CHAPTER VI

LINKAGES : THEIR NATURE AND EXTENT

6.1 Linkages : A Theoretical Background

The location of industrial activities at a favorable point in a region gives rise to many advantageous economic considerations. These advantages are in the form of economies of scale, localization economies, urbanization economies and spatial Juxtaposition economies.[1] Since long it has been recognized by economists that the existence of agglomerative forces combined with other factors attract industrial concentration. When such concentration of industrial units is interlinked to each other, they form industrial complexes. The industrial complex show mutual interrelations of spatial juxtaposition in a given region or country which lead to substantial economies.

Hence industrial complex is a growth centre which propels industrial relations, sustains economic growth and transforms social attitudes on the regional level. A growth centre may be defined to comprise of industries which are interrelated in so far as they make demands on each other.[2] It needs to be of such proportion that its principal units can be assured of their input requirements from the immediate vicinity and intermediate units supporting the principal units will have a market of sufficient size to ensure profitable operations. From this the complex will be perfectly close knit to continue its development by the inter-

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1. Isard,W, "Location and Space Economy" MIT Press, Cambridge, pp. 172 - 79, 1956.

2. Allen, K and Mac Clemon, M. "Region, Problems and Policies in Italy and France", Allen and Unwin, London, 1970.

play of the market forces, once the necleus has been set up. It will be an auto sufficient system capable of inserting itself in the general development of the area in which it is situated.

Generally one comes across the term industrial centre; confusion persist between Industrial complex and Industrial centre. The industrial complex is an economic term usually related to industrial complications in production technology and economic growth of a region. Many economists like Parroux[3] and Boudeville[4] have called growth pole or growth centre, synonymous to industrial complex. French economists call it by developmental pole; where as American economists call it Industrial Complex. Industrial centre means a town or a city where one type or several types, large, medium or small industrial unit or units established just to sell out the products in the markets available, or just to enjoy the benefits of the urban agglomerations. The establishments are generally unplanned and their growth is mushroom without any strong system of interdependence. Technologically, these enterprises are mostly isolated and are unable to enjoy agglomeration economics.

On the other hand industrial complex is a major progressive

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3. Perroux,F., "Economic Space, theory and Applications", Quarter Journal of Economics, Vol. 64. pp. 89 - 104, 1950.

4. Boudeville,J.R., "A Survey of Recent Techniques for Regional Economic Analysis", in W. Isard and J.M. Cumberland (eds.), Regional Economic Planning techniques of Analysis for Less Developed Areas; Organization for European Economic Co-operation, Paris, pp. 383 - 89, 1961.

form[5] of modern organization in industry. Under this form a single major production enterprise covers a variety of lines of production. The products or by products of one type of enterprise serve as the raw material for the intermediate products or auxiliary materials for others. The branches of production are organically, technologically and economically linked in a single production complex. Therefore, complex means not just one firm, one branch of industry in one factory, but a totality of economic relations, a totality of economic exchange.[6] It is an integrated approach to develop a region on micro, meso and macro basis.

Therefore, the concept of an industrial complex is emphasized on two counts (a) Inter-relatedness of economic activities. The industrial units are related to one another by (i) direct inter firm transactions (ii) joint demand for the products or services of other industrial units or joint supply to one or more industrial units (iii) joint use of common resources and facilities, like labour and social infrastructure. (b) the second element of complex in proximity of their location.[7] Many inter-firm transactions taking place within a relatively limited geographical area result into an industrial complex. The

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5. Kolosonskiy, N.N., "The Territorial Production Combination in Soviet Econimc Geography", Journal of Regional Science, Vol. 3, pp. 1 - 25, 1961.

6. Nekrasov, N, "Territorial Organization of Soviet Economy", Progress Publications, Moscow, p.24, 1974.

7. Luttrell, W.F., "Industrial Complexes and Regional Economic Development in Canada", in A. R. Kuklinski, (ed). "Growth Poles and Growth centres in Regional Planning", Mouton, Paris, p.245, 1972.

relationship between firms is commonly known as Linkage. Linkage is a term which means inter-actions between firms in the transmission of goods, people, money and information. In this way the plants involved gain advantages from being near to each other. The industrial products and bye products of one plant are drawn upon by other plants situated in its proximity. This phenomenon is popularly represented by input-output matrix pioneered by Leontief.

The linkages in the manufacturing processes presents the most complicated phenomena. The technical relations in manufacturing process passes many phases. Based on the technical linkages the industrial complexes are broadly divided. Isard and Schooler[8] have identified several types of complexes mostly based on activities in the manufacturing processes. First type of complex in based on single but fairly broad industrial process, such as a nucleonics complex oriented to either fission, fusion or both.[9]

The second type comprises of the large establishments of basic industries. In such, numerous raw materials have to pass through several successive stages in the processing of an end product or groups of end products. The initial raw materials are used and re-used in a comples way by treating and processing them

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8. Isard,W and Schooler,E.W., "Industrial Complex Analysis, Agglomeration Economy and Regional Development", Journal of Regional Science, Vol. I, pp. 19 - 33, 1959.

9. Isard, W (ed.), "Methods of Regional Analysis : An Introduction to Regional Science", M.I.T. Press, Cambridge, Press, p. 377, 1960.

in a consequenial manner. In this way, a cycle of production of an unlimited varieties by multi stage transformation of mineral, animal and plant products, and even of water, of air into industrial materials, is established.[10] Here advanced technology, large scale production and multiple stages i.e. vertical, horizontal and diagonal structures, are characterized. Mono or multi types of complexes are evolved. All the functions related to production or institutional organizations are set in motion on the corporated manner in integrated forms into one gamut. The examples are iron and steel, cement and engineering complexes. In the case of iron and steel; coal, iron ore, limestone and other minerals pass through the processes of transformation into pig-iron and again pig iron to steel ingot, and finally into steel and other structurals. Here every stage depends upon the preceding stage for its basic inputs.

The third type of complex derive from the joint production of two or more commodities from a single class of raw materials, such as, diverse food, fertilizer stock. The fertilizer is the final product of many by-products, therefore, the oil refinery centres become the centre of many units of varieties of products as explained by Jarrett and Isard.[12] These industries are

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10. Joshi,K.L., "Geography of India : Resources and Regional Development", NCERT, New Delhi, p.113, 1978.

11. Jarrett, H.R., "A Geography of Manufacturing", Mac Donald and Evans, Morwich, p. 189, 1977.

12. Isard, W (ed.), "Methods of Regional Analysis : An Introduction to Regional Science", MIT Press Cambridge, Press, p.377, 1960.

generally located at the centre of dense population either due to high transport cost or other distributional constrains or because of consumer service needs. The oil refineries and petrochemical complexes are centres around which numerous industrial units, small, medium and large are concentrated. This cluster of industries are of diverse nature.

In Baroda region, it is the third type of industrial complex that is in existence. It is centred around the Gujarat oil refinery. The industrial enterprises that have developed around it, small medium and large are technologically related and show high linkages. The interdependence among these firms speak of their interrelations, technologically and economically. The technological interrelations among firms is best represented by input output matrix, which is a also the basis on which linkages are estimated. The direct relations between the firms give us only the apparent relations, but the overall relation i.e. the direct and indirect transactions between various industries are captured in total linkages.

In common parlance linkage in variously used. In industrial literature it means a phenomenon which occurs among different industrial units, primarily located in one region. Actually it is an internal functional link between one firm to another based on input-output model, common labour pool, capital link,technological link etc. It is a mechanism under which the output of one unit becomes input for other and thus, both the units are benefited. Moreover, such linked or related industries often require types of labour skills and there is room,

therefore, for a relatively high degree of labour mobility between firms.[13] The advantages accrued are known as economies of concentration, an interesting component of industrial economics. Linkages exist among the intra - industrial and the inter industrial complexes. In the intra - complexes, it is of four types as pronounced by Jarrett[14], Estall and Buchann[15] and Kuchhal.[16] These are vertical, horizontal or lateral, diagonal and technological linkages.

Vertical Linkage : - It is a functional 'interlink' between separate firms each normally forming one stage in a series of operations. It is also known as industry sequence or processes integration. It is the union or combination of the successive stages or processes of manufacture of the finished article beginning from the raw materials, passing through manufacture to the finished product and distribution. The units combined together do not compete side by side but stand end to end, the one receiving the products of the other as its own raw materials, finally forming to one single establishment. The iron-ore, coal, limestone and other raw materials pass through several stages of manufacturing, ultimately into steel or further into steel structures. This accomplishes economies of storage, selling,

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13. Estall, R.C. & Buchanan, R.O., "Industrial Activity and Economic Geography", London, p. 94, 1968.

14. Jarrett, H.R., (1977), op.cit., pp. 189.

15. Estall, r. C. & Buchanan, R.O. (1968), op.cit. p. 94.

16. Kuchhal, S.C., "The Industrial Economy of India", Allahabad, p. 408, 1969.

buying and transportation of materials between the various processes. But it also suffers from the acute draw backs, like in case of dislocation of any of the intermediate processes the whole organization may be thrown out of operation. Again highly integrated industries tend to become inflexible and there by difficult to adopt to business oscillations.

Horizontal or Lateral Linkage : - Such type of linkage takes place when a number of different industrial units produce goods which are finally assembled as parts of a single larger product. Actually it is, units integration in which units of similar character are engaged in the same sphere of activity and complete on the same plane. For example, automobile is the outcome of several industrial units located side-by-side. Such type of linkage is very common and provide external economies in buying, manufacturing, selling and research. These external economies, however, lack in the case of the vertical linkage.

Diagonal Linkage :- It is by service integration process we come across diagonal linkages. It occurs when different goods manufactured by a set of industrial units are used by different sets of other industries. Here the links are with a number of different units and are neither of horizontal nor of vertically oriented firms. Washers, nuts, bolts, ball bearings and few widely used manufacturing products, similarly tools and equipment of different kinds find wide usage in industry.

Technological Linkage : - It is a novel concept in which single manufactured product is variously used as the raw material for

other industries. This inter industry dependence is best depicted in Input - Output table. The direct and total linkages can be estimated from this method. The direct linkages, give only the apparent relations between the firms but the total linkages take into consideration the prevalent technology and the inter industry dependence.

The linkage concept is commonly understood and defined in theory of economic development as one tracing the inter dependent activities and the extent of the relationship between those interdependent activities. Development in a country or region is cumulative in nature. The linkage effects of two industries when viewed in combination are larger than the sum of linkage effects of each industry in isolation. When Industry A is first set up, it's satellites will soon follow, but when Industry B is subsequently established, this may help to bring into existence not only its satellites but some firms which neither A nor B in isolation could have called forth. And with industry C coming into existence some firms will follow that require the combined stimuli not only of B and C, but of A, B and C. This mechanism may go far towards explaining the acceleration of industrial growth which is so conspicuous during the first stage of development.

To provide an explanation for development process in a country like England through an unbalanced growth strategy, Hirschman[17] derived key sectors based on the extent of inter-dependence of economic activities. Since then the linkage concept

received significance in the theory of development to explain balanced growth strategy also. However, the theory that he formulated led to the prescription of unbalancing the economy in favour of high-linkage sectors. It is a presecription that seems to have been followed in many countries of the world. Role of linkages in generating economic growth has been emphasized from demand as well as supply view points. The proponents of demand linkages usually base their arguments on Keynesian multiplier analysis, when they argue for simultaneous setting up of large number of industries to enable process of growth becoming self sustaining by creating effective demand over a wide range of activities. Various developed and developing countries appear to have given a clear priority for secondary production and especially manufacturing over agriculture and services yet the record of growth of an international cross section of countries does not support the Hirschman hypothesis in its extreme formulation. An appropriate development strategy would rely on inducing investment decisions. According to Hirschman's model there are two inducement mechanisms that may ecourage productive activities in a developing country. First, a non-primary activity, i.e. activity that employs significant amounts of intermediate inputs from other activities should be expected to induce attempts to supply these inputs through expanding domestic production. This is backward linkage effect. Second an activity

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17. Albert Hirschman, "The Strategy of Economic Development", New Haven, Yale University.

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which is non final i.e., an activity that does not cater exclusively to final demand, should be expected to induce attempts to utilize its output as inputs in some new activities. This is forward linkage effect.

The first order effects of the different economic activities of a region are linked through direct buying and selling. But the responsiveness that the expansion of an industry is likely to evoke on the industrial system is unlikely to be confirmed to first order effects alone. Due to inter industry linkages,the second order effects would be felt on direct input supplying activities, which in turn would effect the input supplying activities to industries affected during the second round, the process continue till it peters out. Depending upon their linkages in the system different industries would have varied impacts on the economy.

The measures of the linkage effects in an economy is based on Input - Output analysis. Backward linkage coefficient for any J^{th} industry (Lbj) is defined as the ratio of value of intermediate inputs to the value of production.

$$Lbj = \frac{\sum_{i=1}^{n} X_{iJ}}{X_J} = \sum_{i=1}^{n} a_{iJ}$$

Where X_{iJ} represents the output of commodity i used in production of X_J units of commodity J.

Forward linkage coefficient of i the industry denoted by L_{fi}.

$$L_{fi} = \frac{\sum_{J=1}^{n} X_{iJ}}{X_i}$$

Where X_i is the sum of inter industry demands.

Backward and forward linkages are direct effects. Total linkage index considers the indirect effects that generate from direct linkage effects. Thus total linkage for J^{th} sector L_{iJ} is the effect of both direct and indirect linkage.

$$L_{tJ} = \sum_{J=1}^{n} K_{iJ}$$

Where $K_{iJ} = [I - a_{ij}]^{-1}$

If $A = a_{iJ}$ and I is the identity matrix of unit level outputs corresponding to unit level final demands of n sectors in the economy.

