An Analysis of Land Values in Bowling Green, Kentucky

James Frymark
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James M.

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AN ANALYSIS OF LAND VALUES IN BOWLING GREEN, KENTUCKY

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by
James M. Frymark
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AN ANALYSIS OF LAND VALUES IN BOWLING GREEN, KENTUCKY

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CHAPTER I

THE CREATION OF AND FACTORS AFFECTING URBAN LAND VALUES

Introduction

There has been a re-awakening interest in the subject of land values. This has come about as a result of the emerging of such problems as decentralization and obsolescence of many of the urban areas. In addition to these problems, new fiscal crises call for new taxing policies and zoning changes. Many important decisions regarding these matters are based on land value trends.\(^1\)

The renewed interest appears to be based on many of the classical theories of Doreau, Ely, and Hurd, as well as others.

It is recognized that in our modern urban society there is a need for a new approach to the study of urban land values.\(^2\) Classical theories have been highly criticized and are not considered to be pertinent in the modern city as compared to the cities of the early twentieth century when many of the theories were formulated. \(\text{Wendt}\)

\(^2\)Ibid., p. 240.
states that there is a need for a new set of hypotheses regarding urban land values and that these should be tested by extensive empirical research.

Stated in simple terms, land values are those values attributed to specific locations on the earth's surface. This value is exclusive of any buildings or improvements on the site. To have economic value, the land must first be in demand. The reasons for demand may be many. Two main classes of use for land which thereby establish demand and value are as follows: First the land is valued for the production of useful or enjoyable produce. This may be agricultural land, or land mined for minerals. The second major class of land use is for affording sites for dwellings, industries, and commercial or social activities. In both cases, the value of the land is determined by the price buyers are willing to pay for the privilege of using the land. It is the second major class of land use and values that are of interest in this paper.

Purpose of Study

The purpose of this study is to provide insight to the morphology of the city, the nature of the distribution of urban land values, and the relationships of urban land

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values with other features of the city. There have been several other studies investigating the patterns of land values and the results of these studies have aided in the formulating of general theories of urban land values. However, few studies have been concerned with patterns of land values in smaller cities that are not as complex in structure and function as larger cities are. This study is an attempt to investigate the patterns of land values in a small city and to determine whether or not generally accepted basic theories of urban land values may pertain to small cities. However, the results of this study are not to be interpreted as applicable to all small cities, but they may suggest what to expect in other similar studies should they be conducted. In accomplishing the objectives of the study, currently accepted theories of urban land values are reviewed as well as the classical theories. Where applicable, recent studies similar to the proposed one here are referred to. Following the review of literature, hypotheses are formulated and tested using Bowling Green, Kentucky, as the model.

Review of Literature

The Creation of Urban Land Values

Land is desired because it is useful in the satisfaction of human wants by means of the services and
commodities it yields. In the case of urban land, value is placed upon the land as a result of the formation of people into communities. The concentration of these people creates demand for land in a given area which gives rise to the utility and scarcity of urban land. The result is that increased value is placed on this land. After the creation of these urban land values, these values are subject to numerous changes. The patterns of city growth are varied and are attributable to numerous elements just as there are at the same time many factors entering into the determination and maintenance of city land values.

In the urban area, land is useful principally because of its location. Hence the value attributed to a parcel of urban land is dependent on its regional location in relation to other components of the urban structure. The question arises as to what is considered a good location or what location can command the highest value. The answer to these questions may be simple or complex. The determining

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6 Wendt, p. 231.

7 Herbert S. Swan, "Land Value and City Growth," Land Economics, X (May, 1934), 201.

of an ideal location is dependent on the intended use of the land and how it relates to surrounding phenomena.

It is generally understood that urban land is relatively scarce and therefore commands a high price. It is a market commodity and land values are subject to the demand and supply rule of economics. The real values of urban land exist if there is a need for the land and the buildings on it are occupied for the respective purposes which created the value of that parcel of land. Where the land is not used or where the buildings are not occupied, no actual value is created and only potential value exists. However, there may exist a speculative value which is a "hoped-for" value due to the potential earning power of the property.

Land values are often used as a measure of the site advantage of an area. When the value of an urban site increases, it is because the increased advantages on that site do not accrue to other sites and therefore these


11 Unwin, p. 282.

other sites become poorer substitutes. The function of land values, as established by demand supply forces operating in the market, is to furnish a guide for the utilization of land. 

Changes in land values are induced by the events of change in the use of the particular property and the surrounding properties. The value of services and products produced on the land establishes a structure of land values for the area. The value of these services and products is mobile and therefore is of continuous variability.

The field of urban land economics, as stated by Dorau, is thus defined and conditioned by location and use. It is these factors that lead to problems of utilization, valuation, taxation, ownership, and control which are the particular concerns of urban land economics. In the United States, the trend of urban land values has generally been upward. The development of the country and the increasing rate of urbanization is partly responsible for this upward trend. However, because there is a great variation in the stage of development of land values in different cities, it is difficult to make any accurate statement regarding national trends.

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13 Ibid.
14 Ely and Morehouse, p. 234.
16 Dorau and Hinman, p. 152.
The Effects of Transportation on Land Values

In the discussion of land values, frequent reference is made to the role of transportation and location in regard to transportation facilities. An analysis of the influence of transportation facilities upon urban land values has, according to Wendt, revealed that traditional theory has greatly oversimplified the diverse effects such facilities have upon the urban land values.17 There is no model or principle for the distribution of land values applicable to all times and places. This is because peak land value sites have shifted through time, one of the principal causes being the evolution of new forms of transportation.18 In Richard Hurd's classic, Principles of City Land Values, he formulated the hypothesis suggesting the interrelationship of urban land values and urban transportation systems. This proposition has hardly been modified in current essays of urban land values.19

The degree of transportation development in a city determines over-all accessibility and the resulting effect is to determine the land values.20 Accessibility may be

17 Wendt, p. 240.
18 Hoyt, p. 109.
defined as the potential of opportunities for interaction for a given parcel of land. Often accessibility is taken to be a measure of the ease of interaction, but in reference to land values, it is best defined as a measure of the possible intensity of the interaction. By establishing this measure, the best usage of the land can be determined as well as the potential earning power of the land if properly developed.

It is possible to relate improvements in transportation to increases in the effective size of the city region which is the relevant focus for a study of the land market and land value patterns. With the development of new areas, both land and housing prices are lowered thereby increasing the supply of land which increases the aggregate value of land in the area. This development may be accomplished by the expansion of mass transit facilities such as commuter lines, expressways, or conventional highways.

Conventional highways increase significantly land values of those properties immediately abutting the highway because of the demand for such land by highway-catering businesses. Land not abutting the highway and that is

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21 Ibid.
22 Ibid., p. 159.
23 Rudolf Hess, "Land Values Before and After Freeway Development," American City, LX (October, 1952), 117.
not exposed to the large volume of traffic usually does not change in value and may even decrease because of the proximity to the high traffic area. The interrelationship between traffic and business is so intricately intertwined that it is often difficult to distinguish which is cause and which is effect.\textsuperscript{24} It is important to understand the relationships that do exist between these two factors since high land values are usually associated with business sites. The spatial distribution of businesses in essence reflects the spatial distribution of land values.

