. Mathur and R. Bharadwaj (ed.), Economic Analysis in Input-Output Framework -- with Indian Empirical Explorations, 1967.

[98] P. Venkatramaiah and L. Argade, "Changes in Input-Output Co-efficients and their Impact on Production Levels," Artha Vijnana, Vol. 21, March 1979.

fully articulated flow co-efficients matrix but also labour co-efficients. The same 27-sector matrix was used and the labour co-efficients were calculated using the census data. The sectors then were ranked according to their total employment creation per rupee of formal demand and for Rs. 10 lakhs of formal demand (using the wage rates) provided another basis for identifying 'key' industries.

In terms of demand linkages, non-ferous metals, leather tanning and paper and its products emerge as key sectors in the 27-sector matrix. There are, however, a larger number of sectors which have a high backward or forward linkage only (Table 13). If total employment creation (using the wage rates) is considered then structural clay products, glass, non-ferous metals, other non-metallic miscellaneous products and non-ferous products rank in the top five. If we consider the employment creation per rupee of formal demand only then, four of the top five sectors still rank in the top five category -- the exception being non-metallic miscellaneous products.

Comparing the key sectors on the demand and employment linkage basis suggests that within the 90-100 percent range, for the proportion of direct to total employment, the key sectors under demand linkage are also significant under the direct employment creation criterion. If one wants to promote total employment then one needs to examine the rankings of industries on the employment linkage basis.

The other two methods used are the labour-intensity measures and the elasticity of substitution between capital and labour. The labour-intensity calculations were done for the three different types of measures which have been suggested in the literature. These are the capital-labour (K/L)

ratio, the capital co-efficient (capital-value added ratio, K/V) and the value added-labour (V/L) ratio. The rankings on the basis of each method were obtained. The Spearman's rank correlation among each measure suggests that the capital-labour (K/L) ratio is perhaps the most appropriate. On this basis, the sectors which have the top five ranks in the registered sector are: glass and ceramics, food products, wood products, repairing and servicing and leather and leather products. These are the most labour intensive and so have been classed as key sectors. In the unregistered sector the ranking is different for rural and urban areas. The key sectors here are listed in Table 24.

Elasticity of substitution calculations were possible for the registered sector only, as this was the only sector for which data were available. Since the data base here is the same as that used for the labour intensity measure the results are comparable. Based on this fourth method we note that there are few substitution possibilities between capital and labour which would leave output unaffected. In fact, the industries in the registered sector are generally capital intensive. But glass and ceramics, food products, wood products and chemicals emerge as 'key' sectors.

In general, however, the elasticity of substitution method did not provide us with useful results. This was partly due to the nature of our data. Essentially, we needed firm level data. Though our data was for each enterprise, it covered a number of different activities within a sector. Thus, for example, the category of leather and leather products includes such diverse activities as tanning of leather to the manufacture of sandals and chappals. A more useful guide would be obtained if we had more disaggregated data with a large number of observations.

In conclusion, therefore, our analysis indicates that the identification of 'key' sectors depends on the objective function of the central planner. If employment creation is considered to be the main objective, then we would use the 'employment linkage' and 'labour intensity' measures. Employment linkage is inherently superior because this takes account of the interdependence of industries and the indirect implications of industrialisation. On the other hand, if output maximisation is the chief criterion then there is a need to concentrate resources in sectors which have high backward and forward linkages. It is recommended that government policy be more responsive to the techniques suggested above, bearing in mind the limitations of data.

APPENDICES

Appendix A

Some Problems in the Definition of Small-Scale Industries

The problem of defining small-scale industries from an analytical and inter-country comparison viewpoint is acute since what is considered small in one country may be very large in another.[99] The definition must be country specific and may be based on the following considerations:

a) by place of work i.e. people working at home in the nature of cottage or handicraft industries as opposed to those going out to work on a piecemeal basis with the raw materials and machinery being provided by the entrepreneur. It could be based on whether the work is in a rural or urban district. These considerations are implicitly comprised in the distinction often made between cottage and modern small-scale industry.

b) employment levels have been another major basis for definition. This is generally combined with the use of power. Power is used as a factor due to its link with technology and hence distinguishes between cottage and small industry. Power has also tended to be used along with the numbers employed. Some writers have been tempted to use employment alone as an indicator and consider 20-50 persons in any firm as comprising small-scale industry,[100]

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[99] For a survey of varying international definitions see, K.A. Anello, R. Johnston and L. Wagenveld, "Employment Generation through Stimulation of Small-Scale Industries - An International Compilation of Small-Scale Industry Definitions," Georgia Institute of Technology, January 1975.

