CHAPTER II

THEORIES OF INDUSTRIAL LOCATION
AND REGIONAL DEVELOPMENT

Regional policies are in an evolutionary stage and are a relatively recent phenomenon the world over. Neither academic studies of the mechanisms of regional changes nor empirical investigations of the working of regional policies have as yet progressed far enough to produce any consensus view on what constitute the 'right' or more effective methods of securing balanced regional development. In order to understand how current policies have evolved, it is necessary to look, in turn, at the evolution of the theories of industrial location.

Till the 1950s, most development theories concentrated on problems of full employment and equitable income distribution. These were in the context of the national economy and were not generally applicable to regional growth problems. "Only when these problems had been more or less solved did it become reasonable for policy-makers to look at questions of inter-regional equity and of how to raise the economy's production potential by absorbing resources underutilized in certain areas of the country. Thus, preoccupation with national issues delayed intervention in regional problems..." 1

Once a country adopts a policy of planned development, the regional aspect cannot be ignored for long. To achieve rapid growth, the effects

of expanding economic activity at alternative locations must be compared. Again, it is not possible to decide what quantum of investible resources should be allocated to each region for infrastructural development, and especially for location-specific investments in transport, communications and the like, without taking the expected future distribution of economic activity and population into account.

Theories relating to the geographical location of economic activity may be segregated into two broad sets. The first consists of the various theories of location which deal with the organization of economic and human activity in geographical space, and attempt to pinpoint the different factors that influence location decisions and the location patterns that emerge under different sets of conditions. The knowledge that these theories provide regarding factors most likely to affect entrepreneurial location decisions, as well as of the conditions needed to arrive at a certain pattern of economic activity, is required to formulate schemes for the development of a region. The second set of theories relates to regional development and the various strategies that may be adopted in order to achieve optimum regional and national growth. These theories are needed for evolving policies best suited to solve regional growth problems without conflicting with national objectives.

Theories of Location

Till the early sixties, location theories were broadly based on two approaches -- least cost location and market area location.

Least Cost Location The least cost approach to location originated with Launhardt, von Thünen and Weber. The least known work is that of
Launhardt, who explained the location of industry as being determined by differences in cost and in demand at alternative locations. He considered cost differences as the more important factor in finding the optimum location, and dealt with the simplest situation in which two alternative sources of raw materials and one market were assumed to form three corners of a triangle. Given this, the least-cost site would be selected.

Von Thünen's theory related mainly to the agricultural sector. He attributed cost differences at alternative locations to land rent and transportation costs. Different crops would be produced at locations where these costs were minimized. He assumed: (a) homogeneous land, (b) one consuming centre, (c) complete mobility of capital, and (d) equal labour costs or, if wages were different at different sites, the differential would appear as land rent, so that labour costs were unimportant in deciding location.

Weber's theory of location is concerned in particular with industrial location. He made three basic assumptions: (a) fuels and raw materials are found only in some locations, i.e., land is not homogeneous, (b) the size and situation of places of consumption are given, so that the market consists of several points, or consuming centres, where demand is unlimited or constant, and cannot be influenced by any one producer, i.e., conditions are of perfect competition, and (c) there are several fixed labour locations, with labour immobile and in unlimited supply at a given wage rate. Under these assumptions, three factors influence industrial location. The first two are 'general regional factors' -- costs of transportation and labour -- and the third is a 'general local factor' -- agglomerating (degglomerating) forces.
Transport costs are the primary determinant of plant location, and are a function of weight and distance. The locational triangle is used to find the least-transport-cost location. Industries are either material-oriented or market-oriented depending on whether the material index of an industry (which is the proportion of the weight of raw materials used to the weight of the product) is greater than or less than unity. A plant can be diverted from the least-transport-cost location if labour is cheaper elsewhere. The location decision involves finding the optimum substitution between the transport and non-transport cost factors. Two concepts providing measures of the 'pull' of labour are used. The index of labour cost is the average cost of labour required to produce one unit weight of product. Labour coefficient is the ratio of labour cost per unit weight of output to the total weight of product and material to be moved. The costs of transport and labour are decentralizing forces because each draws industry to a minimum cost location. These decentralizing tendencies are either counteracted or intensified by the agglomerating forces (marketing advantages, proximity to auxiliary industries, economies of scale) or the deglomerating forces (chiefly land rent). This latter factor can divert a firm from the least-transport-cost location and can either draw industry together or disperse it.