The influence of mass transit facilities and other transportation facilities upon values of residential sites can be both favorable and unfavorable. Sites along a commuter railway or a main automobile thoroughfare are ordinarily less desirable for residential use than those a block away.\textsuperscript{25} The noise and fumes from such facilities usually persist only in the immediate area and are an annoyance. However, a block away where these factors register little or no effect, land values are higher partly because of the proximity to the transportation facilities. Many households enjoy the presence of an expressway or mass transit line such as a commuter railway, but few want to live directly abutting the facility.

\textsuperscript{24}Swan, p. 195.
\textsuperscript{25}Dorau and Hinman, p. 521.
Up to this point, the topic of land values has been generalized by the discussion of what constitutes urban land values and the positive and negative effects of transportation and accessibility. In the following sections, a closer examination of the spatial distribution of urban land values is made with special attention paid to the pattern of land values found in central business districts and other commercial areas, in residential neighborhoods, and the effects of public buildings on land values.

**Commercial Land Values**

In the urban area, there are two currents of force that pull in opposite directions. One is toward the center of the city and the other is toward its periphery. The forces, working toward centralization and decentralization, have existed from the very beginnings of urban development and are the inevitable by-products of trade and business activity in general.\(^{26}\) However, these forces do not appear to be of equal strength. Empirical evidence suggests, however, that the force toward centralization is still the stronger even though its strength may appear to be weakening. The central business district has the stronger pull because it is the site of a variety of goods which in turn adds to the attractiveness of the city center. The result

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is that traffic and trade come from greater distances to do business in the center. The center is the most desirable place to locate. It is the point of maximum accessibility for both people and business, and it is both people and business that seek locations which are as central as possible. Husband makes note of the analogy of the solar system in which various bodies gravitate around different centers. There is a common center that is the hub of all activity, and similarly, there shall probably always be a central business district serving as the heart of urban business activity.

The central business district does not, however, always remain the most attractive market area with the highest land values. Through time, obsolescence may develop. The structures of the inner city may become less attractive and show signs of deterioration. In these areas, densities will tend to decline and with declining densities go declining land values. The deteriorating conditions and the trend of declining land values are mutually reinforcing.

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28 Ibid., p. 27.
30 Wingo, p. 117.
In the retail section, the land values are highest where the greatest number of shoppers are brought to a market. Most retail establishments are located on the first floor where the highest volume of traffic is found. Corner lots are usually more valuable than interior lots. The corner lots have greater street frontage and hence have greater access to light, air, and to the customers passing by along two fronts. The cross street traffic at the corner is a very valuable adjunct, but its effect diminishes as one moves back from the corner.

Many offices are found in the central business district along with the retail establishments, including professional offices, company headquarters, financial headquarters, and other highly specialized activities that usually do business on a contract basis. These businesses are usually located on the upper floors of the buildings found in the central area. Even though many of these businesses do not necessarily recruit their business from the passing crowds of the area, they locate here because of the prestige in having a central location.

Hoyt, in his writings, implies that the importance of the central business district is declining thereby meaning a relative decline in land values. He notes that a

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32 Dorau and Hinman, p. 531.
1963 study of the metropolitan areas with a million or more population shows only thirty-one percent of the department store sales were made in the central business district. He states that with the rise of new shopping centers since 1963, the percentage of department store sales in central areas has declined still further. This seems to be the reverse of what Van Cleef wrote two years earlier. Van Cleef states that persons from the hinterlands still find greater convenience in carrying on business, especially multiple in nature, in the central business area rather than in scattered peripheral neighborhoods. There does seem to be a lack of agreement in the present importance of the central business district. Despite the conflicting statements, evidence suggests that overall land values in the central business districts are declining. According to Hoyt, the latest land value patterns reveal a lowering of old central land value peaks and a subsidence of minor peaks at streetcar intersections. He notes that land values are rising on the lands that are on the fringes of the city and that are coming into urban use. Yeates and Garner write that the basic elements of the land value

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surface within the urban area jelled in most cities by the 1930's. From that time on, there has been only slight changes in the spatial structure of urban land values. 36

A final argument regarding central business district values, and a reverse of those above, is one put forth by Richardson. He states that it is interesting to note that central city land rents and values continue to soar despite the fact that the central business district's accessibility advantages are being increasingly whittled away by rising traffic congestion and the development of outlying commercial centers equally or more accessible. Richardson adheres to the argument that the prestige of the central city office is the factor which may be maintaining the demand for land in this area. 37

Decentralization, as mentioned earlier, is to some degree natural as a result of the rapid growth in population. 38 As a city grows and expands, outlying business centers will be established and the major thoroughfares that connect these business centers with each other and with the central business district will become ribbons of


38 Husband and Anderson, p. 25.
commercial and business development. The resultant land value patterns should then reflect the varying accessibilities to these different centers in the urban hierarchy.\textsuperscript{39} There is clearly a need for both localized shopping centers and the central business district. As well as competing with each other, these centers supplement each other. With the rise of the new peaks of land values found in these localized shopping centers, there has been a leveling off or the spreading throughout the urban area of the spatial distribution of land value peaks.

\textbf{Residential Land Values}

When studying urban land values, special attention should be paid to the structure of residential land values, for the largest use of urban land is for residential purposes. On the average, households occupy some forty percent of the total developed land and roughly eighty percent of the land area in all private uses in urban communities.\textsuperscript{40} Of the factors affecting the value of residential sites, the two most significant are the intensity of the demand for residential sites and zoning.\textsuperscript{41} Zoning regulations help to guide the orderly development of a community, and it is zoning that preserves land for its intended use and

\textsuperscript{39}Yeates and Garner, p. 252.
\textsuperscript{40}Wingo, p. iv.
\textsuperscript{41}Dorau and Hinman, p. 521.
minimizes drastic land use changes in an area. Additional factors that contribute to the final expression of economic value of the real estate are social factors such as favorable location to different income groups, ethnic groups, and social groups. 42

In residential areas, corner lots may or may not be desirable and therefore may or may not have a high land value. Residential sites located on corners may be subject to many favorable and unfavorable elements. A corner site has the advantage of having an open space on at least one side of the house allowing additional sunlight, air, and breeze. This is especially true in the inner cities. The main disadvantage of a corner site for residential use is that it borders two streets and may be subject to pay street maintenance taxes not just on one side, but two sides. The corner lot is also exposed to more pedestrian traffic which does not increase the value of the property as it may for a business property. In many cases, a large volume of pedestrian traffic may harm the residential property value. 43

In any city, the cheapest lots are usually found in the less desirable areas of the city such as near industries or near abandoned areas, or in areas with an

42 Husband and Anderson, p. 41.
43 Dorau and Hinman, p. 531.
excessive population density. A high population density in many cases contributes to the degeneration of an area and when carried to the extreme, it takes on the form of a slum.\textsuperscript{44} Slum land, if it has no projected usage plans, attracts few buyers and many times the owners of such land wish to dispose of it as soon as possible because of the high maintenance cost of the occupying structure.