Then $[I - A]^{-1} = [I + A + A^2 + A^3 + ...]$

as matrix multiplier is a converging series, providing the inverse elements as the sum of required to sustain the direct

(i) Unit level final demands of n sectors in the economy

(ii) Direct input (First stage inputs) to sustain the unit level final demands.

(iii) All indirect inputs (at all other stages)

inputs as a result of chain reaction effects of interdependence of sectors.

The total forward and backward linkages should be measured in terms of the inverse elements of the `Matrix Multiplier' to sustain unit levelfinal demand. Accordingily for a given sector like chemical categories the measures of forward and back ward linkages can be obtained in terms of the inverse elements in the corresponding rows and columns respectively of the Matrix Multiplier. For refinement and stability of the measure, Rasmussens formula would be appropriate.[18]

Number of studies have been conducted to study the linkage pattern in the economy. Various aspects have received substantial consideration in regional studies in India, with greater focus on determination of linkages of aggregated industry groups or sectors. The linkage effects of individual firms or plants have received insufficient attention due to either the non-availability of data or the assumption that the linkage effects of homogeneous industry groups would be approximately the same as those of individual industries consisting of those groups. However, it has been suggested that the regional and industry linkages of firms in the same industry group or sector vary

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18. Rasmussen, P.N. "Studies in the Inter Sectoral Relations," Amsterdam, North Holland Publishing company, 1953.

considerably.[19] Various studies on small scale sector deal with their linkage patterns, giving major emphasis on their links to large scale enterprises and urban centres. The mutual dependence of small enterprises with in and outside an industry and across sectors is of great importance, which has not been given due weightage and has remained relatively less explored empirically.

6.2 Linkage Studies : A Brief Summary

6.2.1 Small Industry Studies :

An important aspect of linkage patterns that has relevance to policy measures is the interrelationship between the small and large units in the industrial system and spread effect potential of small scale industries. The relation between small and large units is not always competitive,[20] instead small and large units can support each other through mutual buying and selling and also through the process of sub-contracting. Stanley and Morse[21] have suggested that part of the process of industrial development is growth of cost conscious specialization among firms made possible by growth of inter - firm relationships and complimentarities

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19. Sea, C.M.Tiebout, "Input-output and the Firm : A Technique for using National Regional Tables"; Review of Economics and Statistics, Vol.4, 1969 and J.K.Katz and R.L.Buford, The Effect of Aggeration on the Output Multipliers on Input-output Models; Anuals of Regional Science, Vol. XV, No.3 Nov.1981.

20. Subramaniam, K.K. "Linkages of Small Scale Industry Implications for Employment Generation", Indian Journal of Labour Economics, Vol.XIX, No.3-4, Oct.1976-77.

21. Stanely, Engene and Morse, Richard, "Modern Small Industry for Developing Countries", Mc Graw Hill Book Company,1965,New York.

indirectly through market and directly by arrangements for further manufacturing and by contracts to produce components and supplies. A number of studies have shown the existence of close and powerful backward and forward linkages of two types; firstly, the dependence of small units on large scale producers and secondly, the location of these channels in big cities.

The linkages of small industry when viewed from point of dispersal in space (i.e. localisation) exert influence only through transport costs. The pull of transport cost on location of small scale industrial units does not appear to be very decisive.[22] It has been observed that steel using industries predominate the modern small industries sector. Such industries are mostly concentrated in Maharashtra (particularly Bombay), Punjab, Haryana and Gujarat where there is no concentration of steel industry. In all these states, it is the accessibility to market that plays a more decisive role in the establishment of small industrial units. In the states of Haryana and Punjab, highly developed agriculture creates demand for agricultural tools, implements as well as consumers' durables and the demand for these are widely and more or less evenly spread. In these states accessibility to market for small manufacturers is easy and dispersed. In metropolitan and large urban areas, it is not much accessibility to immediate demand, but accessibility to well organized and efficient marketing channels which attract location of industries.

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22. Hashim, S.R., Dadi, M.M. et.al, "Small Industries - Their Role in Development" Report Submitted to ICSSR.

The study of small scale industries in Ludhiana analyse the factors behind industrial change. The industrial linkages which came to be established at Ludhiana[23] beginning with hosiery including wool spinning and textile machinery in the beginning led to growth of bicycle and sewing machines industry in machine tools and auto spares. Added to this the traditional agricultural implements developed further. This process saw many more small scale units coming into existence and provided greater scope for expansion. The concrete examples are in the form of Coimbatore (Cotton knitted wears), Nagpur (Leather goods), Surat (Art silk, diamonds cutting), Cannanore (Ayurvedic Medicines).

However, the growth of modern small scale sector has been largely confined to the metropolitan and urban areas of the country. If one takes away cities with a population of one million or more, Bombay, Calcutta, Delhi, Madras, Hyderabad, Kanpur, Banglore, and Ahmedabad, one would have eliminated almost 75 percent of production in the small sector. The industrial estates set up in and near these big cities have been very successful, while majority of those operating else where have been strugling with poor capacity utilization.[24] The study by Hashim and Dadi,[25] identify two types of economic bases for the development of small scale industries (a) an industrial complex base and (b) a developed agriculture base. They further note that, when the development of small scale industries is based on

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23. Pathak, H.N. "Small Industries in Ludhiana", Economic and Political Weekly, Vol. V, No. 28., July, 11, 1970, pp. 1091-97.

agriculture development, it has a tendency to be more evenly spread. In contrast where the growth of small scale is induced and led by the growth of large scale industrial complexes, it has a tendency to remain concentrated around such a complex and metropolitan area.

Regarding spatial movement a study that examined the rank correlations between agricultural development, development of the large scale industries and of the small scale industries[26] discerned positive and significant relationship between large scale and small scale industries, while agricultural development was seen to be uncorrelated with the industrial development.

Various studies have indicated that the dependence of small scale industrial units on manufacturing sector is very heavy. The results of Gujarat studies are revealing. The technology matrix for Gujarat's industrial system consisting of 12 industrial sectors,[27] where each sector has been broken into sub-sectors of registered and unregistered units, highlighted the directional

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24. Ram.K.Vepa, "Small Industry - The Challange of the Eighties" Vikas Publicity House, 1983.

25. Hashim, S.R and Dadi, M.M., "Economic base and the Spatial Pattern of Small Scale Industry Development" National Seminar on Industrialisation of States in India with Focus on Andhra Pradesh, Aug. 7 - 9, 1987.

26. Vyas, V.S. "Rural Industralization : An Integrated Approach" Karnataka University, Dharwar, 1971.

27. Jan.H.Van-der-veen (i) "Small Industries in India : The Case Study of Gujarat", Ph.D. Thesis Submitted to the Cornell University, 1972. (ii) "A Study of Small Industries in Gujarat State", India Occasional Paper, No.65, Employment and Income Distribution Project, Department of Agriculture University, Conrell University.

imbalance in the flow of products from large scale to small scale units. The flow of products from the registered sector to the unregistered sector is larger as compared to the flow in the opposite direction. The study by Kashyap[28] concludes that the "Inter scale linkages show directional imbalances on current flow accounts, flows of commodities from registered sub-sector to unregistered sub-sector being much larger than the flows in the opposite direction. This highlights the fact that unregistered small scale units primarily satisfy the final demand needs, rather than meeting inter-industry demands.

According to Hashim[29] the dependence of small scale industrial units on manufacturing sector is very heavy .... with in the manufacturing sector, dependence on steel and steel products as basic inputs is predominant. This study concludes that there exist strong backward and forward linkages between small scale industrial sector and large scale manufacturing.

The study on the structural analysis of Gujarat state, reveals a strong integration of small scale sector.[30] It is shown that the urban unregistered industrial sub-sector is far, integrated through backward and forward linkages to the rest of the state wide economy; indeed as far as the back ward linkage is concerned it is better integrated than the registered industrial sub-sector. Another study[31] relating to the cities of Bombay,

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28. Kashyap,S.P. op.cit.

29. Hashim,S.R. -"Input and Output Structures of Small Scale Industries". Artha - Vikas, Jan. - June, 1979.

30. Jan.H.Van-der-veen - op.cit.

31. Sandesara, J.C., "Efficacy of Incentives to Small Industry", Bombay University, Bombay, 1982.

Banglore, Hyderabad and Jaipur indicates that the large scale producers were immediate customers and immediate suppliers of raw material in large number of cases. The small scale industry dependence on large enterprises through forward and backward linkages is heavy.

The study of small and medium industry growth in Jamshedpur[32] provides an interesting result. The basic character of a large majority of the units is that, they all supply products to the steel plants and in this sense they are like ancillary units. It has been observed that one half or more of their output was sold to a single buyer.

Among the small scale units surveyed in Orissa,[33] the chemical and Electrical units are found to have lower forward linkages with the local region and greater proportion of sales is through government agencies and whole sellers.

Registered large and small scale industries showed a tendency to move together over time and space.[34] In the set of industries where scale economies did not matter or where possibilities of competitive or complementary relationship existed between large and the small, it was seen that the major proportions of small and large tended to show similar growth performance, although the fluctuations in the former were noticed to be more intense. Miscellaneous chemicals, machinery and metal

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32. Gupta,L.C., "Dynamics of Growth - Jamshedpur", (IDBI, Bombay Mimeographed, 1980).

33. Mohanty,Bedabati -"Economics of Small Scale Industries," Ashish Publishing House, 1986.

34. Kiran Wadhava -"Urban Fringe - Land Markets : An Economic Analysis", Ph.D. Thesis, Gujarat University, Ahmedabad, 1980.

based enterprises in small scale showed significant dependence on the large scale for their growth.

Because of high linkages between small and large scale industrial units, it is generally observed that small industry is found in the vicinity of large industry. The exceptions are the cases of Punjab and Haryana, where one finds modern small industry concentrated with out much of large industry. As the large industry is concentrated in a few industrially developed states in or around the metropolitan cities and towns, the modern small industry is also found amidst them or close by. It is also observed that as large industry gets decentralized and the relative importance of the other states/areas increases small industry also gets decentralized and its share in other states/areas also increases.[35] It is also worth noting that the importance of small units in principally industrialized areas will be considerably more as the small units in such locations are known to be bigger in size than those in other cities.

Agglomeration is an important explanatory factor in the theories of industrial location. This factor is perhaps more important to the small unit than to the large unit. Through its size, the latter can internalize, at least partly, some of the external economies.[36] The small unit can do no such thing. For its efficient functioning it is all the more dependent upon agglomeration or proximity of the market. And as the markets are

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35. Godbole,M.D., -"Industrial Dispersal Policies," Himalayan Publishing House, Bombay, 1978.

36. Sandesara,J.C., "Small Industrialization. The Indian Experience," Economic and Political Weekly, March 26, 1973.

readily found in locations of large industry, small industry is found amidst or close to large industry.

Various policy measures have been taken to transit the influence of modernization to the interior regions. This transition from highly developed cities with infrastructural facilities and services, attracting financial resources and entrepreneurship is a slow process which involves both public and private sector participation. This is what has happened in the case of industrially developed countries.[37] In a country like India with vast under employment and unemployment in rural areas, constant swelling of the labour market following population explosion, industrial agglomeration creates what economists call the centre-periphery conflict. This resulting in the faster movement of capital, labour, entrepreneurship and other resources towards the developed centres and pulls down the overall economic growth and widens income and other inequalities between the centre and peripheral regions.

A study analysing the industrial and regional linkage effects[38] conclude that the establishment of large industrial plants in less developed regions has not led to a noticeable impact on other sectors of the economy. A major reason for the leakages of benefits of the projects is the existence of traditional inefficient and technologically backward industrial

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37. G.Myrdal, "Economic Theory and Underdeveloped Regions", Duck Worth, London, 1957.

38. M.Ramadhyani - "Industrial and Regional Linkages Effects of a Public Sector Enterprise : An Empirical Study", Economic and Political Weekly, Vol. XIX, No.49, M.133 - 140, Nov.,24,1984.

sector in the less developed regions. The establishment of ancillary units around the parent project is a step that can be expected to increase the regionalization of projects linkages.

Two approaches to the industrialization of regions have been emphasized. One is the establishment of small units with in industrial estate in selected regions, the other way is to plan for large public sector projects in selected areas with a view to providing nucleui of development in the region. The first policy of industrial estate programme is based on the assumption of interdependencies among small scale units and the similar economies to those found with in a single large plant and also releases economic impulses for the region.[39] It is argued that localization of many medium or small plants offer similar economies to those found with in large plant.[40]

The industrial estates set up in and around big cities and in urban centres have been very successful, while majority of those operating else where have been observed to face various problems. Although much have been said about growth centres, in practise, it is the towns that have already developed that have attracted new industries. The few exceptions are the large industrial complex such as Rurkela in Orrissa, Bhilai in Madhya Pradesh, Adityapur in Bihar, Durgapur in West Bengal which have drawn some industries. Overall it is the urban centres that form the core of economic activity.

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39. Alagh,Y.K., "Regional Aspects of Industrialization", University of Bombay, 1973.

40. Florence, P.S., "Investment, Location and Size of Plants", Cambridge University Press,

The study by Kashyap[41] et.al estimate the linkage pattern of 18 industrial estates in Gujarat. This study shows that barring a few exceptions the linkages of units with in the estates as well as with in the district are very poor. Linkages are found strong only in large industrial estates located in areas neighboring major industrial centres like Ahemdabad.

Similar conclusion was reached by the study examining functioning of industrial estates in South Gujarat.[42] The study also noted that though the estate programme was helpful in the promotion of small scale enterprises and even encouraged new but educated and experienced entrepreneurs, the objective of industrial dispersal was not achieved. Most of the rural industrial estates proved to be non-starters.

Sandersara's study[43] indicates that for small industries majority of supplies of raw material and majority of principal customers were located in the same city. thus the study indicates that small industry have high linkages with in the city.

