# Chapter 2

## REVIEW OF LITERATURE

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Chapter - 2

2.1 Introduction

The aspect of industrial location is important for every economy. The Industrial unit can be profitable with help of location concept. The motive of entrepreneur is to make business profitable. In other word, he always try to maximise profits with minimum costs. For that the planned scientific location is required.

The concept of location was not popular in past days. There was not factory system, and making profit was important, most of the production was for local consumption in village and consumed it for themselves. As time passed factory system has existed and the concept of industrial location became more important location decisions are entrepreneurial micro level decisions. The entrepreneur always try to get profit with minimum loss and for that the location or choice of place is required. This would imply that the some logic behind the location of industry.

2.2 Approaches of Industrial Location :-

A task of decision making about Industrial location is highly complex. A manufacture is guided by several factors at the time of choosing a location for the plant such as technical economic, institutional so on.
The industrial location emphasis on the basic aspects of production such as demand and cost, which are known as least cost locational approach and demand approach or market approach.

The least cost approach emphasis the problem of location from the cost side and identifies optimum location at a point where costs are minimum.

The market area or demand approach consider optimum location at a point where market area is optimum or profits are maximum.

**2.2.1 The Least-cost Locational Approach:**

This approach emphasized on search for the least cost condition, where demand is held constant and the locational interdependence of firms is disregarded. In this situation pure competitive market is assumed to be with no monopoly gains.

The three Germans were most interested in plant location theory, namely Launhardt, Von Thunen and Weber. Amongst them Launhardt and Weber have made a theory that is known as ‘Least-cost theory’ of plant location.

Weber (1909), Palander (1935) and Hoover (1937, 1948) indicated that cost of production were the chief determinants of location of industry.

Launhardt and Weber were concerned with manufacturing locations. Von Thunen concentrated mainly with agriculture locations.
2.2.2 The Demand Approach:

According to this approach the plant locations would vary according to demand and size of market. In other word each producer try to choose the location and control the largest market in which he can sell at lower price than his rival.

In this concept the cost assumed to be equal at all locations and this way the cost concept is disregarded. Locational interdependence requires appraisal of the shape and demand curves and the influence on site selection of entrepreneurial conjectural about rival firms locations Christaller and Losch indicated that.

2.3 Various Stages for Plant Location:

Before discussing about plant location, it is required to know about various stages of location. There are three stages of location given below.

Initially the theory of plant location was built upon a purely competitive foundation in which buyers were to be concentrated at a given point and sellers were free to locate any where in an area surrounding the consumption center. It emphasized on minimum cost. This way site selection involved substitution of costs at alternative location in effort to find the place which offered the lowest burden, because of one dimensional market.

In second stage cost is not important but cost is equal at all locations. Demand factor is most important here, which could be treated as a variable. In this stage buyers are scattered over an area and demand for the output of a firm is accepted as a variable factor. In this situation sellers become a Locational
monopolist. The locational interdependence requires appraisal of the shape of demand curve and the influence on site selection of entrepreneurial conjectural about rivals.

Under this conception sellers could monopolize those buyers who were situated most proximate to their plant.

The selection of plant site involved attempts to remain at a distance from rivals. This way location of my firm was dependent upon the site, its rival and buyers.

In third stage both cost and demand are variable. It means for location both are to be considered. For that, a question arises, where the firm can be located as it is affected by both cost and demand.

All these three theories mentioned above with three stages are maximum profit theories, but just for simplification the first stage refers as the least-cost theory, second stage as a interdependence theory and third is maximum profit theory of plant location.

2.4 Location Theories:

Many economists have given theories of location based on these approaches which have been explained earlier.

Weber’s analysis emphasized on location of manufacturing units and considered costs such as transport cost, labour cost and land cost due to agglomeration influencing industrial location. Von Thunen considers two significant factors transport cost and rent of land in the theory of location. Launhardt
attempted an analysis of location of special manufacturing industries in terms of transport cost. Hoover's analysis is more concerned with cost than the demand factors, Palander and Ritschl also concentrated least-cost point as the optimum location August Losch emphasised a theory of location with demand as a major spatial variable.