The highest grade of residential land use will be found in those areas of the city which offer maximum freedom from the possible infiltration of uses which are adverse to the best mode of residential living, offer the best combination of such advantages of elevation, remoteness from traffic yet accessible, and exposure to the natural beauty of the landscape.\textsuperscript{45} The area of high-priced homes is only a small part of the total area of the city.

Lots which will support multi-family dwellings are more valuable than those which will support only single dwelling units.\textsuperscript{46} This is because a lot that can hold a multi-dwelling unit will be more productive and will enable the owner to realize a greater return on his investment. The highest valued multi-family residential sites are usually found in congested districts. However, the site values may be higher in less crowded fine apartment

\textsuperscript{44} Husband and Anderson, p. 44.
\textsuperscript{45} Ibid., p. 40.
\textsuperscript{46} Dorau and Hinman, p. 521.
districts than in the congested tenement districts because of the greater purchasing power of the inhabitants of the former.\textsuperscript{47} These multi-dwelling units have a tendency to be close to the central business district or adjacent to major transportation arteries.\textsuperscript{48}

It is apparent that there are several theories regarding residential land values. The large number of variables to be considered tend to make the establishing of a clear-cut theory impractical. Location though seems to be the key element in the structuring of residential land values. However, different groups of people have different locational preferences as well as varying economic means and it is these factors that help to explain the spatial pattern of residential urban land values.

The Effects of Public Institutions on Urban Land Values

Urban land values may be influenced by the presence of certain public and institutional facilities in the community. Facilities such as a fine arts center, a modern and well-equipped library, or even a university do much to reflect the public spirit of the community. Facilities such as those mentioned above can provide a feeling of uplift for the community and give the community the prospects of

\textsuperscript{47}Ibid.  

growth due to the influx of people desiring such facilities. On the other side, there may be certain public institutions that may depress the land values of an area. A prison or a correctional institution in the community, especially in a small community, may discourage new settlement. Public institutions help to make a city and in turn affect the real estate values found there.49

The presence of public buildings or institutions may attract related or linked establishments to locate nearby. A large university may attract bookstores, clothing stores, eating establishments, and other concerns that can profit from a large student body. Many of these establishments desire to locate near the institution where the market is located and therefore the demand for the land nearby or abutting the facility increases. If the institution shows signs of expanding, the land nearby usually has a higher value than those properties beyond because of the speculative value attached to the land. Proximity to public institutions is one factor that is desirable for residential sites resulting in a positive effect on the land values of the area.50

Complex, indeed, is the effect of these institutions on land values. Often these effects are indirect, but they

49 Husband and Anderson, p. 42.
50 Dorau and Hinman, p. 522.
do exist. The reasons for the positive and negative results are usually related to the type of facility and how the community reacts to it. A public facility or institution may affect the land values of the community as a whole, but the major effects are usually felt in the immediate neighborhood or the facility.
CHAPTER II

HYPOTHESES TO BE TESTED

From the literature of various related studies by urban land economists, geographers, and others, several hypotheses relating to the geographic distribution of the pattern of land values are advanced. These hypotheses are intended to test the relationships between land values and distance from major points in a community.

One of the basic assumptions in the classical theories of land values is that land values tend to decline with distance from the center of the city, usually this being the central business district. As revealed in the earlier discussion of central land values, the peaks of urban land values are usually found here. Many recent studies have revealed that these peaks are declining in magnitude. Yeates has shown that there is a weakening relationship between land values and distance from the central business district.¹ Knos has pointed out the relationship continues to exist in Topeka, Kansas, but he

did not test it through time as Yeates did.  

The central business district is usually the largest and most important of the commercial centers in a city. The congregating of businesses and people in a small area makes this spot highly demanded by both businesses and people alike. However, the central business district is not the only commercial center found in the city. There are several others of lesser importance. The subcenters may not necessarily possess the same drawing power as the central business district, but they do act as a magnet for business and people. The subcenter, such as a regional shopping center, attracts business from the surrounding area and many of the residents of this area find it more convenient to transact business here rather than go to the central business district. The land values in and immediately surrounding these subcenters usually are higher than areas farther away, but they do not peak at the same magnitude as those of the central business district.

If land values should peak in central business districts and regional shopping centers, then they should also rise on and around business thoroughfares characterized by a ribbon type commercial development. Knos attempted to relate land values to distance from the major thoroughfare

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in his study. Yeates cites that even though Knos arrived at results that were proven significant, he feels that it was somewhat inadequately tested since there was only one major business thoroughfare in Topeka.

Similar assumptions have been undertaken by several other geographers. In a study by Garrison, Berry, Marble, Nystuen, and Morrill, the results were that variations in airline distance from shopping centers or central business districts prove to relate significantly with land values. In view of the several studies testing the relationship cited above, it appears to be that only generalizations can be made because of the numerous outside factors that may enter into each test. In most cases, however, the central business district is expected to exhibit the strongest relationship between land values and distance from the city center. The subcenters are also expected to show a strong relationship between land values and distance, but it is not expected to be as strong.

The evidence of the other studies and empirical observation suggest that the same assumptions may be true for Bowling Green. The three hypotheses to be tested

\[3\] Ibid., p. 17.
\[4\] Yeates, p. 11.

regarding the above assumptions are:

Hypothesis 1. Land values and distance from the central business district are inversely related.

In the case of Bowling Green, distance is measured from the center of the Town Square which is the focal point of the city central business district (see Plate I).

Hypothesis 2. Land values and distance from the nearest shopping center are inversely related.

There are two major shopping centers in Bowling Green. The Fairview Plaza Shopping Center lies on the east-southeast edge of town and the Mall Shopping Center is on the west side of the city.

Hypothesis 3. Land values and distance from a major thoroughfare are inversely related.

In Bowling Green, the major thoroughfare is a four-lane highway running along the east and southeast section of town in a north-south direction. The highway is the 31W By-Pass, a part of a major state highway in south central Kentucky.

In an earlier chapter, it was noted that land values tend to hinge partially on the presence of public institutions in the metropolitan area. The effects an institution can have on the mood and spirit of the community as well as on the economy of the area were discussed. Unfortunately,
there does not seem to have been extensive work on the effects an institution such as a civic center, library, or university may have on land values in its neighborhood and the surrounding community. An attempt will be made here to determine the relationship between land values and the presence of a university. The school used in this study is Western Kentucky University which is located approximately six blocks south of the Town Square.

Hypothesis 4. Land values and distance from a major public institution are inversely related.

