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# DEPARTMENT OF AGRICULTURAL ECONOMICS staff paper

LAND VALUES AND LAND USE WITHIN  
AN URBAN ENVIRONMENT:  
A REVIEW OF THEORY  
AND EMPIRICAL FINDINGS

By  
David Stephens  
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COLLEGE OF AGRICULTURE  
UNIVERSITY OF NEBRASKA, LINCOLN, NEBRASKA

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Land Values And Land Use Within An Urban Environment:  
A Review Of Theory And Empirical Findings<sup>1</sup>

by

David Stephens<sup>2</sup>

Introduction

"Cities are the focal points in the occupation  
and utilization of the earth."<sup>3</sup>

The city has become the focal point of today's rapidly urbanizing world. With the rising tide of urbanism has come a wave of problems of expanding magnitude and dimension. Academics have sought to stem the onslaught of problems through investigation of the processes and forces which are thought to shape and form the city. Successful isolation of significant variables and their interrelations is of paramount importance in the attempt to improve the utility of the city for mankind.

The importance of one area of concern has been noted by Alonso:

"The internal structure of cities has proven to be a subject of extraordinary richness and of such complexity that only a modest beginning has been toward its understanding."<sup>4</sup>

It is to this problem of land use within the city that this study addresses itself. Specifically, the main concern will be to review the evolution and origins of various theories pertaining to urban land uses and urban land values.

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<sup>1</sup>A paper prepared for Dr. Maurice Baker as partial requirement for independent study project.

<sup>2</sup>Former graduate student in Department of Geography, University of Nebraska.

<sup>3</sup>Chauncey D. Harris and Edward L. Ullman, "The Nature of Cities," Annals of the American Academy of Political and Social Sciences, 242 (November, 1945), 7.

<sup>4</sup>William Alonso, Location and Land Use, (Cambridge: Harvard University Press, 1964), 2.



By nature many of these theories are based in economics, but the contributions of sociologists, geographers and others will also be noted. The second portion of this paper will examine selected empirical studies in light of theoretical concepts. It is well understood this undertaking is a difficult one, however, it is not without merit for much confusion exists on the relationship of these two aspects of the urban environment.

### The Pre-1900 Period

Implicit in the idea of urban land use and values is the economic concept of rent, a topic of economists, since at least the eighteenth century. Bye writes that although the concepts of economic rent has been severely criticized by some and abandoned by others it still remains a concept fundamental to the understanding of economics.<sup>5</sup> Chisholm underscores the significance of rent to land use saying, "It is therefore, the concept of Economic Rent (author's capitilization) which underlies all questions of competition for the use of land and provides the means whereby this competition is resolved to provide patterns of land use."<sup>6</sup>

Rent in the pre-1900 sense meant agricultural rent, since urbanism on a large scale is a post 1900 development. Thus, we must turn our attention to the early works of those writers who concerned themselves with the problems and questions of agricultural rent. These tended to be primarily Englishmen, whose interest was aroused during the parliamentary debate over the so-called "Corn Laws".<sup>7</sup> Barlowe cites Thomas Malthus, John Rooke, Edward West and Robert Torrens as those who contributed pamphlets during the debates which treated the topic of

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<sup>5</sup>Carl Rollinson Bye, Developments and Issues in the Theory of Rent. (New York: Columbia University Press, 1940), 1.

<sup>6</sup>Michael Chisholm, Rural Settlement and Land Use. (London: Hutchinson University Library, 1962), 26.

<sup>7</sup>Raleigh Barlowe, Land Resource Economics. (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1958), 152.

rent.<sup>8</sup> However, he places the actual credit for origin of the idea in the earlier works of Sir William Petty, Turgot, James Anderson and Adam Smith.<sup>9</sup> Apparently, Smith was the only one of this early group to offer any pronouncement on urban land. Alonso quotes him (Smith) as saying nothing of its urban land values, remarking only that this land (urban land) is unproductive and the landlord is a monopolist.<sup>10</sup> (One wonders how unproductive land can be worth thousands of dollars per front foot in a large city if it is unproductive) For Smith at least, more important was the idea that rent for agricultural land varied due to differences in fertility and the situation of the land.<sup>11</sup>

At the outset of the nineteenth century Ricardo, drawing on the ideas of Smith and others, set forth a treatment of agricultural rent, which although subject to some modifications, forms the basis for most of the modern day thinking on the subject of rent.<sup>12</sup> Two aspects of Ricardo's work that concern us here are those concerning the affect of differential fertility of the soil and locational advantages owing to nearness to the market place. Ricardo placed very heavy emphasis on the idea that the most favorable land (the most fertile) is that which would be placed in production first and then as the demand for products of the land increased less favorable land (less fertile land) would be placed into production. The difference between the returns from the best land and that of the most marginal land was termed by Ricardo "economic rent". He noted that rent might be earned in a second way. This second way, rent earned due to a locational advantage, was not stressed by Ricardo. This manner of earning rent however, became and still is the fundamental principle of urban land economics.

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<sup>8</sup>Barlowe, 152.

<sup>9</sup>Barlowe, 152.

<sup>10</sup>Adam Smith, *The Wealth of Nations*. (New York, Dutton), Vol. I, p. 320; Vol. II, p. 325 as cited in Alonso, 4.

<sup>11</sup>Alonso, 3.

<sup>12</sup>David Ricardo, On the Principles of Political Economy and Taxation, 1817.

Independently of Ricardo's work, von Thunen arrived at the same conclusions concerning the locational advantage of land near the market place.<sup>13</sup> Chisholm writes concerning von Thunen:

"Von Thunen observed that Ricardo based his argument about the nature of Economic Rent (author's capitilization) on differences in the inherent fertility of the soil, but that exactly the same phenomenon arises if the 'quality' of the soil varies not with respect to fertility but with respect to location."<sup>14</sup>

Thus, the various plots of land around a market place were used for the crop or livestock system which offered the greatest return. On any specific plot of land the exact use was determined by the rent bidding ability of a type of activity on that plot owing to savings in transportation cost. Following this reasoning, at some point outward from the market center production would not be profitable owing to prohibitive transportation cost. This idea in a somewhat modified form, often accessibility to the central part of the city, forms a key concept in the attempt to explain urban land values and land uses.

Two other early economists should be mentioned in this section on pre-twentieth century contributions. John Stuart Mill viewed the problem of urban land as:

"...one of a monopoly situation where the value of a fixed and limited supply of 'houses and building ground, in a town of definite extent' will be such that the demand will be sufficient to carry off the supply offered."<sup>15</sup>

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<sup>13</sup>J. H. von Thunen, Der isolierte Staat in Beziehung auf Landwirtschaft und National Okonomie. (Rostock, 1826).

<sup>14</sup>Chisholm, 26.

<sup>15</sup>John Stuart Mill, Principles of Political Economy. (New York: Longmans, Green), 444, 445, 448, 649 as cited in Alonso, 4.

The second of these writers, Alfred Marshall devoted an entire chapter to urban land values, however most of that chapter concerns utilization of land for profits in manufacturing and retailing enterprises.<sup>16</sup> Marshall, like von Thunen, recognized the value of the fixed location of land. He indicated:

"...the fundamental attribute of land is its extension... The area of the earth is fixed; the geographic relations in which any particular part of it stands to other parts are fixed. Man has no control over them; they are wholly unaffected by demand; they have no cost of production; there is no supply price at which they can be produced."<sup>17</sup>

Marshall's locations were of two types, situation and site, these he defines them saying:

"'Situation value' is the sum of money values of the situational advantage of a site...'Site value' is the price which is the price which a site would fetch if cleared of buildings and sold in the free market and is equal to the situation value plus agricultural rent."<sup>18</sup>

As was the case with von Thunen, the Marshall idea of potential use was a function of bidders competing for various sites based on their rent paying ability and that the highest bidder would be able to capture the best site and situation.<sup>19</sup> Marshall, unlike many earlier or even later writers, recognized the importance of not only site and situation, but the size of the lot. He states, "If land is cheap, he (the entrepreneur) will take much of it; if it is clear he will take less and build high."<sup>20</sup>

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<sup>16</sup>Alfred Marshall, Principles of Economics. (7th ed. London: MacMillan, 1920).

<sup>17</sup>Alfred Marshall, Principles of Economics. (8th ed. The MacMillan Co., 1923), 144-145 as cited in Barlowe, 31.

<sup>18</sup>Alfred Marshall, Principles of Economics. (7th ed., London: MacMillan, 1916), 445, 448, 450 as cited in Alonso, 4.

<sup>19</sup>It might be interesting to note that problems of site and situation were the predominate theme in many early non-economic studies of the city. See for example, Charles H. Cooley, "The Theory of Transportation," (Baltimore: American Economic Association), IX, No. 3, 1894.