2.4.1 Least-cost Locational Theories:

Weber's Theory of Location

The problems of Industrial location has been studied by number of economists. Alfred Weber a German economist gave for the first time an analytical approach to the problem of industrial location. He tried to give a modern, systematic and scientific approach for that. It was published in 1909 in German language in the year of 1929.

Weber's theory of location were concerned with manufacturing location. He has classified raw materials into two groups (i) ubiquities and (ii) localized.

Ubiquities like bricks, clay and water are available everywhere but localized material is like wood, coal, or Iron are available only at certain places.

Localised materials are classified into two categories pure materials and gross materials. The materials like cotton, wood etc. add the whole or bulk of weight to the finished product and are called "pure" materials other like wood, coal, or Iron, tea, Sugarcane loose their weight in the process of manufacturing are 'gross' materials.
Weight losing material attract the industry to the place were it is available. All localized materials do no attract industries.

According to Weber’s theory the two factors are most important in determining the location of an industry. (i) Transport cost and (ii) Labour cost.

The industrial units has to choose that location in such a way that its transport costs are minimum. It is made by two factors, weight of the goods to be transported and distance to be covered.

According to him the location of manufacturing industry is determined by the ratio between the weight of localized material and weight of product that is known as a ‘material index’. Industries whose material index is not greater than one usually lie at the place of consumption. If the localized material is not used in production and only ubiquitous material is used the material index will be zero; because material index divided by weight of product.

The industrial location is influenced by labour cost, transport cost, agglomerative and deagglomerative factors. The transport cost and labour, cost which are called regional factors or primary factors. The agglomerative and deagglomerative factors are known local factor or secondary factor. The regional factors have the greatest influence on industrial location.

In this context were explains derivation of the least transport cost location by using the same framework as Launhardt that is called location triangle.

He takes one point of consumption and the most advantageous deposits of the two necessary materials M₁ and M₂. The least transport-cost location is the point at which the total ton-miles involved in getting materials to 9.
place of production and the finished product to the market is at a minimum. Each corner of the triangle exerts a pull on the point measured by the weight to be transported from or to that corner.

In figure the manufacture of one unit of production requires \( x \) tons of material \( M_1 \) and \( y \) tons of material \( M_2 \) with the finished product weighing \( z \) tons to be transported to the market \( c \). It is \( P \) is the point of production and \( a \), \( b \), and \( c \) the distance \( Pm_1 \), \( Pm_2 \), and \( PC \) respectively, the problem is to find that location of \( P \) which minimizes \( xa + yb + zc \). The point can be found by geometry and other method. The use of varignon's mechanical model, in which weight of appropriate size attached to the prices of string passing over pulleys are suspended from the earners of the triangle; the three pieces of string are tied together and the position within the triangle where the knot comes to rest indicates the point of compromise between the three force. If the pull of any one corner is greater than the sum of the pulls of the other corner production will be located at the point or corner of origin of the dominant force.
According to Weber’s theory the industry may not be necessarily centred at the point of minimum. This way weber states, “A location can be moved from the point of minimum transport cost. It can be established at the place where labour cost is minimum transportation cost to a more favorable labour location only if the saving in cost of labour which this new place make possible or larger than the additional cost of transportation which it involves”. The labour location and its power to attract industries depends on labour cost index and locaitonal weight. The ratio between cost of labour per ton of product has been termed by Weber as the labour cost index and the total weight to be transported during the whole process of production as the locaitonal weight. The extent of deviation caused by the varying labour costs can be determined by its “labour co-efficient” that is the rate of labour costs to the location at weight.

The effect of a cheap labour location can be seen in Weber’s isodapane framework.
In figure P₁ is the least-cost location in relation to the market C and material deposits at M₁ and M₂. The circles centered on P₁ are isodapanes, indicating how transport costs rise away from P₁. At E₁ there is a source of cheap labour, the use of which would reduce labour costs by Rs. 3 per unit production. Since L₁ is nearer to P₁ than is the Rs.3 isodepane. A movement from P₁ to L₁ would incur less than Rs. 3 of additional transport costs so total costs will be lower at L₁. If the cheap labour location is within the critical isodapane, it is more profitable location than the least transport cost site that is L₁ in figure, but if it is outside like L₂, P₁ will be the best location.