The study of industrial linkages in metropolitan region of Pune[44] reveals that the newly developed industries are

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41. Kashyap, S.P., et.al "Industrial Estates in Gujarat : A P reliminary Study of Linkage Patterns", Fourth Input-Output Conference, Baroda, 1974.

42. Sanghvi,R.L., "Role of Indusrial Estates in Developing Economy", Multitech Publishing Co., Bombay, 1979.

43. Sandesara,J.C., "Efficacy of Incentives to Small Industry", Bombay, 1982.

44. Bhattarcharya, Ardhendu "Industries in Poona Metropolitan Region - A Preliminary Study", Economic and Political Weekly, Special Number, July, 1969.

charaterized by strong backward and forward linkages. However these linkages have not been exploited to foster further industrial growth in the regions and the existing industries depend heavily on sources outside the region, especially on Bombay, for their input requirements.

The study analyses engineering and chemical industry in the Pune industrial belt. The chemical industry in Pune has high backward linkages. The chemicals constituted 76 percent of all inputs in this industry and these mostly came from Bombay region local feeding is found to be negligible. Similarly the industry show high forward linkages. The local feeding by chemical industry to the chemicals requirement of the region is very meagre and the majority of the requirements came from outside.

The study of small scale industry in North Arcot district of Tamil Nadu[45] reveal that the locations of industries is overwhelmingly urban and they exhibit weakness of local commodity linkages in the product mix. It has also been observed in another study that the larger firms manifest backward and forward production linkages from agriculture. Smaller sized firms have most obvious consumption linkages.[46]

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45. Barbara Harriss, "Regional Growth Linkages from Agriculture and Resource Flows in Non - farm Economy," Economic and Political Weekly, Vol. XXII, Nos. 1 & 2, Jan., 3-10, 1987.

46. Barbara Harriss, "State Policy and the Local Linkages of Industry", in "Growth Linkages from Agriculture : Resource Flows in the Non-farm Economy", Report to ODA, IFPRI and TNAV, London School of Hygiene and Tropical Medicine, Mimeo.

6.2.2 Regional Studies :

There exist few studies depicting the linkages at all India level, few studies have also been conducted at regional level. It would not be out of place to give a brief summary of findings of these studies. Notable among these studies are by Lakadwala, D.T.; Alagh Y. K. and Atul Sharma (1974); Y.K. Alagh, G.S.Bhalla and S.P. Kashyap (1980); S.P. Kashyap (1979). Atul Sharma and Keval Ram (unpublished). The main focus of these studies has been restricted to determination of linkages of aggregated industry groups or sectors. The Indian industrial economy has been estimated to decompose into self sufficient blocks of industries[47] where the interdependency are noticed within the blocks rather than between blocks. This decomposability into blocks is tested by the closeness of Leontief block inverses with the Leontief inverse of the total system.[48]

The clustering of industries have been done by Lakdawala and others.[49] Two types of clusters are emphasized; empirical spatial clusters and technological clusters. The study draws attention to the industries which appeared with in single cluster in both the empirical spatial and technological cluster of industries, which indicates that in the regional context in

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47. Lakdawala, D.T. Alagh, Y.K. Atul Sharma., Regional variations in Industrial development" popular Prakasham, Bombay, 1974.

48. Rohit Desai, "structural decomposition of Indian Industrial Economy", Fourth Indian Input-output conference, Baroda, Sept 1972.

49. Lakdawals, D.T. et.al, op.cit.

India, nascent complexes of interrelated industries have emerged. These are yet small as compared to complexes emerging with in each block of industries in nation reference technology structure. Nascent complexes are found to exist in almost every sector of the industrial economy.

Pattern of inter sectoral relations of the regional economy[50] depicts block diagonality. Almost akin to the national economy, Gujarat economy decomposes itself into food fibre and mining metal blocks. In case of Gujarat the objective of the exercise is to isolate the inter related sub-sectors of industries. Block diagonality gets sharper focus once universal intermediates are withdrawn from each block and are given a separate treatment as an independent block.

An input-output study has been conducted on the economies of Gujarat, Punjab and Haryana[51]. It is seen that the economy of Gujarat Vis-a-vis those of Punjab and Haryana differs in its output, income and employment inducement effects. Sectors in each economy vary in their inducement effect as measured by different multiplier matrices, which means that the choice of sectors for regional development is a difficult task.

The backward linkage pattern for Punjab and Haryana are quite similar to each other but quite dissimilar to those of Gujarat. For Punjab and Haryana linkage indices based on output and employment multiplier matrices are well correlated so is also

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50. Kashyap. S.P "Regional planning in a consistancy framework", Allied Publishers;

51. Alagh Y.K., Bhalla G.S, Kashyap S.P - "Structural analysis of Guiarat, Punjab and Haryana Economics". Allied publishers, New Delhi, 1980.

the case between linkages based on income and wage income multiplier matrices.

The forward linkages in the three economies also show dissimilar patterns. In Gujarat wage income and total income, wage income and employment and income and employment inducement effects correspond well with each other. It is found that in Punjab and Haryana also wage income and income inducements correspond well with each other. On the other hand wage income and employment inducement effects show negative correlations. Out put, income and wage income inducement effects in Punjab and Haryana by and large, show better correspondence compared to Gujarat.

The direct and indirect inducement effects for Gujarat have been studied by the use of linkage indices[52]. Linkages highlight the qualitative nature of the economy, their qualitative picture shows stability over different variants of the regional economy (30 x 30 and 16 x 16 with and without import leakages). Agriculture and allied activities mining electric light and power sectors generally show high forward linkages on different counts (output income wage income and employment) over different variants of Gujarat inter industry model. Textile and construction sectors show high backward linkages and spread of these linkages is also even. If one were to use Rasmussen's definition of "key industry", textile from food-fibre block and construction from mining metal block emerge as sectors of crucial importance in the regional economy. Agriculture and allied

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52. Kashyap, S.P. op.cit.

activities and farm output processing activities also emerge as high backward linkage sectors in their income and employment inducement effects. Backward linkage pattern for these sectors, however are found showing concentration in linkage dispersal.

Another study conducted at all India level divides Indian industries into 83 sectors. The study takes a deeper look at the linkages of 53 manufacturing sectors from among the total 83 sectors[53]. For all the sectors the Direct and Total Income, output, employment generation and Import intensities per million rupees worth of output have been estimated. When direct and indirect linkage effects are taken into account, it is found that the sectors occupying the first ten ranks in terms of magnitude of the total income generation are mostly (except for two services sectors) related to agriculture and related activities. A similar observation can also be made for employment generation. In agriculture related sectors it is observed that the direct linkage effects are very high and the indirect linkages effects are minor.

6.3 The Present Study :

~~However since~~ the present study is confined to small and medium scale chemical units in Baroda region, we present inter industry links of these enterprises. The links of these enterprises to various industries located in the local region and other regions are also analysed. The purpose of attempting this

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53. Atul Sharma, and K al Ram; "Income, output and employment linkages and Input intensities of manufacturing industries in India". Mimeographed.

analysis of linkages is to ascertain :

(i) To what extent chemical industry is linked to various production sectors.

(ii) To what extent chemical industry is linked to local region and other regions.

(iii) To which major industrial groups is the chemical industry linked locally and in other regions and what is the extent of linkages ?

(iv) Is the local region benefiting from the existing inter industry linkages ?

(v) The input structure of various industry groups among chemicals.

(vi) The extent of small industry links to the large scale enterprises.

(vii) The extent of small industry links to the urban centres.

The industries established in a region should be able to create favourable impact by reducing persistence unemployment and by increasing the economic activity of the region. The favourable impact due to industrialization will be felt in the region if the industries (a) can provide sufficient jobs to the local people (b) can exploit and make best use of available local raw materials (c) can draw more of local capital (d) can make optimum use of local entrepreneurial skills (e) can provide goods needed in the region. These objectives can be achieved through strong input-output linkages of the industries with in the region, as well as inter industry ties and inter industry dependence.

It is expected that the development of industries in any particular region will create demand for local raw material and local labour. The local skills are best utilized by these

industries which draw local capital and entrepreneurship. On the other hand there should be demand for the products produced by the industrial units in the region. Demand may originate from the household sector, distributive sector or productive sector. The demand from productive sector will create inter industry dependence in the region and out of strong inter industry dependence, a mature industrial complex will emerge. The demands of the industrial sector are mainly the non final products i.e. the intermediate goods. If in a region there exist dominant industries producing non final products, the industrial sector in the region would show greater inter industry linkages.

Since the present study is confined to study of small and medium scale chemical enterprises, only linkages of these chemical enterprises are studied. However such a study has greater scope for emphasizing the minute aspects which a study at an aggregate level would over look. A micro level study depicts a clear picture of the industry in the region under study. In aggregate level studies inter industry transactions are of paramount importance and the regional transactions are not given due importance. In such studies,the national level technology is of greater importance, but the regional technology or technologies used at different levels of manufacture in actual practise could be different. Even with in an industry the input structure and output disposal patterns vary with the nature of products produced.

A producing sector demands various types of raw material and services. These are not necessarily produced in a particular region. Therefore a producing sector purchases its raw material

and services from a region, depending upon their availability in the region. If the local industries are able to supply the required raw material and services for a given industry then that particular industry would show higher backward linkages to the local region. In the absence of shortage of supplies from the local region an industry is forced to depend upon other regions. However the industry's dependence or like to the local region or other regions is determined by the industrial production in the local region and the structure of industrial production.

The products produced by industries in a region are demanded by various other industries and these to some extent are used for final consumption. If the products produced are final products, then they are sold in the market either locally or outside. If the products produced are non final commodities then these have to under go some processes before they reach the ultimate consumer, in which case these are to be sold to other manufacturing industries. The demands of local industry would be technically related to their outputs. Therefore the output produced in the local region is sold in the same region only to the extent of existing demand for these products in the local region. Some portion of production is sold to other regions too, showing a technological inter link between industries located across regions. The existence of technological inter link lead to inter industry linkages across and within the regions.

Is the region under study actually benefiting from the existing linkages in the industry concerned ? If the region is benefited from the existing linkages it has further scope for

diversification. As a result of growth in the region more labour force would be employed, entrepreneurs would face new opportunities more of local capital would be invested in productive avenues. In addition, entrepreneurship, capital and technologies from other regions are attracted to the local region. The result of growth in the region would be interms of increasing purchasing power of local population as such the demand for various products would raise and new products demanded. As a result the other sectors in the region have greater role to play and new forces come to play.

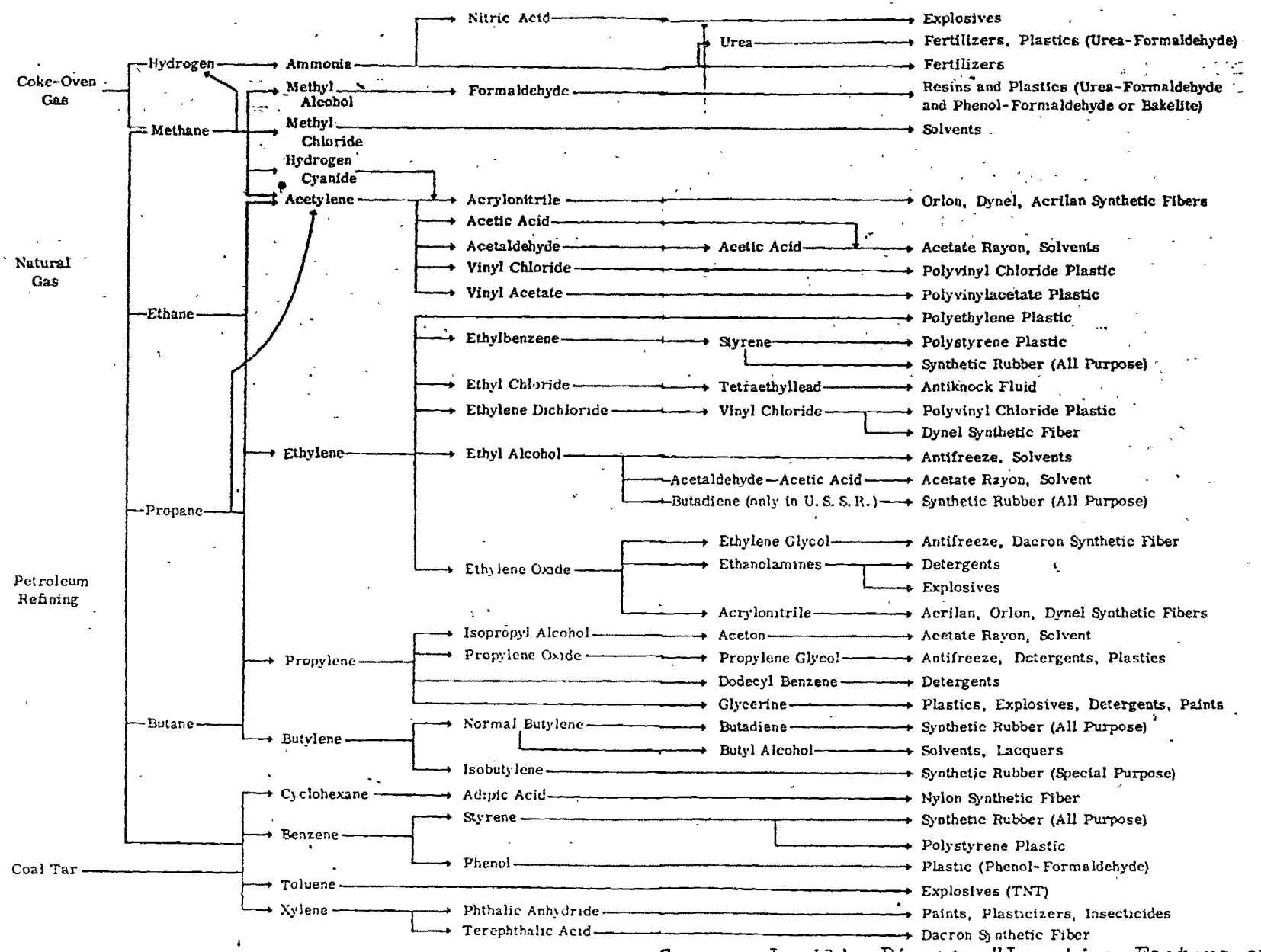
However one does not always come across regions benefiting from existing linkages. Linkages of local region is very important locally, but the magnitude of linkages to other areas or regions may only serve to heighten disparities. The governmental subsidies, developmental scheme are to direct the linkages resulting from industrial development to the local region. If the magnitude of the linkages to other regions is high, then the development envisaged in the local region cannot be achieved, there are also instances where one major region restricting the expansion of industrial activities of smaller centres around. According to the centre periphery model of economic development, the growth pole depicts the transmission of economic prosperity of two sets of opposing forces. On the one hand, growth tends to concentrate in the centre and erodes the economy of surrounding areas; on the other hand development spreads over surrounding areas as the result of growth in the centre. In the early stages of development, the centre attracts resources and factors of production from the production from the

periphery, once the centre reaches a stage of development it influences the development of periphery. If a region does not have well developed inter industry linkages with in the region, then it could be termed as being far from self sufficient. Such a region is expected to depend on other regions and would show high backward and high forward linkages with other regions. These linkages restrict the expansion of the industrial activities in the local region. In such an instance, the local region has great opportunities for expansion and needs to achive greater utilization of capacity. If the competitive strength of the industries in the region has to be improved, it is only by way of clustering of industries with strong inter industry linkages. Such a cluster will increase the competitive strength of the industries by reducing the transport cost and by way of economies of scale, localization economies and spatial Juxtaposition economies.