These hypotheses are primarily concerned with the relationship between land values and distance from a major point in the community of Bowling Green. A statistical analysis of these hypotheses appears in a later chapter.
CHAPTER III

SETTING AND RESEARCH DESIGN

Setting

Bowling Green, Kentucky, is an industrial, educational, and shopping center situated on the Sinkhole Plain of south central Kentucky. The city is 114 miles south of Louisville and 63 miles north of Nashville, Tennessee. To the north and northwest, the city is bound in part by the Barren River (see Plate I). Bowling Green is served by interstate and state highways, the Louisville and Nashville Railroad, an airline, and two bus lines. The city is the largest city in the regional trade area consisting of approximately six surrounding counties.

The 1970 census lists a population of 36,253 residents which includes an enrollment of more than 10,000 at a major regional university located here. The 1970 population figure represents an increase of 27.9 percent over the 1960 census figure, while the 1960 figure shows an increase of 54.5 percent over the 1950 figure. It is evident that in the past twenty years, the city has experienced rapid growth.

Internally, Bowling Green features a Town Square that is located in the central part of the city (see
Plate I). The Square consists of a park-like area with a fountain, gardens, walkways, and benches. Across the street on all four sides of the Square are numerous retail establishments and banks. This area comprises the core of the central business district. In addition to the central business district, there are several other outlying commercial business districts. Two of these may be classified as shopping centers and are shown on the reference map. The other commercial districts are for the most part a small clustering of miscellaneous businesses.

As mentioned earlier, the city is host to a large regional university. According to the Harris classification, Bowling Green is classified as an educational center. The initial site of the school, Western Kentucky University, is a hill top approximately six blocks west-southwest of the Town Square. The sprawl of the present campus extends southward from the hill.

Residential land use may be found as close as one block of the Town Square. Near the Town Square and radiating outward from it are found the older sections of the community. Some of these are well preserved, especially between the Square and the campus, while the other surrounding neighborhoods found north and northeast of the Square are deteriorating or have already been abandoned. Like most other

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cities, the city has a mixture of upper class and lower class residences near the central business district. To the south and southwest of the central city are found areas of recent expansion. This area is also expected to be subject to future expansion.

Intersecting the central area of the city are three major thoroughfares. A major by-pass is located in the southern sector of the community. The interstate highway has an interchange serving the city on the south end and another approximately five miles northeast of town. The area between the city itself and the interstate connections is largely undeveloped even though the land is within Bowling Green.

Research Design

Collection of Data

Data were collected for 1965 and 1970. The collection of data for these two years allows for the comparison of change and distribution of land values in Bowling Green. The lack of more accessible data prohibited extending the investigation farther back in time. The data are appraised property values which are representative of market values and are available at the Warren County Tax Office in Bowling Green. On the property tax records, three values are given. The first is the land value excluding physical improvements. The second value represents the value of
physical improvements, and the third is the total value of the two.

Preparation of the Data

The data, standardized to achieve uniformity, are value per square foot and distance from a particular point. The per square foot value was obtained by dividing the lot size, also available on the tax records, into the given land value. The distance figures are straight line measures. It has been shown that using straight line distance figures instead of actual distance figures may affect the results of some analyses. ² In this particular study, however, it is doubtful whether this would be so at the scale of the model used. Many similar studies incorporate front foot values, but it is believed by this writer that per square foot values are a more accurate measure because they are reflective of the total value of the property rather than a segment. In the sales of urban lots, buyers buy the whole lot since space is needed to place the building that is expected to profit from the frontage exposure.

To meet one of the assumptions of the correlation and regression model, data were logged to better fit a theoretical normal distribution. In the analysis of phenomena that are a part of economic life, the results are

usually skewed.\textsuperscript{3} Therefore, even though the variable itself may not be normally distributed, the log 10 function of the variable may very well be.\textsuperscript{4}

**Statistical Methods Employed**

The statistical methods employed in this study are the simple and stepwise linear regression models. The purpose of using these two techniques is to determine the closeness with which two or more phenomena co-vary and also to measure the nature and extent of this relationship. The possible values for the coefficient of correlation range from +1 to -1. A perfect positive correlation is indicated by a value of +1, and a perfect negative correlation is indicated by a value of -1. In both cases, the total variation is explained.

Following the statistical analysis, data are graphically illustrated by means of map and profile comparisons. The maps employed are land value and residual maps. The residuals, generated from the regression model, are the differences between the actual value and the expected value and are computed by use of the regression equation in which

\begin{itemize}
  \item \textsuperscript{3} A. Hald, *Statistical Theory with Engineering Applications* (New York: John Wiley and Sons, 1952), p. 164.
\end{itemize}
an estimate is obtained given the other value. The residual maps show the degree of the error of estimation. The land value map shows the distribution of land values in the study area. Profiles are also constructed in order to present a visual image of the spatial distribution of land values in any one part of the city. The use of the maps and profiles in conjunction with the statistical tests are believed to make the analysis more meaningful.

**Sampling Method Employed**

The selected points used in the tests are representative of the values found in the surrounding area. There are several kinds of sampling procedures that could have been used. Because of the form in which the data were available, it was determined that a systematic random sample would be most appropriate. This sampling procedure calls for the advance computation of the population size and desired number of samples. The first point was selected randomly and all other points following were systematically spaced. In the sampling procedure, if a tax free property was a selected point, a land value figure was not available. In these situations, the next card in the tax records was selected and this card contained data for the neighboring property since the properties are filed by street address and blocks. This problem was encountered only a few times and therefore the effects of deviating from the sampling procedure are small.
The results of the sample show the points selected to be evenly distributed and therefore acceptable for the study. In their similar studies, both Yeates and Knos used a disproportionate stratified random sample because of the large proportion of the total range of assessed valuations found in a small proportion of a city's area. Bowling Green is much smaller than Chicago and Topeka, however, and therefore extreme variations in any one small area were not expected. A review of the data confirmed this before a final decision was made on the sampling procedure.

The first sample taken consisted of 100 points for each of the two time periods. To assure an even distribution of the selected points, four concentric rings evenly spaced apart were drawn around the Town Square. The result was the establishing of five zones, the fifth being that area outside the fourth ring and yet within the city limits. From each zone, 20 points were selected. This particular sample was used for the testing of all the hypotheses stated earlier. However, as explained later, there was a need to conduct four more samples using more select study areas. For two of these, shopping centers were involved. The study area around these shopping centers was limited to an area extending one mile out from the shopping centers in all directions within the city limits. The one mile area was evenly sectioned into three zones
by use of concentric rings and a sample of 30 points was selected, 10 being from each zone. In two of the other tests, sample sizes of 30 were taken and both were confined to a study area limited by a 1,000 foot boundary. The reason for choosing the one mile and 1,000 foot boundaries was to isolate the study areas from outside land value influencing factors. For each of the four smaller samples, the random systematic sampling procedure was employed.
CHAPTER IV

