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School Quality and Property Values

In Greenville, South Carolina

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Abstract

This study estimates the impact of school quality on property values within the city limits of Greenville, South Carolina. This study differs from others in its use of a relative, rather that an absolute measure of school quality. We apply a hedonic pricing model to estimate the impact of K-12 rankings on the real constant-quality housing values. Based on 3,731 housing transactions carried out from 1994 to 2000, our results suggest that those who choose to live within the city limits of the study pay a premium to live in high quality school attendance areas. Therefore, high-ranked schools have values capitalized into single-family house prices. Further, greater distance to assigned K-12 schools has a negative impact on the value of the property.

Introduction

Just as there are various factors that compel people to relocate, the same or other factors may account for where they eventually choose to go. The decision to move in or out of a community is affected by the availability and quality of amenities in the area. The presence or absence of certain neighborhood characteristics may encourage or discourage such movements. Proximity to and quality of Public schools are examples of infrastructure amenities that may influence locational decisions. Education is very important in the development of a society and every parent wants to give the best they can offer to their kids. Therefore the ability of schools to offer these services in a better and easier way is relevant to many households. This study estimates how much people are willing to pay for better schools and reduced commuting time to those schools through analysis of residential property values. The next section discusses previous

hedonic studies of school quality. Then the data and model used in this analysis are presented followed by our empirical results.

Previous works

Some studies have looked at proximity to schools and how they affect the value of single-family homes. Others have probed further and investigated whether quality of the school matters. Clotfelter (1975) used data from published census tract statistics for the Standard Metropolitan Statistical Area (SMSA) of Atlanta for the years 1960 and 1970. Clotfelter found that for an average increase of 13.6 percent in the proportion of African Americans in schools, price of the average house declined by 6 to 7 percent. He concluded that during that decade, housing values fell where high schools experienced greater desegregation relative to areas where less desegregation took place. Jud and Watts (1981) studied the effects of school quality and racial composition on house values using data for single-family houses within the city of Charlotte, North Carolina for 1977. Jud and Watts found that the quality (as measured by the average grade point) of school is an important determinant of housing values. They found that a one grade point increase in average student achievement test results in a 5.2 to 6.2 percent increase in the value of an average house. They also concluded that the failure to account for school quality could result in an overestimation of the negative effect of the racial component (percent black population in the neighborhood).

Brasington and Haurin (1996) used data from Ohia (Ameristate, 1991) for single-family detached dwellings to investigate the variations in real constant-quality house prices in a hedonic price framework. Their sample size was 45,236 from 140 school districts, with over a third from the central cities of six Metropolitan Statistical Areas (MSAs). They also found that school

quality (measured as the pass rate) is the most important cause of the real constant-quality house price variation. Each percentage point increase in the pass rate increased house value by $400, one-half percent of mean house value for that data set.

Hayes and Taylor (1996) used 1987 data on single-family homes in Dallas Independent School District (DISD), using a variety of school quality measures. Indicators of school quality were current expenditure per pupil (SPEND), average sixth-grade achievement in mathematics (MATH687), the marginal effect of the school on sixth-grade mathematics achievement (SCHL687), and the expected achievement of the student body in sixth-grade mathematics (PEER687). Only SCHL687 was found to be significant, increasing home sale by 0.26 percent for every 1 percent increase. They concluded that while homebuyers may not be responsive to average measures of quality, they are responsive to quality measured as the marginal effect of the school on the students' performance.

Brasington (1999) also investigated a variety of measures of school quality in a study of housing transactions from the six largest metropolitan areas in Ohio. Proficiency tests, expenditure per pupil, and student-to-teacher ratio were found to have positive effects on the value of houses. Average teacher salary and student attendance rates were sensitive to the changes in statistical technique used. Value added (changes in student performance) was found to have no significant effect on the price of properties, while the peer group effect had a positive and significant effect on the value of an average house. Brasington concluded that parents do not appear to choose schooling based on student improvements, but rather on the socio-demographic characteristics.

Brasington (2000) investigated the role of private schools in the housing market and estimated the demand and supply of public schools using the same data set for single-family

detached dwellings. A hedonic model was used to estimate an implicit price for the quality of both private and public schools, which was then incorporated into a three-stage Least square model to estimate school demand and supply. The own-price elasticity of demand was estimated to be –0.19, tax elasticity of demand –0.49 and the income elasticity of demand 0.42. The price elasticity of supply on the other hand was found to be 0.014. The cross-price elasticity between public school and private schools was 0.11. Based on his findings, he concluded that the quantity of public-school quality supplied is almost completely unresponsive to changes in the rate of capitalization of public-school quality into house price in Ohio's metropolitan areas. The cross-price elasticity estimated led him to conclude that demand for public-school quality is not very responsive to changes in the implicit price of private school quality.

Bogart and Cromwell (2000) studied the effect of school redistricting on house values in Shaker Heights, Ohio in 1987. They showed that the disruption of neighborhood schools reduced house values by about 9.9 percent, all else equal. They also found that providing transportation services increased house values by about 2.6 percent.

The above-mentioned studies have used different types of measures of school quality. There is no consensus on the best measure of school quality. This is primarily because these measures tend to give different signals that are sometimes difficult to interpret. This study uses a much more comprehensive relative measure that is based on all the different quality indicators cited above.

