ACCESSIBILITY TO CENTER BUSINESS DISTRICT AND LAND PRICE

Suparmono
Sekolah Tinggi Ilmu Ekonomi
Yayasan Keluarga Pahlawan Nasional, Yogyakarta
e-mail: suparmono.pasca@gmail.com

Abstract

This paper models land price for housing in Sleman district. It uses a multiple regression model to estimate the land price based on various variables. It finds six variables that influence the land price, namely the land width, width of the nearest road, width of the nearest main road, distance to the nearest main road, distance to Yogyakarta ring road, and the travel time to Gadjah Mada University campus. It also finds four insignificant variables, namely distance to Malioboro road, distance to Gadjah Mada University campus, travel time to Yogyakarta ring road, and travel time to Malioboro.

Keyword: Land price, center of business district, accessibility
JEL classification numbers: D46, D49

Abstrak

Paper ini memodelkan harga tanah untuk perumahan di Kabupaten Sleman menggunakan model regresi berganda untuk memperkirakan harga tanah berdasarkan berbagai variabel. Paper ini menemukan enam variabel yang mempengaruhi harga tanah, yaitu lebar tanah, lebar jalan terdekat, lebar jalan utama terdekat, jarak ke jalan utama terdekat, jarak ke jalan lingkar Yogyakarta, dan waktu perjalanan ke Universitas Gadjah Mada. Paper ini juga menemukan empat variabel yang tidak signifikan, yaitu jarak ke jalan Malioboro, jarak ke kampus Universitas Gadjah Mada, waktu tempuh ke jalan lingkar Yogyakarta, dan waktu tempuh ke Malioboro.

Keyword: Harga tanah, center of business district, aksesibilitas
JEL classification numbers: D46, D49

INTRODUCTION

Variations in land prices and the distance of the land to the centre business district (CBD) are important variables in urban theory and the development of the urban structure (Wieand, 1972). The emergence of a new region at the center of business activites in the surrounding area resulting in growing, either for residential, office, commercial, industrial, and business. There is a close correlation between the location factors parcels of land with the land price.

The development of cities, due to the emergence of multiple centers of economic activities, resulted in an increased cost of congestion, social insecurity, pollution, and land prices increases in the surrounding area. The increase in land prices is also caused by several other factors, both economic and non-economic factors. The existence of public facilities and land ownership status is also thought to significantly affect the price of land.

Hanonen (2008) found that unorthodox methods, namely MM Robust estimation, Structural time series estimation and Robust Local Estimation provide more accurate prediction of price land in urban areas compared with the conventional least squares method. Lewis (2007) found a

negative relationship between the price of land with land distance from the city center. He also found a positive influence of classes of roads, land status, and environmental conditions to the land price. He also found that the effect of distance on the ground decreased over time.

This study analyzes the effect of land width, the nearest road width, the the main street width, and the distance of the land to the nearest main road to the price of land for housing in Sleman. It also analyzes the effect of distance and travel time from the CBD to the price of land for housing in the same location.

Sleman district as one of the districts in the Province of Yogyakarta Special Territory which has been experiencing a rapid development. Warsono (2006) found that the development of settlements in Sleman driven by population growth, factors of land ownership rights, and the rapid growth in land prices. The high number of families in Sleman has increased the demand for land for housing, which in turn will increase the price of land (Darmawan, 2005). The increase in land prices in some prime locations in Sleman district during the period 1995 to 2011 to reach an average of 370 percent (see Notary and PPAT, the Land Office, the Office DPKAD, and office developers in Sleman).

Determinant of Housing Land Price

The price of land in urban areas grows faster than it does in rural areas (Cho, 2005). Besides determined by economic factors, land prices are also influenced by factors such as non-economic social, economic, governmental, physical, environmental, and location factors (Eckert and Gloudemars, 1990).

Kryvobokov and Wilhemsson (2007), using a spatial analysis, found that the proximity of the land to the CBD, prestige location, a secondary city center, public facilities, and bus stop significantly affect land prices. The presence of CBD and public facilities increase the price of land, especially land for housing. The existence of the CBD can be seen from the aspect of location and distance to the time required to reach the location of the land. In addition, the proximity to school building also increase the land price (Baumont, 2009). Income levels also determine the demand for land for housing, which in turn influence the price of land (Mundy and Kilpatrick, 2000).

