

# THE DETERMINANTS OF THE REDISTRIBUTION OF MANUFACTURING ACTIVITIES IN KOREA

CHOE SANG-CHUEL

## 1. Methodological Problems

Industrial location has been of great concern to economists, geographers, and regional scientists who seek a spatial theory within their theoretical variants. Although the purpose of this study is not to discuss general location theory, a preview of location theory is needed, which will provide an explanatory framework in searching for the locational determinants of Korean industrial activity.

Historically, the major approach to manufacturing location theory has been the economic equilibrium approach, which can be generalized into two subcategories. One is a partial equilibrium approach, largely initiated and developed by A. Weber, with the primary emphasis on minimizing cost factors; the other follows a general equilibrium framework along the lines of Walras, Pareto, and Cassel. Each approach has a long history and tradition. However, the partial equilibrium approach presents a reality too naive to represent the complexities of the industrial world; and the general equilibrium approach grapples with a task presently too difficult for the state of the economic sciences.<sup>(1)</sup> The economic equilibrium theory, partial or general, essentially has been based on the assumption that the locational decision

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(1) G.J.Karaska and D.F. Bramhall, ed., *Locational Analysis for Manufacturing* Cambridge, Mass.: M.I.T. Press, 1968, p.3.

maker is an economic, and rational, man limited by his finite ability to perceive, calculate, and predict and to imperfect knowledge of actions according to their relative, or expected, utility<sup>(2)</sup> The location theory so far developed by economists depends for its notion of equilibrium on the assumption that human beings are compromisers. A second assumption to the economic model is that an unidimensional psychological continuum utility exists for each individual in terms of which all goods can be ordered.<sup>(3)</sup> The economic equilibrium model is based on the assumption that the locational patterns which emerge from the establishment of a number of industrial plants over a period of time are predicted by assuming that the firms involved are acting to maximize profits.

Although both the general and partial equilibrium approaches simplify the environment considerably (by assuming a uniform plain with an evenly or symmetrically distributed population, a transport surface permitting direct-route connection between any site and all other points, and ubiquitously available raw materials), the locational decision maker must be in possession of the formidable knowledge and rationality characteristics of the economic man in order to ascertain the optimal locations required by each school of location theory.<sup>(4)</sup> The difficulties of arriving at a real world, optimal factory location decision are compounded not only by the fact that the simplifying assumption of least cost and profit maximization but also by a number of conditions that are either totally ignored or inadequately dealt with in these classical theories. This does not mean that common locational factors such as transportation, labor, energy, land, scale economies, market, and so on have not had a significant influence in most locational decisions, but we would still be unable to give a satisfactory explanation as to existing locations, or their continuing attraction for new enterprises, in these terms alone.

Various surveys of migrating firms and plants have revealed a subjugation of profit-and-loss considerations by management to what appear to be more subjective criteria. Thus, a complementary approach to the use of the economic equilibrium approach for an understanding of the movement of industrial firms can be found in a more behavioral consideration derived from purely empirical studies, attempting to learn the reasons for a plant's location. Most

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(2) H.A. Simon, "Economics and Psychology," *Psychological Review*, Vol. 63, 1956, pp.129-38.

(3) M. Holzman, "Theory of Choice and Conflict in Psychology and Economics," *Conflict Resolution*, Vol. 2, No.4 1958, p.313.

(4) Allan Pred, *Behavior and Location: Foundations for a Geographic and Dynamic Location Theory Part 1*. The Royal University of Lund, Sweden, 1967, p.82

studies employing this approach have not been conducted within the framework of classical location theories. Although the economic equilibrium theory will aid in deciphering spatial manifestations of industrial location, it should be enriched by taking into consideration non-optimal behavior, imperfect information, other psychological variables, socially dictated constraints, and the impact of existing patterns on subsequent patterns.

In wider policy terms, the restrictive train of thought of the economic equilibrium approach can lead to lack of understanding of the locational decision-making of the individual entrepreneur. Therefore, policy makers and planners cannot too easily accept the idea that the entrepreneur will follow their economic or physical plan based solely on the premises of the economic equilibrium approach to industrial location.

In Korea many difficulties have been raised, partly from a lack of empirical data and analytical methodology and partly because they are generally less dependent on purely economic conditions than their counterparts in highly industrialized countries. There are several constraints in applying a straightforward economic equilibrium approach in Korea:

(1) The entrepreneurs in Korea have worked in an environment that is loosely explained by economic profitability but based on locally available information and irrational and non-economic considerations. Korean enterprises have to do their critical decision-making with inadequate data for market economics, especially for locational comparison. The individual plant and, perhaps more importantly, the decision-making unit under which that plant operates, does not conform to classical economic premises.