<sup>20</sup>Marshall as cited in Alonso, 4.



In summation of the developments of this period it is evident that urban lands were not the major concern of land economists and that what principles and concepts did develop were mainly an outgrowth of an interest in agricultural land. However, the concepts of rent, rent paying ability, differential rent bid curves, site and situation, and the size of the lot were all shown to be of some importance to the value and use of land in the city.

#### The 1900 To 1950 Period

At the outset of the twentieth century, the interest in land use and values shifted from the continent to the United States. Moreover, several new disciplines entered into the investigation. The economist was joined with the land economist, the urban ecologist and the geographer. This portion of the paper will examine the points of views and contributions of each of these disciplines in the period between 1900 and 1950.

#### The Land Economist

In the United States the rising tide of urbanism spurred Richard Hurd to write what proved to be the foundation study for urban land economics.<sup>21</sup> In his preface, Hurd states the problem:

"When placed in charge of the Mortgage Department of the U.S. Mortgage & Trust Co. in 1895 the writer searched in vain, both in England and this country, for books on the science of city real estate as an aid in judging values. Finding in economic books merely brief references to city land and elsewhere only fragmentary articles, the plan arose to outline the theory of the structure of cities and to state the average scales of land values produced by different utilities within them."<sup>22</sup>

He then proceeds to formulate a theory of urban land values that sounds very similar to that espoused by von Thunen for agriculture.

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<sup>21</sup>Richard M. Hurd, Principles of City Land Values. (New York: The Record and Guide, 1903).

<sup>22</sup>Hurd, v.

Von Thunen apparently anticipated the possibility of extending his ideas to an urban situation. He noted that:

"If we investigate the reasons why site rent increases steadily toward the center of the city, we will find it in the labor saving, the greater convenience and the reduction of the loss of time in connection with the pursuit of business."<sup>23</sup>

Building on this idea Hurd proposed that:

"As a city grows, more remote and hence inferior locations must be utilized and the difference in desirability between the two grades produces economic rent in locations of the first grade, but not in those of the second. As land of a still more remote and inferior grade comes into use, ground rent is forced still higher in the land to the first grade, rises in the land of second grade, but not in the third grade and so on."<sup>24</sup>

He further states:

"Practically all land within the city earns some economic rent, though it may be small, the final contrast being with the city's rentless and hence, strictly speaking, valueless circumference."<sup>25</sup>

Finally he summarizes:

"Since value depends on economic rent, and rent on location, and location on convenience, and convenience on nearness, we may eliminate the intermediate steps and say that value depends on nearness. The next question is, nearness to what? - which brings us to the land requirements of different utilities, their distribution over the city area and the consequent creation and distribution of values."<sup>26</sup>

As we shall see "nearness" will come to mean the center of the city.

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<sup>23</sup>J. H. von Thunen, 212-213, as cited in Richard T. Ely and George S. Wehrwein, Land Economics (New York: The MacMillan Company, 1940), 444-445.

<sup>24</sup>Hurd, 11.

<sup>25</sup>Hurd, 11.

<sup>26</sup>Hurd, 13.

One can hardly allow Hurd's assumption about valueless land on the marginal limits of the city stand. Granted it may not have value for urban land but following von Thunen's arguments it would be the most valuable agricultural land. Moreover, a study cited later in this paper reports that land values rise toward the margin of the city.

Hurd also presents one of the first and most comprehensive statements about the form and structure of the city:

Cities originate at their most convenient point of contact with the outer world and grow in the lines of least resistance or greatest attraction, or their resultants. The point of contact differs according to the methods of transportation, whether by water, by turnpike or by railroad. The forces of attraction and resistance include topography, the underlying material on which city builders work; external influences, projected into the city by trade routes; internal influences derived from located utilities, and finally the reactions and readjustments due to the continual harmonizing of conflicting elements. The influence of topography, all-powerful when cities start, is constantly modified by human labor, hills being cut down, waterfronts extended, and swamps, creeks and low-lands filled in, this, however, not taking place until the new building sites are worth more than the cost of filling and cutting. The measure of resistance to the city's growth is here changed from terms of land elevation or depression, and hence income cost, to terms of investment or capital cost. The most direct results of topography come from its control of transportation, the water fronts locating exchange points for water commerce, and the water grade normally determining the location of the railroads entering the city. As cities grow, external influences become constantly of less relative importance, while the original simple utilities develop into a multitude of differentiated and specialized utilities, tending constantly to segregate into definite districts.

Growth in cities consists of movement away from the point of origin in all directions, except as topographically hindered, this movement being due both to aggregation at the edges and pressure from the centre. Central growth takes place both from the heart of the city and from each subcentre of attraction, and axial growth pushes into the outlying territory by means of railroads, turnpikes and street railroads. All cities are built up from these influences, which vary in quantity, intensity and quality, the resulting districts overlapping, interpenetrating, neutralizing and

harmonizing as the pressure of the city's growth in contact with each other. The fact of vital interest is that, despite confusion from the intermingling of utilities, the order of dependence of each definite district on the other is always the same. Residences are early driven to the circumference, while business remains at the centre, and as residences divide into various social grades, retail shops of corresponding grades follow them, and wholesale shops in turn follow the retailers, while institutions and various mixed utilities irregularly fill in the intermediate zone, and the banking and office section remains at the main business centre. Complicating this broad outward movement of zones, axes of traffic project shops through residence areas, create business subcentres, where they intersect, and change circular cities into star-shaped cities. Central growth, due to proximity, and axial growth, due to accessibility, are summed up in the static power of established sections and the dynamic power of their chief lines of intercommunication.<sup>27</sup>

He offers the analogy that:

The continual readjustments in the life of a city, reflecting the total social relations of its inhabitants, lead to the concept of a city as a living organism. That such a concept is popularly held is shown by the common phrases, the "heart" of the city, to represent the business centre, the "arteries" of traffic to represent the streets, the "lungs" of the city to represent the parks, and, to carry the simile further, the railroad depots and wharves may be called the "mouths" through which the city is fed, the telephone and telegraph lines its "nervous system," while man in his residence has been likened by Spencer to a particle of protoplasm surrounding itself with a cell.<sup>28</sup>

And finally:

Underneath all economic laws, the final basis of human action is psychological, so that the last stage of analysis of the problems of the structure of cities, the distribution of utilities, the earnings of the buildings which house them, and the land values resulting therefrom, turn on individual and collective taste and preference, as shown in social habits and customs.<sup>29</sup>

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<sup>27</sup>Hurd, 13-15.

<sup>28</sup>Hurd, 16.

<sup>29</sup>Hurd, 17-18.

Interest in urban land economics seemed to wane until after World War I when a series of writers rekindled the interest with a series of provocative statements. Stimulation for a renewed interest came from the growing awareness of the need for city planning. To plan the city it was necessary to isolate and understand the forces and processes that shaped the urban environment. Robert Haig sought to provide some insight into these processes and forces in his writings during the late 1920's.<sup>30</sup>

Haig seems to offer little new from the ideas of Hurd and Marshall. The following statements seem to have a very familiar ring:

Rent appears as the charge which the owner of a relatively accessible site can impose because of the savings in transportation cost which the use of his site makes possible.<sup>31</sup>

He further found, as did Marshall and Hurd, that:

An economic activity seeking a location finds that, as it approaches the center, site rents increase and transportation costs decline, as it retreats from the center site rents decline and transportation cost increases.<sup>32</sup>

Haig's contribution comes from his insights into the "cost of friction":

It is these costs of friction (transportation cost and site rental - my parentheses) which the city planner must seek to reduce to the lowest possible level, of two cities otherwise alike, the better planned, from the economic point of view, is the one in which the costs of friction are less.<sup>33</sup>

From this, Haig proposes an interesting hypothesis:

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<sup>30</sup>See Robert M. Haig, "Toward an Understanding of the Metropolis: Part I and Part II," Quarterly Journal of Economics, 40 (1926), 179-208 and 402-434; Robert M. Haig, et. al. Regional Study of New York and Its Environs, (8 vols., New York: The Survey, 1927-1931).

<sup>31</sup>Haig, Toward an Understanding of the Metropolis, II, 421.

<sup>32</sup>Haig, 423.

<sup>33</sup>Haig, 423.

It may be suggested as a hypothesis that the layout of a metropolis - the assignment of activities to areas - trends to be determined by a principle which may be termed the minimizing of friction.<sup>34</sup>

This principle is qualified in reference to housing however:

In choosing a residence purely as a consumption proposition, one buys accessibility precisely as one buys clothes or food, he considers how much he wants the contacts furnished by the central location, weighing the "cost of friction" involved the various possible combinations of site rents, time value, and transportation cost; he compares this want with his other desires and his resources, and he fits it into his scale of consumption, and buys.<sup>35</sup>

Haig's work stimulated interest in the problems of land values and uses. His "cost of friction" and segmentation of residential verses non-residential markets constitutes some of his more important contributions.

