ALTERNATIVE MEASURES OF LOCATION FOR RURAL LAND MARKET ANALYSIS

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As population grows, more economic activity is added in the urban areas that influences rural land markets at the rural-urban fringe. With more rural land acres being converted at the urban fringe, buyers, sellers, planners, appraisers, tax assessors, lenders and others are expected to have an increased need for information about the effect of location and economic development on rural land values.

Empirical research has used various distance variables to measure the effect of location on land values. Kletke and Williams estimated a functional relationship between sale price and square root of distance. Chicoine measured distance variables in radial miles. Shonkwiler and Reynolds estimated distance as a straight line. As distance from a market center increases, rural land values are expected to decline. This suggests an inverse relationship between distance and value.

A general consensus among urban appraisers is that potential buyers express more interest on the travel time to the nearest city or town rather than the distance to such centers of commercial activity. Based on this observation, this study has developed three models to estimate the effect of alternative measures of location on the price of rural land in the southeast Louisiana. For the first model, distances were estimated as a straight line using GIS procedures. The second model includes road distances to nearest town and nearest city that were estimated from Street Atlas USA as the actual road distance from the tract to the closest town and metropolitan area. The last model includes the travel time variables, used as a measure of distance as suggested by Isard and Liossatos, estimated from Street Atlas USA.

Model and Data

Data for this study are based on the rural land market sales from southeast Louisiana as determined through a mail survey. These data represent a subset of a larger data base collected for the state for the period January 1993 through June 1998. The rural land market survey was mailed to state certified appraisers, officers in commercial banks, Farmer Service Agency personnel, Federal Land Bank Personnel, Production Credit personnel, members of the Louisiana Chapter of the American Society of Farm Managers and Rural Appraisers, and Members of the Louisiana Realtors Institute.

The study area includes eight parishes in southeast Louisiana and the metropolitan statistical areas of New Orleans and Baton Rouge. A total of 237 observations on rural land sales were collected, and each rural land sale is a least 10 or more acres in size and is outside the city limits.

Variables hypothesized to influence per acre rural land values are defined in Table 1. PRICE in Table 1 is the dependent variable used in the hedonic model and represents the per acre selling price for each tract of rural land and improvements. Continuous variables expected to have an inverse relationship with per acre selling price include size of tract (SIZE), distance to nearest city (DNC), distance to nearest town (DNT), road distance to nearest town (RDNT), road distance to nearest city (RDNC), travel time to nearest town (TTNT), and travel time to nearest city (TTNC). There is generally a negative relationship between size of tract and per acre selling price because fewer buyers compete in markets for larger tracts; whereas, many buyers compete in markets for smaller tracts. For locational variables including travel time, location theory generally suggests an inverse relationship between distance to markets and per acre selling prices. DNT and DNC were computed as a straight line using GIS procedures; RDNT, RDNC, TTNC and TTNT were computed using the Street Atlas USA computer software.

Continuous variables expected to positively influence rural land values include value of improvements (VALUE), and the time of sale (TIME). These variables represent positive attributes of rural land and hence are hypothesized to have a positive influence on per acre rural land values. The discrete recreational variable (REC) is hypothesized to have a negative relationship with per acre land values because much of the data in this analysis represent marginal marshland and upland that is well suited for hunting, trapping, and other outdoor uses. The discrete commercial variable (COM) is expected to have a positive relationship with per acre land values since it represents an alternative type of demand for rural land that is expected to have higher returns on the land.

Three hedonic models were developed to estimate the influence of the alternative measures of location. All models have in common the SIZE, VALUE, RT, NOMSA, REC and COM variables. The straight line model includes the variables DNC and DNT, the road distance model includes the variables RDNT and RDNC, and finally, the travel time model contains the variables TTNC, and TTNT.

Prior to developing hedonic models of the rural land market area, data were tested for spatial autocorrelation. In this study, spatial autocorrelation occurs if the price variable is correlated with itself over space. Knowledge of spatial autocorrelation is of concern because its presence means there is interdependence in the data, whereas most statistical methods assume independence in the data. Ignoring spatial autocorrelation in a hedonic analysis of real estate values may result in inefficient and biased econometric results.

The presence of spatial autocorrelation was tested using a simple likelihood ratio test. An OLS model and a spatial model were estimated for each of the three hedonic models proposed in this study and the likelihood ratios were compared. Likelihood ratio tests were also used to determined what hedonic model better fits the data.

Results

Although the OLS results are not presented, comparison of the likelihood ratio (LR) tests indicated a significant difference between the maximum likelihood models and OLS models, suggesting the presence of spatial autocorrelation. General results also indicated that problems of multicollinearity and heteroskedasticity are not present in this study.

Hedonic models coefficients are presented in Table 2. The effect of size of the tract (Ln SIZE) was consistently estimated to have a negative influence in the per acre price across all three models. The value of improvements to the tract (VALUE) was statistically significant in explaining rural land values at the one-percent level. This variable was measured in dollars added to the land property (i.e. house, barns, fences, etc.). It was found to have a positive influence in the rural land sales. Time of the sale was found to be statistically significant at the one-percent level. Similarly, paved road access was estimated to have a positive influence in the price of the tract.