(2) In the case of Korea about one-half of the manufacturing establishments have less than fifty employees. These industries are very likely to be oriented to market and tied loosely by raw material needs. They are likely to be small, serving only a limited local market, and ubiquitously distributed. These small firms and plants are higher in sensitivity to noneconomic factors, as a Greek economist noted at the conclusion of his analysis of industrial location of Greece:

Deviations from a general economic equilibrium model have been coupled with the lack of adequate price competition in national market, the family structure of industrial firms, and the industry's dependence upon of highly regulatory and centralized system of public administration and financial institutions. Apparently, excessive government interference in industry

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(5) G. Coutsoumaris, "Regional Activity Relocation Problems in a Developing Countries," *Regional Science Association Papers*, Vol. XII. 1964

and the necessity for dealing extensively with government agencies create sizable diseconomies for industrial firms located far from the administrative center.<sup>(5)</sup>

The personal preferences of the locational decision makers have been cited as an important factor. Accessibility to public services is also a decisive factor in locational choice. Regionalism has acted against rational judgement in locational decision-making for government-sponsored investments.

(3) A major difficulty with the economic equilibrium approach to industrial location is that historical evidence does not support it. As J. Friedmann points out, disequilibrium is built into transitional societies from the start; the technological revolution is permanent; changes in demand and supply conditions are so rapid and their consequences of such magnitude that the premises on which an equilibrium theory can scarcely be considered 'marginal'.<sup>(6)</sup> In a system in which economic marginality does not trade off between different locations, the equilibrium approach cannot be applied in searching for the locational behavior of industrial activity.

(4) The next constraint preventing the introduction of rational and mathematical location models is not unique in Korea but is applicable elsewhere. Several studies have been done in regard to Korean industrial location.<sup>(7)</sup> Those studies have relied on the economic equilibrium approach for their analytical framework, in which programming techniques and econometric models are introduced. But there is much doubt about the contribution of these approaches to the regional plan-making process. Koopmans and Beckmann were forced to confess about their locational model that even in a relatively simple static situation, optimal locations are indeterminate if any interplant transportation costs are involved.<sup>(8)</sup> Since the geographical distribution of markets and population change with time, and input and output prices paid and received, the technologically determined production function and the number, location and competitors are all temporal variables for any given locational decision-maker.

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(6) John Friedmann, *Regional Development Policy: A Case for Venezuela* Cambridge Mass.: M.I.T. Press 1966, p. 14.

(7) For example, see David C. Cole, "An Interindustry Model for Korea," paper delivered at San Francisco Meeting of the American Economic Association, Dec. 1966, p. 20. and Rodger D. Norton, "Formel Approaches to Regional Planning in Korea," *Practical Approaches to Developmental Planning*, edited by Irma Adelman, Baltimore: Johns Hopkine Press, 1969, pp. 185-212.

(8) See. T.C. Koopmans and M.J. Beckmann, Assignment Problems and the Location of Economic Activities, *Econometrica*, vol. 23, 1957, pp. 53-76. Interplant transport costs are another common feature of a reality which is practically ignored in the normative location model.

It is thus impossible for that decision-maker to select an alternative that will yield maximum profits on both a long-term and short-term basis in Korea. Whereas market size is often a constraining factor in the establishment of most heavy industries, economies of scale, which are characterized as one of the typical nonlinear functions, can inhibit the use of programming techniques for locational analysis.

## 2. Major Locational Determinants

In this section I will search for the important locational determinants on which the locational decision makers have acted for the last decade. I have been forced to be satisfied with pinpointing the range of factors which should be taken into consideration, since the aforementioned lack of empirical data and methodological difficulties preclude a deeper analysis.

### (1) Technological Changes

Technological changes have played an independent role in the evolutionary process of industrial productive and spatial system. Technological innovations not only foster expansion within a single industrial category but also dictate the industrial linkage between different industries, resulting in a locally concentrated multiplier and rapid advances to higher thresholds. Furthermore, once technological changes have occurred, the chances for invention and innovation are enhanced, stimulating the continuation of the circular process, perhaps even at an accelerated pace, until diverted or hindered.<sup>(9)</sup> At the early stage of industrialization, technological advancement, whether imported or self-generated, has brought about an increased concentration of certain favored locations. Technological changes have determined not only the locational adaptation of individual firms but also the system of economic activities and overall spatial patterns of the country. The following diagram shows the interactive processes between technological change and locational change. The locational change might be signified as a spatial arrangement of human activities being induced by technological and productive changes. Furthermore, the interaction must not be limited to a one-way operation, since the existence of a certain activity in a region does act as an important base for the initiation of techno-productive changes. In a large and growing industrial center, there is also the development and expansion of many essential and useful services are of great value