The late 20's produced two other works that dealt with the economic forces which operate to shape the city. Admittedly, these are not on a par with those of Haig, but they do mark a growing interest in the problem. The first began with the following preface:

Cities are a distinguished mark of advanced civilizations. There have been careful studies of the political, social and legal aspects of this phenomenon of advanced civilizations since the beginning of scientific inquiry; it is passing strange that the study of the economic aspects of the physical structure itself, and of the uses to which its different parts are put, should not have received earlier attention.

A promising beginning of this study was made in 1903 with the publication of Principles of City Land Values, but for many years the study languished. It received a new impulse from the organization of the Institution for Research in Land Economics and Public Utilities in 1920; and in 1923 with the publication of the first edition of the present work, the study came again into the forefront.

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<sup>34</sup>Haig, 422.

<sup>35</sup>Haig, 423.



Doubtless additional necessity for the study was indicated by the conditions prevailing throughout the country at the end of the Great War, when, due to the accumulated congestion and the tendency toward lateral expansion caused by the universal use of individual transportation, American cities began to develop with a rapidity that was astonishing. Changes in their internal structure were affected with no less rapidity and with as great an influence upon the value of the land.

Another impulse has come from the study of sociologists of what has come to be known as human ecology. The objective of these studies appears to be that of discovering the relationships which exist between social organizations customs, and the institutions and the positions which they occupy relative to each other...

Attention on the problem has also been focused by geographers, by whom an attempt is being made to ascertain the relationship between urban communities and the natural features of the environment in which cities are found. More and more the attention of geographers appears to be turned toward the problems of urban geography.

For many years, the great city planning movement in the United States concerned itself chiefly with elements of the aesthetic in the planning of cities. Latterly, however, there appears to be a tendency, also, for this great group of American thinkers to turn their attention more and more to the problem of uses and the functioning of land in urban areas...

The premise upon which the current studies are being made is that the city is, after all, a natural phenomenon. As such, it is obedient to natural laws. Its growth is a natural growth, and the changes wrought by growth by careful observation can be classified and the natural laws governing them discovered.<sup>36</sup>

Such a statement provides a fitting summary for the status of knowledge on the city at the close of the 1920's.

Of special concern to students of the city at this time were the problems of site and situation. In discussing the internal organization of the city, the

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<sup>36</sup>Stanley McMichael and Robert F. Bingham, City Growth Essentials (Cleveland: Stanley McMichael Publishing Organization, 1928), 5-6.

site factors were of primary importance. This concern is evident in the following statement from Dorau and Himman:

With respect to their influence upon the direction of city growth, physiographic features may be classified as entirely advantageous, partly advantageous, or entirely disadvantageous. Thus, the process of urban structural development involves: (1) proper conformation to the entirely advantageous feature, (2) alteration, to better adapt, of the partly advantageous features, and (3) avoidance or destruction of the entirely disadvantageous features.

Cities quite normally follow the line of least resistance in their development. At the beginning, when the demand for land is not great, the town conforms itself to the advantageous features; in fact, the city has been located exactly where it is partly because of certain desirable features. As the town grows into a city and the demand for land increases, the process is begun of altering them to the city's needs. In both of these first two stages of growth the entirely disadvantageous features are avoided, let alone. Finally when the great city stage is reached and it becomes necessary to utilize every foot of land possible in the urban area, entirely disadvantageous features, physical obstacles, are removed where possible. Thus, it is at the beginning that a city is limited by its physiography, and hence that these factors have the most influence in determining the direction of growth. As the city increases in size, this limitation is more and more overcome and this factor becomes less influential.

The physiographic features which interfere with the free central and axial growth of cities from their points of origin may be classified again according to their physical nature, as, (1) land features, such as hills, ravines, and rough, irregular surfaces, and (2) water features, such as harbors, lakes, rivers, creeks, and swamps.

As has already been noted, business sections grow up on level land and residential sections on land of moderate elevation, transport utilizes low land, industries occupy poor lands, often filled in, and recreational uses are developed around points of natural beauty. Thus to a considerable extent, existing physiographic features can be conformed to. It is the sharp variations from the general topography which form the barriers to growth. Gradual hills may be utilized for fine residential sections without much change, but steep hills must be leveled or otherwise removed. The boring of a 12,000-foot tunnel under Twin Peaks in the city of San Francisco provided access to the center of the city from a large area, causing an urban growth toward the west.

Ravines may be utilized by transport lines and thus promote axial growth parallel to them, but unless they are narrow enough to be bridged easily or shallow enough to fill, growth across them is stopped. Likewise rough and irregular surfaces will be avoided until the demand for sites has become so great as to make it practicable to grade them.

Deep harbors and lakes are irremovable obstacles to city growth and, hence, form part of the outline of cities located on them. As has been pointed out, the waterfront serves as the base for rectangular platting in lake and ocean harbors. In the case of rivers, the usual growth is first along the river for a way, then back from the river, and finally across the river if it is not too wide and if there are good sites on the other side. If the city originates on an island, as in the case of Paris and of New York City, the sites on the island are developed very intensively before growth is carried across the water surfaces. Creeks have the same effect as rivers except that they are crossed or filled in more quickly. The ravine worn by the erosion of a creek often bars city growth except when its use by a transportation line promotes axial growth.

Marshes limit the direction of growth in the case of smaller cities, but as cities become large and spread over the original level and moderate elevations, the demand for land may cause the marshes to be filled in. The Back Bay district of Boston is a striking example of filled-in marshy surface.

It is difficult to isolate and discuss the influence of physiography in determining the direction of city growth because it is so conditioned by economic forces. It was brought out in the discussion above that cities become freer from the limitation of physiography as they become larger because the increasing demand for land makes it practicable to remove natural obstacles. This is an economic consideration. It means that there are enough people able and willing to pay for sites a price sufficient to more than compensate the cost of removing the obstacles of the site.<sup>37</sup>

The major contribution to the understanding of urban land use patterns in the 1930's came from the pen of Homer Hoyt.<sup>38</sup> Hoyt's sector theory can in part be

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<sup>37</sup>Herbert P. Dorau and Albert G. Hinman, Urban Land Economics. (New York: The MacMillan Company, 1928), 76-78.

<sup>38</sup>The Structure and Growth of Residential Neighborhoods in American Cities.  
36.

traced to the ideas of Hurd, but Hoyt's development of the theory was based on a vast amount of empirical evidence. This evidence was collected while conducting research for the Federal Housing Administration in order to assist that agency in determining areas of minimum risk for its mortgage guarantees to lending agencies. His initial studies lead to the well known basic-non basic concept of city economics. Having determined the viability of a city's support base he turned next to formulating guidelines for assessment of the relative degree of risk in various parts of the city. According to Hoyt:

...Rent areas in American cities tend to conform to a pattern of sectors rather than of concentric circles. The highest rent areas of a city tend to be located in one or more sectors of the city. There is a gradation of rentals downward from these high rental areas, or those ranking next to the highest rental areas, adjoin the high rent area on one or more sides, and tend to be located in the same sectors as the high rental areas. Low rent areas occupy other entire sectors of the city from the center to the periphery.<sup>39</sup>

This model tends to confirm earlier ideas of von Thunen and Hurd concerning urban development and hence rising land values, where transportation is improved or some special locational attributes are present. Although Hoyt's main concern was with high quality residential areas the sector theory has application to other types of land use and patterns, e.g. segregation along racial lines, industrial concentrations and commercial developments along transportation arteries

The 1930's fail to produce much else in the way of substantive work from the land economist. It should be noted (and it will be shown) that other disciplines were very active in this period.

Just prior to World War II Ely and Wehrwein discussed the competition for land in the city saying:

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<sup>39</sup>The Structure and Growth of Residential Neighborhoods in American Cities, 36.

Nowhere is the competition of land use greater or more noticeable than in the city...There is a tendency for the uses to form concentric circles around the "100 percent location", but the pattern is usually disturbed by geographical factors and street layout...Rent acts as the "sorter and arranger" of this pattern.<sup>40</sup>

In the same work, the writers introduced a new term, "situs". From the following, it should become apparent that this is nothing new; only a new way of saying accessibility:

...but most of the other (non-recreational) land uses are practically "foot-loose" and follow the principle of "situs"... "Situs" is often considered the chief characteristic of urban land...Costless transportation would do away with "situs"; there would be no "centers" and no advantage of location manifesting itself in high values. In fact, the peak of land values would disappear.<sup>41</sup>

The final pre-1950 contribution from the land economists comes from Richard Ratcliff, whose book serves as a summary for the previous theories and thoughts on urban land values and land uses.<sup>42</sup> Like his predecessors, Ratcliff places considerable importance on location:

The value of the services of urban land derives in a large part from the location of the land and the value differences among plots are primarily a reflection of the differential advantages of particular sites as the locus for various activities.<sup>43</sup>

In addition, he recognized a number of other factors as being important to land use and values:

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<sup>40</sup>Richard T. Ely and George S. Wehrwein, Land Economics (New York: The MacMillan Company, 1940), 138-139.