Land prices are also influenced by some non-economic variables such as comfort, the beauty of the landscape around the location of the land, the level of environmental security (Tita et al., 2006), and population density. Joly and Brossard (2009) found that landscape is the main factors that determine the quality of life in choosing the location of the land for housing. In addition, the spread of population density in a city and metropolitan existence is a factor that also affects the price of land and housing prices (Cypher and Hayungga, 2010). Other non-economic aspects that also affect the price of land for housing are the willingness to pay (willingness to pay or WTP) at a specified price (Moller, 2009).

Another variable that also affect the price of the land is the land status according to the law (Lewis, 2007). In this study, the soil state variables can be divided into two, namely the land for housing and land for rice fields. Both types of land are land ownership certificate status (SHM) and not the status of the right to build (HGB).

Basic Concept of CBD

Manufacturers choose the location in the CBD due to benefit from the relatively low transport costs. For households, the CBD is very important as a place to work or shopping for goods and services. Transportation costs for residents of the city to work or shop tends to be lower around the CBD.

Land for housing located far from urban centers has low prices, but have a high transport costs. Land for housing located near urban centers have high prices,

but have a low cost of transportation. In the end, the price equilibrium will be determined by transportation costs (for further discussion, please read Niemietz, 2012).

Based on the Ministry of Finance Decree, the Directorate General of Taxation Number SE-55/PJ.6/1999, the value of land is determined by physical factor as well as location and accessibility factors. The physical factors is determined by width of of the land, forms of the land, and soil physical properties such as topography, elevation, flood or no flood, fertility (for agriculture) and so on. The location and accessibility are further determined by the distance from city center, distance from supportive facilities, specific location, accessibility, road type, and environmental conditions.

Bid-Rent Theory

Bid-rent approach to the theory states that the price of land is determined by the land uses, namely for the bid-rent function office, residential bid-rent function, manufacturer bid-rent function, and agricultural bid-rent function (Carter and Vandell, 2005). In general, this theory states that the closer the location of the land and buildings of the CBD, the price of land to be paid the higher, and vice versa. Especially for land used for agriculture, the price is assumed fixed and unaffected distance from the center of economic activity. Farm land price is influenced by the level of soil fertility.

The Theory of City Structure

Some theories have tried to explain the structure of cities. Among the first theories is the concentric zone theory. This theory was found by Park and Burgess (1925) that was first used to examine the structure of cities in the United States in 1920. Burgess argued that the city used as a central hub of economic activities of the community around the city The city will grow and spread evenly from the center of the city and stimulate the emergence of different zones, each of which extends parallel.

Following these developments, the structure and location of the zones will form concentric and flanged (ring). The price of land in the city center will be more expensive than the price of land located far from the city center. The further away the land from the city center, then the price would be lower. The determination of land prices according to this theory is associated with aspects of accessibility to the center ground location of economic activity. The patterns of use of land for housing can be divided into three types, namely: high-income housing residents, low-income housing residents, and housing residents as commuters (commuters).

The second theory is the sector theory which was put forward by the Hoyt (1939) by modifying the model of concentration of Burges. This theory states that urban growth is a process that is more concentrated on sectoral patterns. Hoyt agrees with the concept of the CBD that is placed in the center of town. He also supports the idea of the land usage spreading from city center towards the outside of the city center in the form of sector or spurs (wedges). The structure of the city in detail according to Hoyt is sector 1, which is the Central Business District (CBD), sector 2 which is an industrial area and the factory, sector 3 which is housing of low-income residents, sector 4 which is housing for middle-income residents, and sector 5 which is housing for high-income residents. Visually, the theory can be described as follows.

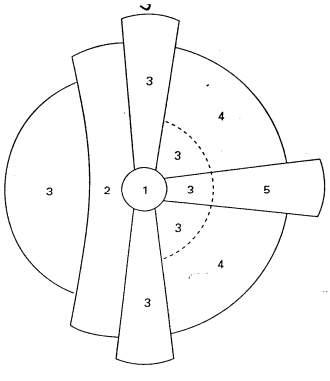

Figure 1: The Sector Theory

In Burges theory, the use of land for housing in the UK can be divided into three types, namely high-income housing residents, low-income housing residents, and housing residents for commuters. This theory assumes that the wind blows from the east to the west, so that the plants will be located in the east of the high-income housing residents. High-income residents will avoid the negative impact caused by the existing. Workers and factory workers would choose to live near the plant site to save on the transportation cost. The house rent in this area is cheaper than those in the other regions.