But movement to a cheap labor location may introduce further complication. It can be seen in figure M₃ is a deposit of the same material as is found at M₁, and it is obvious that a unit at L₁ will prefer to use M₃. A new locational triangle will be set up (M₂ M₃ C) and a new transport cost point at P₂ will emerge, which could be a better location than L₁.

The agglomerative and degglomerative factors are also important for location. These factors are called secondary factors. The total cost of production of industry have also a strong tendency to move toward agglomerating location. If the production cost is less than in increasing transportation cost, the industry will move toward’s agglomerative location. This way, the weberian theory shows how these factors like transportation cost, labour cost, agglomerative and degglomerative factors affect on industrial location. According to weber’s theory cost of transportation plan predominant role in industrial location.
Agglomeration tendencies are treated in much the same way as cheap labour. In figure where five firms (A, B, C, D, and E) are in business, each occupying a separate location inside its own locational triangle. The firms find that they could cut their production costs by Rs. 10 per unit if at least three of them operated in the same location, taking advantage of economies of agglomeration, but in order to gain from this a firm must not incur more than Rs 10 of additional transport costs.

In figure the circle represent the critical isodapanes for each firm. The shaded area is the only place where three firms C, D and E can locate together and still each incur less than Rs. 10 & extra transport costs.

There are some limitations of the Weber’s theory of location. The theory is based on wrong assumptions about labour supply, he assumed two things fixed labour centres and unlimited supply of labour. It is not correct because a rise of an industry at a place may create new labour centres and unlimited labour supply at any center is also not correct as rapid development of means of transport.
and communications so, here alteration is required in weber’s assumption regarding labour supply. Transportation cost depending only on distance to be covered and weighs of the material to be carried requires amendment. It depends on the method of transport, nature of goods also. To make it more realistic, the actual freight rate schedules fixed for different means of transport must be taken into account.

It would be incorrect to assume fixed points of consumption it is observed that consumers are spread all over all the country Location and size of markets may vary with change in the economy. Non economic factors also exert important influence on industrial location. The theory ignores the role of capital and entrepreneurship in industrialization and the classification of material is not proper. Austin Robinson considers this distinction artificial.

**Von – Thunen’s Location Theory :**

Von – Thunen’s has given location theory for agriculture. Here the location decision depends upon the difference in the cost at a given crop at alternative sites. The cost difference are due to land rent and the expense of transportation. He assumed homogeneous land surface and one consuming center. He also involved substitution between transport cost and non-transport cost.
Edger Hoover's Location Theory:

Edgers Hoover (1937) explained location theory in his book ‘The Location Theory and the Shooe and Lather Industry.’ After some time. In 1948 he has given a more selective approach about it in his book ‘The Location of Economic Activity.’ In this book the approach of transport cost has been explained more precisely. According to him the two factors are most important for industrial location (i) production cost and (ii) transport cost. If there is no change in production cot, transport cost is the only variable that affecting price of commodity. An addition, Hoover includes the influence of diminishing returns to scale. He says that extractive industries characteristically operate in a situation where average cost rises with increasing production as the market area gets bigger. Hoover states like weber that in the absence of production cost difference, the best location will be at the point of minimum transport cost. This kind of location might be found at the point of market, at the place where the localized material is available or any other place. But the market price of each producers are different at the different places because of difference in production cost and transport cost. That is why each producers has got different size of market areas. Hoover fallows weber to assume perfect competitive market and emphasis on transport cost. But his theoretical framework is broder than weber’s.

Hoover does not agree with weber’s view about agglomerative factors. Hoover’s approach has its limitations like others. He emphasized transport cost, production cost and neglect demand approach. In other word despite his reference to market areas. He was much more concerned with cost than the demand factor.
**Tord Palander's Theory of Location:**

Swedish economist Tord Palander (1935) has also given an approach of industrial location, in his book 'Beitragezur Standors theorie.' The book was written in Swedish language. He introduced the analysis of market area to explain the behaviour of different firms to get their own market areas. He explained this with the help of diagrams and emphasized transport cost and production cost as well.

Tord Palander's approach was influenced by Weber's work mostly the triangle approach. But somewhere he is different from Weber's work. Weber didn't importance of a dynamic view of location but Palander emphasized on it.

