# THE LÖSCHIAN HIERARCHY OF CITIES: AN EMPIRICAL STUDY OF THE INDIANAPOLIS REGION, 1880

This dissertation was an empirical investigation suggested by central place theory. Its copestone was an attempt to determine whether Löschian notions of city systems could be applied to manufacturing industries. This paper outlines those elements of central place theory most germane to the thesis, before sketching the inferences drawn from its principal findings.

August Lösch was a German scholar who tried to incorporate geography in his approach to economics. He endeavored to account for the spatial theory of economic regions. Lösch's construct is one of the twin pillars of central place theory. It is a theory of spatial differentiation, highlighting the interaction and interdependence of economic activities within and between cities.

Perhaps the most celebrated single contribution in Losch's analysis is his determination of a spatial system of cities--the Löschian central place hierarchy. The discrete grades of this hierarchy are composed of cities with varying degrees of functional complexity. More complex places are termed "higher order" centers and serve larger tributary areas than less complex--"lower order"--centers. The higher order centers supply all the goods and services provided by lower order centers plus some additional functions differentiating them as higher order places. The goods and services characteristically provided by lower order centers are necessities, ubiquitously available in higher and lower order centers alike.

A considerable number of empirical studies have been applied to evaluating the central place hierarchy in the last quarter of a century. These studies, however, have concentrated on the retail and service sectors of urban economies but have neglected manufacturing, a rich though still virtually unmined lode. This research broke with the customary thrust of empirical studies because it concentrated on the manufacturing sector associated with urban centers. Although data were laboriously gathered through traditional historical methods, the historical research itself was illuminated by insights obtained from economic theory, and facilitated by use of that powerful tool, the modern high-speed computer.

The historical portion of the research utilized the Census of Manufacturing manuscripts for 1880. This superbly detailed body of economic data is deposited with the Indiana State Library at Indianapolis. The study itself focused on seventy-five townships in a twenty-six county region surrounding Indianapolis.

There were 124 different industries, as defined by the Bureau of the Census, represented in the sample region. These industries ran the gamut from the mundane and ubiquitous to the specialized and isolated. The location of the different industries was, on the whole, consistent with a priori and intuitive expectations.

On the one hand, six industries--lumber-sawing, flouring- and grist-milling, blacksmithing, brick and tile works, boot- and shoemaking, and wheelwrighting--were located in 42 percent or more of the townships in the study. Thus, only a few manufacturing industries were elemental, and widely distributed throughout the region. At the other extreme, the production of artificial limbs, lightning rods, and sewing machine cases, for example, were three of the fifty-one industries found in only one township. All but four--more than 93 percent--of these unique industries were situated in Indianapolis, the rest all coming from townships with populations greater than 5,000. Thus, unique industries were domiciled exclusively in the larger, relatively more complex, economies in the sample region.

Since, by inference, townships possessing unique industries will be of a higher order than those with just ubiquitous ones, it was possible to generate a tentative four-tier hierarchy based on that simplistic division. Even such a crudely generated hierarchy did fulfill many of the a priori requirements of Löschian theory. The ubiquitous industries were widely dis-

tributed throughout the hierarchy. Even the most elemental communities enjoyed either a lumber-sawing mill or a flouring- and gristmill, a blacksmithery or a brick and tile works. In all but five instances the townships included two industries--usually a pair from the four most ubiquitous ones mentioned above. Higher order cities tended to possess several establishments covering most of the ubiquitous industries, plus a selection from the fifty-eight less widespread industries. Unique industries were, by definition, sparsely distributed and appeared in only one township.

Additional objective evidence supporting this formulation of a central place hierarchy was obtained through statistical tests. Capital investment, number of employees, annual payrolls, value of material input, and value of product output for the most widespread industries in the sample region were subjected to analysis-of-variance tests. (There were too few establishments in other industries to insure sufficiently large samples for testing purposes.)

The test results for each of the six most ubiquitous industries overwhelmingly endorsed the hypothesis that there were significant differences between similar industries located in different orders of the hierarchy. That is, an industry in a particular census classification exhibited substantially different economic characteristics depending on the order in the central place hierarchy of the township in which it was located.

On the basis of admittedly simplistic and arbitrary concepts of the Löschian hierarchy, utilizing a previously untested sector of urban economies, the evidence discussed in this paper may be interpreted as lending support to the Löschian theory of city systems.

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