Another important theory is the multiple nuclei theory which was put forward by Harris and Ulman (1945). According to them, the city's concentric and sectoral are not as simple as described by previous theories. The growth of the city started from the city core becomes more complex due to the growth of a new city that serves as a valve in the growth process of urban development.

Around nuclei 1 will appear cells of growth (nucleus 2 to 9) as activity centers which are separated with one another. These urban centers will be characterized by specialization and differentiation of space. The number of centers formed will vary from one city to others. These urban centers may serve as seaports, airports, industrial complexes, rail networks, campus, or the a new town.

The main variables that determine the price of the property is the distance between the location of the property to the city center and the center of economic activities (Central Business District). CBD in the broadest sense can be defined as an area of economic activity in the zone of the land value (ZNT) covering or relating to a central location for shopping activities, education, offices, terminals, railway stations, hospitality, recreation, and other centers of economic activity (for discussion, see for example Haughwout et al. (2008).

Changes in accessibility can be used as a measure of the influence of new transportation facilities on property values, but it can cause two problems (Lin and Hwang, 2003). First, saving travel costs due to the transportation facility is difficult to measure accurately. Secondly, accessibility was not able measure benefits and costs incurred by the subway system on property values.

Research Theoretical Frame

Land prices measure the value of land based on productivity and economic strategic value contained in the soil. The concept of value can be grouped into several types, namely insurable market value, going-concern value, liquidation value, assessed value, and the value of the building and the value of investments (for further discussion, see, for example, Fernandez, 2003).

The value of an item or unit of production arises from a production unit that produces useful goods. Thus, the value of an item that is sold at a fair price is basically the same as the cost of production of the goods plus profit. A good is manufactured because it is useful. This concept is known as the cost of production value theory which is the foundation of the classical school of economic thought (for further discussion, see, for example, Bouare, 2009).

The development of a city resulted in a change in land use zone structure and the price of land. In this case, there are four kinds of land, namely land for office bid-rent function, land for residential bid-rent function, land for manufacturer bid-rent function, and land for agricultural bid-rent function. Each zone of lands its own pattern in the formation of clusters in the city. The growth of population in urban areas has also led to the housing needs of the higher land (see for example, Hansberg et al., 2010).

Operation Definition of Variables

CBD or central business activities can be measured in a variety of indicators. According to Tang and Yeung (2009), CBD has several features such as high accessibility, becomes the concentration of tertiary employment, high land prices, high density construction level, has sharp competition, and wide spreading areas.

In accordance with the above criteria, this paper determines some CBDs in Sleman namely Malioboro area, Adisucipto Airport, Tugu Railway Station, Ringroad, and Gadjah Mada University (UGM). Malioboro is chosen as one of the CBDs because it is a trading center, offices, tourist, and cultural in Yogyakarta. Adisucipto airport and the Tugu rail station are chosen as one of the the CBDs because they are the centers of the main modes of transportation in Yogyakarta. UGM is chosen as of of the CBDs because it is a center of education, trade, and lodging business.

The determination of land prices in urban areas can be explained using two approaches (Moller, 2009). The first one is market price of land, namely the outcome of negotiations in the market. The second one is the land value standards, which is conducted by public officers. In this paper, the methods used to assess the land price is market price derived from the price of the transaction is recorded in the notary, Land Deed Official (PPAT), District Office, and Developers of housing in the Sleman district.

Travel time is one form of the concept of accessibility. The first approach is a problem-oriented approach. The second approach is based on spatial interaction framework. The third approach measures the benefits provided to an individual by a system of land use. Travel time can be predicted using transportation cost. For this study, because polycentric urban pattern is simple, the travel time is predicted by the time needed to reach the CBD location of the location of the ground by using a mode of personal transportation and the normal rate of speed in urban areas.

There are two concepts of CBD accessibility (Stanilov, 2003), namely integral and relative accessibilities. Of the studies that have been conducted, the distance to the CBD is the the most important factor that determine the distribution pattern of activities. For areas with multi nuklei, accessibility is defined not only as a link between the location to the city center, but also the ease of reaching a location from various locations in the area. In integral models, accessibility is developed in two factors, namely the distance to the nearest highway and the closest distance to the main arterial roads. In this case, the distance is measured in a straight line from each location to the place marked. This study uses the same method used by Stanilov (2003) to measure the distance to the CBD and the ring road to the ground using, namely uses the straight-line distance from the point to the location of the CBD and the ring road. In addition, Lewis (2007) suggests the influence of the width of the road on the status of the land is proposed.