THE STATISTICAL AND CARTOGRAPHIC ANALYSIS OF THE MODEL

The Town Square Analysis

The first analysis was conducted to determine the relationship between land values and distance from the Town Square. The hypothesis was that land values decrease with increasing distance from the Square. The results are shown in Table 1. The data used were for the two time periods, 1965 and 1970. However, there were insignificant differences between the results found for each time period, so it was decided to use only the most recent data.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>SIMPLE CORRELATION COEFFICIENTS OF VARIABLES VALUE PER SQUARE FOOT AND DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from</td>
<td>r</td>
</tr>
<tr>
<td>Town Square</td>
<td>-.52*</td>
</tr>
<tr>
<td>Nearest Shopping Center</td>
<td>-.29*</td>
</tr>
<tr>
<td>31W By-Pass</td>
<td>-.39*</td>
</tr>
<tr>
<td>Western Kentucky University</td>
<td>-.02</td>
</tr>
</tbody>
</table>

*Significant at .01 level
In the overall review of the patterns and relationships of land values and distance in Bowling Green, it is apparent that land values and distance from the central business district produce the strongest relationship found. A visual representation by means of a land value map showing land values and their proximity to the Town Square shows that the largest deviations from the mean of land values were found either very close to the Town Square or far out (see Plate II). Those points with a large positive deviation were found within a three block area of the Square on the major thoroughfares that pass through the center of the city and alongside the 31W By-Pass. The reasons for these deviations can be traced to the extreme variations in values between commercial and non-commercial properties. Therefore, nearly all the commercial sites in the sample were far above the mean. Empirical observation indicates that the commercial sites with the large positive deviation are located either near the center of activity in the central business area or on a major thoroughfare. This is indicative of the fact that it is these values that form peaks while the remaining values represent a leveling off area of land values. As seen in the outer rings, most of the points deviated little from the mean. On the fringes of the city, there are points that fall far below the mean. This helps to support the hypothesis in so far as the lowest values are found farthest from the
SI AND DEVIATION

STUDY AREA
BOWLING GREEN, KENTUCKY

LAND VALUES
1970

PLATE II
center of the city. With few exceptions, the land value map tends to support the hypothesis.

A review of the residuals (see Plate III) shows that there are several correlation values overestimated and a few underestimated values in the immediate vicinity of the Town Square. The overestimated values suggest that the central area around the Square does not have the peak of values that it was assumed to have. It appears that the overall values in the central area form more of a plateau of high values than a peak. No specific pattern exists. Many of the overestimated and underestimated values are widely scattered. The lack of a clear pattern suggests that the sample points possess variable characteristics that caused their actual value to deviate significantly from the expected value. For example, south and southeast of the Square along Scottsville Road, many of the values were underestimated. Empirical observation shows that an upper class neighborhood and a new subdivision are in this area. The area also has a new high school, a new hospital, and a new shopping center. Because of the attractive neighborhood and the promise of facilities that will make living in the area convenient, the land values are higher regardless of distance from the central business district. Basically the same holds true for those points south-southwest of the Square in the Nashville Road vicinity, where a shopping center is surrounded by several fairly new subdivisions.
STUDY AREA
BOWLING GREEN, KENTUCKY

PLATE III
To the north and east of the Square, many of the values were overestimated. These areas of town are older and do not hold promise for future community growth. For Bowling Green, recent expansion has taken place south and southwest of the central part of the city and continues to do so while there has been relatively little growth in the northern sectors of the city. Other than these predominant patterns, the significant errors of estimation of the other points may be attributed to isolated factors. For example, the lot may be a commercial property at an intersection or may be a pocket of high or low priced homes.

The profiles of the distribution of land values in Bowling Green produce another view of the patterns found (see Figure 1). They were drawn from the northeast to the southwest corner. The profiles are somewhat similar with the exception of the deviations found in the central business district. The outlying areas of the city reflected consistently low land values. In these areas, the per square foot values seldom exceeded $0.25 while values nearer to the central part of the city increased significantly. Those values in and immediately surrounding the central business district were highest, especially along the northwest-southeast profile. The northeast-southwest profile did not have the extreme differences partly because it crossed those areas of the central business district that are in a period of deterioration.
FIGURE 1

PROFILES OF LAND VALUES

IN BOWLING GREEN, KENTUCKY
An analysis of the values and residuals, as well as the profiles, seem to support the earlier hypothesis regarding land values and distance from the central business district. The negative relationship ($r = -0.52$) when tested for significance is acceptable at the .01 level. Based on the above, the research hypothesis stating that land values decrease with increasing distance from the central business district is accepted.

**The Nearest Shopping Center Analysis**

The second hypothesis tested, postulating an inverse relationship between land values and distance from the nearest regional shopping center, provided a simple correlation of $-0.29$. This value is too weak to accept without further investigation. Therefore, a separate study will be conducted later to further investigate what relationships may exist between land values and distance from a shopping center in Bowling Green. Since there are two regional shopping centers in the city, the Fairview Plaza Shopping Center and the Mall Shopping Center (see Plate I), each will be investigated separately. By limiting the study area, it is believed that a clearer picture may be obtained of the relationships that do exist.

**The By-Pass Analysis**

The third hypothesis stated that there is an inverse relationship between land values and distance from a major
thoroughfare, and in Bowling Green the thoroughfare is the 31W By-Pass. The simple correlation value obtained from the regression analysis was -.38 which is somewhat weak. Clouding the validity of this relationship is the fact presented in the review of literature in an earlier chapter that a thoroughfare usually has a pronounced effect on the land values abutting the passageway, or in the immediate vicinity. As in the case of the test between land values and distance from the nearest shopping center, it is believed that an independent test is necessary. It is suspected that those points that lie far from the location in question are apt to be influenced by other variables at the same time and therefore not show a strong relationship to any one variable. The hypothesis is neither accepted nor rejected until a further test is made which also appears later.

**The University Analysis**

The final hypothesis tested was that land values and distance from Western Kentucky University are inversely related. The regression analysis resulted in a simple correlation value of -.02. This relationship is very weak and the validity of the test is therefore doubted until a further test is made. The weak relationship indicates that the influence of the university on land values in the community may be overpowered by other dominating factors. Therefore, it is suspected that the university exerts an influence
only in its immediate neighborhood. Such factors as the central business district, regional shopping centers, and major thoroughfares in the community may extend their sphere of influence and be partially responsible for the weak relationship. The weakness of the relationship is verified when it fails to be significant at the .05 level of significance (see Table 1). At this point, the hypothesis will neither be accepted nor rejected until a further more refined analysis is made. The results of this later analysis appear in the following chapter.

**Results of the Stepwise Regression Analysis**

The simple regression analysis provided satisfactory results for only one of the four tests conducted. The correlations obtained for the other tests were not significant enough to justify rejection or acceptance of the hypotheses at this point. The multiple regression analysis also indicates the need for further research (see Table 2). In order to determine what percent of the total variation was accounted for by all the variables together, the stepwise regression model was used. The variables in this model are selected one by one in order of the amount they explain total variation. Distance from the Town Square proved to be the most important variable in explaining the land value patterns in the city. This was followed, in order of significance, by distance from the By-Pass, Western Kentucky
<table>
<thead>
<tr>
<th>Distance from</th>
<th>R</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town Square</td>
<td>.51</td>
<td>26%</td>
</tr>
<tr>
<td>31W By-Pass</td>
<td>.60</td>
<td>36%</td>
</tr>
<tr>
<td>Western Kentucky University</td>
<td>.61</td>
<td>37%</td>
</tr>
<tr>
<td>Nearest Shopping Center</td>
<td>.62*</td>
<td>38%</td>
</tr>
</tbody>
</table>

*Significant at .01 level

University, and the nearest shopping center. The variables of distance from Western Kentucky University and the nearest shopping center fail to explain at this point any patterns found. When all the above variables were considered together in the model, thirty-eight percent of the total variation was explained. This is not a statistically significant figure and does not adequately account for the major portion of the variance.