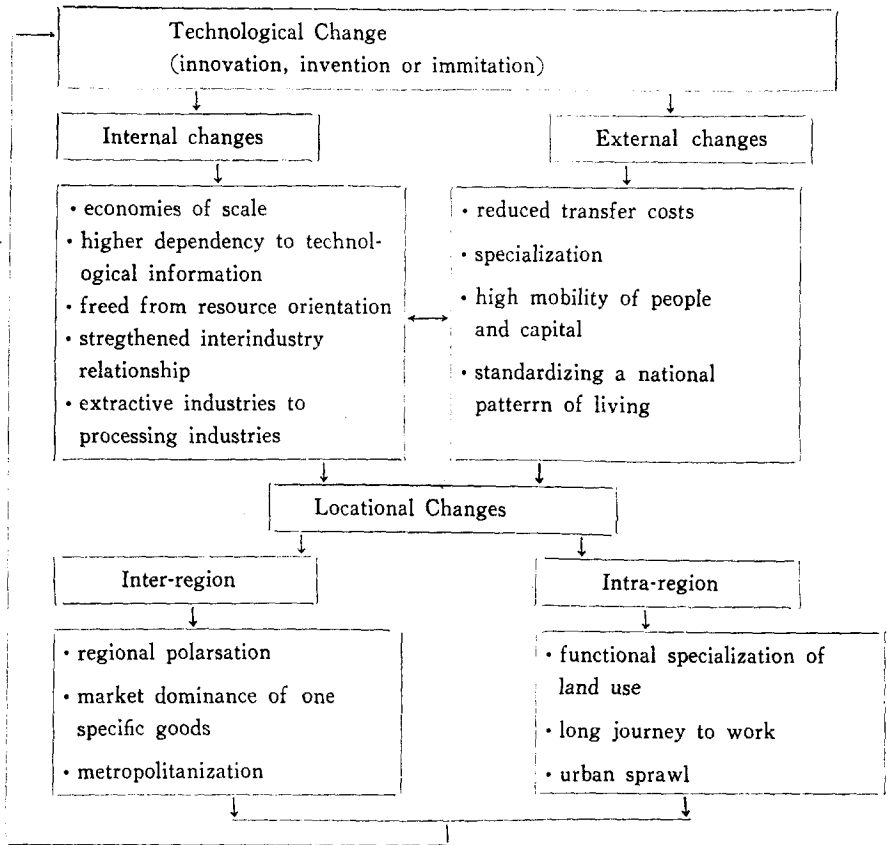
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(9) See, Allen R. Pred, *The Spatial Dynamics of the U.S. Urban and Industrial Growth, 1800-1914*, Cambridge, Mass: M.I.T. Press, 1966, pp.174-78

to the smaller firms that cannot maintain their own servicing staffs.

The concentrated accumulation of capital has made possible a far more efficient mass production than can be achieved by simple accumulation of capital, and the urbanized population has created a mass market which sustains mass production. Technological information, which

A Schematic Flow of Interaction Between Technological Change and Locational Change



is readily available in the large metropolitan areas, is the most important factor in determining the locational concentration of industrial activities, especially of small industries. Small industries are highly dependent upon free external economies. Small and medium-sized industries have moved to the large metropolitan areas like Seoul and Pusan, where agglomeration economies are available. This trend is not unique in Korea, as Vernon has shown in his study of the New York metropolitan area, the industries which are most attracted are those highly dependent upon auxiliary business services and which need frequent direct personal

contacts with buyers and sellers.<sup>(10)</sup>

## (2) Transportation

As transportation costs are reduced, customers some distance away from the plant will find that the price they pay for the product is reduced. The time-space continuum of the geographic area that could be served by several small firms has been replaced by one large firm. As A. Losch pointed out, reduced transportation rates have tended to transform a scattered ubiquitous pattern of production into an increasingly concentrated one, and to effect progressive differentiation and selection between sites with superior and inferior resources and trade routes.<sup>(12)</sup> We have also seen from the industrial growth of Korea that the reduction of transportation costs in an area in which resources were evenly distributed tended to cause concentration of production rather than decentralization shown to occur in the area with ubiquitous resources. An example of the former is the basic metal industry and of the latter, the manufacture of furniture and fixture.