Before we examine the nature and extent of backward and forward linkages in case of small scale industry, we ~~it would not be out of place~~ to discuss the nature of the products produced by petrochemical industry and discuss the relation between petrochemical and chemical industries. The petrochemicals are the originating point for a number of organic and inorganic chemicals which are used as raw materials in different categories of chemical and non chemical industries. The petrochemicals exhibit their links to various other sectors of the economy as well. In the following section, we take a look at petrochemical industry in general and in Baroda in particular.

6.4 Petrochemical and Chemical Industry :

Chemical industry covers a wide range of industries starting from gaint petrochemical and fertilizer complexes to the small and light industries such as paints, soap, plastics. This industry is closely linked with other segments of the economy (see flow chart) in variety of ways. The chemical industry also play a key role in the country's defensive and offensive capabilities. In the modern times chemical products are indeed substituting other materials in every sector of the economy and are serving almost every industry. In addition it can make very valuable contributions in augmenting food production, conservation of water resources, provision of newer fibres to substitute cotton, provision of improved construction materials to substitute scarce metals, in organizing an effective programme of population control, in meeting health needs of the population and in many other ways. Apart from its importance to other sectors of the industry the chemical industry has been notable in meeting the domestic needs such as apparels, furnishings, electrical goods, detergents, talcum powder and deodorants, shoes, flavouring agents preservatives, creams, tooth - paste utensils and many more. Large scale petrochemical and chemical enterprises can therefore be expected to initiate growth of number of manufacturing units of a wide range of industries. A similar phenomenon has been noticed in Baroda region. The overall industrial development of the region can be attributed to the growth of petrochemical industry in the region.



Flowsheet of Principal Petrochemical Raw Materials, Intermediates, and End Products.

Source: Lesilie Dienes, "Location Factors and Locational Developments in the Soviet Chemical Industry, The University of Chicago Publication.

The dominance of petro chemicals and chemicals in the Baroda region is a clear cut phenomenon. The Gujarat refinery (Koyali) can be considered as a starting point of the chain of industrial link in the region. It uses the crude produced in various regions of Gujarat. Despite its production of motor spirit, LPG, kerosine, aviation fuel, diesel, it also produces Benzene, Toluene, naptha and residual fuels which all have wide industrial applications. It also produces n-Heptane and Aluminium rolling oils which were earlier being imported. The refinery dispatches its products by pipeline, rail and road to various distribution and consuming centres all over India. It is linked to Gujarat State Fertilizer company (GSFC) Indian Petro Chemicals Corporation Limited (IPCL) by pipeline and plays a predominant role as a mother industry for supplying the feed stock to various large scale industries. This refinery supplies LPG to the Baroda citizens through pipelines, in addition to the supply of LPG cylinders all over the country. GSFC draws Naphtha (For fertilizer manufacture) LSHS (for fuel requirement) Benzene (Caprolactum production) from Gujarat refinery. Gujarat Narmada Fertilizer company (GNFC) uses the LSHS supplied by this refinery for fertilizer production. IPCL draws feed stock from refinery and coverts them into petrochemicals which have wide applications in various sectors of the economy. The supply of feed stock by Gujarat refinery to IPCL are as follows.

Naptha (For Aromatic plant and olefin plant)
Kerosene (For Linear Alkyl Benzene plant)
LSHS (for fuel requirement)
n-Heptane
Cracked LPG (For polymer plant)

In addition to this the Gujarat refinery supplies chemicals for defence purposes, major chemical of which is Toluene. The feed stock supplied by the refinery is converted into fertilizers and various petrochemicals.

The Gujarat state fertilizer company produces various fertilizers, Bio-fertilizers and many products which have variety industrial applications such as MEK oxime, Nylon- 6, Malanine, olium, Anone, Sulphuric acid, sulphardioxide Gipsum, Anhydrous Ammonia, Argon gas. Methyl Methacrylate Monomer, polymehyl methacrylate sheets polymethyl and Methacrylate pellets. These products have multiple applications such as in textiles, Acrylies, Engineering plastic, polymers, Multilayer films, helmets, Resine, welding and as raw materials in some chemical industries. This large industry is linked to various small scale enterprises through purchases of material and sales of products. It provides raw material and also gives guidance to various industries. The industry reported that it purchases material from about 370 small scale units and supplies material to large number of small scale units directly and through dealers.

Indian petrochemicals corporation limited is the largest petrochemical company in India. It draws the feed stock from Gujarat refinery and converts them into numerous products which have variety of uses. Basically raw material (Petrolium, coal gas) are converted into primary chemicals such as ethylene, acetelene and Benzene which inturn are converted to commodity chemical such as PVC, poly styrene, synthetic rubber, dyes insecticides etc. These commodity chemicals are converted into products like paints, pipes, shoes, bottles, Drugs and

pesticides. Therefore petrochemicals when converted to final products substitute many traditional products and are also found to be much cheaper.

Petrochemicals are used in farming for dual purposes. Firstly, they are used in increasing the crop yield. Solvents derived from petrochemical sources are essential raw material for the manufacture of insecticides, fungicides and herbicides. Secondly the polyethylene films are widely used for canal and reservoir linings for conserving water, covering food grains and nursery bags for tender plants.

Petrochemicals products are used in manufacture of telecommunication cables, telephone instruments, accessories and components for radar and satellites. IPCL contributes to publishing industry by way of providing solvents for the manufacture of high quality printing inks.

Petrochemicals products are used for the manufacture of medical accessories and its chemicals are in use in pharmaceutical industry as basic raw materials. Poly butadiene rubber is an essential raw material in manufacture of tyres for all kinds of vehicles. Acrylic fibre an alternative to wool, synthetic leather an alternative to natural leather are manufactured from petrochemicals. Linear Alkyl Benzene is used in manufacture of detergent soaps and releases our edible oil resources for purposes more important than the manufacturing of soap. Plastic components for air crafts, parachutes made from synthetic fibre, uniforms and blankets for defence purposes are made out of petrochemicals. Toluene is the starting point for

manufacture of ammunition for defence. In addition to these, there exist variety of uses for petrochemicals from simple house hold items such as tumblers, toys, brushes, packing material, baggages, to textiles and many more.

The products of IPCL are used by various small, medium and large scale enterprises to convert them into final products. Depending upon the nature of the products and their usage, IPCL sells its products to various industrial organizations. For products like LDPE (Low Density Poly Ethylene), LAB (Linear Alkaline Benzene) and Xylenes, the distribution policies are oriented towards unorganized sector as these products can be effectively converted into final products by these industries. other products are mainly supplied to organized sector as these have little demand in unorganized sector. The unorganized sector consists of cottage, household industries and these are largely run on small scale. All the industrial units in unorganized sector can be classified as small scale enterprises. The organized sector consist of large, medium and a certain proportion of small scale industries which are run on modern lines. Therefore, the supply of raw material by IPCL to unorganized sector would be only to a part of the small scale industry in the country. However, the company reports that substantial portion of output is sold to unorganized sector and their customers are largely from unorganized sector.

The company (IPCL), has not yielded to the soft option of serving large consumption centres nearby. The harder efforts at developing under developed areas and promoting small enterprises are being pursued in the national interest. Market seeding

efforts are being followed up with uniform prices, availability of products the users door steps all over the country. Of the various products produced by IPCL, LDPE, Poly Propylene, LAB, Poly Butadiene Rubber and Acrylic fibre are the products whose sales to unorganized sector in each case is above 50 percent of the total produce. These products constitute a major proportion of the total output by IPCL. Even in few other products, the market share of unorganized sector is consider able high. The sales of LDPE to unorganized sector is to terms of 98 per cent, 90 per cent in poly propylene,70 percent in LAB, 60 per cent is poly Butadiene, Rubber, and 50 per cent in Acrylic fibre. Overall the unorganized sector draws approximately 50 per cent of the produce by IPCL. In terms of the number of customers (industrial institutions purchasing products) from IPCL, the customers from unorganized sector constitute around 96 per cent. These customers are located in Baroda regions as well as regions outside Baroda.

The establishments of a large scale industrial unit in a region brings into existence a number of small and medium enterprises. The establishment of Gujarat Refinery in early 1960's is considered as turning point of industrialization of Baroda region. The establishment of GSFC and IPCL at later dates have given an additional spurt to the industrial development of the region, leading to establishment of number of surplus satellites and finally into a mature industrial complex. The chemical industry by its very nature is linked to various industries. With the advent of petrochemicals, its usages have multiplied. The large scale chemical and petrochemical

enterprises located in Baroda have not only influenced the growth of Baroda region but also have caste their influence on other regions. In Baroda region numerous small and medium scale enterprises have come up in a wide range of activities. These small scale enterprises are linked to large enterprises by way of purchase of raw material and supply of finished products. The satellites that have developed based on these large scale enterprises are also found to be interdependent and their linkages extend beyond the Baroda region.

In an input - output frame work a producing sector purchases outputs of different sectors as inputs and sells to them its own output as input. Sectors are thus interlinked through purchases and sales of their outputs. obviously, transactions differ from sector to sector and for a particular sector from time to time and as such inter-sectoral relatedness varies both in nature in degree. As noted above, a sector performs two types of inter - sectoral activities input purchasing and output distributing (selling). On the basis of the type of sectoral activities input use linkage (backward linkage) is distinguished from output distribution linkage (forward linkage). A sectors input linkage describe how it depends upon other sectors for its inputs, while its distribution linkage exhibit the dependence of other sectors on its own output for their resources. The importance of a sector to other sectors is thus judged by its distribution linkages, while its input linkages reveal the importance of other sectors to it. In the following sections the backward and forward linkages of chemical enterprises with different sectors and regions are analysed.

6.5 **Backward Linkages** :

The purchases by a enterprises consists of different material and these are purchased from different sources (located inside Baroda district or outside Baroda district). Some times the same input is found to be purchased from different sources. It is observed that in many instances the purchases by the firms are not directly from the producers but from middlemen. Therefore care was taken to identify the actual producer where ever possible. Depending upon the nature of inputs, these were classified into twenty broad categories. Two of these twenty categories consist of Basic Organic Chemicals and Basic Inorganic Chemicals. These two categories of inputs were further divided into 4 (four) sub - groups each. Therefore, we have in total inputs being divided into twenty six categories. The purchases by each firm of the chemical industrial group under study has been divided into these twenty six categories.

These twenty six categories are (1) Basic inorganic chemicals, which are further divided into (a) inorganic acids; (b) inorganic salts; (c) inorganic solvents; (d) other inorganic compounds, (2) Basic organic chemicals, which are further divided into (a) organic acids; (b) organic salts; (c) organic solvents; (d) other organic compounds, (3) Fertilizers and concentrated pesticides, (4) Paints, Varnishes and lacquers, (5) Basic drugs and formulations, (6) Perfumes and cosmetics, (7) Inedible oils, (8) Turpentine and synthetic resins, (9) Other chemicals, (10) Food and food products, (11) Petroleum products, (12) Non-metallic mineral products, (13) Basic metal and alloys, (14) Other raw material, (15) Electricity, (16) Other fuels, (17)

Packaging, (18) Transport, (19) Repair and maintenance, (20) Miscellaneous.

From among these, twenty categories information regarding input purchases according to the origin of the input could be collected only for the first fourteen categories. For these categories, inputs have been classified depending on their origin that is, Baroda district or Gujarat (other than Baroda district) or other regions. For the rest of the size categories, it is assumed that these material originate from Baroda district. The purchases of all these categories of inputs are from Baroda district, but one cannot definitely say that their origin is in Baroda district. For example, the electricity supply to the industries in Baroda region is done by the Baroda Municipal Corporation (BMC), but the BMC purchases electricity in bulk from various electricity generating organizations in Gujarat (chiefly Gujarat Electricity Board) and other regions. Therefore, this assumption, that the purchases of input in the last six categories are solely in Baroda district is a limitation of this exercise. The category other fuels include petrol, Kerosine, Low Density Oil, Diesel, and fire wood. The category miscellaneous includes different input that are not classified in the above 19 categories and also includes the firms expenditure on sales promotion measures.