While some of Weber's assumptions are realistic, those regarding labour immobility, perfect capital mobility and unlimited demand are unlikely to hold in reality.

Hoover also followed the least-cost approach. He divided costs on the basis of the three activities of a firm: procurement of raw materials, processing, and distribution of the finished product. The first and
third activities involve transfer costs, which have to be minimized. Transport rates depend on location because they vary according to routes and terrain, and do not vary directly in proportion to distance. The costs of productive factors also play a role in deciding location. Land prices are generally widely different at different sites, labour costs to some extent and capital costs the least. If factor substitution is possible, then it can also play a role in site-selection. The location where transfer and processing costs are minimized is selected. However, there is mutual repulsion between sellers to avoid excessive competition. "To the extent that this mutual repulsion outweighs conflicting locational considerations, producers tend to be spread out in a pattern similar to that of market demand"², so that market areas are formed. As far as orientation of industries is concerned, generally "early stages of production are material-oriented and late stages are market-oriented while intermediate stages are relatively 'footloose' as to transfer considerations."³

The main limitations of the von Thünen-Weber type theory are: (a) the emphasis on the search for the least-cost location whereas, in reality, a site is chosen on the basis of costs as well as demand; (b) demand is assumed to be unlimited and constant at certain points, and is unaffected by a seller's choice of location whereas, actually, demand is variable depending on and affecting (c) locational interdependence between firms and consumers. This aspect is entirely ignored.

3. ibid., p. 46
Sales-Maximizing Location The inquiries into the spatial interdependence of locations began with Hotelling. Given inelastic demand for a product, he tried to show that firms would locate at the centre of the market area in order to maximize sales. As the number of firms increased, the market area would be divided between them, and each firm would locate in the centre of its market area.

Christaller and Lösch developed the Central Place Theories. Both assumed: (a) a homogeneous plain with even distribution and quality of natural resources, (b) equal population density at each point of this plain, (c) identical consumer preferences and production techniques for each product, (d) a different demand function for each product, and (e) rational behaviour of consumers and producers. External economies and inter-plant linkages were ignored. Depending on the range of a good (the distance over which a consumer would travel in order to buy the good) and the demand function, market areas are formed, and each producer is a monopolist in his market area. While the market areas for each product is of a different size depending on the 'range', the shape of all areas is hexagonal; this is the optimum polygonal shape closest to the circle which leaves no unfilled space and empty corners. Thus, with differences in transportation costs, demand functions and possibilities of exploiting economies of scale, the resulting spatial distribution of producers is to be found.

"Christaller starts with the good that has the widest spatial range and develops his organization from above while Lösch ... starts with the good having the smallest spatial range and ... derives the organization from below." Lösch's model applies to transportable commodities and

4. T. Hermansen, "Development Poles and Development Centres in National
Christaller's to immobile services. Both develop a hierarchy of producing centres, each producing more and more types of goods as market areas for different goods overlap. So, while firms within an industry disperse, each trading over its own hexagonal area, there is an agglomeration of industries.

The main limitations of the Central Place theories are the uniformity assumptions; neither natural resources nor demand are evenly distributed over space. Even if they were to start with, interdependence would lead to unevenness in the location of demand. The other problem is that they do not provide a theory of development because they only try to explain the existence of certain patterns of centres, and not how these patterns came into existence nor how they will change. It may be observed that the least-cost theories ignore the demand factor, whereas the locational interdependence theories virtually exclude the cost factor. The 'maximum profit location' theory provides a synthesis.