Weber, Hoover and Palander indicted that cost of production were the chief determinants of location of industry. They emphasised the search for the least cost conditions where demand factor is hold constant.

**Sargent Florence's Theory Of Location:**

Weberian theory was based on deductive approach. It has been a critisised by many economists and Sargent Florence was one of them who has critisised strongly. Florence emphasized on inductive approach. He tried to get some statistical data for measuring the degree of location. This way he has given an approach on industrial location in his book 'Investment, Location and size of plant in the year of 1948.'
According to Sargant Florence, the economic activities are related to population. It means the economic activities just not depends on geographical area but population of the country are to be considered.

Sargant Florence mentioned that the relation of an industry to an area is not so important as the relation of the industry to the distribution of occupied population as a whole. This way he tries to establish relationship between population distribution in a country and distribution of industry.

He explained this approach with the help of new concepts, 'Location Quotient' and co-efficient of localisation.

His theory criticized on the ground that the theory explained industrial dispersal in a country, but did not explain the causes responsible for the selection of location for establishment on industry. The second point is that he has ignored the economic base for industrial location which is the only sound base for his theory. He explains the political boundaries of a region for industrial location. He takes the number of workers the basis for calculating to location factor and co-efficient of location. It would not be logical to choose only one factor namely, number of workers, but other factors are to be considered.

This way Sargant Florence's theory location has lots of limitations but still it is important for industrial location. The two concepts, the location factor and co-efficient of location are of great help in assisting and understanding the industrial location, industrial concentration and industrial dispersal in a country.
2.4.2 Revenue/ Demand/ Interdependence Theory of Location:
August Losch’s Theory of Location:

Christaller’s (1933) and August Losch’s (1940) approach has recognized the locational interdependence of firms indicated that the proximity and size of market were chief determinant of location of industry. Loach rejects least cost approach by producing a theory of location with demand as a major spatial variable. The right approach to him is to find the place of maximum profits, where total revenue exceeds total cost by the greatest amount.

Losch recognized that different industries would pass different size hexagons which in turn would generate different intraindustry concentrations. But differential intraindustry cost would arise as a result of different agglomeration. He failed to combine on analysis of intraindustry cost and demand differential in one model. He concentrated on demand as sale determinant of location and neglects special variations in costs. Transport cost has the effect only limiting the size of the market area.

2.4.3 Profit Maximisation approach (Theory):
Greenhut’s Location Theory:

The least cost approach and demand or market approach are one sided approach. Walter isard and Melvin Greenhut have tried to integrate both least cost and demand approach to find the profit maximization location.

Greenhut’s theory of Industrial Location incorporate cost factor, demand factor, cost reducing factor, Revenue increasing factor etc. He says transportation cost influencing location only when the cost of transportation forms a substantial part of total cost. His approach incorporates both major elements, demand and cost for location, therefore it is a more general theory of location.
For integrating the 'least cost' and 'location interdependence' approaches, Greenhut adopted maximization of revenue as the criteria for finding the optimum location. Despite Greenhut's emphasis on the demand factor, both theoretical and empirical inquiry have subsequently remained preoccupied with the cost approach.

Greenhut (1964) again urged that attention be given to the demand factor. He says that demand is dependent on the choice of location and also influences it and more variable than cost.

He makes useful distinction between demand as an area determining factor of location selecting one area for location instead of others because of the greater size of the market in the one and demand as the site determining factor of location which involves choice in relation to the location of competitors. He stated that empiricists have failed to take into account the site determining effect of demand that is, they failed to recognize role of locational interdependence in site selection.

**Walter Isard's Theory of Location:**

Isard's major works on location theory is location and space economy, published in 1956. In Location and space economy the stated aim is to develop principles for a general theory of location, drawing upon various elements of the work of others. Isard emphasized mainly on manufacturing.