<sup>41</sup>Ely and Wehrwein, 444-445.

<sup>42</sup>Richard V. Ratcliff, Urban Land Economics. (New York: McGraw Hill Book Company, 1949).

<sup>43</sup>Ratcliff, 346.

Available urban land is usually found in parcels that were established by the original plot and often can not be expanded or contracted...Other limiting factors arise from the physical aspects of structures ...Another limiting factor is the influences that a large increment of supply will have on market price.<sup>44</sup>

Ratcliff extends his ideas to city growth and structure:

In discussing the economics of urbanization, it was the underlying hypothesis that the location pattern of urban areas is a reflection of basic economic forces, and that this arrangement of people, building and activities in urban concentrations at strategic points on the web of transportation is a part of the economic mechanism of society.<sup>45</sup>

On the above premise he based his argument for the growth and development of the land use pattern within an urban environment:

It is an observable phenomenon that, as cities grow and mature, there tends to evolve a rational pattern of land uses, a basic structure composed of the several functional areas in which are concentrated the major urban activities such as retailing, manufacturing, recreation, and so on. The same basic tendencies appear in all cities in spite of minor differences resulting from variations in topography, size, and maturity. The underlying pattern is apparent even though it is often modified by irrational real estate developments or special physical conditions. If it can be assumed that urbanism is basically an economic phenomenon, it is a logical deduction that the internal organization of cities has evolved as a mechanism to facilitate the functioning of economic activities and that the apparently haphazard arrangement of use areas does have an essential order.<sup>46</sup>

Finally, he places special emphasis on the land market as the eventual sorter of urban land use:

...The determination of urban land use is a market process. The use that is made of each parcel is the result of economic competition among alternative

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<sup>44</sup>Ratcliff, 354-355.

<sup>45</sup>Ratcliff, 368.

<sup>46</sup>Ratcliff, 368.



uses. Thus, the processes of city growth are economic processes and the pattern of land use is the product of the urban land market.<sup>47</sup>

Because in every community there exists a variety of land uses, each parcel is the focus of a complex but singular set of space relationships with the social and economic activities that are centered on all other parcels. To each combination of space relationships, the market attaches a special evaluation, which largely determines the amount of the bid for that site which is the focus of the combination. Thus certain locations are more highly valued for residential use than other sites because of the greater convenience to shops, schools, centers of employment, and recreation facilities. Corner locations command a higher price for certain types of retail use because of greater convenience to streams of pedestrian traffic...<sup>48</sup> It is the competition of land uses in the market that distributes the use types in an arrangement that approaches the most efficient pattern.<sup>49</sup>

Ratcliff's major contribution comes from his drawing together of the work of those who have proceeded him. Unfortunately, he neglected to footnote many of the ideas which obviously were gleamed from other sources. There are, however, two other disciplines that contributed to the land use - land value problem in the period between 1900 and 1950. The contributions of the human ecologist and the geographer during this period are discussed in the next two sections of this paper.

#### The Human Ecologist

Almost parallel with the development of land economics has been the rise of human ecology. Thomlinson credits Hurd with the Star Theory, what he calls the oldest ecological theory of city structure.<sup>50</sup> Such a star pattern was supposed

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<sup>47</sup>Ratcliff, vi.

<sup>48</sup>Ratcliff, 283-284.

<sup>49</sup>Ratcliff, 289.

<sup>50</sup>Ralph Thomlinson, Urban Structure: The Social and Spatial Characteristics of the City. (New York: Random House, 1969), 143.

to arise owing to the collection of people and urban activities along transportation arteries radiating out of the city.

Much of the early work in human ecology was associated with a group of urban sociologists at the University of Chicago in the 1920's and 1930's. The best known idea on the city emulating from this group was contained in the work of E. W. Burgess.<sup>51</sup> The "zonal" or "concentric" model is based on the notion that city development takes place outward from the center, in the form of a series of concentric zones. These zones are formed primarily by the outward displacement of residents owing to the influx of new residents into the more centrally located zones. In light of this sociological explanation of city growth and structure, it is interesting to find a statement about land values:

Land values are the chief determining influence in the segregation of land areas and in the determination of the uses to which an area is put.<sup>52</sup>

That same school of thought at Chicago also produced McKenzie's seven processes in urban ecology.<sup>53</sup> Although in this idea space is important, the concepts involved are oriented toward the manner in which people keep sorting themselves out in an urban environment. McKenzie proposes the following forces:

- (1) Concentration is the piling up or massing of people in an area; it is centripetal.
- (2) Deconcentration is the outward movement from existing cluster; it is centrifugal.
- (3) Centralization is the gathering of people around a pivotal point. It differs from concentration in that it involves integration around a definite focus; concentration makes no reference to arrangement about a pivot. The most visible illustration is the familiar American central business district.

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<sup>51</sup>E. W. Burgess first published his "concentric theory" in 1924, but that article was reprinted and is better known in R. E. Park, E. W. Burgess, and R. D. McKenzie, The City (Chicago: 1925), 47-62.

<sup>52</sup>Park, Burgess, and McKenzie, 203.

<sup>53</sup>Robert D. McKenzie, "The Scope of Human Ecology," in E. W. Burgess (ed.), The Urban Community. (Chicago: Chicago University Press, 1926).

- (4) Decentralization is the tendency to move away from the central focus and to shed the urban arrangement of activities and buildings. Deconcentration differs in that it involves an expansion of urbanism; Patrick Geddes' conurbation is deconcentration, not decentralization.
- (5) Segregation is the clustering together of similar people or institutions - a sifting of population groups and land uses into harmonious types, as through an egg-sorting machine. The operative principle is that like units, whether of people or of specialized functional activities, tend to gather in a given area.
- (6) Invasion is the penetration of one group or function into an area dominated by a different group or function. This encroachment into a segregated area by a group or institution different from the one already there may arouse strong feelings and contribute to interracial tensions.
- (7) Succession is the complete displacement of the established group or use from an area by an invading group. It is the climax or end product of invasion (until another invasion-succession cycle begins).<sup>54</sup>

Unfortunately, McKenzie only describes processes rather than testing them to see if they indeed work. Granted the above are observable in most urban situations but they describe rather than explain events. This type of criticism can in most instances be applied to much of the work by the human ecologist.

Firey is equally at fault for his idea that land use in Boston is a function of values, symbolism, solidarity and fetishes.<sup>55</sup> He states:

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<sup>54</sup>McKenzie.

<sup>55</sup>Walter Firey, Land Use in Central Boston (Cambridge, Mass.: Harvard University Press, 1947).

If space gets its socially relevant qualities through cultural definition, and if social systems may locate in terms of social values, there is obviously far more to the society-space relation than an intrinsic nexus...A satisfactory ecological theory must conceptualize this non-intrinsic nexus and integrate it with the propositions applying to intrinsic spatial adaptation...Characteristics of space are not those belonging to it as a natural object of the physical world, but rather those which result from its being a symbol for a social system.<sup>56</sup>

More recently, the human ecologists have combined empirical studies with theoretical pronouncements. Two recent examples are the works of Shevky, Bell and William and that of Tyron.<sup>57</sup> The former's "social area analysis" operates on the assumption that persons living in one type of social area tend to differ in attitude and behavior from persons living in other types. This idea is somewhat vulnerable because of a rather arbitrary selection of variables, plus it tells us only about the character of residential use of land by certain social groups. The latter's "cluster analysis" is similar in intent, only more complicated in method. Again the technique is of value in sorting out groups of people and equating them with certain parts of the city, but it does not offer much insight into the whys of the pattern.

A human ecologist a bit more akin to the land economist in his thinking is Quinn.<sup>58</sup> He notes the importance of land values in sorting out the land use pattern of the city saying:

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<sup>56</sup>Firey, Introduction.

<sup>57</sup>Eshref Shevky and Wendell Bell, Social Area Analysis (Palo Alto, California: Stanford University Press, 1955) and Eshref Shevky and Marilyn Williams, The Social Areas of Los Angeles (Los Angeles: University of California Press, 1949) and Robert C. Tryon, Identification of Social Areas by Cluster Analysis (Berkeley: University of California Press, 1958).

