LIVING ON THE EDGE: RESIDENTIAL PROPERTY VALUES IN THE URBAN/RURAL FRINGE?

Fahmida Fakhruddin

Department of Agricultural and Applied Economics

Clemson University

260 Barre Hall

Clemson, SC 29634

Molly Espey

Department of Agricultural and Applied Economics

Clemson University

263 Barre Hall

Clemson, SC 29634

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ABSTRACT

Using hedonic analysis of residential properties in the upstate of South Carolina, location in the urban/rural fringe is estimated to have a significant positive value relative to either rural or urban locations. The differential impact of private and public undeveloped land on housing price is estimated empirically. The results indicate that homes in the rural fringe, urban-rural fringe and urban fringe are worth about 11, 8 and 6 percent more respectively than homes in urban areas. The results also show that lake front, lake access and lake view houses are worth about 48, 35 and 30 percent more respectively than the houses which do not have lake view, lake access or lake frontage.

Keywords: open space, hedonic, fringe, lake

South Carolina is primarily a rural state but currently one of the fastest growing states in the United States, particularly in the I-85 corridor of the upstate between Atlanta, Georgia and Charlotte, North Carolina. As the demand for residential and non-residential development increases, the urbanized areas are expanding beyond the city limits, shifting the urban perimeters into the once rural areas. This transformation of rural areas into urban/rural fringe is profoundly affecting small communities and rural areas.

Rural areas provide numerous amenities such as recreational opportunities and attractive views, while urban areas provide more job opportunities and other conveniences. Urban areas also provide disamenities such as traffic congestion, noise, and pollution however. Fringe areas, on the other hand, may provide an attractive combination of rural and urban amenities. One way to determine the value of locating in the urban/rural fringe is to examine housing prices across a range of urban, rural, and fringe areas. This paper estimates the differential impact of urban, rural, and fringe locations on residential property values in the upstate area of South Carolina. More detailed analysis will focus on the significance of public versus private open space in the fringe and rural areas in determining housing values.

The hedonic property price method, which uses existing markets to estimate marginal values, was used to estimate the economic value of locating in fringe areas. The hedonic pricing method is based upon the idea that environmental characteristics, such as air or water quality, will affect the productivity, and thus the rent, of a given parcel of land (Freeman 1993). The value obtained through this study is not a complete economic value for fringe areas. Because these estimates are based on housing prices in Pickens,

Oconee and Anderson counties, only the value to residents who live in these counties are observed; non-residents' values are not taken into account.

This study focuses first on general location in terms of urban, fringe, or rural. Then more detailed estimation will consider the type of open space in each area, differentiating between private and public land and between farmland and forest.

Recent Literature

Many empirical studies have sought to measure the effects of various types of open space such as neighborhood and large urban parks, greenbelts, water-bodies and wetlands on a home's sales price. Kitchen and Hendon (1967), Weicher and Zeibst (1973), Hammer and others (1974) all studied parks in Lubbock, Texas, in Columbus, Ohio, and in Philadelphia, Pennsylvania respectively. Correll and others (1978) found that in Boulder, Colorado, properties adjacent to greenbelts were worth an average of 32% more than those 975 walking-meters away (32000 ft). Frech and Lafferty (1984) examined the effect of the actions of California Coastal Commission to preserve open space. Nelson (1985) found that greenbelts increase the value of urban land in proximity and theorized that this effect also extends to the exurban land market where people will locate and commute through the greenbelt to jobs in urban areas.

Parsons (1992) found that land use restrictions in Maryland designed to protected Chesapeake Bay caused 14% to 27% increase in housing prices for houses 305m (1000 ft) inland from the bay and major tributaries, to between 4% and 11% for houses up to 4.8 km (3miles) away. Thibodeau and Ostro (1981) studied wetlands in the Massachusetts Charles River Basin. . Lacy (1990) analyzed property value appreciation rates for open space or cluster subdivisions in Concord and Amherst, Massachusetts. In

Concord, properties in an open space subdivision appreciated 167.9% between 1980 and 1988, compared to 46.8% for the town as a whole. In Amherst, houses in an open space subdivision appreciated 462% between 1968 and 1989, while houses of similar size and price in a conventional subdivision appreciated 410% during the same period.