METHODS

The population frame to be analyzed comprises all transactions on residential land in 20 villages in 9 districts in Sleman district in 2012. The population frame is selected on the basis of Regulation No. 11/2007 on Housing Development that establishes the area permitted and directed for residential land in Sleman. The population of the land transactions for the year 2012 according to the Office of Management and Asset Wealth Sleman District amounted to 6,945 transactions with the following distribution (table 1).

This paper applies the proportional cluster random sampling technique. The population frame is divided into various clusters according to the number of villages in nine districts in Sleman. From these clusters, the transactions are randomly and proportionally selected.

Table 1: Numbers of Land Transactions for Housing in Sleman Regency, 2012

No	District	Village	Number of Transactions
1.	Gamping	Trihanggo	365
		Ambarketawang	315
		Banyuraden	240
		Nogotirto	230
		Balecatur	330
2.	Godean	Sidoarum	256
3.	Mlati	Sinduadi	446
		Sendangadi	409
		Sumberadi, Tlogoadi	172
		Tirtoadi	179
4.	Depok	Maguwoharjo,	556
		Condongcatur,	616
		Caturtunggal	598
5.	Berbah	Kalitirto	207
6.	Kalasan	Purwomartani	616
7.	Ngemplak	Wedomartani	657
8.	Ngaglik	Sariharjo,	452
		Minomartani	119
9.	Sleman	Tridadi	182
Total Population			6,945

Source: DPKAD, Sleman Regency, 2012

Table 2: Distribution of Number of Samples in Each Location

No	District	Village	Jumlah Sampel
1.	Gamping	Trihanggo	20
		Ambarketawang	17
		Banyuraden	13
		Nogotirto	13
		Balecatur	18
2.	Godean	Sidoarum	14
3.	Mlati	Sinduadi	24
		Sendangadi	22
		Sumberadi, Tlogoadi	9
		Tirtoadi	10
4.	Depok	Maguwoharjo,	30
		Condongcatur,	34
		Caturtunggal	33
5.	Berbah	Kalitirto	11
6.	Kalasan	Purwomartani	34
7.	Ngemplak	Wedomartani	36
8.	Ngaglik	Sariharjo,	25
		Minomartani	6
9.	Sleman	Desa Tridadi	10
Total of Samples			378

Source: Research Samples, Calculated

Data on land transactions are obtained from the notary and PPAT, District Office, Office of the Regional Asset and Wealth Management (DPKAD), and the National Land Agency (BPN). After the transaction of data acquired land, then confirmation of purchase and sale of land to each location so that some data is not con-

tained in the record of the transaction can be validated. This paper also conducted a survey to find various of data that are not available in the record of the transaction, for example, the existence of roads and road width size.

The population under the study is homogeneous, so the sample size does not have to be too large to represent the properties of the population. A formula which is recommended to determine the sample size is as follows (for more on this, please see Jones et al., 2005):

$$n = \frac{N}{1 + N_e^2} \quad (1)$$

where n is the sample size, N is the population size, and e is the error tolerance or significance level. Using the above formula, assuming 5% significance level, n = (6945/(1+6945*0.05*0.05) = 378.22 which is approximately 378. Using the technique of proporsional cluster random sampling, the sample elements are distributed as in table 2.

This paper estimates a multiple regression using an OLS (ordinary Least Square) technique. The constructed model of land price is:

$$\frac{P_i}{A_i} = \beta_0 e^{\beta_1 X_{1i}} \quad (2)$$

where P is the land price, A is the land size, and X_1 is the distance from the city center, β_0 is the land price in the city center, β_1 is the price as the function of distance, namely the land gradient price. To estimate the model, the above model is then transformed into a model in log as follows:

$$\ln\left(\frac{P_i}{A_i}\right) = \ln\beta_0 + \beta_1 X_{1i} + \sum_{j=2}^{n} \beta_j X_{ji} + \varepsilon_i \quad (3)$$

Where x_{ji} are determinants of per unit land price, β_j are coefficients to be estimated, and ε are error term.