<sup>58</sup>James A. Quinn, Human Ecology. (New York: Prentice Hall, 1950).

Land values...offset, as well as, reflect the struggle for location within the metropolis.<sup>59</sup>

Quinn's argument is based on three hypotheses:

Hypothesis of minimum costs: Ecological units tend to distribute themselves through an area so that the total costs of gaining maximum satisfaction in adjusting population to environment (including other men) are reduced to a minimum.

Hypothesis of minimum ecological distance: If other factors are constant in an area, ecological units tend to distribute themselves through it so that the total ecological distance reversed in adjusting to limited environmental factors, including other ecological and social units, is reduced to a minimum.

Hypothesis of median location: In a free competitive system, social and aesthetic factors being equal, a mobile ecological unit tends to occupy a median location with respect to (1) the environmental resources it uses, (2) other units on which it depends, and (3) other units it serves. If several ecological units find their medians located at the same place, that ecological unit tends to occupy the common median which can utilize it most intensively.<sup>60</sup>

Much of the work of human ecologist has centered on residential patterns.

Hawley summarizes the outlook toward residential land values:

Familial units are distributed with reference to land, values, the location of other types of units and the time and cost of transportation to the center of activities...The influences of these three factors are combined in a single measure, namely, rental value for residential land use.<sup>61</sup>

Alonso provides a very fitting summary as to the contributions of the human ecologist:

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<sup>59</sup>Quinn, 272-289.

<sup>60</sup>Quinn, 272-289.

<sup>61</sup>Amos H. Hawley, Human Ecology. (New York: Ronald Press, 1950), 280.

While the two disciplines have influenced each other, they have remained distinct, the land economist relating primarily to economics and city planning, and the ecologist to sociology.<sup>62</sup>

Much the same type of commentary can be applied to the next group discussed in this part of the paper, the geographer.

#### The Geographer

Charles Colby was one of the first geographers to emphasize the nature and character of urban land use patterns.<sup>63</sup> Colby saw the modern city as a dynamic organism undergoing constant evolution:

This evolution involves both a modification of long-established functions and the addition of new functions. Such functional developments call for new functional forms, for modification of forms previously established, and for extensions of, and realignments of, the urban pattern. Apparently these developments of function, form, and pattern are governed by a definite although as yet imperfectly recognized set of forces. Among these forces, two groups stand out prominently. The first group is made up of the centrifugal forces which impel functions to migrate from the central zone of a city towards, or actually to or beyond, its periphery, while the second includes powerful centripetal forces which hold certain functions in the central zones, and attract others to it.<sup>64</sup>

His study of the problem tends to lead him to conclude that:

...centrifugal forces made up of a combination of uprooting impulses in the central zone and attractive qualities in the periphery, while the centripetal forces focused on the center zone and made that zone the center of gravity.<sup>65</sup>

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<sup>62</sup>Alonso, 9.

<sup>63</sup>Charles C. Colby, "Centrifugal and Centripetal Forces in Urban Geography," Annals of the Association of American Geographers, 23 (March, 1933), 1-20.

<sup>64</sup>Colby, 1.

<sup>65</sup>Colby, 1.



Colby recognized three zones within the city, the "inter or nuclear", "middle zone" and "peripheral zone" and that urban functions migrated from zone to zone owing to the various pressures of centrifugal or centripetal forces.<sup>66</sup> In discussing the centrifugal movements and forces he listed various uprooting forces including increasing land and property values, high tax rates, traffic congestion, diminishing supply of land, desires to avoid nuisances, incompatible site requirements, and legal restrictions.<sup>67</sup> Pulling functions out of the central zone were, availability of land, good transportation facilities, lower land values and less traffic congestion.<sup>68</sup> The entire push outward can be summarized into six dominate forces shaping the city. According to Colby, these forces are spatial force, site forces, situational force, force of social evaluation, status of an organization's occupation, and the human equation.<sup>69</sup> Pull inward, in Colby's view, were site attraction, functional convenience, functional magnetism, functional prestige and the human equation.<sup>70</sup>

It is rather obvious from the rather brief review of Colby's work above that he has in general merged the idea of the land economist and the human ecologist. Again as with so many of the early studies of the city, the classification of processes fail to provide insight into the actual nature of the processes themselves.

After Colby's work, a whole host of rather specialized land use studies were produced by geographers interested in the city.<sup>71</sup> Time and space do not permit

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<sup>66</sup>Colby, 2.

<sup>67</sup>Colby, 4.

<sup>68</sup>Colby, 7.

<sup>69</sup>Colby, 10.

<sup>70</sup>Colby, 11.

<sup>71</sup>See for example Malcolm J. Proudfoot, "City Retail Structure," Economic Geography, 13 (October, 1937), 425-428.

review of these studies, but it should be noted in passing that the vast majority of these works were little more than the author's subjective classification of differing types of land use. They were non-empirical studies and treated static conditions and thus are of little value.

Probably the greatest contribution concerning land use from geographers, was the work of Harris and Ullman.<sup>72</sup> The multiple nuclei theory is based on the idea that several generative nuclei serve as growth and focal points for the city. These separate nuclei arise because:

1. Certain activities require specialized facilities. The retail district, for example, is attached to the point of greatest intra-city accessibility, the port district to suitable water front, manufacturing districts to large blocks of land and water or rail connection and so on.
2. Certain like activities group together because they profit from cohesion. The clustering of industrial cities has already been noted above under "Cities as concentration points for specialized services." Retail districts benefit from grouping which increases the concentration of potential customers and makes possible comparison shopping. Financial and office-building districts depend upon facility of communication among offices within the district. The Merchandise Mart of Chicago is an example of wholesale clustering.
3. Certain unlike activities are detrimental to each other. The antagonism between factory development and high-class residential development is well known. The heavy concentrations of pedestrians, automobiles, and streetcars in the retail district are antagonistic both to the railroad facilities and the street loading required in the wholesale district and to the rail facilities and space needed by large industrial districts, and vice versa.
4. Certain activities are unable to afford the high rents of the most desirable sites. This factor works in conjunction with the foregoing. Examples are bulk wholesaling and storage activities requiring much room, or low-class housing unable to afford the luxury of high land with a view.<sup>73</sup>

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<sup>72</sup>Harris and Ullman.

<sup>73</sup>Harris and Ullman, 13-14.

Again what emerges in this geographical contribution is yet another scheme of classification of the city's land use with limited utility. Harris' and Ullman's contribution lies mainly in the suggestion that several nuclei constitute important focal points and generative centers within the city.

In summarizing the developments in the theories of land values and land use within the city during the period 1900 and 1950, one finds voluminous writing which is long on subjectivity and short of empirical proof or evidence. Unfortunately, no uniform theme has developed to unite the three disciplines most concerned with the problem. Instead, it appears that each has chosen to go its own way, while turning a deaf ear to the others. What does emerge is a vague understanding that the problem involves a multitude of economic, social and spatial variables. The interrelationship and even some key variables are poorly known. Much of the more recent work in this problem area addresses itself to more precise measurement of variables and their interrelationship.

#### Post 1950 Developments

The explosion of interest in the urban environment has yielded a multiplicity of studies, ideas, theories and models, many of which are germane to the topic under discussion. Time and space, as well as the available resources permit only a brief review and commentary on some of the better known works and workers. Because of the diversity of approach and again the lack of any discernible theme, this section has been chronologically arranged. Such an approach shows the evolution of thought in somewhat halting, and occasionally backward steps, but it appears to be the best method of organization.

Walter Isard's, Location and Space Economy, was not primarily concerned with the problem as interurban location and utilization of space.<sup>74</sup> However, he did include a short appendix on the theoretical aspects of land use in the city. He presented the location problem as one of substitution analysis:

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<sup>74</sup>Walter Isard, Location and Space Economy. (New York: John Wiley and Sons, Inc., 1956).

In bringing this appendix to a close, we wish to state that the urban land-use problem can be presented in terms of substitution analysis and as an integral part of general location theory, much as agricultural location theory has been. In essence, the businessman substitutes among various outlays and revenues when he selects both the commodity (product or service) to be produced and his location. He may substitute rent outlays for advertising outlays or for outlays to alter the quality of his commodity when he considers shifting his location to any site closer to the core; or, if he maintains quality and advertising outlays, he incurs additional rent outlays to acquire additional revenue potentials. In weighing the several commodities which he might produce, once again he substitutes among the outlays and revenues associated with the several commodities, much as the farmer does in selecting the particular set of crops to be cultivated.<sup>75</sup>

In addition, he comments on the role of other factors in the location decision:

It must constantly be borne in mind, however, that the businessman operates within a setting of restraints. Certain of these restraints are imposed by the features of his physical environment, such as topography and existing structures. Certain are associated with social and economic conditions which relate to such factors as total demand, total income, tastes, and cultural patterns, whose treatment falls within the scope of a volume on regional analysis. These restraints are of as great importance in shaping land-use patterns as are the businessman's own decisions. Since these restraints differ from urban area to urban area, they, in turn, induce logical patterns of land use which differ from area to area. They furnish a partial justification for the kaleidoscopic variety of reality.<sup>76</sup>

Ralph Turvey scorns somewhat the economists and their concept of economic man creating urban land use.<sup>77</sup> He has examined imperfections in the land market and institutional factors, such as the legal complexity of ownership, the effect of taxation, zoning, the imperfections in the knowledge of both the buyers and

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<sup>75</sup>Isard, 205-206.