[100] '...small scale industry which includes the informal or unorganized sector is most commonly defined to include all firms up to 20-50 workers each...,' D. Morowetz, "Employment Implications of Industrialisation in Developing Countries, Economic Journal, Vol. 84, September 1974, p. 525.

c) capital being a scarce resource has tended to qualify in itself as a basis,

d) the organisation of the business is another criteria. If management skills are required especially in relation to dealing with other people then this has tended to be another basis for determining whether a person is working on his own account and so is not an industry as opposed to one having an employer and worker relationship,

e) by the nature of operations in terms of tools and techniques in use,

f) by functional category i.e. whether production is for the export or home market. This has demand implications for both the product produced and its supplying industries. These functional characteristics are especially identified by Staley & Moarse.[101] Nanjundan et. al. also use markets served as a chief characteristic on the basis of the following three characteristics: little specialisation in management, close personal contact, no dominant position in the market.[102]

It is quite evident that the definition of small-scale industries can be very wide-ranging depending on the objectives in hand.

While the definition is crucial, one cannot afford to be bogged down by this problem. From a policy point of view, in a number of cases, the definition has been alluded to but may have to be ignored in the ultimate

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[101] E. Staley and R. Morse, Modern Small Industry for Developing Countries, McGraw Hill, New York, 1965.

[102] S. Nanjunden, H.E. Robinson and E. Staley, Economic Research for Small Industry Development, Asia Publishing House, Bombay, 1962.

analysis. Thus Prime Minister Nehru, for example, in the Indian National Planning Committee concluded that:

> "...there is no great importance in searching for the best definition. Some working definition may be adopted clearly indicating where they overlap. What is important is a list of industries to be considered and large and small-scale industries to be separately grouped. Where there is a difference of opinion, the small industry may be put into two or more groups to begin with and attention be drawn to this fact."[103]

In the Indian context, the definition gets especially marred by the use of such terms as 'traditional', 'cottage', 'village', and 'home' industries. The cottage industry is that industrial establishment which generally does not use mechanical power and is operated largely by hand. Hence village and handicraft industries come under this category. Small-scale industries on the other hand are those that use motive power, 'modern' means of production and are run by small entrepreneurs.

Due to the variety of bases for defining small industry recourse is made to the statistical definitions. Here some measure of employment and investment is used.

The Karve committee[104] using an investment cum employment definition treated all units having capital investment up to Rs. 5 lakhs and employing less than 100 workers without using power, as small-scale units. The Government of India first adopted this employment cum capital definition but subsequently only capital employed was used as a determining criterion for the purposes of specific government assistance.

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[103] Government of India, Rural and Cottage Industries - National Planning Committee Series, Report of the Sub-committee, Vora Publishers, Delhi, 1948, p. 54.

[104] Government of India, Report of the Village and Small-Scale Industries Committee, 1956.

In the Second Plan the definition is capital of Rs. 5 lakhs and employing less than 50 persons when using power. The third plan replaced the maximum number of persons with a minimum of 10 persons having capital investment not exceeding Rs. 5 lakhs.

The definition of small-scale during the census which has been used by us was in terms of capital of Rs. 7.5 lakhs or less in original value of plant and machinery and Rs. 10 lakhs or less in the case of ancillary units. The National Sample Survey used covers all manufacturing establishments not registered under the Factories Act 1948, using power and employing less than 10 workers and those using power and employing less than 20 workers.

Appendix B
Leontief Inverse of 27x27 Matrix for Small Scale Industries

	1	2	3	4	5	6	7
1.	1.058520	0.004758	0.007252	0.583344	0.063963	0.047343	0.116183
2.	0.001028	6.06668	3.77636	0.102548	0.666999	0.320771	0.136870
3.	0.000014	0.0	1.00001	0.001372	0.129899	0.041164	0.035467
4.	0.010121	0.000061	0.007465	1.00972	0.001563	0.022058	0.030711
5.	0.0	0.0	0.0	0.0	1.0	0.0	0.0
6.	0.0	0.0	0.0	0.0	0.0	1.0	0.0
7.	0.0	0.0	0.0	0.0	0.0	0.0	1.0
8.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	0.02587	0.000719	0.009778	0.032224	0.002803	0.002253	0.003771
11.	0.0	0.0	0.0	0.0	0.0	0.000014	0.002686
12.	0.011385	0.016274	0.010176	0.006604	0.002461	0.001368	0.001617
13.	0.014032	0.018716	0.011707	0.008046	0.002885	0.015623	0.005626
14.	0.001499	0.001999	0.001251	0.000860	0.000308	0.001671	0.000663
15.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19.	0.0	0.0	0.0	0.0	0.0	0.000016	0.000250
20.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21.	0.0	0.0	0.0	0.000003	0.0	0.002659	0.000005
22.	0.0	0.0	0.0	0.000003	0.0	0.002873	0.0
23.	0.006540	0.000311	0.013769	0.014273	0.002179	0.001312	0.037554
24.	0.0	0.0	0.000008	0.0	0.000001	0.000204	0.004938
25.	0.018595	0.069439	0.045487	0.012617	0.009015	0.004725	0.003852
26.	0.004311	0.013498	0.013101	0.005561	0.010038	0.005897	0.009309
27.	0.056824	0.021029	0.023854	0.04189	0.033186	0.007448	0.023278