Initially, Isard sees a combination of the frameworks of Von Thunen, Losch and Weber as a possible approach to a general theory Von Thunen's. He puts transport inputs, previously referred to as distance inputs (Isard 1951) on the same level as the four conventionally recognized factors of production as a requirement of the productive process.
Isard attaches great importance to the fusion of location theory with other branches of economic theory which he attempts through the well known substitution principle. The framework is the familiar locational triangle with the market is at on corner (c), sources of two materials at the other corner M₁ and M₂ and distances as shown in figure. Pattern of concentric agricultural zones around a central city combines readily with Losch's hexagonal pattern of settlements and market area concerned on a major metropolies. The assumption of uniform and equal distribution of resources in the level plain of Von Thunen and Losch is relaxed by the introduction of a Weberian type of analysis, in which plant location incondition of material localization is considered. This way new production sites and cities may emerge from a weberian mechanism, to be added to the Thunen Losch landscape.

Like most earlier theorists, Isard gives much attention to the transport factor.

The initial problems is to find the optimum location given certain assumption regarding freight rules and quantity of material needed for plant at some set distance from one corner of the triangle, three miles from c. The arc Ts represents a locus of possible points.

Israd first restated webers's theory and generalized it to incorporate transport cost consideration of inputs and produces. This allowed the possibility of more than one production sites. Finally Loschian market area analysis and agricultural location theory based on Von Thunen was embraced to complete space economy. The equilibrium conditions were stated in stabilistion terms, in a form comparable to that of most production theories. Isard's synthesis thus advanced
both industrial and general theory of location and also achieved some kind of integration with other aspects of economic theory.

Isard could thus introduce spatial context to general equilibrium type of framework while involving a general framework by synthesis which he incorporated Weber's classical theory, Palander's extension; the central place theory, and market area framework and agricultural land use theory. He was able to show significance of scale and urban agglomeration economies in the locational selections.

David Smith:

He developed the idea of the spatial interaction of cost and revenue as a constraint of locational choice. Spatial Variations in total cost and total revenue create an optimum location at which profits may be maximized. And also spatial margins beyond which profitable operation is not possible, within the margin the firm is free to locate anywhere provided profit maximization is not required. A position within the relevant spatial profitability margin is the most general necessary locational condition for plant viability.

2.4.4 Conclusion:

These theories or approaches of industrial location are sufficient to study comparative cost analysis and some empirical applications.

Weber (1929) postulated that firms choose plant location in accordance with least transport cost. Hoover showed that transport costs tend to encourage firms to locate either at raw material sources or at the centres of market
and tend to discourage intermediate localizations unless favourable rate structures can be negotiated.

Webber's concentration on transport costs as the major determinant of location patterns stimulated the growth of a school of theorists whose models were based on demand factor. Losch (1954) developed a general theory of location theory on competition for available markets.

Greenhut have tried to integrate both cost and demand approaches to find the profit maximization location. His theory incorporates many factors therefore it is a more general theory of location. However his approach emphasized both major factors demand and cost. Despite his emphasis on the demand factor both theoretical and empirical inquiry still preoccupied with cost considerations only.

Isard (1956,196 ) made an important contribution in theories of location by the successful synthesis of both approaches that is least cost and centrality of markets. He formulated a general theory of location and mainly concern with evolving the theoretical framework which can help in understanding the operation of location process in real world.

In concluding these study summary, remarks on a few other contributions may help to complete it. Moses (1958) has taken the important step of introducing a variable production function. This way allowing variations in scale and Combinations of factors for the locating firm.

Alonso (1967) has attempted to reformulated classical theory, incorporating such complications as economies of scale factor substitution and elastic demand into an expanded and generalized weber type model.
Fetter and Hotelling type of approach often acting as product determination and in that respect has the implication of introducing change in demand over space. Costs are assumed as identical over space. Demand has been assigned a significant role in their approach. Their approaches are based on the motion of imperfect competition.

Lefeber (1958) represents an attempt to classical location theory with the general economic theory of equilibrium.

2.5 Some Empirical Applications:

Introduction:

A major purpose of this chapter is to explain location approach, theories and give some empirical application of location theories as well as to discuss some case studies. Actually, the industrial location can be very difficult to understand and no theory will ever produce models that can perfectly replicate and completely explain actual patterns of plan location.

The general aim is to indicate ways in which theory may assist in the understanding of industrial location in the real world. The number of case studies that is related to comparative cost analysis and empirical studies have been taken into consideration.