Do and Grudnitski (1995) found that proximity to golf courses increased property sales prices by 7.6%. Lupi et al (1991), Doss and Taff (1993), examined the influence of wetland type and wetland proximity on residential property values. Lutzenheiser and Netusil (1999) and Netusil and Bolitzer (2000) studied the impact of proximity to various types of open space on property values in Portland, Oregon. Their study showed that open space and open space type have statistically significant effect on homes sales prices. Netusil and others (2000) examined whether open space can be self – financing. Since open space near by could enhance property values and tax revenue, their study showed that the possibility for self-financing space occurred only in neighborhoods where homes had high assessed values. Espey and Owusu-Edusei (2001) analyzed the impact of the proximity of different types of parks to residential houses in Greenville, South Carolina. Their study showed that there was a positive impact (about 15%) on housing prices for homes between 300 and 500 feet of small neighborhood parks.

A growing number of studies in the economics literature have taken into account spatial characteristics in hedonic modeling. Geoghegan et al (1997) were the first to use landscape ecology indices in a spatial hedonic framework. Focusing on the watershed of Patuxent river near Washington D.C. they developed a model to explain land and housing values by capturing how individuals value the diversity and fragmentation of land uses around their homes. Bockstael (1996) and Parks (1991) also concentrated on spatial

characteristics in the modeling of land use change. Hardie et al (1999) focused on forest conservation regulations in Maryland to measure landscape values. While much information exists concerning values associated with urban areas or rural areas, information related to the value of fringe areas through the use of the hedonic model is limited. Most recently, Isakson and Ecker (2001) examined the influence of location in the market for undeveloped urban fringe land in Denver, Colorado. The study of open spaces ties into the fringe variables within the upstate of South Carolina, and gives some background on how such open spaces can be considered valuable.

The Hedonic Method

Rosen (1974) is often credited with the formalization of the hedonic price framework. His theory describes the underlying market for heterogeneous goods, suggesting that the price of a quality-differentiated good is a function of the levels of characteristics composing the good. Hedonic prices are the implicit prices of the good's utility-bearing attributes, represented by the slope of the hedonic function with respect to the characteristics. According to Leggett and Bockstael (2000) if the hedonic price function is accurately estimated, its partial derivative represents the individual's marginal WTP for the characteristics.

The valuation of public and private open space in Anderson, Pickens, and, Oconee counties were based upon a traditional cross-sectional hedonic property model. It is assumed that the housing market is in equilibrium, because producers and consumers are small relative to the market so that prices are given. It is also assumed that individuals have made utility-maximizing choices given the prices of alternative housing locations

and that the prices just clear the market. This technique assumes that the sales price of a house reflects its structural, environmental and neighborhood attributes. This can be represented as

$$P_i = f(S_i, N_i, E_i)$$

where, Pi is the price of the i^{th} home, S_i is a vector of structural characteristics such as number of rooms, N_i is a vector of neighborhood characteristics such as school quality or crime rates, and E_i is a vector of environmental characteristics. Environmental characteristics analyzed in this study include lake proximity measured as lake view, lake access, or lake front, locational characteristics indicating location in an urban, rural, or fringe area, as well as near a national forest.

Taking the partial derivative with respect to each argument in the hedonic model yields the marginal price of each characteristic (Freeman 1993). Each consumer will try to equate marginal cost of that characteristic with marginal benefit (WTP) to maximize his/her utility. If the housing market is in equilibrium, the calculation of the marginal cost of a given characteristic through regression analysis will provide an estimate of the consumer's marginal WTP for that characteristic (McLeod 1984).

The major problem of the hedonic method is its fundamental assumption that consumers of residential property have complete information. Because consumers may not be aware of all of the environmental services provided by an environmental entity, their marginal WTP for a particular open space may not reflect the true economic benefits of the resource. Another problem of the hedonic method is that by only measuring the marginal value of residents with access to an environmental good, the benefits received

by non-homeowners are not taken into account. Therefore, the resulting estimates provide only a subset of the values in which one may be interested (Perman and others 1996).

Despite these problems, the hedonic method is not very controversial for several reasons. First, its estimates are unbiased as they are based on observation of economic behavior, not stated preferences. Secondly, this method makes it possible to observe the marginal prices of several environmental amenity values simultaneously. Third, since it uses existing housing data, it is less time-consuming and less costly compared to surveys.

Data and Area Description

Research by Marek (2001) has resulted in categorization of Anderson, Pickens and Oconee counties into rural, urban, and three degrees of fringe (urban-fringe, rural-fringe and rural -urban fringe), based on housing density and land use as shown in Figure 1. Housing sales data for the period February 1999 to February 2001, including sales price, date of sale, and housing characteristics, has been collected from Multiple Listing Service (MLS) and includes over 3400 sales. Housing characteristics include the number of bedrooms, number of bathrooms, age, square footage, acreage, whether or not the house has air conditioning, whether or not the house has a garage, and whether or not the house in good condition or needs repair. This data is combined with the fringe location data, information about lake frontage, lake access, and lake view, and relative proximity to private and public open spaces in Anderson, Pickens and Oconee counties, South Carolina. This area is divided by three major lakes (Jocassee, Keowee, and Hartwell) and includes six state parks. It is bordered on one side by a National Wild and Scenic River

and the Sumter National Forest, and by the metropolitan area of Greenville, South Carolina on the other side. Location of the houses is shown in figure 2.