Maximum Profit Location Greenhut tried to find the maximum profit site, i.e., a spatial position where the spread between total costs and total revenues is maximized. Costs of factors of production are divided into two categories: basic, or cost at source, which is incurred irrespective of location, and locational, or additional costs involved in bringing the factor to the location where it is needed. The factor or factors making up a relatively large part of total cost variations have the most influence on location. A small

component of total costs has an important influence on location if its cost varies at different sites more than that of other factors. A factor which has no locational cost has no influence on location even if it accounts for a large proportion of total cost.

As far as demand is concerned, its elasticity is the deciding factor; the greater the demand elasticity for a product, the more dispersed the industry will be. The location of smaller firms is influenced by external economies, which larger firms can ignore since they can generate their own internal economies of scale.

This model is deceptively simple; actually, the variables are simultaneously interdependent. Both the cost and demand factors are taken into account, and the concept of 'psychic income' is introduced, which is the satisfaction derived by the entrepreneur by locating at a site of his choice. This is a purely subjective consideration which introduces various complexities into the model. 5

While all the theories of location outlined above aim at finding the optimum location patterns under given sets of assumptions and conditions, the theories now dealt with are basically theories of development, and treat the spatial element of growth as part of development in the national economy.

**Growth Pole Theory**

Perroux inductively derived the theory of growth poles from observing the fact that development does not appear everywhere and all at once and is essentially polarized; forces inherent in the development

process work towards the clustering of economic activities and growth. While Perroux dealt with the economic aspects, Boudeville extended the theory to include the geographical dimension. Both these theories are dynamic because inter-temporal relations play an important role.

A regional growth pole may be defined as a "set of expanding industries located in an urban area and inducing further development of economic activity throughout its zone of influence." Perroux conceived of the process of economic growth as essentially unbalanced and involving a succession of dynamic poles through time. He based his arguments on Schumpeter's theories of the role of innovations and large-scale firms. He argued that entrepreneurial innovations are the main causal force behind economic progress, and that most innovating activities take place in large firms. From this, he came to the concepts of dynamic firms and leading industries. The features of a dynamic propulsive firm are that it is relatively large, generates significant growth impulses to its environment, has a high ability to innovate and belongs to a fast-growing sector. A leading propulsive industry is relatively new, operates at an advanced technological level, is fast-growing with a high income elasticity for its product, and has strong inter-industry linkages so that it can dominate its environment and transmit its growth impulses and innovative tendencies throughout its sphere of influence.

The formation of a growth pole requires such leading industries to provide a 'core' around which other industries, with which the leading industry has strong backward and forward linkages, form clusters.

These clusters are called industrial complexes and constitute growth poles. Leading propulsive industries form one system of industries and induce growth in two other systems of industries: lateral induced industries and capital goods industries. The whole process changes the industrial structure and enables the rapid growth of the industrial sector as a whole. Finally, a growth pole can be called as such only when it is large enough to dominate its environment. The emergence of such growth poles can lead to the development of the pole region and, through transmission, of the nation as a whole. Thus, the growth pole model depicts the transmission of economic prosperity as the result of two opposing forces -- growth tends to concentrate in some centres and erodes the economy of the surrounding areas, and development spreads over the surrounding areas as a result of growth in the centre.