The linkages are viewed in terms of inter industry transactions. However there is the regional dimension to these transactions in addition to the industrial/sectoral dimension.

which is not given due importance by the researchers. Few studies at micro level have emphasized on these aspects to certain extent. In this section the backward linkages of the small scale chemical enterprises are analysed.

All the 95 industrial units covered by the survey in Baroda region together consume a total of Rs. 15.78 crores worth of industrial inputs which work out to a ratio of 0.74 percent of output in 1984-85. The total inter industry feeding with in the region was Rs. 7.34 crores or 46 percent of the total inputs used, the rest coming from other regions of Gujarat and outside Gujarat. Before we analyse the inter industry and regional transactions in greater detail, let us take a view of the input structure of chemical enterprises. The inputs per unit of output (Input coefficients) are discussed in the following sub section and the results are presented in table -6.1.

6.5.1 **Input coefficients** :

Input output analysis is based on the assumption of constant input coefficients. This implies that over sufficiently long periods the input coefficients in a particular industry remain stable. This limitation does not minimize the utility or working out the input structures of different industries. The assumption of constant input coefficients can only be regarded as an approximation to the more complex production function observed in reality. Input coefficients in an industry cannot be constants, if they do not change at all, economic progress is unlikely. Changes in input coefficients differ from industry. Each industry

has its own peculiarities and it is useful to study them in isolation. The Table -6.1 provides input coefficients by industry. In calculation of the coefficients the gross output is taken into consideration against the value of raw material, therefore as the sum of the coefficients is less than unity. The materials consumed have been suitably aggregated into twenty broad classes reported earlier. The input structure depends on the type of products produced. For all chemical industries basic chemicals form major inputs. The basic organic chemicals have been subdivided into four categories. However this remains a broad classification based on the chemical structure and the properties of those material. Basic inorganic chemicals have also been divided into four broad classifications. Care was taken to cover all the material consumed in these broad classifications. Intermediates, final products and other binding and dispersing agents have been classified separately. In the dyes and paints, Drugs and pharmaceuticals, Fertilizers and Pesticides industry it is observed that intermediate products form a major composition. In all the industries Benzene derivatives are found to be a major raw materials.

The coefficients estimated here are at an aggregate level and these do not represent product level coefficients. In chemical industry fundamental difficulty is encountered because commodities which come out as outputs may be substitutes, while the inputs going into these commodities may not be substitutes or different from each other. Many of the chemicals processes yield by-products which have very much different properties to

Table 6.1 Input structure of different chemical industrial groups (input coefficients) (1984 - 85)

Sr. No.	Input	Inorganic chemicals	Organic chemicals	Fertilizers and pesticides	Dyes and paints	Drugs and pharmaceuticals	Soap and cosmetics	Other chemicals
	Basic							
1	Inorganic chemicals	0.3750	0.2272	0.1366	0.1423	0.0323	0.0925	0.2459
(i)	Inorganic acids	0.0813	0.0986	0.0147	0.0164	0.0155	0.0193	0.0731
(ii)	Inorganic salts	0.1852	0.0887	0.0439	0.0807	0.0037	0.0464	0.1265
(iii)	Inorganic solvents	0.0282	0.0355	0.0718	0.0227	0.0131	0.0032	0.0299
(iv)	Other inorganic compounds	0.0803	0.0044	0.0062	0.0225	-	0.0236	0.0165
	Basic							
2	Organic chemicals	0.0965	0.1857	0.3130	0.1344	0.0859	0.2808	0.2007
(i)	Organic acids	0.0237	0.0125	0.0005	0.0516	-	0.1607	0.0633
(ii)	Organic salts	0.0232	0.0698	0.0482	-	0.0205	0.0090	0.0405
(iii)	Organic solvents	0.0496	0.0599	0.2643	0.0602	0.0516	0.0701	0.0675
(iv)	Other organic compounds	-	0.0435	-	0.0226	0.0138	0.0410	0.0293
3	Fertilizers and Pesticides (concentrated)	0.0046	-	0.01396	0.0074	-	-	0.0037
4	Paints, lacquers and varnishes	-	-	-	0.0584	0.0009	0.0206	-
5	Basic Drugs and formulations	-	-	-	-	0.3357	-	-
6	Perfumes and cosmetics	-	0.0214	-	-	0.0001	-	0.0019
7	Inedible oils	-	-	-	-	-	0.0891	-
8	Turpentine and synthetic resins	0.0123	0.1093	0.0032	0.1729	-	-	-

Table 6.1 (Contd...)

Sr. No.	Input	Inorganic chemicals	Organic chemicals	Fertilizers and pesticides	Dyes and paints	Drugs and pharmaceuticals	Soap and cosmetics	Other chemicals
9	Other chemicals	0.0204	0.0079	0.0172	0.0323	0.0094	0.0392	0.0962
10	Food and food products	-	-	-	-	0.0006	-	0.0053
11	Petroleum products	0.0386	0.0230	0.0025	-	0.0017	0.0106	0.0599
12	Non - metalic mineral products	0.0215	0.0008	0.0022	0.0053	0.0023	-	0.0021
13	Basic metal and alloys	0.0549	0.0289	0.0064	0.0089	0.0036	-	-
14	Other raw materials	0.0029	0.0032	0.0180	0.0044	0.0331	0.0203	0.0031
15	Electricity	0.0374	0.0247	0.0093	0.0186	0.0243	0.0109	0.0109
16	Other fuels	0.0525	0.0381	0.0114	0.0172	0.0034	0.0068	0.0228
17	Packaging	0.0202	0.0213	0.0500	0.0502	0.0841	0.0476	0.0163
18	Transport	0.0139	0.0094	0.0211	0.0093	0.0120	0.0191	0.0185
19	Repair and maintaince	0.0144	0.0153	0.0078	0.0054	0.0332	0.0085	0.0108
20	Miscellaneous	0.0215	0.0181	0.0491	0.0663	0.0490	0.0860	0.0083
21	Gross value added	0.2154	0.2656	0.2125	0.2667	0.2886	0.2680	0.2936
22	Gross output	1.0021	0.9999	0.9999	1.0000	1.0002	1.0000	1.0000

Note : Estimated from the data collection from 95 chemical enterprises in Baroda region.

that of primary product. Hence even in case of firm level studies certain difficulties are faced in estimating input-output coefficients. This has been illustrated by Barna[54] with the example of cotton and Rayon yarn or textiles which are substitutes products for the consumers who buy and hence there may be justification on aggregating the production of these commodities into a single industry. However the raw materials used for making cotton yarn are very much different than those used for rayon. The manufacturing processes are also different. This calls for disaggregation of the sector.

At times, the complexities involved are so great that it becomes extremely difficult to take into account all the inter relations and alternative combinations of product - mix that can be produced with the same input or slight variation of the given inputs. This difficulty is often experienced in the chemical industries. This is all the more so because Even within the same firm, the product - mix may change fast. A firm producing more than one product may change the input combinations for producing a chemical of different nature. Hence even at firm level the input coefficients can vary.

The input coefficients as expected are found to vary with each industry. The importance of a particular input, depends upon the nature of the products and the technology adopted.

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54. Tibor, Barna - "Classification and aggregation in input - output analysis", in, structural dependence of the Economy Ed, Tibor Barna.

Therefore the input structure would differ from one firm to

another firm. The industrial input requirement per unit of output varies from 0.7064 in other chemicals to 0.7875 in fertilizer and pesticides. In Drugs and pharmaceuticals, the basic drug formulations used per unit worth of output is 0.34. In Dyes and paints, synthetic resins and turpentine used for unit worth of final product is 0.17. In all other industrial categories basic chemicals form the core of the materials used. The basic chemicals are a broad category consisting of numerous chemicals which have their own specific properties. In Fertilizer and pesticides, the concentrated pesticides used for one rupee worth of output is 0.14. Over all the chemicals form a large raw material base for this industry. The importance of other inputs cannot be neglected. Each firm draws material depending upon its necessity which is determined by the products produced and the technology used.

The gross value added per unit of output is presented at the end of the table - 6.1. The value added per unit of output varies from 0.2936 to 0.2135 in various industrial groups. However when one takes into consideration, the firm level data, the variations are more pronounced.

The industry wise input pattern is derived from the information provided by the sample units. It may be mentioned here, that the input coefficient matrix, presented above is based on this data only. The basic data obtained is presented in the form of table - 6.2 . It gives the purchase of inputs by various chemical industries of Baroda from Baroda district and outside Baroda district at 1984-85 prices. The data has two dimensions

in it, firstly the inter - industry dependence and secondly the regional dependence. Let us first analyse the inter-industry dependence.

6.5.2 **Industry Linkages**

The chemical industries in Baroda can be categorised into groups depending on the intensity of their linkages with other industries. The heavy dependence of an industry on a particular product or group of products reveal its intensity of backward linkage to that particular product/products. It has been observed that firms under survey exhibit very low linkages to very high linkages of 48 percent. Therefore it has been decided to broadly divide the industries depending on the levels of backward linkages into 3 categories :- (see table - 6.2)

(i) Highest backward linkages. An industry is classified under this category, if the contribution of a product to input requirement of the industry is greater than 33 percent (i.e. 1/3rd). (ii) High backward linkages - An industry is classified under this category, if the contribution of a product to input requirements in the industry is to the tune of 10 percent to 33 percent (i.e. 1/10th to 1/3rd). (iii) Low backward linkages - An industry is classified under this category, if the contribution of products to input requirements in the industry is less than 10 percent. As a matter of fact every input has its importance in production structure, but a firm can still maintain and pull on its production despite shortages in some of the materials. Higher the linkages of an industry to a particular product/group

of products, a firm cannot function with out them and the firms dependence on such products is heavy.

(i) Highest backward linkages : The industries which fall into this group are inorganic chemicals, fertilizers and pesticides, Drugs and pharmaceuticals, soap and cosmetics, other chemicals. In all these industrial categories a product or group of homogeneous products from a sector contribute to more than 1/3rd of their material inputs.

In case of inorganic chemical industry in Baroda, 48 percent of its material inputs are basic inorganic chemicals Out of 2.55 crores expenditure on inputs, Rs. 1.22 crores is spent on purchase of inorganic chemicals only. This shows intensity of backward linkage of the inorganic chemical industry to the basic inorganic chemical industry. The dependence of this industry is found to vary with the nature of various categories of Basic inorganic chemicals.

The fertilizer and pesticides are found to depend on basic organic chemicals to the tune of 40 percent of material inputs (amounting to Rs. 1.06 crores). This industry manufactures various fungicides, Biocides, Bio-fertilizers and different kinds of pesticides and products for which the organic solvents are used in large quantities.

Drugs and pharmaceuticals industry is dependent on Basic Drugs and formulations. Out of total input purchases of 3.18 crores, Rs. 1.5 crores is spent (47 percent) on Drugs and formulations only.

Other chemicals industry which manufacture various laboratory and fine chemicals spend 35 percent of its input requirements (Rs. 88 lakhs) on Inorganic chemicals only.

Any disruption in supply of raw material from the industries producing these products would invariably lead to lowering of efficiency of the plants. This `Highest dependence' is largely due to the nature of chemical industry, which is raw material based. Even though this industry exhibits high forward linkages to various other sectors, it exhibits backward linkages to only few sectors.

(ii) High Backward Linkages : An industry is categorised as exhibiting high backward linkage if it is highly dependent on a single product or a group of homogeneous products to the tune of 10 percent to 33 percent of its input requirements. It has been observed that all the chemical industrial groups have exhibited high linkages to one or other industrial sector.

Organic chemicals are basically the compounds of carbon and Hydrogen. The raw material used by this industry are for the most part, already man made products. For this reason, this industry is clustered around petrochemicals and oil refineries. This industry is heavily dependent on Basic chemicals both inorganic and organic. The basic chemicals; inorganic (31 percent, Rs. 57 lakhs) organic (25 percent, Rs. 47 lakhs) form 57 percent of input requirements of this industry. In addition this industry is also dependent on synthetic resins to the tune of 15 percent of the input requirements.

Other chemicals which manufactures laboratory chemicals and fine chemicals is also found to depend on basic organic chemicals to the tune of 28 percent (Rs. 72 lakhs); other chemicals it selt to the tune of 14 percent of the input requirements.

Dyes and paints industry is diverse in nature with wide range of products. For this industry Turpentine and synthetics resins form a major input which constitute 24 per cent of purchases (Rs. 50 lakhs). This industry also exhibit high linkages to the chemicals industry with inorganic chemicals (19 per cent); organic chemicals (18 per cent) form a input requirements.

Inorganic chemicals industry use basic organic chemicals to the tune of 12 per cent of input requirements. Fertilizers and pesticides use Basic inorganic to the tune of 17 per cent and concentrated pesticides to the tune of 18 per cent of its input requirements. Soap and cosmetics requires basic inorganic chemicals (13 per cent) and inedible oils (12 per cent) as input requirements. In case of Drugs and pharmaceuticals 12 per cent of input requirements are basic organic chemicals.

These various inputs, exhibit high backward linkages to the chemical enterprises; however, the importance of other inputs can not be undermined.

(iii) **Low Linkages** :

The importance of other products (less than 10 per cent) cannot be underestimated. Their share in the input costs are low

but at times are very crucial in nature. A general input of prime importance in this category is electricity and at times water is of very great importance. A short supply or cut in supply would effect the production schedule and plant capacit cannot be used to the fullest extent. A more important, but insignificant input (in terms of cost) in chemical industry are the catalysts. A catalysts monitors the production process (either it speedens or slower the reaction). with or without taking part in the reaction. It is of great importance in chemical process, but while estimating the linkages it gets an insignificant role.

Overall, one notices that chemical enterprises exhibit high backward linkages to the Basic chemicals industry, which consists of Basic inorganic chemicals and Basic organic chemicals. Except for Dyes and paints (37 per cent); Drugs and Pharmaceuticals (16 per cent); the firms expenditure of purchase of basic chemicals is to the extent of 50 per cent and above. Various other chemicals also form a large proportion of input structure. This indicates heavy dependence of this sector on chemicals itself.