In addition to the primary data described above, this paper also uses primary data in the form of land location, land size, the width of the road and the nearest main road, the travel time from the location of the land to the city center, as well as other necessary data. The supporting data are obtained from various sources, which are Department of Finance and Asset Management Areas (DPKKD) Sleman District, Tax Office (KPP) for the Land and Building Tax (PBB) Sleman regency, especially for the data relating to the transaction of sale of land in the city of Yogyakarta, as well as monthly reports from district and notary.

The estimated model in this paper is as follows:

$$\begin{aligned} LANDPRC = {} & \beta_0 + \beta_1 LW + \beta_2 WNR \\ & + \beta_3 WNMR + \beta_4 DLNMR \\ & + \beta_5 DLYRR + \beta_6 DLMAL \\ & + \beta_7 DLUGM + \beta_8 TTLRR \\ & + \beta_9 TTMAL + \beta_{10} TTLUGM \\ & + \varepsilon \end{aligned} \quad (4)$$

where
LANDPRC is land price for residential and paddy field,
LW is land size,
WNR is width of the nearest road,
WNMR is width of the main road,
DLNMR is the distance of the land from the nearest main road
DLYRR is distance of the land to Yogyakarta ringroad
DLMAL is distance of land to Malioboro
DLUGM is distance of land to UGM campus
TTLRR is travel time from the the land to Yogyakarta ring road
TTLMAL is travel time from the the land to Malioboro
TTLUGM is travel time from the the land to UGM campus

RESULTS

The analysis of data provides the following results:

Table 3: Data Analysis Results

Variable	Regression coefficients	*t*-statistic	Probability	*F*-stat	Adjusted R^2
(Constant)	2226149.615	3.696	.002		
LW	-904.095	-3.072	.006		
LJLDKT	185711.824	2.506	.021		
WNMR	219651.132	3.173	.005		
DLNMR	-1832.313	-4.023	.001		
DLYRR	-185.888	-2.796	.012	15.231	.831
DLMAL	76.275	1.502	.149	(0.000)	
DLUGM	-43060.341	-.959	.349		
TTLRR	7701.217	.253	.803		
TTLMAL	-9890.797	-.450	.658		
TTLUGM	-110146.160	-2.732	.013		

Based on the calculation results of multiple regression analysis, it was found that by using a 5% significance level, only four variables that affect land prices are *BROAD*, *LJLDKT*, *WNMR*, *DLNMR*, *DLYRR*, and *TTLUGM*. The distances of the land to the main road and ring road have negative impacts on the land prices. This means that the further the distance, the lowest the price of the land. *DLMAL* (the distance from land to Magelang road) has a positive impact on the price land, because Magelang road is not an amenity for residential.

The *F*-statistic of 15,231, with a significance level of 0.000, implies that all independent variables in the model jointly significantly influence the variation in the price of land for housing in Sleman. The value of adjusted R^2 is 0.831 which means that 83.1% variation in the independent variables can explained by the variation in the independent variables.

CONCLUSION

From the previous discussion, some conclusions can be drawn as follows. The variables used in this study are capable of explaining the phenomenon of the price of land for housing in Sleman. It can be seen from the coefficient of determination for 0831.

Amenities used as predictor variables, namely amenities of Gadjah Mada University campus, amenities of ring road, and amenities of Magelang street are able to explain the change in the price of land for housing in Sleman. From the amenities, only amenities of Magelang street which does not have a direct influence on the price of land, while amenities include northern ring road and amenities include GMU campus, in terms of distance and travel time, affect the price of land for housing in Sleman.

Independent variables used in this study have an overall influence on the price of land for housing. Partially, of the ten independent variables used in the model, only four variables do not significantly influence the price of land for housing in Sleman.

REFERENCES

Baumont, C. (2009), "Spatial Effects of Urban Public Policies on Housing Values," Appears in *Regional Science Papers*, Vol. 88, No. 2, June.

Bouare, O. (2009), "An Evaluation of David Ricardo's Theory of Comparative Costs: Direct and Indirect Critiques," *Journal of Economic Development*, 34(1), 99-126.

Carter, C.C. and K.D. Vandell (2005), "Store Location in Shopping Centers: Theory & Estimates," *Journal of Real Estate Research*, 27(3), 237-266.