Theories of Geographical Incidence and Transmission of Economic Development

The growth pole theory is a theory of how growth takes place through the development of poles which are successively replaced by new poles when the old ones stagnate. But it does not explain why the poles are formed in some places and not in others, nor how the growth impulses generated by these poles are spatially transmitted. The works of Hirschman, Myrdal and Williamson attempt to tackle these aspects, and are essentially development theories based on economic, as well as social, cultural and political, aspects of development. Hirschman tried to synthesize theories of geographical incidence of growth with those of the transmission of development impulses.
Starting from the observation, like the French school, that growth is always regionally unbalanced and spatially concentrated, he contended that such concentration of growth is essential for faster national growth. The process of development is carried out through chains of disequilibria operating from the growth poles. An advance at one point sets up pressures towards growth at subsequent points. If all these points are within the same growth space, the country tends to be split up into progressive and backward regions. This is especially because investors tend to over-estimate the external economies due to the poles so that they "spend a long time mopping up all the opportunities around some 'growth pole' and neglect those that may have arisen or could be made to arise elsewhere." This sustained growth in one or a few parts of a country affect the other parts, both favourably and unfavourably. The most serious of the unfavourable or polarization effects is that the developed areas may drain all the skills and enterprise, as well as capital, from the depressed areas. The little industry that the backward 'South' possesses may become depressed due to 'Northern' competition. However, Hirschman expected the favourable or trickling-down effects to ultimately gain the upper hand. Growth impulses would be transmitted to the 'South' through inter-regional trade and investment, especially as congestion in the developed areas increased and 'Northern' industrial expansion was hampered by the insufficient size of the home market. Policy-makers would be impelled to introduce measures for developing the lagging regions. In reality, despite Hirschman's strong arguments to the

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contrary, polarization effects could be the stronger of the two forces. This is the conclusion reached by Myrdal. His spread and backwash effects correspond to Hirschman's trickling-down and polarization effects. Myrdal concludes that the backwash effects are likely to be stronger in underdeveloped areas, whereas development tends to increase spread effects. This pessimistic view is based on 'circular and cumulative causation' wherein persisting spatial imbalances in less developed countries hinder development and result in a cumulative process, so that poverty becomes its own cause. Therefore, the mechanism for spread effects needs to be strengthened in the initial stages of national development.

Williamson's convergence-divergence hypothesis was based on the view that regional economies diverge in the early stages of a country's development due to four factors: (a) migration of educated and skilled labour to the richer regions, (b) migration of capital to these regions, (c) central government policies which concentrate investment in infrastructure and amenities in richer regions where the perceived need is greater, and (d) lack of linkages between regional markets which retards spread effects. As the economy matures, Williamson expected convergence by a reversal of the diverging forces.

While all these theories try to explain the process of regional growth and development, none of them provide a key as to how development can be initiated in a backward region. However, several strategies have been evolved on the basis of these theories.
Strategies for Regional Development

An OECD report points out: "Regional economic policy poses numerous problems, in particular how to assess the costs and benefits of alternative methods for dealing with regional disparities." When considering the problem in the context of national economic growth, is it preferable to encourage emigration from a region with unfavourable economic conditions rather than to try and modify the economic structure of the region? If a growth pole strategy is to be adopted, which regions and industries should be selected? What system of incentives and subsidies should be used to promote industry in underdeveloped regions, if at all? Or again, is there a danger of state subsidies to firms in selected parts of a country leading to distortion of competition and a general lowering of productivity? There are no hard and fast rules whereby these questions can be answered, and measures to reduce regional disparities have not been in operation long enough to have established proven results. The main strategies that have evolved are basically growth pole strategies which attempt to bring about 'decentralized concentration of development' through a conjunction of policies and incentives.

"The alleged superiority of decentralized concentration of development efforts as a strategy for speeding up the process of economic growth and interregional integration and equalization is well illustrated by the fact that their validity is assumed to be independent of the economic and social systems of the countries within which they are to

8. Organization for Economic Co-operation and Development
be applied." In developing countries, a growth pole strategy may be especially relevant because the main problem is how to geographically allocate given resources so as to gain the maximum generation and transmission of development impulses.

Growth pole strategies have been designed to achieve two purposes: (a) to develop lagging regions by concentrating investment to reap economies of scale and agglomeration, and (b) to counteract the 'pull' of large congested urban areas by providing employment within the region, thus preventing the emigration of labour which would otherwise take place. Each broad region in a country is expected to gain if a growth centre policy is adopted because it is assumed that growth centres benefit their surrounding areas. This is implicit in public policies designed to stimulate extensive development by concentrating upon a few areas. However, "to date, these strategies have not been notably successful, primarily because they have suffered from a tendency towards proliferation of a large number of relatively small centres." 