On Pg 248 — you say a high of 48%

6.5.3 **Regional Linkages** :

The other aspect of linkages is the regional dependence of industries. The input requirements in a region can be met, only if the required products are produced in the region or available as a resource in the region.

In the absence of which the industries in a region has to

Table 6.2 Purchase of inputs by various chemical industries of Baroda from various industries located in Baroda district and outside Baroda district (1984-85). (Rs.'000)

Supplying sectors located within Baroda district and other regions.	Demanding sectors located in Baroda region: Inorganic Chemicals	Organic Chemicals	Fertilizers and pesticides	Dyes and paints	Drugs and pharmaceuticals	Soap and Cosmetics	Other Chemicals
1	2	3	4	5	6	7	8
Basic							
1. Inorganic chemicals							
Baroda district	2979 (24.42)	3064 (53.48)	966 (20.82)	1162 (28.10)	304 (21.01)	674 (61.95)	4169 (47.30)
Outside Baroda	9222 (75.58)	2666 (46.52)	3674 (79.18)	2973 (71.90)	1143 (78.99)	414 (38.05)	4645 (52.70)
Total	12201 (47.79)	5730 (30.94)	4640 (17.34)	4135 (19.40)	1447 (4.55)	1088 (12.64	8814 (34.81)
(a) Inorganic acids							
Baroda district	828 (31.28)	1671 (67.19)	129 (25.9)	207 (43.49)	76 (10.98)	120 (52.86)	1300 (49.58)
Outside Baroda	1819 (68.72)	816 (32.81)	369 (74.10)	269 (56.51)	616 (89.02)	107 (47.14)	1322 (50.42)
Total	2647 (10.37)	2487 (13.43)	498 (1.86)	476 (2.23)	692 (2.17)	227 (2.64)	2622 (10.36)
(b) Inorganic salts							
Baroda district	982 (16.29)	902 (40.30)	225 (15.07)	640 (27.29)	38 (22.62)	336 (61.54)	2016 (44.46)
Outside Baroda	5045 (83.71)	1336 (59.70)	1268 (84.93)	1705 (72.71)	130 (77.38)	210 (38.46)	2518 (55.54)
Total	6027 (23.61)	2238 (12.09)	1493 (5.58)	2345 (11.01)	168 (0.53)	546 (6.34)	4534 (17.90)
(c) Inorganic Solvents							
Baroda district	436 (47.60)	451 (50.45)	512 (20.99)	226 (34.29)	190 (32.37)	38 (100)	645 (60.28)
Outside Baroda	480 (52.40)	443 (49.55)	1927 (79.01)	433 (65.71)	397 (67.63)	- -	425 (39.72)
Total	916 (3.59)	894 (4.83)	2439 (9.12)	659 (3.09)	587 (1.85)	38 (0.44)	1070 (4.23)
(d) Other Inorganic Compounds							
Baroda district	733 (28.07)	40 (36.04)	100 (47.62)	89 (13.59)	- -	180 (64.98)	208 (35.37)
Outside Baroda	1878 (71.93)	70 (63.96)	110 (52.38)	566 (86.41)	- -	97 (35.02)	380 (64.63)
Total	2611 (10.22)	111 (0.59)	210 (0.78)	655 (3.07)	- -	277 (3.22)	588 (2.32)

Table 6.2 contd....

1	2	3	4	5	6	7	8
2. Basic Organic Chemicals							
Baroda district	1915 (60.99)	3634 (77.60)	1910 (17.96)	842 (21.56)	1180 (30.71)	2649 (80.25)	1866 (25.94)
Outside Baroda	1225 (39.01)	1049 (22.40)	8724 (82.04)	3064 (78.44)	2662 (69.29)	652 (19.75)	5327 (74.06)
Total	3140 (12.30)	4683 (25.29)	10634 (39.75)	3906 (18.33)	3842(12.07)	3301 (38.36)	7193 (28.47)
(a) Organic acids							
Baroda district	535 (69.30)	200 (63.69)	17 (100)	415 (27.65)	- -	1560 (82.58)	770 (33.92)
Outside Baroda	237 (30.70)	114 (36.31)	- -	1086 (72.35)	- -	329 (17.42)	1500 (66.08)
Total	772 (3.02)	314 (1.70)	17 (0.06)	1501 (7.04)	- -	1889 (21.95)	2270 (8.97)
(b) Organic Salts							
Baroda district	429 (56.82)	1439 (81.71)	440 (26.89)	- -	371 (40.46)	75 (70.75)	515 (35.44)
Outside Baroda	326 (43.18)	322 (18.29)	1196 (73.11)	- -	546 (59.54)	31 (29.25)	938 (64.56)
Total	755 (2.97)	1761 (9.51)	1636 (6.12)	- -	917 (2.88)	106 (1.23)	1453 (5.74)
(c) Organic solvents							
Baroda district	951 (58.96)	1070 (70.72)	1453 (16.18)	327 (18.70)	609 (26.38)	674 (81.80)	326 (13.47)
Outside Baroda	662 (41.04)	443 (29.28)	7528 (83.82)	1422 (81.30)	1700 (73.62)	150 (18.20)	2094 (86.53)
Total	1613 (6.33)	1513 (8.17)	8981 (33.57)	1749 (8.21)	2309 (7.25)	824 (9.58)	2420 (9.55)
(d) Other organic compounds							
Baroda district	- -	925 (84.47)	- -	100 (15.24)	200 (32.47)	340 (70.54)	255 (24.29)
Outside Baroda	- -	170 (15.53)	- -	556 (84.76)	416 (67.53)	142 (29.46)	795 (75.71)
Total	- -	1095 (5.91)	- -	656 (3.08)	616 (1.94)	482 (5.60)	1050 (4.15)
3. Fertilizers & Concentrated Pesticides							
Baroda district	95 (63.33)	- -	630 (13.29)	85 (39.53)	- -	- -	60 (44.78)
Outside Baroda	55 (36.67)	- -	4111 (86.71)	130 (60.47)	- -	- -	74 (55.22)
Total	150 (0.59)	- -	4741 (17.73)	215 (1.01)	- -	- -	134 (0.53)

Table 6.2 contd....

1	2	3	4	5	6	7	8
4. Paints, Varnishes and Lacquers							
Baroda district	- -	- -	- -	270 (15.91)	40 (100)	172 (71.07)	- -
Outside Baroda	- -	- -	- -	1427 (84.09)	- -	70 (28.92)	- -
Total	- -	- -	- -	1697 (7.96)	40 (0.13)	242 (2.81)	- -
5. Basic Drugs & Formulations							
Baroda district	- -	- -	- -	- -	2616 (17.42)	- -	- -
Outside Baroda	- -	- -	- -	- -	12400 (82.58)	- -	- -
Total	- -	- -	- -	- -	15016 (47.18)	- -	- -
6. Perfumes & Cosmetics							
Baroda district	- -	217 (40.19)	- -	- -	5 (100)	- -	67 (100)
Outside Baroda	- -	323 (59.81)	- -	- -	- -	- -	- -
Total	- -	540 (2.92)	- -	- -	5 (0.02)	- -	67 (0.26)
7. Inedible Oils							
Baroda district	- -	- -	- -	- -	- -	822 (78.51)	- -
Outside Baroda	- -	- -	- -	- -	- -	225 (21.49)	- -
Total	- -	- -	- -	- -	- -	1047 (12.17)	- -
8. Turpentine & Synthetic Resins							
Baroda district	140 (35.00)	340 (1..34)	24 (21.82)	119 (2.37)	- -	- -	- -
Outside Baroda	260 (65.00)	2416 (87.66)	86 (78.18)	4907(97.63)	- -	- -	- -
Total	400 (1.57)	2756 (14.88)	110 (0.41)	5026 (23.58)	- -	- -	- -
9. Other chemicals							
Baroda district	370 (55.72)	185 (92.50)	236 (40.34)	246 (26.20)	71 (16.86)	315 (68.33)	649 (18.82)
Outside Baroda	294 (44.28)	15 (7.50)	349 (59.66)	693 (73.80)	350 (83.14)	146 (31.67)	2800 (81.18)
Total	664 (2.60)	200 (1.08)	585 (2.19)	939 (4.41)	421 (1.32)	461 (5.36)	3449 (13.62)
10. Food & Food products							
Baroda district	- -	- -	- -	- -	25 (100)	- -	130 (68.06)
Outside Baroda	- -	- -	- -	- -	- -	- -	61 (31.94)
Total	- -	- -	- -	- -	25 (0.08)	- -	191 (0.75)

Table 6.2 contd...,

1	2	3	4	5	6	7	8
11. Petroleum Products							
Baroda district	945 (75.18)	519 (89.48)	85 (100)	- -	75 (100)	97 (77.60)	915 (42.62)
Outside Baroda	312 (24.82)	61 (10.52)	- -	- -	- -	28 (22.40)	1232 (57.38)
Total	1257 (4.92)	580 (3.13)	85 (0.32)	- -	75 (0.24)	125 (1.45)	2147 (8.48)
12. Non Metalic mineral products							
Baroda district	327 (46.71)	20 (100)	75 (100)	- -	20 (19.80)	- -	75 (100)
Outside Baroda	373 (53.29)	- -	- -	155 (100)	81 (80.20)	- -	- -
Total	700 (2.74)	20 (0.11)	75 (0.28)	155 (0.73)	101 (0.32)	- -	75 (0.30)
13. Basic Metal and alloys							
Baroda district	412 (23.06)	475 (65.07)	183 (83.56)	30 (11.63)	65 (59.38)	- -	- -
Outside Baroda	1375 (76.94)	255 (34.93)	36 (16.44)	228 (88.37)	95 (40.62)	- -	- -
Total	1787 (6.99)	730 (3.94)	219 (0.83)	258 (1.21)	160 (0.50)	- -	- -
14. Other Raw Material							
Baroda district	65 (69.15)	81 (100)	330 (54.01)	65 (51.18)	361 (24.39)	189 (79.08)	50 (45.45)
Outside Baroda	29 (30.85)	- -	281 (45.99)	62 (48.82)	1119 (75.61)	50 (20.82)	60 (54.55)
Total	94 (0.37)	81 (0.44)	611 (2.28)	127 (0.60)	1480 (4.65)	239 (2.78)	110 (0.43)
Other Inputs (All Purched as Baroda Districts)							
15. Electricity	1216 (4.76)	622 (3.36)	317 (1.18)	540 (2.53)	1087 (3.42)	128 (1.49)	389 (1.54)
16. Other Fuels	1709 (6.69)	960 (5.18)	386 (1.44)	499 (2.34)	150 (0.47)	80 (0.93)	816 (3.22)
17. Packaging	656 (2.57)	538 (2.91)	1700 (6.35)	1459 (6.85)	3761 (11.82)	560 (6.51)	586 (2.31)
18. Transport	453 (1.77)	236 (1.27)	717 (2.68)	271 (1.27)	538 (1.69)	224 (2.60)	662 (2.62)
19. Repair and Maintainance	470 (1.84)	385 (2.08)	265 (0.99)	158 (0.74)	1483 (4.66)	100 (1.16)	388 (1.53)
20. Miscellaneous	614 (2.42)	457 (2.47)	1667 (6.23)	1927 (9.04)	2192 (6.88)	1011 (11.74)	298 (1.18)

Table 6.2 contd....

1	2	3	4	5	6	7	8
Total Inputs							
Baroda district	12366 (48.44)	11733 (63.36)	9491 (35.48)	7673 (36.00)	13973 (43.91)	7021 (81.58)	11120 (43.92)
Outside Baroda	13164 (51.56)	6785 (36.64)	17261 (64.52)	13639 (64.00)	17850 (56.09)	1585 (18.42)	14200 (56.08)
Total	25530 (100)	18518 (100)	26752 (100)	21312 (100)	31823 (100)	8606 (100)	25320 (100)
Gross output	32539	25217	33972	29062	44732	11757	35845
Backward Linkages							
Total (%)	78.46	73.43	78.74	73.33	71.14	73.20	70.64
(i) Baroda District (%)	38.00	46.53	27.94	26.40	31.24	59.72	31.02
(ii) Outside Baroda District (%)	40.46	26.90	50.80	46.93	39.90	13.48	39.62
Gross value added (current prices)	7009	6699	7220	7750	12909	3151	10525

Source : Survey data (Based on the data collected from 95 chemical enterprises in Baroda region)

Note :

(i) Figures in brackets corresponding to totals of each supplying industry are percentages of total inputs demanded by the producing industry.

(ii) Figures in brackets corresponding to supplying sectors for (a) Baroda District (b) outside Baroda are percentage of the sales of each supplying sector to a producing sector.

depend upon the produce of other regions. The industrial dependence or regions for input requirements, to certain extent explain the locational pattern of industries, though one has to accept that other criteria too influence such location pattern. In what follows the input linkages of 95 enterprises surveyed in accordance with the region of inputs are discussed.

Out of the total purchases by the surveyed firms, which amounts to Rs. 15.17 crores; 46 per cent are purchased from Baroda district only (Rs. 7.3 crores). The linkage pattern is found to vary with the type of industry. In soap and cosmetics 85 per cent of the purchases are from Baroda district. The lowest recorded purchases are in fertilizers and pesticides which is 35 per cent. Variations are great when one observes the firm wise data. Even when one takes a glance at the product wise inputs purchases from different regions, one notices lot of variations.

Basic inorganic chemicals are purchased from outside Baroda district, to the extent of 65 per cent. Basic organic chemicals are purchased from outside Baroda district to the tune of 38 per cent. Even though one finds concentration large chemical, petrochemical and fertilizer companies in Baroda region, the basic chemicals to a large extent come from other regions. The other major inputs that come from outside Baroda district are concentrated pesticides, Turpentine and synthetic resins and other chemicals. Various inputs such as electricity, packaging, transport, repair and maintenance and other services, all originate from Baroda district only.