The results of the stepwise regression model confirm the earlier suspicion of the need for further research, especially with those variables of distance from the By-Pass, Western Kentucky University, and the shopping centers. When considered together, the variables do not provide an adequate explanation of the pattern of land values in
Bowling Green and therefore it is suggested that they be considered independently of each other.
CHAPTER V

THE MODEL REFINED

The general hypothesis regarding land values from the Town Square, the central point of the central business district, does adequately explain the overall pattern of land values in Bowling Green and therefore was accepted. However, the hypotheses citing minor patterns found within the city were neither accepted nor rejected pending further investigation. It is the purpose of this chapter to refine the hypotheses in question by using limited study areas with new samples taken within the boundaries of the limited study areas. The purpose of using the isolated study areas is to investigate the effects of a shopping center, by-pass, or university on land values in the immediate neighborhood since it had been realized that the use of a city-wide sample blurs the effects any one unit may have on land values, especially if they are on the opposite end of the city and subject to more immediate land value influencing factors.

As was the case with the original tests, data were used for 1965 and 1970. Once again, it was found there were no significant differences in the correlations obtained for the two time periods. There were also insignificant
differences in the land value and residual maps. Therefore, in the following analysis, only the most recent data are mapped and discussed.

**The Nearest Shopping Center Analysis Refined**

The original test postulating an inverse relationship between land values and distance from the nearest shopping center was conducted on a city-wide basis. In the refinement of the analysis, two tests are conducted, each using one shopping center with its respective study area and sample. It is suspected that this procedure would best reveal any patterns that may exist.

**The Fairview Plaza Shopping Center Analysis**

The simple correlation coefficient obtained for the relationship between land values and distance from the Fairview Plaza Shopping Center was +.58 which is significantly different from the original value of -.29 which involved a larger study area and an additional shopping center (see Table 3). The implication here is that the effects of a shopping center on land values in its surrounding area are significantly different than in the city as a whole.

An examination of the land value map showing values and distance from the Fairview Plaza Shopping Center indicates a positive relationship that verifies the figure obtained for the coefficient (see Plate IV). Most of the values are within one standard deviation of the mean. Outside of these,
LAND VALUES
1970

STUDY AREA
FAIRVIEW PLAZA
SHOPPING CENTER

OVER +2SD
+1SD TO +2SD
+1SD TO -1SD
UNDER -1SD

PLATE IV
TABLE 3

SIMPLE CORRELATION COEFFICIENTS OF REFINED MODELS VARIABLES PER SQUARE FOOT AND DISTANCE

<table>
<thead>
<tr>
<th>Distance from</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairview Shopping Center</td>
<td>+.58*</td>
</tr>
<tr>
<td>Mall Shopping Center</td>
<td>-.05</td>
</tr>
<tr>
<td>31W By-Pass</td>
<td>-.70*</td>
</tr>
<tr>
<td>Western Kentucky University</td>
<td>-.19</td>
</tr>
</tbody>
</table>

*Significant at .01 level

those that were over one standard deviation of the mean are to the east of the shopping center at a considerable distance. Also, some of the values that were greater than the mean were found to be closer to the central business district than the shopping center. These positive relationships can be attributed in part to the fact that these values are apparently influenced by their proximity to the central business district. It seems that there would continue to exist a positive relationship between land values and distance from this particular shopping center should the sample and study area be enlarged. The points selected for this analysis are primarily residential sites. It is suspected that proximity to a shopping center in a community the size of Bowling Green does not have a significant bearing on land values, especially those of residential sites.
A look at the residuals shows that the same values that were located near the central business district with large positive deviations were significantly underestimated (see Plate V). Outside of these values, with the exception of two, all the other values were estimated with relative accuracy with minor positive and negative deviations. As for the two that were overestimated, their effects are believed to be minimal on the overall analysis.

The results of the statistical analysis regarding land values and distance from the Fairview Plaza Shopping Center were unexpected. A completely opposite relationship was found from the one hypothesized. A look at the results of the test between the land values and distance from the Mall Shopping Center will perhaps provide a further explanation as to what can be expected in testing for relationships between land values and distance from a regional shopping center in Bowling Green. Only then can the hypothesis be either accepted or rejected.

The Mall Shopping Center Analysis

The simple correlation coefficient obtained for testing the relationship between land values and distance from the Mall Shopping Center is -.05 which differs considerably from the value of+.58 found in the Fairview Plaza test, and is hardly related to the original value of -.29 using the larger sample and study area. More
than eighty-three percent of the sample points are within one standard deviation of the mean (see Plate VI). These values are evenly distributed and there is only one value greater than one standard deviation of the mean and four under one standard deviation. The distribution of these values does not suggest the existence of any pattern. The point with a large positive deviation is situated on a corner opposite the shopping center and is commercially utilized. Those with the large negative deviations are large parcels of land that at the present time are not fully utilized. In one case, the lot is part of an industrial park and the land may be undervalued in order to attract industry into the area.

Most of the sample points in the Mall study are residential sites. The area has been recently developed and there are many subdivisions around the shopping center. The shopping center is not very large, is not a major employer, and does not offer the variety found in the central business district. This may be a partial explanation of the insignificant relationship found between land values and distance from the center.

The residual map shows that only two properties near the shopping center were significantly underestimated (see Plate VII). There were a few properties that were overestimated, and this includes the one industrial site mentioned above. Otherwise, most of the values were
RESIDUALS
1970

STUDY AREA
MALL SHOPPING CENTER

NUMBERS IN STANDARD ERRORS OF ESTIMATE

GREATER THAN +1.0
0 TO +.99
0 TO -.99
LESS THAN -1.0

PLATE VII
estimated to be within one standard error of estimate. As seen on the land value map, there is a lack of a pattern that would indicate either a strong positive or negative relationship. The Mall is one of the newest shopping centers in Bowling Green, and it is possible that it has not had time to make an impact on the land values of the immediate area.

Consideration of Both the Fairview Plaza and Mall Shopping Centers

The results of the independent tests reflected major differences between themselves and also failed to support the hypothesis. There may be several reasons for these differences with the major ones being mentioned above. Because of the lack of supporting evidence that there does exist an inverse relationship between land values and distance from the shopping center, the hypothesis is rejected.