In this study, Structural characteristics includes the condition of the house with condition 1(con1) indicating excellent condition and condition 3 (con3) indicating needs to repair, the number of bathrooms (bath), number of bedrooms (bed), age of the house (age), square footage of the house (sqft), air conditioning (ac), lot size (acreage), whether or not the house has a garage (garage), and whether or not the house is a mobile home (mobile). Garage, ac, con1, con3 and mobile are 0-1 dummy variables while the others are continuous variables. Neighborhood characteristics are approximated by dummy variables, which includes nearby city or town in which the house is located. Environmental characteristics include whether the house has lake view (lview), lake access (laccess), or lake frontage (lfront), and whether the house is located in rural(R), or, urban (U), urban-rural fringe (URF), urban-fringe (UF), or rural fringe (RF) and whether or not it is near public land (public). Lview, laccess, lfront, R, U, UF, URF, RF and public all are 0-1 dummy variables. Summary statistics for the housing and environmental variables are shown in Table 1.

Empirical Estimation

This study uses ordinary least squares estimation of a semi-log model with housing price as the dependent variable. This structural form is found to produce the best results in previous hedonic literature. The coefficient estimates represent the percentage change in the price of a house for a one-unit change in the explanatory variable.

One of the common problems with hedonic model is the problem of multicollinearity-a situation in which independent variables move with each other. This

makes coefficient estimates for the model's parameter unreliable. The variance inflation factors (VIF) were calculated for each variable included in the model. There is evidence of multicollinearity if the largest VIF measure is greater than 10 and the mean of all the VIFs is considerably larger than 1. Initially, there was multicollinearity problem in the model with the neighborhood variables. Then, the neighborhood variables are replaced by county variables, which solved the problem of multicollinearity in the models.

Two models are estimated, with the only difference being that in the first urban-fringe (UF), urban-rural fringe (URF), and rural fringe (RF) are grouped into one "fringe" variable and in the second, all three being categories are included. Results are shown in Table 2.

The results show that the structural characteristic variables are all significant and of the expected sign. For example, the variables- sqft, bed, bath, ac, acreage all have positive impact on housing prices while older homes, homes in need of repair and mobile homes all have lower values all else constant.

None of the city variables are significant. This most likely indicates that the general nature of location (urban, fringe, rural) might be the more significant value in this study area as discussed below. County variables appear to be significant In addition, proximity to national forest land is found to be insignificant. This may be because of the relative abundance of open space in the study area. Estimation results are shown in table 2.

Fringe location is estimated to have a positive impact on home sales prices and this impact appears to be greatest for rural –fringe areas. The lake frontage, lake access and lake view all have a significant positive effect on housing prices. Further, these

amenities have the expected relative values, with lake frontage worth more than just lake access and lake view positive but less than either lake frontage or lake access.

In model 1, the results indicate that homes in the rural fringe are worth about 8 percent more than homes in more urban areas. Homes in the rural fringe more than likely offer scenic landscapes, safe residential areas, and a pleasant atmosphere, while also offering the conveniences of nearby cities. In model 2, the results indicate that homes in the rural fringe are worth about 11 percent more than homes in urban areas whereas homes in the urban-rural fringe and urban fringe are worth about 8 percent and 6 percent more respectively. In both the models the results show that lake front, lake access and lake view houses are worth about 48, 35 and 30 percent more respectively than the houses which do not have lake view, lake access or lake frontage.

Conclusion

In general, both location in the urban/rural fringe and lake proximity have a positive impact on residential property values in Anderson, Pickens and Oconee counties, South Carolina. Interestingly, initial estimates indicate location near a protected public area such as a national forest did not significantly influence property values. Integration of the housing data into GIS will allow for more detailed analysis of more public spaces including several state parks in Northern Pickens county and the 17,500 acres Clemson Experimental Forest Land. The next step of this study is to estimate in more details the type of open space in each area, differentiating between farmland and forest. This study will also use Arc GIS to estimate the effect of relative proximity to private and public open spaces on residential property values in Anderson, Pickens and Oconee counties.