2.5.1 Comparative Cost Studies:

The identification of areas variations in total cost for any plant or industry is a difficult matter, involving the analysis of a number of different inputs patterns. But the problems are not that much difficult and a number of fairly
complete comparative cost studies have been published during the past quarter of a country. They have been mainly confined to industries in which the number of inputs are small. Primary Metal Industries have been favorite subjects for studies of this kind. A number of interesting comparative cost analysis have been undertaken in the iron and steel industry, where the cost of two inputs (Iron ore and coal) dominates all other locational considerations.

*Primary Metal Manufacturing Industry:*

[Zinc-Smelting By Cotterill (1950)]

This is a weight losing material oriented process. The main material used zinc concentrates and coke to which must be added less significant quantities of fire clay, chemicals and water.

The concentrate is mainly produced in couer d' Alene, the southern Rockies, the tri-state are occupying the contiques corners of Kansas, Missouri, and Arkansas, and the newyork New Jersey area. The major source of coke is the colfied belt extending from Illionis to Pennsylvania. The market for slab zinc and the biproducts of smelting process is largely within the major manufacturing belt.

Cortterill is primarily concerned with the comparative advantage of alternative smelter locations with respect to the major inward freight item (the transportation of concentration) and the cost of shipping the slab zinc output to the consumer.

The case of production for the Pittsburgh market is considered, examining four smelter locations near material sources (Anaconda, Dumas, Fort Smith, and East-St. Louis) and one close to the market (Donora, Pennsylvania).
Eight possible sources of concentrate are taken into account and summarizes the inward and outward freight costs per ton of output for the five locations assuming that each uses the material source with the lowest freight costs. East st. Louis is the best location from which to serve this particular market generally the smelters near the material sources are at an advantage.

An analysis shows here that the same location and market with respect to various sources of concentrate, showing that there is no source that would enable the market located smelter at Donara to produce cheaper than material located plant using the same source. This shows again the freight cost advantage of East st. Louis.

From the analysis of freight costs corterill concludes that “If a zinc smelter lies along the line-of haul to the market the freight date structure tends to nullify only advantage to be gained by choice of geographical location, from the standpoint of raw material and market locative factors.

*Case Study of Aluminum Industry by Krutilla (1955)*:

Aluminum Industry involves three stages:

1. Production of refined ore (alumina) from bauxite.
2. The electrolytic reduction of refined ore to metallic aluminum.
3. Fabrication of aluminum product.

The refining normally take place at the source of material. For that two tons of bauxite are required to produce one ton of alumina. The reduction of the refined ore to alumina is undertaken in low cost power areas because of the large quantity of electrical energy used.
Fabrication is performed near the market, as the metal in its unfinished form moves at a lesser freight rate than the final product.

Krutilla is mainly interested in the reduction of ore to aluminum. He takes three regions of the United States: The Tennessee Valley, the Texas Gulf coast, and the Pacific Northwest. The approximate combination of inputs required for the production of one ton of aluminum is 18,000 kilowatt hours of electric energy, two tons of refined ore, one half ton of carbon, and sixteen man hours of labour and the market comprises the principle aluminum fabrication centers.

For electricity, the hydroelectric potential of the Columbia Basin gives the Pacific Northwest the advantage over the other two regions. The natural gas sources putting the Gulf coast in second place. Imported ores make Gulf coast the least-cost location for supplies of alumina with the Tennessee valley second. For carbon costs, the differences between them are not very great. Average hourly wage rates tend to favor the Tennessee valley in terms of labour costs with the Gulf coast second.

As a rough indication, The Tennessee Valley shows high cost of inputs assembly. Other two, the Gulf coast and the Pacific Northwest are so close but it is difficult to say that one is better location production than the other.

In this situation Krutilla found that the industry had been elected in Texas and Louisiana. There were offered two reasons for that; the first is that despite the Northwest’s enormous hydroelectric potential, generating capacity has not been developed as rapidly as the aluminum industry’s sharply increased
demand and the other is a regional advantage arising from a government tax amortization policy which favors Lousiana.

**Synthetic Fibers Industry by Airov (1956, 1959)**

Airov's approach is first to determine regions within which plant location is technically feasible and then to evaluate the comparative cost advantages of hypothetical location in each region.

The manufacture of synthic fibers is clearly labour oriented as far as the spatially variable cost items are concerned, and by comparison the other inputs shown contribute relatively little to total cost.