<sup>76</sup>Isard, 206.

<sup>77</sup>Ralph Turvey, The Economics of Real Property: An Analysis of Property Values and Patterns of Use. (London: Allen and Unwin, 1957).

sellers, and the predominance of structures which tend to tie up land for long periods of time. He states:

If the determinants of the equilibrium constellation of prices and resource-use changed infrequently or slowly, while adjustments to such changes took place relatively rapidly and without much friction, the actual pattern of prices and resource allocation would usually correspond fairly closely to the equilibrium pattern. It would thus be possible to analyse the existing state of affairs in terms of an equilibrium construction. Now so far as the long run is concerned, this is not generally the case with urban property, because the great durability of buildings makes urban change a very slow process and one that is never completed.

If the conditions were different and buildings had very short lives, the actual shape and form of a town would be close to its equilibrium pattern...But since this is not the case, since most towns are not in equilibrium, it is impossible to present a comparative static analysis which will explain the layout of towns and the patterns of buildings; the determining background conditions are insufficiently stationary in relation to the durability of buildings. In other words, each town must be examined separately and historically.<sup>78</sup>

Another attack on the validity of certain premises of land economics comes from Paul Wendt.<sup>79</sup> In a series of articles during the late 1950's, he took issue with what he termed the Haig-Ely-Dorau-Ratcliff hypothesis:

Examination of these earlier writings (Ely, Haig, Dorau) reveals serious shortcomings in their attempt to apply traditional price and rent theory to urban site valuation problems. Important assumptions with regard to demand influences are seldom made explicit in the literature. Since the urban land market is divisible into many virtually non-competing submarkets, the rents paid for centrally located sites can not be satisfactorily explained as differential returns over "no rent" sites. Further the spatial concepts within which urban land functions, location decisions and revenues have been traditionally examined no longer

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<sup>78</sup>Turvey, 47-48.

<sup>79</sup>Paul F. Wendt, "Theory of Urban Land Values," Land Economics, 33 (August, 1957), 228-240; "Urban Land Value Trends," The Appraisal Journal, 26 (April, 1953) 254-269; and Economic Growth and Urban Land Values," The Appraisal Journal, 26 (July, 1958), 427-433.

appear acceptable to modern day urban communities. Analysis of the influence of transportation and other technological improvements upon urban land values has revealed that traditional theory has greatly oversimplified the diverse effects which such developments may have upon the demand and supply schedules for urban land.<sup>80</sup>

In a rejoinder to Wendt's criticism, Ratcliff accuses him of "scholarly myopia" saying, "In sum, my evaluation of Professor Wendt's article is that it adds little to our understanding of urban land values and it subtracts nothing from Ely-Haig-Wehwein-Dorau-Hinman-Morchouse, and if you please Ratcliff."<sup>81</sup> Less Wendt's argument be dismissed completely, it should be noted that Hoyt would appear to be at least in partial agreement. Hoyt concludes an article of changing land values saying, "Thus, the recent dynamic factors in land values, due chiefly to new transportation media, have caused profound changes in the old land value pattern, and changes calculations based on former trends."<sup>82</sup>

Yet another challenge to the ideas of the past came from Alonso.<sup>83</sup> His challenge took the following form.

Since the beginnings of the twentieth century there has been considerable interest in the urban land market in America. R. M. Hurd in 1930 and R. Haig in the twenties tried to create a theory of urban land following von Thunen. However, their approach copied the form rather than the logic of agricultural theory, and can be shown to be insufficient on its own premise. In particular the theory failed to consider residences which constitute the preponderant land use in urban areas.<sup>84</sup>

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<sup>80</sup>Wendt, "Theory of Urban Land Values," 240.

<sup>81</sup>Richard V. Ratcliff, "Commentary: On Wendt's Theory of Land Values," Land Economics, 33 (November, 1957), 362.

<sup>82</sup>Homer Hoyt, "Changing Patterns of Land Use," Land Economics, 36 (May, 1960), 117.

<sup>83</sup>William Alonso, "A Theory of the Urban Land Market," Papers and Proceedings of the Regional Science Association, 6 (1960), 149-157.

<sup>84</sup>Alonso, "A Theory of the Urban Land Market," 149.



Alonso suggests that families of rent curves can be developed for various types of land uses and that the functions with steeper curves will capture the more central and accessible locations in the city. He claims this idea can be applied to a single class of land use (residential) so that different income groups' housing locations can be explained. This same approach was embodied in his doctoral dissertation and later appeared as Location and Land Use. The work of Alonso and that of Wingo discussed below must be counted as the major contributions to solution of the land use - land value problem during the 1950's and 1960's.

Wingo's model of use and value is transportation oriented.<sup>85</sup> He develops his model in the following manner:

First: a concept of transportation demand based on certain characteristics of the labor force and of the journey-to-work will be developed.

Second: a systematic general description of the transportation function, based upon its technological characteristics and its response to demand, will be described.

Third: a general transportation cost function will be elaborated to integrate time-based costs, distance-based costs, and overhead costs as they affect the decisions of the demanding unit.

Fourth: a system of location rents which result from the transportation cost function will be described, and this, with a discussion of the implications of a supply of space, will round out the picture of the supply elements encompassed by the model.

Fifth: the manner by which the individual household "demands" space will be developed, so that we can describe the demand conditions of the model.

The final step of the model is the bringing together of the supply and demand elements so that a spatial distribution of location rents and household densities is generated.<sup>86</sup>

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<sup>85</sup>Lowdon Wingo, Transportation and Urban Land, (Washington, D. C.: Resources for the Future, 1961).

<sup>86</sup>Wingo, 22.

After arguing for the validity of his model he points toward public policy as the key to explaining the utilization of space in the city. He writes, "So long as the market, circumscribed as it may be by public policy, is the principle machinery allocating urban space among competitive use, this interaction will be the dominant city shaping force in our society."<sup>87</sup>

Commenting on the major differences in their works Alonso says of Wingo's work

The principle divergence between Mr. Wingo's theory and my own occurs at the outset. Mr. Wingo separates into independent compartments the preferences for accessibility (the dollar value of commuting time) in  $K(t)$  and for living space (the consumption function of  $(E:2)$ ). Price and quantities are related within each of these two relations. In my approach, on the other hand, the preferences for land and accessibility (and other goods) are interrelated, and kept distinct from the budgetary considerations until they are joined in terms of the marginal rates of substitution and marginal rates of substitution and marginal cost. All other differences stem from this source.<sup>88</sup>

The urban land economist, Muth, writing in the early 1960's, suggested a model of residential land use.<sup>89</sup> Specifically, Muth concerned himself with the questions—why some cities were more spread out than others, and what were the economic forces that determined the distribution of urban population. He develops a simple residential model stating:

For any pattern of residential location to be an equilibrium one, for each consumer to be at his optimum location, the savings in housing cost from a small change in distance must exactly equal the change in the higher transportation cost.<sup>90</sup>

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<sup>87</sup>Wingo, 93.

<sup>88</sup>Alonso, Location and Land Use, 183-184.

<sup>89</sup>Richard F. Muth, "The Spatial Structure of the Housing Market," Papers & Proceedings of the Regional Science Association, 7 (1961), 207-220.

<sup>90</sup>Muth, 208.

The model is tested in forty-six cities. Results rather expectedly show a tendency for urban population density to decrease with distance from the center of the city, for density gradients to be smaller where cities were spread out or transportation costs were low. The spread of cities was also shown to correlate positively with the number of sub-standard dwellings and that cities that are increasing in size have small density gradients. One wonders just what all this has to do with residential land use, however, some ideas (certainly not very new ones) are evident from the above information.

In a somewhat similar study Brigham developed a residential land use model for Los Angeles County.<sup>91</sup> His model assumes a functional relationship between a particular urban site and its accessibility to economic activities, its amenities, its topography, its present and future uses and certain historical variables. One wonders how such variables can be measured. On the positive side, the model is not without merit. Brigham does find that airline distance to the CBD is an extremely meaningful variable. But, as Mills notes, "Most of Brigham's other variables appear to be plausible contenders for the role of explaining land values. But, with at least some, there is a serious question of whether they should be included."<sup>92</sup> This model and many others like it suffers from a lack of proven applicability in other situations. The literature of the early 1960's has many other examples of models with only limited use.