Appendix B (contd.)
Leontief Inverse of 27x27 Matrix for Small Scale Industries

	8	9	10	11	12	13	14
1.	0.075424	0.0	0.0	0.002549	0.0	0.026657	0.005531
2.	0.267293	0.0	0.0	0.004550	0.0	0.000349	0.000972
3.	0.070036	0.0	0.0	0.001203	0.0	0.000005	0.000013
4.	0.029719	0.0	0.0	0.000083	0.0	0.003437	0.009574
5.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.	1.35171	0.0	0.0	0.0	0.0	0.0	0.0
9.	0.0	1.0	0.0	0.0	0.0	0.0	0.0
10.	0.007886	0.0	1.0	0.086927	0.017786	0.024145	0.000306
11.	0.002686	0.0	1.236320	0.0	0.0	0.0	0.010175
12.	0.001527	0.0	0.0	0.000040	1.0	0.002867	0.000063
13.	0.001843	0.0	0.0	0.009909	0.0	1.04864	0.000076
14.	0.045418	0.0	0.0	0.005378	0.0	0.112016	1.19649
15.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.	0.0	0.0	0.0	0.000046	0.0	0.0	0.0
18.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21.	0.000338	0.0	0.0	0.155506	0.0	0.0	0.0
22.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23.	0.043914	0.0	0.0	0.050945	0.015706	0.003151	0.000135
24.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.	0.004691	0.0	0.0	0.000326	0.1567	0.012919	0.000119
26.	0.013986	0.0	0.0	0.084851	0.004736	0.004877	0.001723
27.	0.018454	0.012252	0.0	0.035989	0.026861	0.033147	0.012205

Appendix B (Contd.)
Leontief Inverse of 27x27 Matrix
for Small Scale Industries

	15	16	17	18	19	20	21
1.	0.001114	0.0	0.092363	0.01791	0.001387	0.058089	0.0
2.	0.000229	0.0	0.016237	0.00300	0.000244	0.010212	0.0
3.	0.000012	0.0	0.000217	0.000040	0.000003	0.000137	0.0
4.	0.001892	0.0	0.159872	0.029550	0.002398	0.010045	0.0
5.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	0.000776	0.0	0.005102	0.001019	0.000079	0.003209	0.000405
11.	0.010175	0.0	0.0	0.0	0.0	0.0	0.0
12.	0.000013	0.0	0.001046	0.000202	0.000016	0.000658	0.0
13.	0.000097	0.0	0.001274	0.003558	0.000026	0.000801	0.0
14	0.236388	0.0	0.000136	0.00038	0.000358	0.000086	0.0
15.	1.0	0.0	0.0	0.0	0.0	0.0	0.0
16.	0.0	1.0	0.0	0.0	0.0	0.0	0.0
17.	0.0	0.0	1.0	0.0	0.0	0.0	0.0
18.	0.0	0.0	0.0	1.31536	0.002888	0.0	0.0
19.	0.0	0.0	0.0	0.0	1.03364	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.0	1.0	0.0
21.	0.001280	0.0	0.0	0.0	0.010005	0.0	1.79184
22.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23.	0.000446	0.0	0.002260	0.036304	0.000113	0.033755	0.0
24.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.	0.148174	0.0	0.002	0.000515	0.000030	0.010543	0.0
26.	0.001039	0.0	0.024880	0.005689	0.026112	0.015596	0.006623
27.	0.019170	0.060332	0.006633	0.017451	0.00318	0.089396	