The linkages of an industry to the local region depends upon

its very nature. An industry like dyes and paints exhibit high linkages to other regions because one of its major raw material 'turpentine' is available mainly from Uttar Pradesh and Haryana. The pesticides industries are found to exhibit high linkages to Bombay region. Overall the chemical enterprises are found to exhibit high backward linkages to the local region.

6.6 **Forward Linkages** :

The total number of products manufactured by the firms surveyed are 237. Some of these products are by - products of the firms, which carry value in the market. Many of the firms are found to manufacture products using simple processes. However, few firms have ventured into high technology fields and are manufacturing complicated products. In complicated processes where multi - products are manufactured, it is difficult or even say impossible to attribute inputs to a certain output. Because of the nature of reactions, the by - product which yields in the process can be entirely of a different class. For example, the by - product plants in steel projects are coal based chemicals which are a class all together different from the steel industry.

The chemical enterprises in Baroda regions are found to exhibit output disposal links to various industries across regions. The data pertaining to the sales of the enterprises have been collected on firm to firm basis. The firms exhibited no difficulty in giving information and the problem was that firms at times did not know the ultimate user or consumer of their product. The data pertaining to the immediate source was forth

coming and in cases where the producer is in direct contact with the customer, the data was collected with little difficulty. The sales through trade channels do not always lead to us to the ultimate consumer. In many instances, the product changes number of hands before reaching the ultimate consumer. Traders in Baroda region were contacted and where ever possible the ultimate consumer was located. Sales, through traders where ultimate consumer could not be identified is represented as a separate category in the classification of sales. The data is presented in table - 6.3.

Depending upon the destination of outputs to various industrial categories, the sales of the firms have been classified by region and industry. In all, the output disposal linkages are classified under 16 heads. The sales of the firms in various chemical industrial groups have been classified under these categories. Out of these 16 categories, 9 are different types of chemical industries. Laboratory chemicals are classified separately as these are sold to different organization in chemical industry and outside it. These chemicals have wide applications such as for research purpose, clinical laboratories, industrial uses etc.

The sixteen categories are (1) inorganic chemicals (2) organic chemicals (3) fertilizers an pesticides (4) dyes (5) paints (6) drugs and pharmaceuticals (7) cosmetics (8) soap (9) other chemicals (10) laboratory chemicals (11) paper and jute (12) textiles (13) food industry (14) agriculture (15) trade and other industries (16) final use.

	Paints			Drugs and Pharmaceuticals			Cosmetics			Soap		
Total	Baroda District	Outside Baroda District	Total	Baroda District	Outside Baroda District	Total	Baroda District	Outside Baroda District	Total	Baroda District	Outside Baroda District	Total
12	13	14	15	16	17	18	19	20	21	22	23	24
11832	250	451	701	1257	2836	4093	505	226	731	-	-	
(36.36)	(35.66)	(64.34)	(2.15)	(30.71)	(69.29)	(12.58)	(69.08)	(30.92)	(2.25)			
1566	-	-	-	3475	11286	14761	585	1401	2046	-	-	
(6.21)				(23.54)	(76.46)	(58.54)	(28.59)	(71.41)	(8.11)			
88	-	-	-	599	7993	8592	-	-	-	-	-	
(0.26)				(6.97)	(93.03)	(25.29)						
2607	247	1494	1741	-	-	-	-	-	-	-	-	
(8.97)	(14.11)	(85.84)	(5.99)									
-	-	-	-	1213	16788	18001	-	-	-	-	-	
				(6.74)	(93.26)	(40.24)						
1417	-	-	-	39	79	118	288	1621	1909	654	2817	3471
(12.31)				(33.05)	(66.95)	(1.00)	(15.09)	(84.91)	(16.24)	(18.84)	(81.16)	(29.52)
393	116	185	301	950	11291	12241	172	360	532	573	2230	2803
(1.10)	(38.54)	(61.46)	(0.84)	(7.76)	(92.24)	(34.15)	(0.48)	(67.67)	(1.48)	(20.44)	(79.56)	(7.82)

Each of these categories are divided into two divisions depending upon the destination of the products sold. These are (1) Baroda district (2) Outside Baroda district [this category consist of sales to (a) other districts of Gujarat (b) other states and (c) exports].

The information pertaining to the disposal of output, produced by chemical enterprises surveyed is presented in table 3.3. The total output produced by these 95 enterprises amounts to Rs. 21.3 crores. Of the total output, 68 per cent (Rs. 14.49 crores) goes in as input to other industries. The rest 32 per cent (Rs. 6.82 crores) goes for final use directly or through traders. Out of its own output, the chemical industry uses 56 per cent (Rs. 11.93 crores) as its input. Overall the industrial link is to the tune of 68 per cent, but this industrial link is across regions. Therefore, the regional dimension exist to the output disposal linkages (forward linkages). Let us first analyse the industry links in detail.

6.6.1 **Industry Linkages** :

An industry acts as a feeder to member of other industries, which are diverse in nature. Chemical industry's product have wide applications in number of industries and are used in day to day life of every individual. This is one industry which exhibit high forward linkages. Depending upon the degree of linkages the industries can be classified into (1) Highest forward linkages (2) High forward linkages (3) Low forward linkages. an industry

can be classified in the first category, if more than 1/3rd (33 per cent) of its output is sold to one particular industry. An industry can be classified in the second category, if its sales to a particular industry is to the tune of 1/10th to 1/3rd (10 per cent to 33 per cent). Industries whose sales to a particular industry is less than 10 per cent, then it can be classified as exhibiting low linkages.

(1) Highest forward linkages :

The industries exhibiting highest linkages to a particular industry are inorganic chemicals, organic chemicals, drugs and pharmaceuticals, other chemicals. It is observed that in three of these cases, the industry exhibit highest linkages to Drugs and pharmaceuticals manufacturers. The sales to this industry forms 27 per cent of output of all chemical enterprises surveyed.

Inorganic chemicals industry, sell 36 per cent of its output to dyes manufacturers. These chemicals because of their intermediate nature exhibit forward linkages to various other industries.

Organic chemical industry manufacture various chemicals which are demanded by industries manufacturing final products. 59 per cent of output of organic chemical industry is sold to drugs and pharmaceuticals.

Drugs and pharmaceuticals industry is found to sell its products to itself for further processing to the tune of 40 per cent of its produce.

Other chemicals industry which manufacturers various fine

chemicals and laboratory chemicals sell 34 per cent of its outputs to drugs and pharmaceuticals. As noted earlier, drugs and pharmaceuticals, industry have been purchasing significant proportion of production in Baroda region. The sales to this industry are largely in Baroda, Ahmedabad, Ankleshwar and Bombay industrial centers.

(2) High linkages :

The chemical industries are found to exhibit linkages to non - chemical industries. A portion of their products are sold for final consumption. However, greater proportion is sold to other industries for further processing. An industry is categorised as exhibiting high forward linkage if it sells its products to an industry to the tune of 10 per cent to 33 per cent.

Inorganic chemicals industry sells its products to inorganic itself to the tune of 14 per cent of its output.Organic chemicals is also found to sells its output to organic chemical itself to the tune of 11 per cent of its output.

Fertilizers and pesticides sales to the drugs and pharmaceuticals to the tune of 25 per cent and to fertilizers and pesticides to the tune of 31 per cent.

Soap and cosmetics sales to dyes industry is 12 per cent, cosmetics 16 per cent, soap manufacturing (30 per cent) textiles (10 per cent). This industry is found to exhibit disposal linkages to a number of industries. Other chemicals exhibit high disposal linkages to laboratory chemicals manufacturing

industries.

In addition to these the produce of chemical industry is sold to a number of industries, in minute quantities. The chemical industry is said to exhibit low linkages to these enterprises. That is when sales are less then 10 per cent of output.

Many industries are found to exhibit forward linkages to non industrial sector. Fertilizers and pesticides industry sells a large proportion of its output 35 per cent to agriculture sector. Many of the products are sold for final use directly or through traders. Depending upon the usage of the products and bye products produced these are sold for final consumption. The sales to traders and final use directly are found to vary from. 62 per cent in dyes and paints to a low of 7 per cent in inorganic chemicals.

6.6.2 **Regional Linkages :**

In general it is observed that as a region develops, more and more of regional output of one industry is utilized as input by other industry in the region. This implies that the ratio of inter industry demand to gross output of the sector tends towards unity. When the ratio is less than unity as we see in the case of chemical enterprises in Baroda region, it means that the input is not fully processed in the region, but is either exported and/or used for final consumption. Out of the total output, only 18 percent (Rs. 3.8 crores) is sold in Baroda district, the rest 72%

is sold in other regions, other districts of Gujrat (23 per cent) other states in India (58 per cent); exports, (1 per cent). approximately. These appears slight variations in the proportionate sales by different industrial categories.

The data presented in table - 6.3 reveal that for all the chemical industrial groups the disposal linkages to Baroda district are lower than that of other regions. In case of soap and cosmetics 35 per cent of sales is in Baroda district and in all other industrial categories it is less, least being the case of drugs and pharmaceuticals (10 per cent). In case of soap and cosmetics industry, its sales to dyes industry and textiles industry in Baroda district was observed to be greater than that of other regions. In inorganic chemicals industry, its sales to cosmetics manufacturing industry and sales to final use have been observed to be greater in Baroda district than in other regions. For all other industries and for each of the industry purchasing from the industries in Baroda, the sales to other regions are reported to be high. This indicates a high forward links of chemical enterprises to other regions and a low link to the local (Baroda district) region. We have noted earlier that the firms are highly backward linked to the Baroda district. This indicates that, in general the purchases from the district are high, with low sales in the district.

In the previous section and in this section we have seen the linkage pattern of small enterprises of chemical industry to that of various other sectors and to different regions. The literature on small scale industry has laid great emphasis on the linkages

of small scale industry to that ot urban centres. With the help of the same data let us take a look at the linkage pattern of chemical enterprises (input purchase linkages and output disposal linkages) to the large scale industry and to urban centres. The results and discussion follows in the next section.

6.7 **Linkages** - Small industry with large industry and urban centres :

As large industry is concentrated mainly in developed regions so is the modern small scale industry. Modern small scale industrial units are generally found to be linked to large producers for purchase of materials and sale of products. Various studies have indicated the nature of relation of the small scale industry to that of large industry. The study by Dhar[55] on small scale industry in Delhi indicates that in majority of the industries the greater proportion of raw material originates from large scale establishments. Products produced by small scale units are used as raw material to a less extent by large establishments. Howeyer, the material usages depends upon the nature of industry. The study by Lakdawala and Sandesara[56] pertaining to small scale units in Bombay city indicate that the small producers are facing heavy competition from the large scale producers. Gupta[57] in his study of small and medium industry in

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55. Dhar P.N, - op.cit.

56. Lakdawala D.T. and Sandesara, J.C. - " Small industries in a big city. A survey of Bombay". 1960, Bombay.

57. Gupta L.C. - op.cit.

Jamshedpur indicates that, these firms sell more than half of

their produce to large scale units. As a matter of fact they act as ancillary units producing the requirements of large enterprises and they derive their raw material from large enterprises. The study by Sandesara[58] indicates that the large producers were immediate customers and immediate suppliers of raw material in a large number of cases. Various other studies such as by Kashyap[59], Van deer Veen[60] too indicate dependence of small sector on the manufacturing sector. The study by Mathur[61] on small scale units in Agra region indicates that many enterprises were acting as ancillary to large chemical, scientific goods, shoe industries, agriculture implements etc.

Modern small scale industry is found to be highly concentrated in urban centres. Various studies have indicated that the concentration increases with the size of urban centres. It has also been observed that this industry show high forward and backward linkages with the regional economy. Their immediate purchasers and sales are primary in urban centres. Various policy measures to decentralize this sector have not yielded much result. The study by Lakdawala and Sandesara[62] of the Bombay city

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58. Sandesara J.C. - `Efficacy of incentives to small industries'. University of Bombay, 1982.

59. Kashyap S.P. - "Regional planning in a consistency frame work'. Allied publishers.

60. Jan. H. Vandeer Veen op.cit.

61. Mathur S.P. -`Economics of small scale industries'.Sandeep prakashan. 1979.

62. Lakdawala D.T. and Sandesara J.C. op.cit.

indicate that the immediate suppliers of raw material and

immediate purchasers of final products are mostly located in the city. However, these are only immediate purchaser or suppliers, that is, they are neither the ultimate users of the product nor the producers of the material. In this sense they do not indicate only the final linkage and they are only link leading to the ultimate linkage. This study also indicates that retailers and whole sellers are the major supplies of raw material and purchasers of final product. The study by Dhar[63] on small scale industries in Delhi indicates that greater proportion of raw material originates from outside Delhi region. The study of chemical and engineering industry in Pune by Bhattacharya[64] 'indicate' that the local linkages are not well developed as the major portion of raw material used in these industries originate from other regions. The final products are destined to outside Pune region and heavy dependence upon Bombay is indicated..

There is a distinct and positive relationship between the growth of small scale and large scale sectors. As large scale enterprises are largely concentrated in urban centres so is the modern small scale industry which exhibit high links with them. Small scale sector can be divided into three categories with regard to their relationship with large scale sectors. Firstly there is a category of small industry which depend for their growth on the growth of large scale sector for example, suppliers

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63. Dhar P.N. - op.cit.

64. Bhattacharya Ardhendu - op.cit.

to large scale manufacturers, small units serving or finishing

products of large industry etc. The second catagory consist of those small scale units which are independent of large scale units, with regard to their market, for example, handicrafts. The third category is where the large units and small units compete for the same market e.g., hand looms, khadi and village industries etc.