Airov concludes that there are unlikely to be any synthetic fiber plants located in two of the regions, the Taxas Gulf coast area represented by orange has a substantial labour-cost penalty and New England (Boston) has the highest fueal and power-cost of any region as well as a transport-cost disadvantage.

According to the Airov study, the most advantageous location is Puerto Rico. Here the low wage rates more than offset the higher costs of the other inputs. Puerto Rico led to the conclusion that the labour cost advantage could more than compensate for high transport costs. If sufficient economies of agglomeration could be established through the development of an integrated petrochemical synthetic fiber complex.
The reviews of the Zinc, Aluminum and synthetic fibers studies are sufficient to illustrate the kind of practical comparative cost analysis that have been undertaken in recent years.

Other studies of a similar kind include Lindsay (1956) on oil refining and Isard and Schooler (1956, 1959) Isard (1960) on the petrochemical industry.

There are some more limited studies of costs in alternative locations in Britain, mainly concerned with the possible effect of Industrial relocation in accordance with government regional planning policy (Hague and Newman 1952; Luttrell, 1952, 1962).

2.5.2 International Comparisons:

All the comparative cost studies are confined to alternative locations within the same country or region. International comparison are rare but one study about it is given by Hirsch (1967). He studied the manufacturing costs in the United States and Israel.

He considered the possibility of a located in Israel being able to complete in the United States market for crystals of the kind used in the manufacture of optical instrument and similar products. An output by value of 2,00,000 lakh per year was assumed.

As analysis shows, Here Israel's main advantage is in labor costs, as might be expected, but there is also a slight overall saving in other production costs.
The cost of shipping this high value product to the United States is relatively small, but when the cost of overseas sales, staff and office facilities is added the total shipping and marketing costs are almost twice as high from Israel, despite Israel appearing to have a slight advantage over the domestic producer when all costs are taken into account.

**2.6 Other Empirical Studies:**

Some empirical studies have been given to provide more details of location approach. They are as follows.

**The Iron and Steel Industry in the United States:**

The higher degree of localization of iron and steel manufacturing is one of the most important features of the economic geography of the United States. This industry is closely related to the transportation cost. Coal is the most important raw material for this industry, and the need for plants to be close to supplies of coal dominated all other location considerations. So the pull of the coalfield was great enough to insure the location of plants there.

As technology improved the coal supplies lost their dominant position. The reduction in the importance of coal increased the pull of the market.

An attempt to measure the pull of the market in relation to that of coal and ore supplies in the immediate postwar period was made by Rodgers (1952). He showed that on the basis of weight alone the finished product is of less significance than both the two major materials but the situation is reversed when freight rates are introduced. Finished steel travels at a much higher rate than coal and ore, this makes its transport cost greater than for both the material
together. This way in the weber model the market would have the dominant pull now. But Rodgers found that this was not the case. His comparison of the patterns of production and consumption at the end of the 1940s showed the market to be much more dispersed than the industry itself. Iron and steel production require a very large investment in fixed capital equipment and this contributes towards locational stability. For a long time this tendency was also strengthened by the basing point pricing system, which helped to preserve the comparative advantage of the Pittsburgh area with respect to the erection of new capacity.

This study can be regarded as contributing to a test of the hypothesis that the major market had become the best location for new capacity, and the economic rationality required a substantial shift in emphasis from material orientation to market orientation.

**The Pre-war Cost Situation:**

The comparative cost advantage of alternative locations at the end of 1930s, and the future location pattern likely to come about, was the subject of a major paper by Israel and Capron (1949).

Israel and Capron first attempted to work out the cost of assembling the three major inputs such as Iron-ore, coal, and limestone at thirteen different producing centers (Birmingham, Provo, Duluth, Pueblo, Pittsburgh, Bethlehem, Cleveland, Youngstown, Detroit, Buffalo, Chicago-Gary, Sparrows point San Bernadino). In 1939 Birmingham had a considerable cost advantage, arising from the extremely low transport charges involved in the use of local ore and coal. The
low cost of material assembly at two western locations Provo in Utah and Pueblo in Colorado made total costs comparable with these in the traditional centers in the major manufacturing belt. The high cost of coal put the lakeside plants at Detroit Buffalo, and Chicago-Gary at a slight disadvantage when compared with Pennsylvania locations.