Appendix B (contd.)
Leontief Inverse of 27x27 Matrix
for Small Scale Industries

	22	23	24	25	26	27
1.	0.010506	0.000000	0.032375	0.000000	0.000000	0.000000
2.	0.001848	0.0	0.009387	0.0	0.0	0.0
3.	0.000025	0.0	0.001294	0.0	0.0	0.0
4.	0.018180	0.0	0.046688	0.0	0.0	0.0
5.	0.0	0.0	0.0	0.0	0.0	0.0
6.	0.0	0.0	0.0	0.0	0.0	0.0
7.	0.0	0.0	0.0	0.0	0.0	0.0
8.	0.0	0.0	0.0	0.0	0.0	0.0
9.	0.0	0.0	0.0	0.0	0.0	0.0
10.	0.001017	0.0	0.002543	0.0	0.0	0.0
11.	0.0	0.0	0.002815	0.0	0.0	0.0
12.	0.000119	0.0	0.000376	0.0	0.0	0.0
13.	0.000149	0.0	0.000534	0.0	0.0	0.0
14.	0.000020	0.0	0.012605	0.0	0.0	0.0
15.	0.0	0.0	0.0	0.0	0.0	0.0
16.	0.0	0.0	0.0	0.0	0.0	0.0
17.	0.0	0.0	0.0	0.0	0.0	0.0
18.	0.001677	0.0	0.000141	0.0	0.0	0.0
19.	0.001934	0.0	0.050685	0.0	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.0	0.0
21.	0.925702	0.0	0.001009	0.0	0.0	0.0
22.	1.0	0.0	0.0	0.0	0.0	0.0
23.	0.032787	2.59562	0.530324	0.0	0.0	0.0
24.	0.000285	0.0	1.0013	0.0	0.0	0.0
25.	0.000323	0.007616	0.002288	1.0	0.0	0.0
26.	0.008296	0.011423	0.007910	0.0	1.0	0.0
27.	0.018287	0.077552	0.028415	0.0	0.0	1.0

Appendix B (contd.)
Leontief Inverse of 27x27 Matrix
for Small Scale Industries

Sector No.	Industry Name
1	Other iron and steel
2	Non-ferrous metals
3	Non-ferrous products
4	Light ferrous products
5	Special industrial machinery
6	Other electrical equipment
7	Automobile equipment
8	High precision products
9	Fertilizers
10	Petroleum and coke
11	Glass
12	Structural clay products
13	Other non-metallic minerals
14	Wood manufactures
15	Beverages and tobacco
16	Oils and fats
17	Preservation and canning
18	Other textiles
19	Manufacture of textiles n.e.c.
20	Rubber, tubes and tyres
21	Leather tanning
22	Leather and other products
23	Paper and its products
24	Other industrial products
25	Coal mining
26	Printing, publishing and stationery
27	Generation and transport of thermo-electric power

Source: P. Venkatramaiah, "Flow Co-efficients for the Small-Scale Sector Industries," in P.M. Mathur and R. Bharadevaj (ed.), Economic Analysis in Input-Output Framework - with Indian Empirical Explorations, Vol. I, 1967.

Appendix C

Leontief Inverse of 36x36 Matrix for Large, Small and Other Industries

	1	2	3	4	5	6	7	8
1.	1.06398	0.02486	0.43118	0.00485	0.00504	0.00706	0.01247	0.01226
2.	0.00028	1.00245	0.00167	0.00285	0.00114	0.00287	0.00710	0.00433
3.	0.01944	0.04169	1.0411	0.00453	0.00187	0.00757	0.01018	0.01992
4.	0.00052	0.00695	0.00113	1.04312	0.00380	0.05772	0.03037	0.02782
5.	0.00098	0.02929	0.00096	0.00585	1.03322	0.08001	0.15193	0.04393
6.	0.00066	0.00217	0.00106	0.02318	0.01275	1.29119	0.16657	0.34688
7.	0.00059	0.00133	0.00060	0.01180	0.00398	0.12957	1.33042	0.14550
8.	0.00083	0.00292	0.00121	0.04256	0.01898	0.06011	0.07363	1.10488
9.	0.00400	0.04130	0.00365	0.03109	0.00841	0.01774	0.05504	0.03112
10.	0.00006	0.00020	0.00052	0.00349	0.00061	0.00166	0.00232	0.00109
11.	0.00004	0.00032	0.00013	0.00386	0.00010	0.00138	0.00099	0.00066
12.	0.00223	0.01677	0.02043	0.00235	0.00040	0.00185	0.01020	0.00261
13.	0.00017	0.00153	0.00045	0.00167	0.00067	0.00282	0.00814	0.00623
14.	0.00003	0.00013	0.00015	0.00034	0.00038	0.00051	0.00067	0.00072
15.	0.00060	0.00203	0.00065	0.00376	0.01249	0.00756	0.00549	0.00373
16.	0.00004	0.00045	0.00007	0.00050	0.00017	0.00059	0.00145	0.00208
17.	0.00012	0.00007	0.00029	0.00043	0.00017	0.00058	0.00068	0.00599
18.	0.00016	0.00243	0.00026	0.00127	0.00064	0.00303	0.0086	0.0055
19.	0.00023	0.00116	0.00043	0.00825	0.00783	0.01625	0.01558	0.01218
20.	0.00252	0.00055	0.00181	0.00072	0.00030	0.01223	0.00329	0.00497
21.	0.00272	0.00310	0.00229	0.00149	0.01079	0.00233	0.00318	0.00151
22.	0.00003	0.00011	0.00028	0.00044	0.00008	0.00051	0.00088	0.00044
23.	0.00110	0.00205	0.00844	0.00018	0.00004	0.00029	0.00070	0.00039
24.	0.00002	0.00017	0.00004	0.00020	0.00008	0.00032	0.00081	0.00052
25.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26.	0.00343	0.00293	0.00199	0.00113	0.00111	0.00918	0.09009	0.01036
27.	0.00077	0.00745	0.00142	0.01531	0.00620	0.03770	0.04543	0.03273
28.	0.00085	0.00756	0.00177	0.00851	0.00481	0.01680	0.03525	0.02271
29.	0.00428	0.04653	0.01078	0.05191	0.02050	0.08375	0.21571	0.11797
30.	0.00319	0.00805	0.00218	0.00245	0.00093	0.01055	0.01471	0.00530
31.	0.00285	0.00446	0.02844	0.02100	0.00252	0.02805	0.02998	0.02694
32.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.	0.00001	0.00005	0.00001	0.00019	0.00010	0.00579	0.00145	0.00216
35.	0.00002	0.00048	0.00004	0.02524	0.01102	0.00224	0.00234	0.00114
36.	0.00006	0.00036	0.00030	0.01268	0.00133	0.01149	0.01952	0.00498