This has implications for the choice of locations for growth poles. Either lagging regions or regions intermediate to the advanced and backward regions may be selected. It is usually not advisable to establish development poles in the lagging regions where all (or most) of the infrastructure has to be provided. Even if this were done at great cost to the economy, it would not be a sufficient condition for development to occur. For growth impulses to be

10. T. Hermansen, op. cit., p. 2

transmitted to the whole region, and not remain limited to the centre itself, the region should have people and organizations capable of absorbing the benefits and exploiting the opportunities made available. It is felt, therefore, that intermediate locations provide a better medium for initiating growth and require fewer resources than very backward locations. Attention needs to be paid to the kind of industries that are promoted in these selected growth centres, as well as to the development of human resources in the less advanced areas.

Inter-Industry Linkages Economies of scale, external economies and complementarities are important for the development process to be sustained and gain momentum. Hirschman talks of the "investment-promoting character of investment, not indirectly through additional savings out of the incomes created by investment, but through direct contact or contagion." This has implications for the kind of projects to be chosen. Projects which do not result in the creation of significant external economies, but are only 'net beneficiaries' of such economies, cannot be of much use for setting up a cumulative developmental process in the region. Regional development policy must identify and set up activities with the highest super-multiplier effect (internal blocking) and identify and install mechanisms to reduce leakages from the region (external blocking). If subsidies are to be offered, the opportunity cost of an investment should be considered and industries selected so that the region has good input-output access for the particular activities initiated.


Regional industries can be divided into three categories: (a) material-oriented industries which form the 'export base' of the region, (b) service industries or support industries for the export industries, and (c) residentiary industries which cater to local demand. The most relevant distinction for purposes of regional development planning is between the export base industries and the others (and not between tiny, small and large scale industries).

Growth propelling industries are considered to be those for whose products the demand is outside the lagging region; since such demand will grow faster than local demand (in the backward area), these industries are expected to grow faster. The growth of the support and residentiary industries depends on the fate of the export industries; if these grow, so will the others. There is a fourth category of industries, the 'foot-loose' industries, which are neither resource-based nor market-oriented. These are generally dynamic and modern industries, which may be precisely the kind required for creating growth centres.

In this context, the concept of 'industrial complexes' needs mention. Though similar to the concept of growth poles, industrial complexes have a more practical applicability because the process of their formation is planned. An industrial complex is a conglomeration of economically and technologically linked industrial units at a specific location. The complex consists of a cluster of such units around a 'core' industry which is usually heavy industry. The inter-relationships between the concerned industries are such that they operate optimally when they are spatially concentrated. The industrial inter-connections are planned so as to ensure an optimal composition
of the entire complex, involving also the economic, social and cultural infrastructure, and auxiliary and servicing plants. The prominent feature of an industrial complex is that the expansion of any of the industries would set in motion a process of development sustained by a very high super-multiplier provided by the combined effect of the ordinary final demand multiplier and induced inter-industry deliveries which are further supported by the accelerator.\textsuperscript{14} As such, industrial complexes can serve as useful tools for regional development of industry.\textsuperscript{15}

**Development of Human Resources**

One of the main factors hampering the development of lagging regions is the absence of human resource development. People in these regions are unprepared not only for employment opportunities in other regions, but also in their own areas. It has been suggested that "more attention will have to be given to the improvement of the social environment in the development areas, since it is increasingly recognized that human and psychological factors are key ingredients of successful regional policies."\textsuperscript{16} Out of all investments made in a region, those in social amenities usually receive the lowest priority. Hansen says that "in many cases inadequate investment in human resources has occurred not only because of inadequate local funds but also because available funds have been squandered on attempts to attract industry. Instead of building better schools and using public amenities to attract firms, there has

\textsuperscript{14.} T. Hermansen, *op. cit.*

\textsuperscript{15.} The concept of industrial complexes must not be confused with that of industrial estates. In the latter, pre-industrial infrastructure is provided but the industries set up need not be economically or technologically inter-linked.