Israel and Capron next considered the effect of the cost of serving the market. The analysis shows how selected procuring centers compared with respect to the new market at Newyork Detroit, and seattle. It includes the cost of assembling the material as well as freight charges on finished steel. The Pittsburgh is at the bottom of the list strengthens the view that this area's competitive position was deteriorating, relative to both waterside locations well laced for cheap ore and locations at or near the markets (that is Bethlehem and Detroit). The seattle market shows that the low cost of assembly at Prove and Pueblo is more than offset by high transport on the finished product.

The general assessment of the competitive position given by Isard and Capron was as follows. The Pittsburgh Youngstown Cleveland area was the best location from which to produce for its own market and Chicago Gary was best placed to supply the market of the Chicago area.

These observations support the hypothesis of market oriented plants gaining competitive advantage at the expense of traditional locations in and around Pittsburgh.

As Craig (1957) was to confirm a few years later, both theoretical and empirical evidence indicated that the selection of the optimum location for steel
production had become almost entirely a matter of market proximity.

Simple comparative cost analysis generally tends to support this hypothesis, for it appears that almost all the major national markets could be served cheaper from local plants than from those in other regions. However, when the demand factor is introduced in the form of the size of the market necessary to support a modern integrated facility, and when the additional factors of scale and agglomeration economics, the immobility of fixed capital and corporation structure are taken into account, the argument is less persuasive.

**Lindberg Study of the Swedish paper industry**

Olof Lindberg’s studier over pappersindustriens Lokalisering (1951) is One of the most interesting empirical studies of industrial location. The original is in Swedish but contains an English summary which was published separately in 1953. Lindberg’s approach is derived directly from classical variable cost theory as developed by Weber and extended by Palander.

Lindberg uses maps of hypothetical cost isolines for an imaginary regions to suggest how conditions changed between the 1830’s and the 1930s.

Lindberg makes maps for three points in time, representative of the hand-mill period, the ground wood period and the chemical pulp period. Although the three maps represent hypothetical situations and are not based on precise comparative cost data. They suggest the likely locational characteristics of the paper industry at different period of time.

Lindberg’s analysis constituted a test of the generally accepted idea that the paper industry is material oriented in its locations. He found this not to
be true. Three tons of wood are required for one ton of the finished product but as the material is almost ubiquitous, its locaitonal influence is small. This conclusion stress the important principle that no matter how large an input may be as an element of total cost. It will have a major bearing on locational choice only if the cost of getting it to the pant varies significantly from place to place.

**2.7 Other studies in indian context :**

There have been certain attempts to analyse the spatial spread of individual industries to discover the relative importance of various location factors in the case of industry. The work has been done by other scholars regarding the various location factors in the case of industry in Indian Context.

The work of Thadani, Sharma and Chaudhri fall in this category. Mehta and Mukerji have tried to analyse the extent spatial concentration of selected industries. They have used the method that is directly or indirectly evolved by Florence. Most of these studies have tried to analyse the spatial concentration of individual industries. This studies have not been able to present the spatial manifestation th entire industrial sector.

However some attempts have made to analyse the spatial behaviour of the entire industrial sector. The studies of Dholakia, Lahiri, Sastry and Dhar and Nair are quite valuable in this regard.

The studies of K Sivaprasad and K. Shreerama Murty are quite valuable in this regend. They tried to examine the disparities in respect of the location of large and medium industries. The study has done by the method which have been given by Sargant Florence. Hence the study points out the need for an
effective implementation to achieve an equitable distribution of employment opportunities for all the people in different region of the state of Aandhra Pradesh.

2.8 Relevance Of Present Research

Various approach of location and empirical studies have been discussed in this chapter. It shows the importance of industrial location. The main objective of this study to examine the trends in localization of selected industries of Gujarat state during the period of analysis. These locational trends shows relative importance of different districts or regions as also the propensity of each industry for dispersal or decentralization.

An analysis of the locational trends may also indicates the direction in which future expansion is likely to take place in the absence of state regulation and control.

The present study is based on the concepts which have been given by Sargant Florence. An attempt would also made to analyse and examine the validity of inductive findings in the light of weberian analysis.

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