Appendix C (contd.)

Leontief inverse of 36x36 Matrix
for Large, Small and Other Industries

	9	10	11	12	13	14	15	16
1.	0.04396	0.03713	0.05580	0.40595	0.30125	0.06668	0.35271	0.01513
2.	0.00544	0.00434	0.00379	0.07698	0.00303	0.00548	0.00564	0.00315
3.	0.01377	0.00556	0.12633	0.01545	0.00905	0.09613	0.01066	0.01322
4.	0.02355	0.08939	0.02665	0.01263	0.01757	0.01716	0.01944	0.07316
5.	0.04635	0.09323	0.02735	0.00977	0.01209	0.01094	0.02870	0.13010
6.	0.00943	0.02660	0.01673	0.00565	0.00674	0.00662	0.00930	0.02515
7.	0.01536	0.00851	0.01054	0.00330	0.00334	0.00308	0.00425	0.01091
8.	0.01244	0.03354	0.01383	0.00998	0.01414	0.01063	0.01584	0.01652
9.	1.35127	0.01359	0.04571	0.02612	0.03351	0.03452	0.01536	0.12770
10.	0.00127	1.01754	0.00200	0.00052	0.00057	0.00049	0.00122	0.00099
11.	0.00546	0.00419	1.0049	0.00557	0.00141	0.00136	0.00134	0.00382
12.	0.00802	0.00212	0.00341	1.13148	0.00166	0.00991	0.01096	0.00391
13.	0.00526	0.00445	0.00245	0.00324	1.27601	0.06563	0.00924	0.00438
14.	0.00087	0.00326	0.00055	0.00074	0.01797	1.34314	0.03029	0.00075
15.	0.02138	0.10899	0.00387	0.01745	0.00986	0.00414	1.13777	0.01527
16.	0.00818	0.00121	0.00533	0.00074	0.00066	0.00102	0.00089	1.00988
17.	0.00028	0.00584	0.00054	0.00028	0.00145	0.00042	0.00197	0.00091
18.	0.01269	0.01335	0.02337	0.00611	0.00406	0.00432	0.00180	0.00789
19.	0.00973	0.02592	0.00788	0.00373	0.01616	0.01411	0.01311	0.01578
20.	0.00334	0.00138	0.00131	0.00181	0.00149	0.00123	0.00196	0.00120
21.	0.00545	0.00222	0.00177	0.00382	0.00445	0.00327	0.00370	0.01174
22.	0.00039	0.00044	0.00050	0.00046	0.00048	0.01615	0.00077	0.00056
23.	0.00029	0.00032	0.00116	0.00258	0.00047	0.00088	0.00059	0.00033
24.	0.00067	0.00043	0.00047	0.00041	0.00036	0.00063	0.00061	0.00440
25.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26.	0.00373	0.00151	0.00204	0.00222	0.00220	0.00097	0.00186	0.01777
27.	0.02103	0.04476	0.02350	0.01838	0.01477	0.01601	0.02703	0.01526
28.	0.02909	0.01817	0.01932	0.01720	0.01536	0.02678	0.02592	0.02009
29.	0.17064	0.11311	0.12015	0.10848	0.09614	0.16971	0.16363	0.09277
30.	0.00541	0.00842	0.00192	0.00376	0.00741	0.00249	0.00798	0.00663
31.	0.01757	0.03547	0.02161	0.01472	0.01969	0.01045	0.02634	0.02016
32.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.	0.00048	0.00060	0.00043	0.00019	0.00144	0.00111	0.00019	0.00082
35.	0.00106	0.00314	0.00093	0.00041	0.00055	0.00053	0.00077	0.00314
36.	0.00101	0.00192	0.00952	0.01057	0.00100	0.00208	0.00105	0.01494

Appendix C (contd.)