The work of Rickert in the Washington, D.C. area is yet another example.<sup>93</sup>

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<sup>91</sup>Eugene F. Brigham, "The Determinates of Residential Land Values," Land Economics, 41 (May, 1965), 325-334.

<sup>92</sup>Edwin S. Mills, "The Value of Urban Land," in Harvey S. Perloff (ed.), The Quality of the Urban Environment (Baltimore: Resources for the Future, Inc., 1968).

<sup>93</sup>John E. Rickert, The Present and Potential Role of State and Local Taxation in the Preservation of Open Space in the Urban Fringe Areas (Washington, D.C.: Urban Land Institute, 1965).

Using land values based on tax assessments he examined the interrelationship of various types of distance variables. Two of these were rather interesting and proved somewhat significant in explaining land values. These were a measure of physical amenities (the distance to certain utility services) and social amenities (the distance from a major shopping center).

Wendt's and Goldner's study centered in Santa Clara County, California.<sup>94</sup> Variables examined included: airline distance to the CBD, an index of job accessibility, size of lot, value of improvements, FHA site desirability index and median family income of census tracts. Findings supported job accessibility as the most significant variable in explaining land values. Mills says of this study, "Their index implies that a given employment center has more effect on land values the further away it is. Surely, distance to employment and level of employment should affect land values in an opposite direction."<sup>95</sup>

As with other studies, one wonders why some variables were included. Certainly one would expect land values and FHA site desirability indexes to show a strong positive relationship.

Probably the most refined model of urban land value is Mill's second generation aggregative model.<sup>96</sup> This model is a simplified version of an earlier scheme. The unusual feature of this model is that it does not have to focus on the center of the city, but can be oriented around several significant points of production or employment. This model assumes three activities take place in the city. These activities are (1) the production of goods, (2) intracity

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<sup>94</sup>Paul F. Wendt and William Goldner, "Land Values and Dynamics of Residential Location," in Essays in Urban Economics, (Berkeley; University of California Press, 1966).

<sup>95</sup>Edwin S. Mills, "An Aggregative Model of Resource Allocation in a Metropolitan Area," American Economic Review, 57 (May, 1967); "The Value of Urban land," in Harvey S. Perloff, The Quality of the Urban Environment, (Baltimore: Resources for the Future, 1968) 231-253.

<sup>96</sup>Mills, The Value of Urban Land, 241.

transportation and (3) housing. The author claims that from his model one can deduce, the rent distance function, the price of output of transportation, land use and density-distance functions.

Mills uses regression analysis on land values in Chicago to provide support for his model. He postulates that as time passes the urban area grows, and centers of economic activity other than the city center become more important, with the result that distance from the city center explains less of the variability in land values. Furthermore, that it is undesirable to restrict oneself arbitrarily to residential land in investigating land values.<sup>97</sup> Mill's study is an interesting one and his notion about dispersal of city forming nuclei, although not new, does offer considerable food for thought and merits further investigation

Harris, Tolloy and Harrell in their study of land values in Raleigh, North Carolina have attempted to isolate the so called "amenity component" (that is one of the major influences leading to the distance decay of land values in the geographic variation in residential amenities).<sup>98</sup> From land values at the center of the city they subtracted the value of land at the margin of the city and the value of travel saving. The residual of this operation was regarded as the amenity value. To support their contention they regressed the residual land values on a number of supply and demand variables thought to be associated with amenities:

Tenancy, zoning and socio-economic class variables were supply related variables found to be statistically significant...Significant demand variables explaining amenity expenditures were income, family size and structure type.<sup>99</sup>

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<sup>97</sup>Mills, 250.

<sup>98</sup>R.N.S. Harris, G.S. Tolloy and C. Harrell, The Residential Site Choice (Mimeographed, North Carolina State University, 1968).

<sup>99</sup>Harris, Tolloy and Harrell, 20.

This section of the paper has sought to illustrate some of the ideas that have been put forth as factors involved in land use and land value pattern in the city during the period since 1950. What emerges is large numbers of studies (by all means not all have been cited here) which focus on a number of different variables in an attempt to produce models that approximate reality. Probably the greatest criticism that can be leveled at these recent studies is their narrowness of focus - a concern with only one or two variables or a single city. On the other hand, certainly each new idea or model adds to our understanding of the process and forces shaping the use and value of land in the city. From this analysis one can assume that there is some general agreement among students of land economics. Among these are ideas that land values are a function of (1) use - present and potential, (2) location of the land within the city, (3) its amenity value accorded a site. This is:  $\text{land value} = \text{location rent} + \text{anticipation on present or future use} + \text{amenity rent}$ . A graphic representation of some of these ideas is presented below. Although considerable diversity of opinion exists, some general agreement is possible on the basic mechanisms involved in establishing the value of land within the city. Examination of several empirical studies may shed some additional light on the problem.

Empirical Studies of Urban  
Land Values

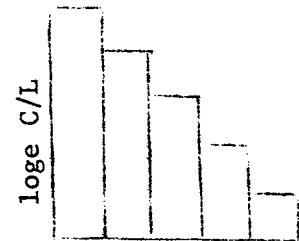
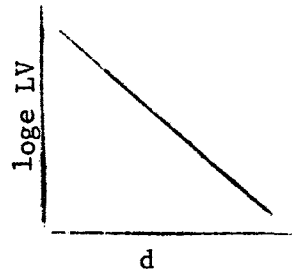
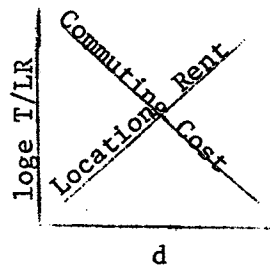
The classic empirical study of urban land values was penned by Homer Hoyt.<sup>100</sup> In justifying his study, Hoyt notes, "Therefore a close relationship might be expected to exist between the physical growth of a city and changes in land value. The exact character of the kinship between the two sets of forces is not a simple one, and can be determined only by an analysis of their behavior in the past."<sup>101</sup>

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<sup>100</sup>Homer Hoyt, One Hundred Years of Land Values in Chicago (Chicago: The University of Chicago Libraries, 1933.)

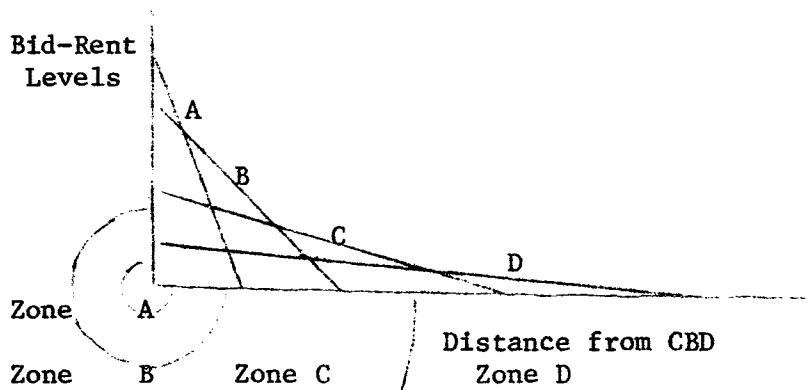
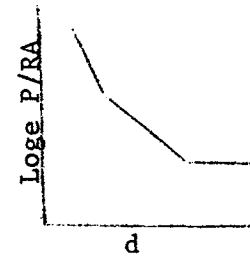
<sup>101</sup>Hoyt, 5.

A MODEL OF LAND VALUES AND POPULATION DENSITIES\*



T=trans. cost  
 LR=location rent  
 LV=land value  
 C=capital  
 L=land  
 C/L=capital land ratio  
 d=distance

P=population  
 RA=residential  
 area  
 P/RA=net population  
 density



\*After Berry and Horton

Unfortunately, Hoyt had more interest in the real estate aspects of land values rather than the factors that influenced them. He did, however, cite the importance of population increases and transportation improvements as influencing land values. Hoyt's study was, like many others, far more descriptive than analytical.

A few years later, Chicago was again the scene of another study which involved some discussion of land values. Mayer in his analysis of outlying business centers discusses the growth of business nucleation:

Competition for location is most intense where peak land values result; but outward from these corners along the major transportation axes there is also competition for location, each kind of business seeking to get as near to the major corner as its rent paying ability will allow. The result is a gradual decline in land values with increasing distance from the core.<sup>102</sup>

He foresees however,

...a decreasing importance of core intersections and a more even distribution of land values in the nucleation.<sup>103</sup>

Here again, most of the work with land values was descriptive rather than analytical.