## (3) Change of Market Centers

In the case of establishments in certain categories of consumer goods industries, locational factors, other than market, exercise a negligible influence irrespective of variations within the limits in the scale of operations. Plants in this category are not systematically planned, although adequate note of their requirements of different facilities should be taken into account whenever industries come into existence. These industries are by and large of local significance. Small scale industries have shifted to a few large population centers where internal immigration has been taken place. Those industries are, for example, footwear, wearing apparel, made-up textile goods, furniture and fixtures, printing and publishing, and transport equipment.

## (4) Development of Substitute Inputs

The development of substitute inputs also greatly changes industrial location. It is illustrated by the development of substitute raw materials in the textile industry in which cotton and silk formerly constituted 90 percent of its inputs. The region, which was the main cotton-producing area, has experienced a decline of its textile industry since the 1950s because the region has not succeeded in coping with the favorable locational requirements for

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(10) Raymond Vernon, *The Changing Economic Functions of the Central City*, New York: Committee for Economic Development, 1959, pp. 28-37.

(11) August Losch, *The Economics of Location*, New Haven, Conn: Yale University Press, 1954, pp. 174-78

the synthetic fiber industry.

#### **(5) Imported Material Orientation**

Since the basic heavy industries have not developed within the national economy alone, due to lack of an adequate market, raw materials or other facilities, plants for the secondary processing industries tend to be located near coastal towns or other areas having ready access to imports. Cities adjoining ports have provided other locational advantages facilities for importing of raw materials, well-developed railway transport systems radiating into the interior of the country, and other external economies. In Korea the lack of an internal market has either impeded the growth of inland region's industries or led to a locational pattern marked by locational concentration in the port cities.

From this point of view, the city of Pusan and its peripheral areas are one of the most suitable locations. The location of the Ulsan industrial complex was also partially justified by this reason.

#### **(6) National Security**

In the case of heavy industrial plants, another important locational consideration was given to national security in terms of gross investment carried out by foreign capital, which mainly capital intensive manufacturing sectors. In manufacturing, the foreign capital inflow was of great significance in the construction of plants for chemical fertilizer, oil-refining, and synthetic fibers, which were intended primarily to achieve import substitution. In the selection of plant location the foreign investors have had to be very sensitive to national security for their investment in Korea under cease-fire. They accept some degree of risk under the existing national defense system but try to reduce as much as they can. The foreign investors, as well as the government, prefer to locate in southern coastal areas rather than the northern part of the country. Accordingly, large heavy industrial plants established after 1960 were located to minimize an attack from North Korea.

#### **(7) Monopolistic and Oligopolistic Location**

The government invests through two channels: the nationalized industries such as tobacco and fertilizer, and the government corporations where social costs and goals are the prime consideration. Locational decision-making of the government enterprises has shown different patterns from those of private enterprises. The manufacture of tobacco, monopolized by the government, was intended to minimize the disturbance of the existing market share and to divide the nation into a few large markets in order to maximize profit under monopoly. The



government has intervened in the establishment of fertilizer plants by direct, or mixed, investments. So far four fertilizer plants have been established. The first two were in Naju and Chungju to minimize distribution costs or, in other words, with a consideration of the consumer's proximity. But the locational decisions for the latter two would have been based on political pledges for a specific province. The selections were motivated on short-term benefits to a specific locality at the expense of prolonged hauling over the nation.

The government corporations and large private corporations have been operated under the protection of an oligopolistic price system. The petroleum and cement industries belong to this category. Petroleum industrialists are likely to divide the market into three areas: south west, southeast, and central parts of the county-wide market. Though the first refinery in Ulsan covered the entire country in its market domain, the appearance of the second refinery in Yosu forced it to seek a compromising point in peaceful market sharing. Now a third one is under consideration, to be located in the central part of the country. Somehow these three petroleum refineries will reach an agreeable redelineation of market sharing. In this way they can maximize their profit, as Townroe pointed out in his location study of England:

In sectors of industry with a high level of oligopoly, the market standing of the corporation assumes more importance for investment policy, especially if one corporation decides to move from a state of peaceful co-existence with other corporations to a position of aggression in order to obtain a large market share and increased profits.<sup>(12)</sup>

The cement industry, in contrast to the petroleum industries, is self-sufficient with domestic raw materials in the mideastern region of the country. Thus, most cement plants are concentrated in one region near their raw materials. But the cement industry is strong enough to divide the national market for their goal of profit maximization through oligopolistic sharing.

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(12) P.M. Townroe, "Locational Choice and the Individual Firm," *Regional Studies*, Vol. 3, No. 1, 1969, p.17.