Location and Measurement of Economic Activity

After the analysis and projection of population and migration in different regions are done, the next task for economic development is to decide its optimal location, measurement, and projection.

Most of the classical scholars in location theory come under the influence of German thought. The first attempt at a general location theory began with Alfred Weber (Friedrich 1929), although Von Thünen (1856), the father of location theorists, far in advance of his time, did make progress toward a general locational analysis. Launhardt (1885), a major predecessor of Weber, treated the location theory with narrower sets of circumstances than were encompassed in Von Thünen’s isolated state. Weber was also influenced by Roscher (1878) and Schaffle (1873). Predohl (1925) extended the partial equilibrium analysis of Weber to a more general equilibrium case. The more recent theory of location starts with the modification and extension of the classical system. The basic reference begins with Isard (1956), Hoover (1937, 1948), Lösch (1959), Alonso (1964), and Greenhut (1956). They focus on the total transportation cost but introduce variations in labor, power cost, and the like, as well as internal and external economies. Kuhn and
Keunne (1962), Cooper (1968), and others have proposed algorithms for this extended version.

Let us briefly state Isard's model. Like Weber, he assumes constant-coefficient production functions and uses a general spatial transformation function such as

$$\Phi(Y_1, \ldots, Y_K, M_A S_A, M_B S_B, \ldots, M_j S_j, X_{K+1}, X_{K+2}, \ldots, X_n) = 0,$$

where $Y_1, \ldots Y_K$ represents quantities of various inputs other than transport; $M_A S_A \ldots M_L S_L$ represent quantities of various transport inputs; $X_{K+1} \ldots X_N$ represent quantities of various outputs; $M_A, M_B \ldots M_L$ represent the weights of various raw materials; and $S_A, S_B \ldots S_L$ represent the distances products and raw materials moved. Assuming that total revenue and costs on all inputs are fixed, the firm's customary problem is to maximize profits.

$$V = - P_1 Y_1 - P_2 Y_2 \ldots - P_K Y_K - r_A M_A S_A - r_B M_B S_B - r_L M_L S_L + P_{K+1} \ldots + P_n X_n,$$

where $P_1, P_2 \ldots P_n$ are prices and $r_A, r_B \ldots r_L$ are transport rates. This maximization leads to the conditions

$$\frac{r_I}{r_J} = - \frac{d(M_j S_j)}{d(M_i S_i)} (M_c S_c) = \text{constant},$$
$$\frac{r_I}{r_C} = - \frac{d(M_C S_C)}{d(M_i S_i)} (M_j S_j) = \text{constant},$$
$$\frac{r_J}{r_C} = - \frac{d(M_C S_C)}{d(M_j S_j)} (M_i S_i) = \text{constant},$$

which can be interpreted as substitution principles of marginal analysis of economics. Isard's conditions were relaxed by Moses (1958). Lefeber (1955) reformulated them for a more realistic situation with respect to discrete points. Samuelson (1952) extended this problem within a linear programming framework. An interesting formulation of the problem is that of Stevens (1961), who discusses the implications of the dual variables in transportation programs for the classical theory of location rent.

Lösch's formulation of location theory is both spatial and multiregional. He considers a broad, homogeneous plane with uniform transport facilities in all directions where raw materials are uniformly available in sufficient quantities. Under this condition, he deduces that the market area of an individual producer will be a hexagon. For each commodity the plane is dissected into a honeycomb of hexagonal market areas.

Closely related to the Lösch theory of market areas is Christaller's (1933)