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Table1:Summary Statistics: Housing Characteristics (N=3438)

Variable	Mean	Min	Max
PRICE	132,506	7,500	959,000
GARAGE	1.2	0	5
SQFT	1807	100	6500
AGE	17.5	0	51
BED	3	1	6
BATH	2	1	4.5
ACREAGE	1.15	0	362
AC	0.91	0	1
MOBILE	0.07	0	1
CON1	0.43	0	1
CON3	0.03	0	1

Location Classification

Location	# in Range
Urban	1323
Urban fringe	190
Urban rural fringe	850
Rural fringe	1041
Rural	34
Public	290

Lake Classification

Lake Measure	# of Houses
Lake front	128
Lake access	262
Lake view	116

Table 2:Estimation Results: Dependent Variable Log of Price

Variable	Model 1	Model 2
Intercept	10.145*	10.145*
	(0.039)	(0.039)
SQFT	0.0004*	0.0004*
	(0.000012)	(0.000012)
AGE	-0.00853*	-0.00858*
	(0.000506)	(0.000506)
BED	0.021*	0.020*
	(0.012)	(0.012)
BATH	0.161*	0.160*
	(0.016)	(0.016)
AC	0.405*	0.405*
	(0.0208)	(0.0208)
ACREAGE	0.004*	0.004*
	(0.00077)	(0.00077)
MOBILE	-0.599*	-0.593*
	(0.0235)	(0.0235)
CONDITION1	0.054*	0.054*
	(0.0136)	(0.0136)
CONDITION3	-0.268*	-0.265*
	(0.0372)	(0.0372)

Standard Errors are in parenthesis. Significance level *=0.01

Table 2:Estimation Results (Continued):
Dependent Variable Log of Price

Variable	Model 1	Model 2
FRINGE	0.07*	___
	(0.014)	
URBAN FRINGE	____	0.0493*
		(0.0156)
URBAN RURAL FRINGE	____	0.0710*
		(0.026)
RURAL FRINGE	____	0.096*
		(0.017)
RURAL	0.090	0.096
	(0.064)	(0.065)
PUBLIC	-0.029	-0.033
	(0.027)	(0.027)
LAKE FRONT	0.465*	0.451*
	(0.030)	(0.031)
LAKE ACCESS	0.355*	0.345*
	(0.022)	(0.022)
LAKE VIEW	0.311*	0.300*
	(0.033)	(0.033)
Adjusted R-square	0.76	0.76