The By-Pass Analysis Refined

Using a refined study area and a new sample, which are explained in the research design, the simple correlation obtained for the relationship between land values and distance from the By-Pass is -.70 which is considerably higher than the value of -.38 obtained in the first test (see Table 3). This second value is indicative of a strong relationship between the two variables. A look at the
land value map (see Plate VIII) shows that more than eighty percent of the selected points fall within one standard deviation of the mean. Most of these values are found farthest from the By-Pass and in isolated instances are found relatively close to the By-Pass. Those values that are much greater than the mean are found near or on the By-Pass. It should be noted that the By-Pass is intersected by two heavily traveled streets, Fairview Avenue and Broadway, which lead to the central business district. Along these two streets, on both sides of the By-Pass, commercial establishments are taking advantage of the heavy traffic movement in the area. For those properties, the value per square foot did not decline as rapidly as the land values on the neighborhood or residential streets leading away from the By-Pass.

The highest values, besides being found directly fronting the By-Pass, are also found near the corners where the above mentioned streets intersect the By-Pass. This adheres to the principle regarding the intersection of two major streets usually being the peak value intersection of the area.¹ The main reason for the properties along the By-Pass having much higher values than the surrounding properties is that it is these properties that hold the

LAND VALUES
1970

STUDY AREA
31W BY-PASS

PLATE VIII
most promise for commercial usage. In regard to those properties that deviated little from the mean, this was expected. In the gathering of the data, it became apparent that there was little range in land values away from the By-Pass. A review of the land value map therefore supports the idea that the presence of the By-Pass affects only those properties that can directly benefit from the traffic movement of the area.

A look at the residuals (see Plate IX) indicates that those properties closest to the By-Pass were underestimated. The reason may be that the majority of the properties in the area, as mentioned above, are within the same value range except for those directly facing the By-Pass or a major street that bisects the By-Pass. Those values farthest away from the By-Pass were estimated with accuracy suggesting that the effects of the By-Pass or any other land value influencing factors are minimal in this area. Those properties that were overestimated are on the northern fringe of the By-Pass. It is this area that has the least amount of commercial property. This area also fringes the older and more deteriorated section of Bowling Green. The quality of the neighborhood in and around this area seems to lower the land values. It may also be that because the north end is not as heavily traveled, the demand for land in this area for commercial purposes is not as great. A final point to be noted is
RESIDUALS
1970

STUDY AREA
31W BY-PASS

NUMBERS IN STANDARD ERRORS OF ESTIMATE

- GREATER THAN -1.0
- 0 TO -0.99
- 0 TO -0.9
- LESS THAN -1.0

PLATE IX
that the land use of the area in discussion is not necessarily dependent on a large volume of traffic. Some of the businesses found here are auto body shops, transmission repair garages, and storage buildings.

Those businesses further south on the By-Pass undoubtedly depend on the larger volume of traffic found in the area. It is for these reasons that the land values are somewhat higher both on and away from the By-Pass. The quality of the neighborhood is better and the type businesses found here appeal to more people. It should also be pointed out that the traffic is heavier in this area for several reasons. Most of the feeder streets are found in this area. Also, most of the traffic moves through here because it is a major route to the several smaller shopping districts that are found further south of this area.

An examination of the maps shows measurable differences between land values and distance from the major thoroughfare lined with commercial establishments. When testing the significance of the correlation coefficient, it is found to be acceptable at the .01 level. The strong relationship found here was expected, and the differences between this test and the original test support the argument that a city-wide test cannot be made for secondary land value determining factors. The hypothesis, with its refined study area and sample, is accepted.
The University Analysis Refined

As with the refinement of the By-Pass analysis, a refined study area and sample are used in the reconsidering of the hypothesis postulating an inverse relationship between land values and distance from Western Kentucky University. Use of the simple regression model for testing the relationship between the two variables results in the simple correlation value of -.19 which is weak, but stronger than the value of -.02 originally obtained.

A look at the land value map (see Plate X) shows the points of one standard deviation or less from the mean are found to the south, east, and west of the university. This pattern suggests one or both of two things. In these areas, there do not exist any major factors that would strongly influence land values. The second implication is that the moderate deviations may imply the lack of any relationship. This will be determined later.

To the north of the university are found the largest deviations from the mean. Here many of the values were far greater than the mean, suggesting that these points are subject to other factors that may have positive effects on their values. A comparison of these points to the proximity of the central business district suggests that a location between the university and the central business district may have a higher value. It is interesting to note that these points with high values are residential properties.
One would expect this area to be commercialized because of the benefits of being located between two major traffic generators in the city.

Also to the north are a few values that fall well below the mean value of the sample points. These points, however, are not centrally located between the central business district and the university as those mentioned in the preceding paragraph. It should also be noted that those points that fall below the mean value are in an older and somewhat run-down neighborhood.

A review of the residuals reflects a similar pattern to that found on the land value map (see Plate XI). Those points that were significantly underestimated are found in the area between the campus and the central business district. To the east of the university are a small number of points that were moderately underestimated. A partial explanation for this may be that these points do have proximity to the 31W By-Pass. Empirical observation also suggests that these points may have higher values because of the esthetic qualities of the neighborhood. The remaining points were estimated fairly accurately.

The above analysis of the land values and residuals supports somewhat the original hypothesis. However, the relationship is weak and is not significant at the .05 level of significance. A stronger relationship had been expected since the university is a traffic generator and therefore
land nearby would be sought by commercial interests if zoned accordingly. Also, a growing university, and Western is growing, usually causes some speculative value to be added to the surrounding properties in anticipation that the university will pay an adequate price to allow for the execution of its expansion programs. This does not appear to be the case here.

Despite the weak statistical relationship, the hypothesis is accepted. Empirical observation reveals that for the most part the properties surrounding the university are occupied by well-kept and, in some cases, upper class residences. The presence of the high quality physical improvements does have a tendency to favorably affect land values. It is believed that proximity to the university adds prestige to a residential address in a city the size of Bowling Green.

A Final Review of the Profiles

The refinement of the models had indicated that in some cases smaller patterns exist within the city. However, it is apparent that with the exception of the By-Pass, there are no major peaks of land values other than the central business district area. A final reference to the profiles confirms this (see Figure 1). The northwest-southeast profile is level and consistent in slope until it crosses through the central business district and the By-Pass.
The other profile does not share the same deviations, but does reflect the same pattern of land values in the outer fringes of the city. The profiles confirm the strong as well as the weak relationships found.

A Comparison of Some of the Results of This Study with Yeates's Study of Chicago

Although Bowling Green is much smaller than Chicago, some of the results of the tests can be compared with the results of similar tests Yeates conducted in his study. For the simple correlation coefficient between the logarithm of distance from the intersection of State and Madison, the central point he selected, and the logarithm of front-foot value, he obtained the inverse relationship of -.29, using 1960 data.\(^2\) The significance of the difference in land value patterns around the central business district in the two cities can be determined by comparing Yeates's value with the correlation coefficient obtained in this particular study. Using the \(z'\)-transformation test, the deviation obtained is greater than two standard deviations.\(^3\) Therefore, it can be concluded that the degree of difference in land values and distance from the central business district


in the two cities is significant. There appears to be a stronger relationship in Bowling Green than in Chicago. Yeates does cite that the relationship in Chicago has weakened in the fifty years from 1910 to 1960. This could be indicative of the fact that even though the hypothesis postulating an inverse relationship between land values and distance from the central business district is weakening in the larger cities, it continues to be strong in smaller cities where the original structure and layout of the city is less exposed to the disruptive forces that would cause the spreading out of land values.