Cho, J. (2005), "Urban Planing and Urban Sprawl in Korea," *Urban Policy and Research*, 23(2), 203–218.

Cypher, M.L. and D.K. Hayungga (2010), "Market Competition for High Density Resiedntal Land," *International Journal of Strategic Property Management*," 14, 19–34.

Darmawan, D.A. (2005), *Konsepsi dan Studi Empiris tentang Harga Tanah*, Pusat Penelitian dan Pengembangan Badan Pertanahan Nasional, Jakarta, halaman 16-20.

Eckert, J.K. and R.J. Gloudemars (1990), *Property Appraisal and Assessment Administration*, The International Association of Assessing Officers, Chicago, Illionis, USA.

Fernandez, E. (2003), "Fair Valuation of Real Estate," Bank for International Settlements Paper No. 21.

Hansberg, E. (2004), "Optimal Urban Land Use and Zoning," *Review of Economic Dynamics*, 7, 69–106.

Hanonen, M. (2008), "Predicting Urban Land Price: A Comparison of Four Aproaches," *International Journal of Strategic Property Management*, 12, 217–236.

Hansberg, E.R., P.D. Sarte, and R. Owens III (2010), "Housing Externalities, *Journal of Political Economy*, 118(3), 409-432.

Harris, C.D., and E.L. Ullman (1945), *The Nature of Cities*, Annals of the American Academy of Political and Social Science, 242, 7-17.

Haughwout, A., J. Orr, and D. Bedoll (2008), "The Price of Land in the New York Metropolitan Area," *Current Issues in Economics and Finance*, 14(3), 1-7.

Hoyt, H. (1939), *The Structure and Growth of Residential Neighborhoods in American Cities* Washington, Federal Housing Administration.

Joly, D. and T. Brossard (2009), "A Quantitative Approach to the Visual Evaluation of Landscape," *Annals of the Association of American Geographers*, 99(2), 292–308.

Jones, S.R., S. Carley, and M. Harrison (2005), "An Introduction to Power and Sample size Estimation," *Emergency Medicine Journal*, 20, 453-458.

Kryvobokov, M. and M. Wilhemsson (2007), "Analysing Location Attributes With A Hedonic Model for Apartement Price ini Donesk, Ukraine," *International Journal of Strategic Property Management*, 11, 157–178.

Lewis, D. (2007). "Revisiting the Price of Residential Land in Jakarta, Urban Studies,' 44(11), 2179–2194.

Lin, J. and C. Hwang (2003), "The Analysis of Property Prices before and after Taipei MRT Opening," *Journal of the Eastern Asia Society for Transportation Studies*, 5, 2817-2830.

Moller, J. (2009), "Regional Variations in the Price of Building Land: A Spatial Econometrics Approach for West Germany, *Annal of Regional Science*, 43, 113–132.

Mundy, B. and J.A. Kilpatrick (2000), "Factor Influence CBD Land Price," *Real Estate Issues*, 25(3), 39-49.

Niemietz, K. (2012), "Abundance of Land, Shortage of Housing," Institute of Economic Affairs Discussion Paper, No. 38.

Park, R.E. and E.W. Burgess (1925), *The City*, The University of Chicago Press.

Stanilov, K. (2003), "Accessibility and Land Use: The Case of Suburban Seattle, 1960–1990," *Regional Studies*, 37(8), 783–794.

Tang, B.S. and S.C.W. Yeung (2009), "Central Business District Development in a Transition Economy –Case Studies of Guangzhou and Shenzhen, China," Direct RGC Grant to the Hong Kong Polytechnic University of Hong Kong A-P032.

Tita, G., T.L. Petras, and. T. Greenbaum (2006), "Crime and Residential Choice: A Neighborhood LevelAnalysis of the Impact of Crime on Housing Prices, *Journal of Quantitative Criminology*, 22, 299–317.

Warsono, A. (2006), *Perkembangan Pemukiman Pinggiran Kota pada Koridor Jalan Kaliurang Kecamatan Ngaglik, Kabupaten Sleman*, Master Thesis, Magister Pembangunan Wilayah dan Kota, Universitas Diponegoro, Semarang.

Wieand, K. Jr. and F. Richard (1972), "A Note on the Variation of Land Value with Distance from the CBD in St. Louis," *Journal of Regional Science*, 13(3), 167-180.