New Orleans MSA estimates were statistically significant at the one-percent level, indicating that properties close to New Orleans sell for more per acre than properties in the rest of the study area. The variable reason for purchase recreational was found to be statistically significant at the five-percent level. It was found to have a negative influence in the price of the tract. On the other hand, the variable reason for purchase commercial was found to have a positive influence in the rural land sales, and it was statistically significant at the ten-percent level.

Measures of Location

Results from the straight line model indicated that the distance to nearest town variable did not influence the price of the tract. However, distance to nearest city was statistically significant at the one-percent level. It was found to negatively affect the land value.

The road distance to nearest town and road distance to nearest city variables were estimated to have a negative impact on rural land values. Road distance to nearest town was statistically significant at the ten-percent level, and road distance to nearest town was statistically significant at the one-percent level.

Finally, results from the last model indicated that the travel time variables had a negative influence in the price of land. Travel time to nearest town was statistically significant at the five-percent level, while travel time to nearest city was statistically significant at the one-percent level.

Although likelihood ratios were not statistically different among models, results indicated that the highest maximum likelihood value was for the travel time model. The lowest likelihood value was for the straight line model.

Summary and Conclusions

The purpose of this study was to develop empirical economic models to estimate the effect of alternative measures of location on the price of rural land in the southeast Louisiana. Results showed that maximum likelihood models were significantly different from the OLS models, suggesting the presence of spatial autocorrelation in the hedonic models. The benefits of using spatial models include improved prediction, better statistical inference through unbiased standard errors, and better estimates because of the way location is handled within the modeling procedure.

All the variables tested in the hedonic models had the excepted signs and were statistically significant at the five-percent level except for reason for purchase commercial variable for the straight line model and the road distance model. However, it was statistically significant in the travel time model. These results may suggest that, in fact, the travel time model represented a better way to fit the data.

The variable distance to nearest town for the straight model was not statistically significant. Travel time to nearest town was not statistically significant at the five-percent level. Travel time variables (as a measure of distance) were statistically significant at the five-percent level in explaining rural land values. Likelihood values were not significantly different between models. However, with this particular set of data, the travel time model had the highest likelihood value indicating that this model best fits the data.

References

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Table 1. Variables Used in Hedonic Model Estimation, Southeast Area, Louisiana Rural Land Market Survey, 1993- 1998.

Variable	Description	Expected Sign
Continuous Variables		
PRICE	Per acre price of land ($)	
SIZE	Size of the tract (acres)	(-)
VALUE	Value of improvements ($)	(+)
DNC	Distance to nearest city (miles)	(-)
DNT	Distance to nearest town (miles)	(-)
RDNC	Road distance to nearest city (miles)	(-)
RDNT	Road distance to nearest town (miles)	(-)
TTNC	Travel time to nearest city	(-)
TTNT	Travel time to nearest town	(-)
TIME	Month of sale	(+)
Discrete Variables (1,0)		
RT	Paved access road	(+)
REC	Reason for purchase: recreational	(-)
COM	Reason for purchase: commercial	(+)
NOMSA	New Orleans Metropolitan Statistical Area	(+)

Table 2. Estimated coefficients for Hedonic OLS and ML models using alternative measures of location for the southeast Louisiana rural land market area, 1993-1998.

	MODEL		
Item	**Straight Line**	**Road Distance**	**Travel Time**
Variable			
W (SPATIAL LAG)	0.0414 (5.9392)***	0.0382 (5.4938)***	0.0370 (5.3151)***
Ln SIZE	-0.2482 (-9.7706)***	-0.2456 (-9.7558)***	-0.2482 (-9.2881)***
VALUE	-0.0000019 (4.3337)***	-0.0000019 (4.2676)***	-0.0000019 (4.3495)***
TIME	0.0080 (4.4370)***	0.0081 (4.5460)***	0.0086 (4.3495)***
NOMSA	0.5380 (6.3712)***	0.5771 (6.9961)***	0.5536 (7.1412)***
RT	0.1897 (3.6456)***	0.1790 (3.4633)***	0.1731 (3.3357)***
REC	-0.2171 (-2.3996)**	-0.2064 (-2.3006)**	-0.1866 (-2.0832)**
COM	0.3458 (1.7534)*	0.3785 (1.9333)*	0.4022 (2.0535)**
DNT	-0.0047 (-1.1740)		
DNC	-0.0132 (-4.8570)***		
RDNT		-0.0059 (-1.8415)*	
RDNC		-0.0094 (-4.4330)***	
TTNT			-0.3133 (-2.4711)**
TTNC			-0.4765 (-4.4712)***
INTERCEPT	8.4353 (57.7936)***	8.4914 (563071)***	8.6217 (52.3472)***
LR TEST	-106.422	-105.072	-104.589

z- values are in parentheses, ***denotes statistical significance at the 0.01 level, ** denotes statistical significance at the 0.05 level, and * denotes statistical significance at the 0.10 level.