In comparing the simple correlation coefficients between land values and distance from the nearest shopping center of this study with the value Yeates obtained, two separate comparisons were made. Yeates had one value and that was for the nearest shopping center. Since each shopping center was treated independently in this study, two values are available. When comparing the correlation coefficient obtained for the Fairview Shopping Center analysis with the value Yeates obtained for the nearest shopping center, the results significantly deviate from each other thereby indicating the lack of similarities in land value patterns around shopping centers in the two cities. However, when using the results of the Hall Shopping Center,

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4 Yeates, p. 123.
the results of the comparison indicate similarities in the land value patterns. The inconsistency found above in the pattern of land values around shopping centers in Bowling Green makes it difficult to compare these patterns with those found in other cities and therefore makes it impractical to state unqualified generalizations regarding these patterns in Bowling Green.
CHAPTER VI

SUMMARY AND CONCLUSIONS

In the previous chapter, several generally accepted hypotheses concerning land values within cities were tested and analyzed. These hypotheses, accepted, rejected, or modified in several other studies were used here to examine the spatial distribution of land values in Bowling Green and to determine how this distribution compares with cities of other case studies such as those of Yeates and Knos. The results of the tests conducted in the previous chapter did not always provide the expected results. It is therefore necessary at this point to bring them together and to state some reservations that perhaps will make these theories more relevant to cities the size of Bowling Green.

Hypotheses Reconsidered

Hypothesis 1. Land values and distance from the central business district are inversely related.

This hypothesis proved to be true for the city of Bowling Green. Although there was no pronounced peak of land values as found in many of the larger cities, there was found in the central business district the highest land
values in the city. This particular theory is applicable to Bowling Green and probably to other cities of the same size.

Hypothesis 2. Land values and distance from the nearest shopping center are inversely related.

Because the first attempt at testing this relationship was considered invalid for numerous reasons, two independent tests were conducted with the sample points in specifically selected areas. The first of the independent tests failed to bring out the hypothesized relationship and the results also opposed generally accepted theory. The second test, dealing with a second shopping center and study area of its own, also failed to support the hypothesis. The results of this test differed from the first by failing to show any definite relationship regardless of whether or not it was in accordance with the theory stated in the hypothesis.

The major problem most likely lies in the fact that even though the two shopping centers are of considerable size for a community the size of Bowling Green, their effects on land values are not the same as those found with much larger shopping centers in larger cities. Because any one point in Bowling Green is easily accessible and within a short driving time, the role of regional shopping centers in different sectors of the city is not as
pronounced as it would be in a larger city where greater
distances are found between the regional shopping centers
and the central business district.

A hypothesis such as this cannot be adequately
tested in a community the size of Bowling Green. Since
several other studies of larger scope have found an inverse
relationship between land values and distance from the
nearest shopping center to exist, the hypothesis as stated
cannot be flatly rejected or accepted without first making
reservation to the size of the study area. In Bowling Green,
there does not appear to be a distinct relationship between
land values and distance from the nearest shopping center.

Hypothesis 3. Land values and distance from a
major thoroughfare are inversely
related.

The test conducted to determine what relationship
existed between land values and distance from the 31W By-
Pass, which serves as the major thoroughfare in Bowling
Green, resulted in an inverse relationship. The values had
dropped rapidly with increasing distance, therefore creating
a steep ridge of values along the By-Pass. Only those
parcels that directly abut the By-Pass can commercially
benefit the most from the high volume of traffic in the
area. Even though the hypothesis was tested on only one
thoroughfare, the theory holds true for Bowling Green and
it is suspected that the inverse relationship found between
the two variables is most pronounced in cities the size of Bowling Green. The reasons for this suspicion are that in a smaller city a thoroughfare usually develops as a shopping district rather than as a high-speed by-pass or beltline as found in larger cities.

Hypothesis 4. Land values and distance from a major public institution are inversely related.

The results of the test using Western Kentucky University as the major public institution indicated the existence of an inverse relationship, although somewhat weak. The problem encountered here was that there was no other major public institution other than the university with which to make a comparison. Although the hypothesis was accepted, there is a demonstrated need for further research on this particular hypothesis.

Weaknesses of the Study

The results of the several tests conducted have indicated that generally accepted theories of land values are applicable in a city the size of Bowling Green. It is apparent that the behavior of some land values is basically the same in small and large cities alike, although the degree of change or variance may be significantly different. Naturally land values are not expected to peak in the central business district as they do in Chicago. Bowling
Green is a much smaller and more simplified model, but similar land value patterns are evident.

The fact that Bowling Green is much smaller and a more simplified model than used in other studies may be cited as a weakness of this study. Bowling Green was selected to be representative of the small city. As with other small cities, its simple structure and functions are facts of reality. There is no need to build complexity into a model if it is simple in its original state.

In using the simple model of Bowling Green, only the most accessible variables were used in the analysis. These were the per square foot values and distance figures. Variables such as population density of properties of given values, income structure of the city, racial characteristics of neighborhoods, and distance from recreational facilities were not considered in this study. Granted, their inclusion would have made the study more meaningful and revealing as to the morphology of the city, but due to a lack of data and time, such an analysis could not be undertaken.

Areas of Further Research

As cited above, only two variables were used in this study. Little attention was given to population densities, income structures, and racial distributions in the community. The incorporating of these variables in the analysis would have perhaps presented a clearer picture as
to the cosmopolitan structure of the community in relation
to the spatial patterns of land values. Questions may arise
as to the relationship of population densities and land
values in Bowling Green or to the combined relationship of
income, density, and land values. Many other questions may
arise, all being relevant to the structure of land values
in the community. The answers to such questions lie in
further research. Urban land economists and geographers
alike can perhaps arrive at more meaningful conclusions
regarding land values and these may in turn be helpful in
obtaining a better understanding of the structure and
dynamics of the urban organism.
## APPENDIX A

### SUMMATION OF PROPERTY VALUES USED IN STUDY

<table>
<thead>
<tr>
<th>Sample Used</th>
<th>Range of Per Square Foot Values</th>
<th>Range of Lot Size (Square Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowest</td>
<td>Highest</td>
</tr>
<tr>
<td>Town Square</td>
<td>$ .03</td>
<td>$5.16</td>
</tr>
<tr>
<td>Fairview Plaza Shopping Center</td>
<td>.11</td>
<td>5.60</td>
</tr>
<tr>
<td>Mall Shopping Center</td>
<td>.01</td>
<td>3.00</td>
</tr>
<tr>
<td>31W By-Pass</td>
<td>.09</td>
<td>1.89</td>
</tr>
<tr>
<td>Western Kentucky University</td>
<td>.12</td>
<td>.68</td>
</tr>
</tbody>
</table>
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