Leontief Inverse of 36x36 Matrix
for Large, Small and Other Industries

	17	18	19	20	21	22	23	24
1.	0.10245	0.03022	0.00309	0.02331	0.02420	0.10833	0.34478	0.06555
2.	0.11199	0.00533	0.00295	0.00321	0.00225	0.00408	0.01038	0.00342
3.	0.12505	0.05212	0.00299	0.05154	0.03855	0.04609	0.30488	0.14679
4.	0.01934	0.02866	0.11663	0.02798	0.00560	0.01473	0.01064	0.01741
5.	0.01453	0.01729	0.02962	0.02599	0.03094	0.00912	0.00796	0.05782
6.	0.00834	0.01228	0.02731	0.09706	0.00770	0.00511	0.00316	0.00410
7.	0.00414	0.00789	0.01238	0.15742	0.00165	0.00251	0.00161	0.00197
8.	0.01405	0.02349	0.07635	0.01404	0.00248	0.00770	0.00419	0.00481
9.	0.06929	0.07657	0.01284	0.01510	0.02226	0.03049	0.00952	0.01349
10.	0.00070	0.00094	0.00266	0.00058	0.00016	0.00041	0.00036	0.00037
11.	0.00122	0.00248	0.00194	0.00038	0.00020	0.00067	0.00074	0.00025
12.	0.00932	0.00977	0.00116	0.00252	0.00813	0.00329	0.12666	0.00336
13.	0.15094	0.00922	0.00307	0.00303	0.00171	0.36290	0.00215	0.00296
14.	0.00332	0.01141	0.00052	0.00025	0.00011	0.08456	0.00020	0.00045
15.	0.04035	0.00493	0.00141	0.00139	0.00102	0.01311	0.00237	0.01006
16.	0.00133	0.00119	0.00060	0.00060	0.00036	0.00082	0.00041	0.00061
17.	1.02058	0.00070	0.00086	0.00016	0.00258	0.00050	0.00016	0.00012
18.	0.00452	1.16833	0.01199	0.00940	0.00364	0.00781	0.00288	0.01004
19.	0.01031	0.01601	1.03308	0.00794	0.00236	0.00788	0.00545	0.01034
20.	0.00158	0.00917	0.00131	1.00165	0.00057	0.00114	0.00148	0.00094
21.	0.00342	0.00372	0.00162	0.00084	1.00002	0.00185	0.00172	0.00122
22.	0.00051	0.00062	0.00061	0.00028	0.00010	1.00127	0.00024	0.00024
23.	0.00135	0.00081	0.00036	0.00052	0.00066	0.00052	1.02119	0.00123
24.	0.00073	0.00058	0.00033	0.00039	0.00019	0.00050	0.00027	1.00041
25.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26.	0.00153	0.03833	0.00166	0.01109	0.07232	0.00211	0.00951	0.00085
27.	0.02004	0.04771	0.03201	0.01956	0.00774	0.01508	0.00989	0.01545
28.	0.03098	0.02457	0.01422	0.01651	0.00803	0.02115	0.01271	0.01753
29.	0.19593	0.15336	0.08753	0.10335	0.05024	0.13415	0.07337	0.11047
30.	0.00389	0.00444	0.01294	0.00278	0.00047	0.00280	0.00185	0.00098
31.	0.01783	0.03037	0.05181	0.00854	0.00270	0.00965	0.01179	0.00731
32.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.	0.00096	0.00054	0.00286	0.00056	0.00007	0.00052	0.00007	0.00009
35.	0.00062	0.00087	0.00313	0.00095	0.00046	0.00045	0.00034	0.00103
36.	0.00322	0.00428	0.01018	0.00324	0.00029	0.00063	0.00142	0.00049

Appendix C (contd.)