Standard errors are in parenthesis. Significance level *=0.01

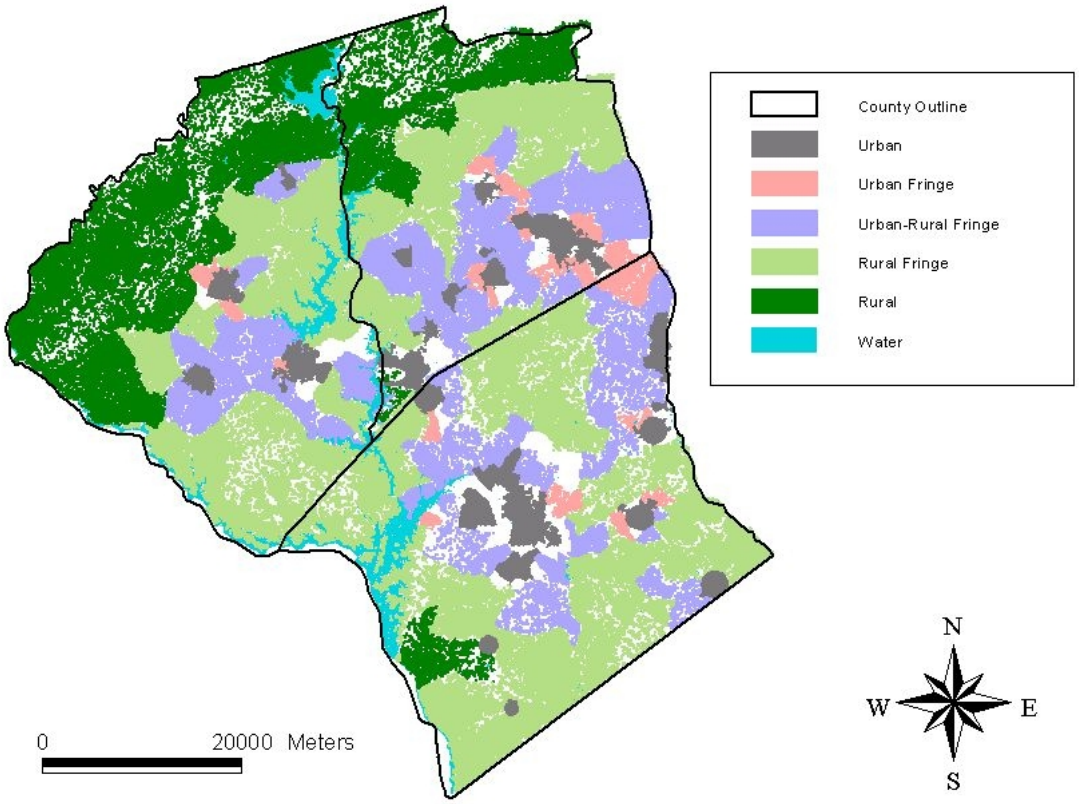

Figure 1: Map of Fringe Areas

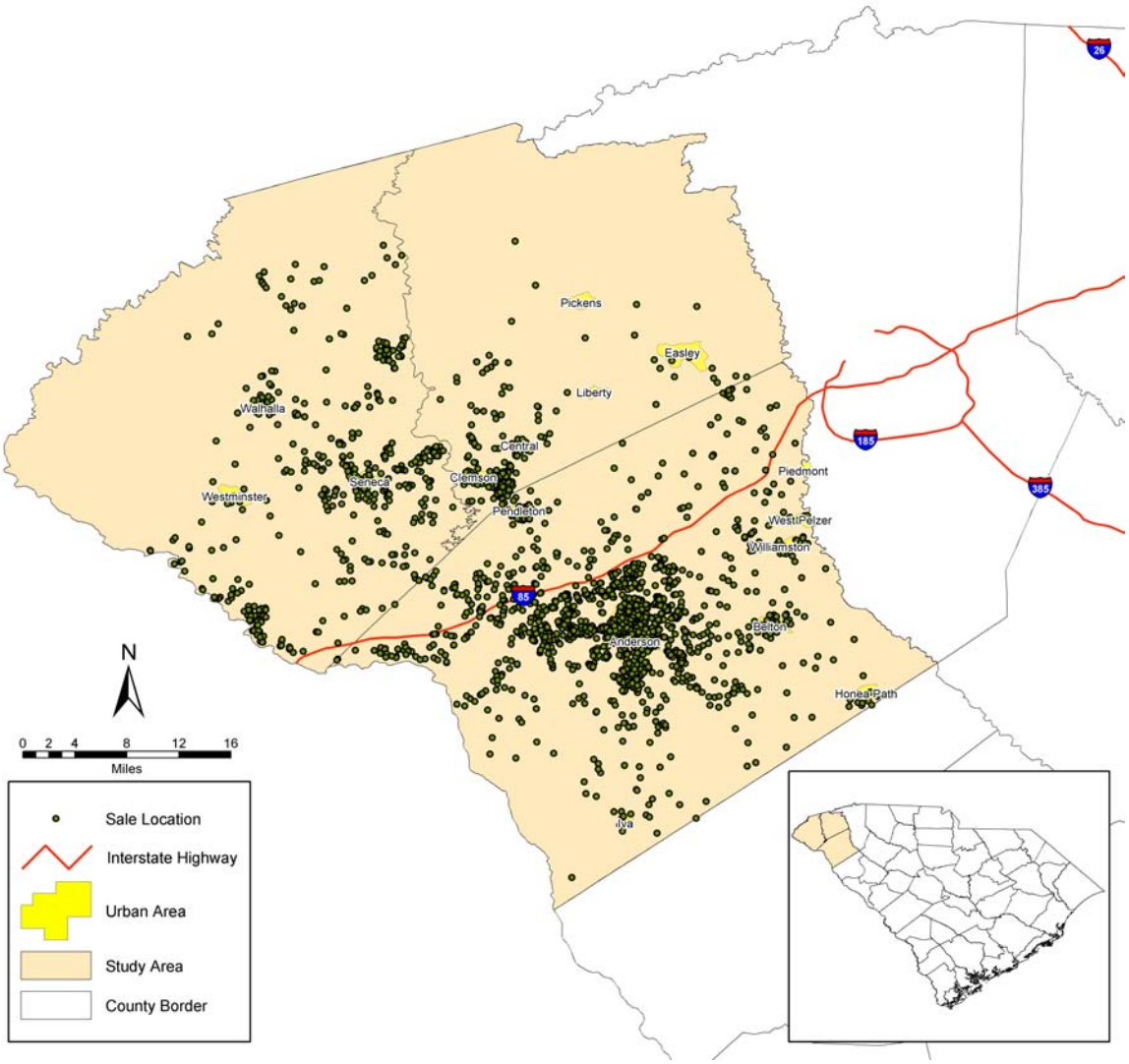

Figure 2: Map of Location of the Houses