Continuing the study of Chicago, Haynes described the pattern of land use and values along the C.B. & Q. Railroad.<sup>104</sup> He states his purpose saying,

The purpose of this investigation is to describe the pattern of one of the urbanized extensions (the pattern of suburban communities extending outward from Chicago along the railroads) as reflected in residential land values and related to the value of residential land to lines of public transportation, to industrial areas and to any topographic feature which seems to affect the value of nearby residential property.<sup>105</sup>

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<sup>102</sup>Harold R. Mayer, "Patterns and Recent Trends of Chicago's Outlying Business Centers," Journal of Land and Public Utility Economics, 18 (February, 1942) 4-16.

<sup>103</sup>Mayer, 11.

<sup>104</sup>Charles R. Haynes, "Suburban Residential Land Values Along the C.B. & Q. Railroad," Land Economics 33 (May, 1957), 177-181.

<sup>105</sup>Haynes, 177.



His findings are summarized below:

One: suburban rail service connecting continuous urbanized areas runs in an area of high residential land values relative to areas without such service or some distance away from such service.

Two: the actual point-to-point values form, however, a jagged line with peaks close to the stations and dips between the stations. Residential land values, then, are in the form of a rough pyramid around each station with the apex at or near the suburban station. Land values are, however, depressed for about one-quarter to one-half mile each side of the tracks parallel to the railroad right of way.

Three: there is a trend in residential land values. The trend is downward going away from the city and is proportional to the distance (time) from the city in an observable ratio (in this area one dollar per front foot, on the average, for every minute of average suburban express train running time).

Four: residential land values are depressed within about one-half mile of industrial areas but are elevated from one-half to one-and-one-half miles distant from the industrial areas.

Five: residential land values tend to be elevated along stream or river banks but tend to be depressed in the stream or river valleys.<sup>106</sup>

Again the treatment is more descriptive than analytical, however, in his summary statements cited above, Haynes does offer some insights or guesses as to mechanism involved in the land market.

Seyfried working in Seattle with land values attempts to test the hypothesis market forces allocating the supply of land among alternative land uses within an urban area.<sup>107</sup> His idea is essentially the same as von Thunen's, namely rent differential among homogenous sites are explained by transportation cost. To test the idea, rent surfaces for Seattle were constructed. Significant correlations were obtained away from the city's center, but comparison of the slopes of the regression lines going in different directions indicated one profile,

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<sup>106</sup>Haynes, 181.

<sup>107</sup>Warren R. Seyfried, "The Centrality of Urban Land Values," Land Economics 34 (August, 1963), 275-284.

the western one, to be three times that for the northern slope, while profiles for the other two directions lay in between.<sup>108</sup> Knos found much the same type of situation in Topeka.<sup>109</sup> There, land values were found to decline inversely with the reciprocal of distance from the city center and major radial routes, while they appeared to vary directly with the direction of growth within the city.<sup>110</sup> In some recent work on the commercial structure of cities, Berry, Tennant, Garner and Simmons have found a strong correlation between commercial development, high land values and major intersection of highways.<sup>111</sup>

Probably the most extensive empirical analysis of land values has been that of Yeates.<sup>112</sup> Yeates hypothesizes six variables in a multiple regression model to explain variation in the land value surface of Chicago. These variables were (1) distance from the CBD, (2) distance from regional level shopping center, (3) distance from Lake Michigan, (4) distances from nearest elevated-subway line, (5) per of nonwhite population of the block in which a particular site is located and (6) population density.<sup>113</sup> Fitting the model to various time periods provided very different results. Explanation was good for 1910 and 1920 but very low for 1960. Most of the decline in explanation was due to the lessening influence of the CBD. When sectors were examined some had land values increasing toward the outer

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<sup>108</sup>Seyfried, 282-283.

<sup>109</sup>Duane Knos, Distribution of Land Values in Topeka, Kansas. (Lawrence: Kansas University Bureau of Business Research, 1962).

<sup>110</sup>Knos as cited in Brian J. L. Berry and Duane F. Marble, Spatial Analysis: a Reader in Statistical Geography (Englewood Cliffs, N. J.: Prentice Hall, Inc., 1968) 280.

<sup>111</sup>See especially Brian J. L. Berry, R. J. Tennant, Berry Garner and James Simmons, Commercial Structure and Commercial Blight, (Chicago: University of Chicago. Department of Geography, Research Paper No. 85), 1963.

<sup>112</sup>Maurice H. Yeates, "Some Factors affecting the Spatial Distribution of Chicago Land Values, 1910-1960," Economic Geography, 41 (January, 1965), 57-70.

<sup>113</sup>Yeates, 68-69.

edge as opposed to the center (such a finding is very contrary to the general concept of land values increasing toward the city's center). Other findings indicated regional shopping centers were not as an important a variable as map inspection might indicate. Lake Michigan, or closeness to, appears to have some amenity value for its explanation of land values has risen. The role of transportation lines also are shown to be lessening in Yeates' study. The findings on population density and nonwhite population prove very interesting.

The analysis of both of these factors suggest that as the percentage of nonwhite in an area increases, land values decrease until such time as the population density begins to rise (due to piling up in overcrowded ghettos) at which time land values start to rise as a result of intense subdivision of property and competition for living space.<sup>114</sup>

Yeates' finding, especially that of an increasing value toward the periphery of the city proves very interesting. This could, as he points out, be due to the pull of outlying CBD's of cities near Chicago or it may not. In any case, it is the type of result which calls for more investigation into the problem of land use and land values in an urban environment.

#### Some Alternative Approaches

Before concluding, comments ought to be made about three other approaches to solutions of the land value-land use problem. Andrie Rogers makes a plea and a rather strong case for a probabilistic approach for development of models of the urban environment. He argues:

The emergence of urban spatial structure as a definite and important area of research has developed increasing attempts, in the form of theories, to bring conceptual order out of the complex relationships of human activities with physical space. Analysis of these theories discloses that, to a large extent, their differences stem from the point of view with which the problem is approached and the means by which it is analyzed. Common to all theories, however,

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<sup>114</sup>Yeates, 70.

has been the strict adherence to determinism. This paper suggests that, due to the overwhelming complexities which underlie human behavior, a probabilistic approach may be the only method by which operational models of considerable generality can be developed. The use of the probability calculus as a means for assessing the combined effects of a great number of interdependent factors has proved useful in other disciplines and suggests itself as a possible analytical method in urban studies as well.<sup>115</sup>

Berkman, and later Pred and Kibel have suggested that game theory may provide a tool to solution of the problem.<sup>116</sup> The latter two summarize their findings saying,

Three general conclusions seem in order. First, the general model of locational processes presented in this paper appears to be a useful conceptual framework for studying spatial growth phenomena. Its emphasis on behavioral characteristics and interdependence, and its dynamic and probabilistic properties seem most appropriate for describing and exploring these phenomena. Second, the use of gaming simulation as an approach to the study of locational dynamics appears to be equally fruitful. The ability to study role playing and the interaction of locational actors provides the analyst with a much needed tool for unravelling the complex nature of locational behavior. Finally, the marriage of the general model of locational processes with the gaming simulation approach appears from preliminary observations to be a profitable one.<sup>117</sup>

A third area which would seem to offer promising results would be work with perception. Some of the studies cited above have indirectly involved this idea, but none have made it an overt variable. Much is said about distance, time, cost and amenities in attempting to develop a theory of land value and use. This writer would like to suggest that these are only complex summary variables of the entire decision making process and that if we could understand the perception involved in

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<sup>115</sup>Andrie Rogers, "Theories of Intraurban Spatial Structure: A Dissenting View," Land Economics, 43 (February, 1967), 112.

<sup>116</sup>See Herman G. Berkman, "The Game Theory of Land Use Determination," Land Economics, 41 (February, 1965), 11-19 and Allan R. Pred and Barry M. Kibel, "An Application of Gaming Simulation to a General Model of Economic Locational Process" Economic Geography, 46 (April, 1970), 136-156.

<sup>117</sup>Pred and Kibel, 156.

these variables we would be better able to develop a model that can more closely approximate reality.

### Conclusion

This exercise has proven to be interesting, discouraging and hopeful, all at the same time. The interesting portion has been pouring over the literature and attempting to isolate some trends and themes within it. Discouraging has been the lack of themes and often direction. One frequently asked the questions of why and how?, but only infrequently were answers provided. But such conditions only underscore the need for additional work. Finally, some hope is merited because of the increasing interest in the problems of land use and land values in urban environments. Several new approaches have been suggested above and perhaps they, along with more traditional studies, will yield the answers to why? and how? the city develops as it does.

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