Leontief Inverse of 36x36 Matrix
for Large, Small and Other Industries

	25	26	27	28	29	30	31	32
1.	0.04987	0.07049	0.00554	0.00662	0.00789	0.00500	0.00768	0.02979
2.	0.01212	0.01259	0.00974	0.00325	0.02873	0.00167	0.00244	0.00627
3.	0.07286	0.05183	0.00209	0.00426	0.00260	0.00239	0.00498	0.01175
4.	0.01454	0.02586	0.01179	0.31449	0.02386	0.01159	0.00659	0.03597
5.	0.00803	0.01968	0.04913	0.02081	0.00513	0.00727	0.00703	0.02352
6.	0.00823	0.01797	0.01974	0.09248	0.00461	0.00816	0.01145	0.04539
7.	0.00300	0.00723	0.04396	0.01814	0.00272	0.00741	0.00315	0.11698
8.	0.00610	0.01437	0.00594	0.02020	0.00216	0.00365	0.00759	0.01898
9.	0.06914	0.28430	0.05355	0.09418	0.00772	0.00862	0.01841	0.09860
10.	0.00041	0.00066	0.00125	0.00594	0.00080	0.00082	0.01780	0.01622
11.	0.00067	0.00190	0.00197	0.00169	0.00062	0.0021	0.00030	0.04153
12.	0.02722	0.11370	0.00778	0.00226	0.00113	0.00320	0.00639	0.02422
13.	0.03024	0.00520	0.00115	0.00421	0.02630	0.01067	0.00458	0.01907
14.	0.00079	0.00056	0.00056	0.00074	0.00055	0.00037	0.00424	0.00405
15.	0.00733	0.00657	0.00184	0.00370	0.00068	0.00053	0.00282	0.00521
16.	0.00111	0.00243	0.00049	0.00099	0.00500	0.00018	0.00030	0.00137
17.	0.14590	0.00029	0.00009	0.00044	0.00017	0.00033	0.00856	0.00827
18.	0.01267	0.02446	0.00183	0.02240	0.00052	0.00122	0.00094	0.00399
19.	0.00478	0.01180	0.00960	0.00859	0.00517	0.02863	0.00622	0.00497
20.	0.00150	0.00352	0.0045	0.00214	0.00467	0.01567	0.00437	0.00187
21.	0.00121	0.00202	0.00093	0.00670	0.00084	0.02070	0.01547	0.01774
22.	0.00031	0.00038	0.00012	0.00270	0.00134	0.00032	0.00538	0.03978
23.	0.00166	0.00556	0.00035	0.00026	0.00017	0.00024	0.00621	0.00094
24.	0.00057	0.00068	0.00014	0.00035	0.00388	0.00009	0.00014	0.00049
25.	1.03232	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26.	0.21907	1.12507	0.00322	0.00274	0.00053	0.00222	0.00702	0.01020
27.	0.01387	0.02005	1.01473	0.02423	0.01469	0.09492	0.01147	0.02842
28.	0.02423	0.02991	0.00922	1.01534	0.00484	0.02058	0.00656	0.03638
29.	0.15271	0.18095	0.37914	0.09222	1.04210	0.02358	0.03791	0.13013
30.	0.00149	0.00234	0.00118	0.00355	0.00298	1.01566	0.03040	0.00588
31.	0.00779	0.01031	0.00582	0.03246	0.01468	0.02890	1.00319	0.11805
32.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
33.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.	0.00024	0.00026	0.00264	0.00053	0.00010	0.00036	0.00012	0.00040
35.	0.00044	0.00083	0.00080	0.00781	0.00063	0.00036	0.00023	0.00112
36.	0.00101	0.00181	0.00110	0.00484	0.00053	0.00469	0.00314	0.00330

Appendix C (contd.)

Leontief Inverse of 36x36 Matrix
for Large, Small and Other Industries

	33	34	35	36
1.	0.00374	0.0	0.02114	0.00505
2.	0.00095	0.0	0.05636	0.00305
3.	0.00109	0.0	0.00988	0.00241
4.	0.00090	0.0	0.04473	0.12373
5.	0.00120	0.0	0.05641	0.03089
6.	0.00260	0.0	0.28000	0.00532
7.	0.00576	0.0	0.08680	0.00269
8.	0.00065	0.0	0.05771	0.00658
9.	0.00352	0.0	0.44275	0.01298
10.	0.00015	0.0	0.04882	0.00952
11.	0.00452	0.0	0.00258	0.00062
12.	0.00808	0.0	0.00493	0.00230
13.	0.00131	0.0	0.00844	0.00985
14.	0.00024	0.0	0.00076	0.00764
15.	0.00033	0.0	0.01421	0.00225
16.	0.00008	0.0	0.00395	0.00020
17.	0.00169	0.0	0.00076	0.00020
18.	0.00026	0.0	0.00712	0.00091
19.	0.00028	0.0	0.03844	0.00530
20.	0.00012	0.0	0.00505	0.00208
21.	0.00018	0.0	0.00317	0.00087
22.	0.00235	0.0	0.00068	0.01983
23.	0.00007	0.0	0.00037	0.00011
24.	0.00003	0.0	0.00114	0.00037
25.	0.0	0.0	0.0	0.0
26.	0.00047	0.0	0.00718	0.00043
27.	0.00266	0.0	0.07129	0.01189
28.	0.00133	0.0	0.05325	0.01500
29.	0.00828	0.0	0.30178	0.09656
30.	0.00033	0.0	0.00645	0.00249
31.	0.00669	0.0	0.02055	0.01212
32.	0.0	0.0	0.0	0.0
33.	1.0	0.0	0.0	0.0
34.	0.00003	1.0	0.00168	0.00009
35.	0.00003	0.0	1.06855	0.00331
36.	0.00024	0.0	0.00415	1.00170

Note: List of Industries are as listed in Table 14.