An analysis of data at all India level on small scale industry show that 60 per cent of small units both in terms of value of production, and number of units fall in the first category, which are dependent on large scale units and these will continue to depend on large scale sector. It is also to be noted that the more modern section of small scale sector are usually more dependent on large scale industry in a complementary fashion. It is these industries that exhibit greater links to the urban sector.

The chemical industry in Baroda region consist largely of modern enterprises, these are expected to exhibit greater links to the large sector and urban regions. It is found that the small enterprises in this sector produce variety of products which have diverse uses in various sectors of the economy. The present study analysis its linkages with large enterprises and urban regions. The results are presented in table 6.4 and 6.5. For this purpose information was collected pertaining to the sale and purchases of the firms to the large scale enterprises and urban centres.

Table -6.4 presents the information pertaining to linkages of small enterprises with large scale enterprises in terms of

Table 6.4 Sale and purchase of material : chemical enterprises and large scale units.

(Rs. '000)

Industry	Value of sales to large scale enterprises	Sales to large scale enterprises or proportion of total sales	Value of purchases from large scale enterprises	purchases from large scale enterprises as proportion of total purchases
Inorganic Chemicals	10353	0.3118	9173	0.3593
Organic Chemicals	7138	0.2831	11554	0.6239
Fertilizers and Pesticides	8377	0.2882	18313	0.6845
Dyes and Paints	6882	0.2026	9147	0.4292
Drugs and Pharmaceuticals	17007	0.3802	19652	0.6175
Soap and Cosmetics	1939	0.1650	4946	0.5747
Other Chemicals	13316	0.3715	14815	0.5851
All (below 100 Hp)	65012	0.3050	87600	0.5549

Source : Same as Table 6.1.

purchase of raw material and sale of final products. It is observed that small enterprises are greatly dependent on large scale enterprises for their raw material than in terms of marketing their products. When one takes into consideration the transactions on capital accounts, the interdependence of small industry on large sector becomes much more pronounced.

Small scale chemical enterprises in Baroda report that around 55 per cent of their total input purchases are from large scale industries. Among various chemical industries, fertilizers and pesticides are found to depend on large scale sector to the tune of 68 per cent of their inputs. Firms in inorganic chemical industry report the minimum backward linkages with large scale enterprises. Overall the chemical enterprises show high backward linkages with large scale sector.

Small chemical enterprises, sales to large scale enterprises are to the extent of 30 per cent of their output. However, variations exist between industries. Firms in Drugs and pharmaceuticals industry exhibit high forward linkages with large enterprises. This industry is found to sell 38 per cent of its output to large enterprises. The products mainly consist of basic drugs and fine chemicals. Soaps and cosmetics industry is found to exhibit low forward linkages with large enterprises. In this industry 16.5 per cent of the sales are to the large scale enterprises.

Inorganic chemicals have exhibited greater sales to large

enterprises. Inorganic chemical enterprises are found to be linked to various large and medium textile, and dyes industries located in Surat and Ahmedabad regions of Gujarat.

The chemical enterprises are found to be highly linked to the industrial economy. They exhibit strong linkages to the urban sector and exhibit greater linkages to the regional industrial sector. The linkages of chemical enterprises to the urban centres are presented in table 6.5. It is clear from the data that the small chemical enterprises exhibit higher background linkages to urban centres than forward linkages.

Small scale chemical enterprises are found to depend on urban centres for inputs to the extent of 56 per cent of their purchases. Within this industry, fertilizers and pesticides purchase approximately 70 per cent of its inputs from urban centres. Dyes and paints industry on the other hand purchase only 38 per cent of their input from urban centres. Organic chemicals, soap and cosmetics industries are also found to exhibit high background linkages to the urban centres.

These small enterprises exhibit low forward linkages to the urban centres. Approximately 38 per cent of their produce is sold in urban centres. Inorganic chemical industry is found to sell 58 percent of its produce in urban centres. The intermediate chemicals are found to have markets in urban centres to a greater extent than the final products. Drugs and pharmaceuticals, dyes and paints industries exhibit low forward links with the urban centres.

Table 6.5 Sale and purchase of material : chemical enterprises and urban centres.

(Rs. '000)

Industry	Value of sales to urban centres	Sales in urban centres as proportion of total sales	Value of purchases from urban centres	Purchases from urban centres as proportion of total purchases
Inorganic Chemicals	18819	0.5784	11705	0.4585
Organic Chemicals	10114	0.4011	12351	0.6670
Fertilizers and Pesticides	8688	0.2989	18703	0.6991
Dyes and Paints	9467	0.2787	8081	0.3792
Drugs and Pharmaceuticals	11480	0.2566 @	10456	0.5799
Soap and Cosmetics	5429	0.4618	5394	0.6268
Other Chemicals	16870	0.4706	13914	0.5495
All (below 100 Hp)	80867	0.3794	88604	0.5613

@ One firm was selling its complete output to Indian defence services.

Source : Same as Table 6.1.

Inorganic chemicals and other chemicals industries appear to show greater forward linkages to the urban centres than in terms of dependence on urban centres for various inputs. In both these industrial categories the the purchases from urban centers are considerably lower than their sales to the urban centres.

When we take into consideration the linkages of the chemical industry to the large enterprises and urban centres, it can be inferred that the firms exhibit higher backward links than forward links. Inorganic chemical industry exhibit an opposite phenomenon. The sales of this industry are greater than purchases from the urban centres and large scale sectors.

6.8 **Overall view**

Till now we have seen the backward and forward linkages separately. These linkages together explain the overall inter relations between the industries within and outside the local region. These give an overall picture of the linkage patterns in existence. In table - 6.6 we present Industry wise purchase of raw material by place of origin and sale of finished products by place of destination. The regional demarcation is done based on (a) Baroda District (b) Gujarat State (other than Baroda District) (c) other regions i.e, regions outside Gujarat state (d) foriegn countries. The peripheral districts of Baroda could be taken as a separate category to analyse their links with industries in Baroda. With the development of good transport net work, even far off regions could be well connected to Baroda region. This is evident in dyes and paints industry and

Fertilizers and pesticides industry. Therefore we have confined to these four categories only.

Is the local region exploiting the linkages to the fullest extent ? Any linkages by the industries to other regions serve only as leakages to the local region. Linkages of the local region is very important locally, but the magnitude of linkages to other areas or regions may only severs to highten disparities. But we rarely see an industry in a open economy which is not linked to different industries and regions. The location of an industry in a particular region itself gives an impetus to the regional economy as the local capital, material and human resources are used directly. This would also lead to indirect effects in the economy. If the overall linkages are to be totally internalized, there must exist an industrial complex which is self sufficient in nature. That is to say a large cluster of industries which mutually demand each other products exhaustively. Such clusters are not found to occur in India[65].

From the data presented in Table -6.6, we can conclude that the concentration of chemical enterprises in Baroda region is largely due to the availability of raw material. In addition to the availability of raw material, the favorable industrial climate in Gujarat state has acted in favour of location of these industries. The chemical industry in Baroda region is dependent

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65. Lakdawala D.T. et,al - op.cit.

on Baroda district for 46.5 percent of its raw material and only

Table 6.6 Industry wise purchase of Raw material and sale of finished products by place of origin and place of destination.

Industry	Baroda District		Gujarat State (Other than Baroda District)		Other Regions		Imports	Exports	Total Purchases	Total Sales
	Purchases with in Baroda District	Sales with in Baroda District	Purchases with in Gujarat	Sales with in Gujarat	Purchases from other regions	Sales in other regions				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Inorganic Chemicals	12366 (48.44)	9381 (28.83)	6380 (24.99)	8528 (26.21)	6784 (26.57)	14630 (44.96)	- -	- -	25530 (100)	32539 (100)
Organic Chemicals	11733 (63.36)	5831 (23.12)	2750 (14.85)	2557 (10.14)	3535 (19.09)	16589 (65.79)	500 (2.70)	240 (0.95)	18518 (100)	25217 (100)
Pesticides and Fertilizers	9491 (35.48)	3920 (11.54)	3537 (13.22)	9462 (27.85)	12609 (47.13)	20590 (60.61)	1115 (4.17)	- -	26752 (100)	33972 (100)
Dyes and Paints	7673 (36.00)	5459 (18.78)	3492 (16.39)	10183 (35.04)	8987 (42.17)	12700 (43.76)	1160 (5.44)	720 (2.48)	21312 (100)	29062 (100)
Drugs and Pharmaceuticals	12973 (43.91)	4586 (10.25)	3473 (10.91)	7249 (16.20)	12523 (39.35)	31098 (69.53)	1854 (5.83)	1799 (4.02)	31823 (100)	44732 (100)
Soap and Cosmetics	7021 (81.58)	4171 (35.48)	1264 (14.69)	2403 (20.44)	321 (3.73)	5183 (44.08)	- -	- -	8606 (100)	11757 (100)

18 percent of the sale of its produce. This shows that the chemical industry has higher backward linkages to the Baroda region than its disposal linkages. To other regions in and out of Gujarat state, the volume of sale of final products are found to be greater than the value purchase of raw material. The chemical industries located in Baroda region exhibit higher linkages to the markets outside Gujarat state. In all industrial categories, the `other regions' (outside Gujarat state) exhibit higher linkages both backward and forward in comparison with other district of Gujarat state.

The purchase of raw material and sale of final products varies from one industry to another in a region. The availability of raw material in a local market has influence on the purchase pattern of industries. This is clearly evident in case of Dyes and Paints, Fertilizers and pesticides where they had to depend on other markets due to the non availability of raw material in the local market. Hence these industries are expected to exhibit lower backward linkages to the local region. An industry like soap and cosmetics which gets all the raw material locally exhibit high linkages to the local region.

Imports are found to be generally greater than exports and it is an expected phenomenon. All industries except inorganic chemicals, soap and cosmetics reported imports, of those reporting imports, Fertilizers and pesticides do not report any exports. In Industrial groups Drugs and pharmaceuticals, Dyes and Paints, the exports from 4.02 percent and 2.48 percent respectively.

For the units above 100 H.P. also it is found that the backward linkages to the local region are greater than the forward linkages in the local region. 34 percent of their raw material is purchased from Baroda district and approximately 16 percent is sold within the district. Even in value terms the purchases are greater than sales in the local region. To regions outside Baroda district, these enterprises exhibit higher disposal linkages than backward linkages. Imports form 7.5 percent of the value of raw material and exports are 1.3 percent of total output produced.

When we look at the purchase and sale patterns of enterprises by the size of enterprises, we get some interesting results. The data are presented in Table - 6.7. The data reveal that smaller firms are linked to the local region to a greater extent than larger firms. When we look at purchases by firms from Baroda district, we find in the smallest group i.e. 0-10 H.P. connected, they form 62 percent of the total purchases in that group. As the size of the firms increases the ratio is found to fall. The purchases for units in 76 - 100 H.P. group is 43.8 percent and for units above 100 H.P. group it is 34 percent approximately, however there is found to be little discrepancy in the 51-75 H.P. group.

The sales in the local region by the smaller firms is higher than that of relatively larger firms. The sales in 0-10 H.P. groups forms 31 percent of their total sales and it gradually falls to 16 percent in firms above 100 H.P. However

Table 6.7 Purchase of Raw material and Sale of finished products by place of origin and place of destination by Horse power connected to enterprises (Rs. '000).

H.P. Connected	Baroda District		Gujarat State (other than Baroda District)		Other Region		Imports	Exports	Total	
	Purchases	Sales	Purchases	Sales	Purchases	Sales	Purchases	Sales	Purchases	Sales
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0-10	8376	6341	1915	6456	3086	7303	60	81	13377	20181
	(62.17)	(31.42)	(14.32)	(31.99)	(23.07)	(36.19)	(0.44)	(0.44)	(100)	(100)
11-20	477	2408	1267	2431	1484	3816	89	-	7614	8655
	(62.70)	(27.82)	(16.64)	(28.08)	(19.49)	(44.10)	(1.17)	-	(100)	(100)
21-30	11190	5005	3814	4468	5960	16856	497	-	21461	26329
	(52.14)	(19.01)	(17.77)	(16.97)	(27.77)	(64.02)	(2.32)	-	(100)	(100)
31-50	10952	4225	3349	6072	12058	23102	1874	1514	28233	34913
	(38.79)	(12.10)	(11.86)	(17.39)	(42.71)	(66.17)	(6.64)	(4.34)	(100)	(100)
51-75	18293	7382	4913	11135	6893	28573	4677	659	34776	47749
	(52.60)	(15.46)	(14.13)	(23.32)	(19.82)	(59.84)	(13.45)	(1.38)	(100)	(100)
76-100	19852	13296	9542	17688	20347	43711	2659	602	52400	75297
	(37.89)	(17.66)	(18.21)	(23.49)	(38.83)	(58.05)	(5.07)	(0.80)	(100)	(100)
Above 100	101927	60574	49815	78705	127817	226051	22536	4699	302095	370029
	(33.74)	(16.37)	(16.49)	(21.27)	(42.31)	(61.09)	(7.46)	(1.27)	(100)	(100)

Note :-

1) Columns 1,3,5,7 are breal up of column 9.

2) Columns 2,4,6,8 are break up of column 10.

3) Figures in the parentheeis are percentages of total

there are some discrepancies in some groups, but the overall results, indicate that the smaller firms links are greater to the local region. A similar patter was observed when firms were classified by size, taking capital as a measure.

However this would not be the pattern for all the industrial groups. In Dyes and Paints industry all firms including small units are found to exhibit higher linkages with other regions mainly due to non availability of raw material locally. In case of soap and cosmetics firms of all sizes are found to exhibit higher linkages to the local region.

The linkages to other districts of Gujarat does not show any specific pattern. When we look at the firms purchases and sales to other regions, we notice that the larger firms exhibit greater linkages. The pattern is much clear in terms of sales than in terms of purchases from other regions. Smaller sized firms exhibit lower linkages both backward and forward with other regions than larger firms.