\textsuperscript{16.} OECD, *op. cit.*, p. 89
been a pronounced tendency to extend financial inducements directly to firms and letting the schools wait. If wages are considerably lower in the depressed regions, industrial units may find it worthwhile to provide on-the-job training. The alternative is for the State to invest in manpower training.

Though a growth centre strategy may provide a useful basis for the development of the lagging regions, special incentives to attract industries to the new growth centres may still be required. In general, incentives of some sort are necessary to promote industrial development in the less developed areas, irrespective of whether a growth centre policy is adopted or not.

Incentives for Industrial Development

Assistance by the State to industry in lagging regions is designed to compensate firms for the additional expenses involved by being located in an area which has a relatively poor access to markets and/or raw materials, lack of skilled and managerial personnel, infrastructure and support industries. "Subsidization and incentives are justifiable in economic terms to the extent that they represent an attempt to overcome the divergence between marginal private costs and marginal social costs," and to steer industry to selected regions. However, they may not always be effective, may promote the wrong kind of development and may be of great cost to the economy.

A wide range of instruments may be used, both positive and negative.

17. N. M. Hansen, op. cit., pp. 108-9

The negative measures are restrictive: direct control on movements of capital, and restrictions on expansion in congested areas. Richardson suggests, however, that "negative controls are not to be recommended. Although of negligible budgetary cost, they may hide substantial real costs in terms of sacrifices of national efficiency."\(^{19}\) This is a debatable point. For instance, if firms in congested areas are made to fully pay for the social costs of concentration (say, by the imposition of a tax equivalent to the marginal social cost generated by the location of each additional firm in a congested area), this would act as a great disincentive to choose such locations. The revenue thus obtained could then be used to subsidize industrial development in the lagging regions. In fact, if the price mechanism was allowed to operate without hindrance, and prices truly reflected social costs, the industries remaining in congested areas would be only those for whom the special advantages of the area exceeded the high cost of labour, land and congested facilities. But, the price mechanism is not allowed to work properly. "Rents are not allowed to rise as much as they should....High transport costs do not rest where they belong....New firms coming into the area are shielded from some of the additional costs they impose."\(^{20}\) Hence, the incentive to industry to locate outside the congested areas is diminished. Negative measures should be used to overcome such price distortions.

The positive measures used are direct inducements to firms such as

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grants, loans or investment incentives favouring capital, or wage subsidies, regional discrimination in government contracts and the construction of new government establishments (factories and research and development laboratories) in depressed areas, price-fixing in fields such as transport, that affect regional location, selection of, and stimulus to, regional growth centres, increasing the supply of basic industrial services, infrastructure and social amenities, investment in education and natural resource development, and publicity and provision of information relating to lagging regions.

Two points may be mentioned. One is that selective inducements are required rather than blanket, indiscriminate aid to all types of industries; this would ensure the development of industries best-suited to each region in terms of resources and requirements. Secondly, the bulk of incentives are contributions to capital, and may result in the promotion of capital-intensive technology. This aspect assumes importance when the main objective of regional policy is to provide employment in the depressed regions. It is true that modern industry is increasingly capital-intensive, and labour subsidies may stimulate inefficient and uncompetitive industries and production techniques. Still, if incentives do not encourage industries which increase local demand for labour, the employment situation in the lagging regions will not improve. Probably some combination of capital and labour subsidies is required -- say, a capital subsidy in areas where higher costs of capital and repair and maintenance constitute the major problem, and a labour subsidy in areas where labour productivity is low, so that employment costs are higher due to costs of training local labour or importing
technical personnel from the developed regions.

Application of a regional development policy generally brings about regional growth and industrialization faster than increases in standards of living. However, the effects of regional policy take time, so that reduction in regional disparities is faster when more resources have been used in this regard or the policies have been in operation for a longer period. There are several debatable issues involved in the formulation of industrial location policies. Some of the basic issues are discussed, and the regional strategies in operation in some other countries are briefly reviewed to derive lessons and inferences, before studying the evolution of industrial location policies in India.