Source: S.P. Gupta, Planning Models in India - with Projections to 1975, Praeger Publishers, New York, 1971, Table 11.4, 1955/56.

Appendix D

Aggregation of Sectors for Calculating Labour Co-efficients and Wage Rates

Sector No.[a]	NIC Product Codes
1	3313-16, 3322, 3325
2	3333, 3353, 3362
3	3339, 3349
4	3359
5	3539, 3541, 3542, 3545, 3548, 3549
6[b]	3639
7	3748, 3792
8	3801-03
9	3113
10	3059, 3070
11	3211, 3213-17, 3219
12	3209
13	3299
14	2701, 2702, 2709-11, 2720-23, 2729-30, 2741-44, 2749
15	2023, 2200, 2210, 2221, 2223, 2241, 2242-44, 2249
16	2199
17	2026, 2029
18	2602-03, 2613-14, 2623, 2629, 2641-42
19	2699
20	3002-04, 3009, 3011, 3021, 3023-25, 3029
21	2902-05
22	2906, 2909, 2911-14, 2920, 2931-32, 2939, 2990
23	2804-05, 2809, 2811-13, 2819, 2831-32, 2839
24[b]	3499, 3579, 3599, 3806, 3899
25[b]	3059, 3070
26	2850, 2870, 2880, 2890
27[b]	3701

Note: [a]Sectors names are as listed in Table 11.
[b]Approximate classification.

Source: Report on Census of Small-Scale Industrial Units, op. cit., various pages.

Appendix E

Labour Co-efficients for 27 Small-Scale Industries

Sectors		Labour Co-efficients
1.	Other iron and steel	0.0881
2.	Non-ferrous metals	0.0420
3.	Non-ferrous products	0.0466
4.	Light ferrous products	0.0565
5.	Special industrial machinery	0.1403
6.	Other electrical equipment	0.0406
7.	Automobile equipment	0.1202
8.	High precision products	0.1257
9.	Fertilizers	0.0231
10.	Petroleum and coke	0.0651
11.	Glass	0.1950
12.	Structural clay products	0.3291
13.	Other non-metallic minerals	0.1271
14.	Wood manufacture	0.1004
15.	Beverages and tobacco	0.0842
16.	Oils and fats	0.0941
17.	Preservation and canning	0.0585
18.	Other textiles	0.1042
19.	Manufacture of textiles n.e.c.	0.0741
20.	Rubber, tubes and tyres	0.0932
21.	Leather tanning	0.0300
22.	Leather and other products	0.0728
23.	Paper and its products	0.0760
24.	Other industrial products	0.1189
25.	Coal mining	0.0651
26.	Printing, publishing and stationery	0.1571
27.	Generation and transport of thermo-electric electric power	0.0990

Source: Report on Census of Small-Scale Industrial Units, Vol. I and II, op. cit., various pages.

Appendix F

Elasticities of Substitution for Registered Small-Scale Industries

	Sector	Elasticity of substitution	T-Statistics	$\bar{R}^2$
1.	Food products	1.17	5.4567	0.71
2.	Beverages	0.76	1.5649	0.80
3.	Hosiery and ready-made garments	0.03	0.0927	0.42
4.	Wood products	0.79	2.3398	0.87
5.	Paper products, printing, etc.	0.31	0.8096	0.56
6.	Leather and leather products	0.17	0.3683	0.80
7.	Rubber and plastic products	0.48	1.9087	0.73
8.	Chemicals	0.76	3.7607	0.55
9.	Glass and ceramics	1.40	5.4412	0.84
10.	Basic metal industries	0.13	0.2106	0.13
11.	Metal products	0.88	2.0799	0.60
12.	Machinery and parts	0.21	1.2385	0.74
13.	Electrical and electronic products	0.91	2.6508	0.17
14.	Transport equipment	0.42	2.2712	0.94
15.	Miscellaneous	0.28	0.9936	0.74
16.	Repairing, servicing and job work	0.22	1.1189	0.96

Source: Report on Census of Small-Scale Industrial Units, Vol. I & II, op. cit., various pages.

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