Data

Sales data for single-family homes between 1994 and 2000 was obtained from the Greenville County property office. The data contains price as well as housing characteristics such as location (address), number of bedrooms, number of bathrooms, house square footage, lot

size for lots over one acre, whether or not the house has air conditioning and whether or not the house has a garage. The database also includes a depreciation factor used to assess effective house age, taking into account both actual age and the condition of the house. This variable has a maximum value of 100 for a new house. Parks are categorized into four groups based on size and the amenities available on them (see Espey and Owusu-Edusei 2001). GIS Data (shapefile) on school and attendance areas within Greenville city was obtained from the School District of Greenville County. School absolute ratings over a four-year period is obtained from the Greenville District web site (http://www.myscschools.com/). The ratings are Unsatisfactory (U), Below Average (B), Average (A), Good (G) and Excellent (E). Distance from the center of each attendance area to assigned schools (elementary, middle and high) are computed. This gives the average distance to the school.

Houses are mapped out on the Greenville city map using GIS software package. The attendance area map is overlaid with the house maps to identify houses found within each attendance area. Buffers are also created at 100 feet intervals around parks and a golf course. Houses are assigned ranges based on the buffer they fall in. Map of Houses is also overlaid on the Census block map, enabling assignment of neighborhood characteristics contained in the census block data. The census block data includes number of housing units, median household income, average household size and median household value. The number of housing units is divided by the total census block area to obtain a measure of housing unit density within a block.

Model

A hedonic housing price technique is used to model the price of a house as a function of the characteristics of a house as follows:

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

where P_i is the log of price of a given house, S_i is a vector of structural characteristics including condition (DEPR) with a higher value indicating better condition, the number of baths (BATH), square footage of the house (SQFT), air conditioning (AC), lot size, and whether or not the house has a garage (GARAGE). AC, GARAGE, and two lot size variables are 0-1 dummy variables while the others are continuous variables. N_i is a vector of census block characteristics and E_i is a vector of dummies for proximity to parks, a golf course and schools. R_i is a vector of dummies for school rank categories. This study uses ordinary least squares estimation of a semi-log model, the structural form found to produce the best results in previous hedonic studies. Definitions and descriptive statistics of variables in the regression models are reported in table 1. Definitions and number of observations within all categories of open space proximities are also reported in tables 2 and 3.

Results and discussion

Table 4 shows regression results for four models using Ordinary Least Squares. Two ranges are delineated for golf course, three for park type 1 and two for types 2, 3 and 4 each. All housing and demographic characteristics had the expected signs. Annual dummies were included to control for any year-specific differences in prices after deflating all into 1990 dollars using monthly consumer price index. Prices are 3 percent higher between the months of April and September.

Assigned elementary schools within 2640 feet (quarter of a mile) were 18 percent higher than those beyond 10560 feet (two miles). Schools between 2640 and 5280 feet were 17 percent higher than those beyond 10560 feet. Schools between 5280 and 10560 feet were 7 percent higher in value. Assigned middle schools within 10560 feet sold for 16 percent higher than those

beyond 10560 feet range. Assigned high schools within 10560 feet sold for 12 percent higher than those beyond 10560 feet range.

Unsatisfactory and Below Average ratings were left in the intercept. If the assigned elementary school has an Average rating, there is no significant difference in the value of the house. If it is Good, it sold for 12 percent higher and 10 percent higher if it is Excellent. For middle schools, if the school is Average, it sold for 31 percent higher and 23 percent if it is Above Average. House prices in attendance areas with high schools that are Average are not significantly different from those Below Average. However those rated Above Average are 12 percent higher in value than those below average. Finally, if the house is within an attendance area with all K-12 rated Average and Above, the value is 19 percent higher than the attendance areas with Below Average schools.

Conclusion

This study has used another measure of school quality (school rankings), which is relevant in making a choice between school attendance areas for those who choose to live within the city limits of Greenville, South Carolina. It has been found that attendance areas with higher school ratings have higher property values, all else constant. Also, distance to the assigned schools has a negative impact on the value of the property. In general, golf course and parks have positive impact on property values. Such information could be useful to developers deciding whether or not to include schools, parks or golf courses in new subdivisions. It could also help city planners and school districts determine potential tax revenue benefits that could accrue to the city if the relative quality of schools were to increase. Demographic information obtained from census tract data could help determine the relationship between demographic characteristics and the purchase of housing near schools, golf courses and neighborhood parks.

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Table 1: Summary Statistics for Housing Characteristics (n = 3731)

Variable	Mean	Std. Dev.	Minimum	Maximum	# of observations=1 for dummy variables
Quality	80	13.6	5	100	
# of Bathrooms	1.68	0.74	0.2	7	
Square footage	1459.25	612.26	240	6276	
Air conditioning	0.44	0.50	0	1	2349
Garage	0.13	0.34	0	1	710
1 to 4 acres	0.03	0.19	0	1	192
Over 4 acres	0.02	0.14	0	1	107
April – September sales	0.56	0.5	0	1	2986
# Sold in 1994	0.14	0.35	0	1	522
1995	0.14	0.35	0	1	522
1996	0.16	0.37	0	1	597
1997	0.16	0.37	0	1	597
1998	0.17	0.37	0	1	634
1999	0.16	0.37	0	1	597
2000	0.07	0.25	0	1	261

Table 2: Proximity Measures by Type of Amenity

Open space type	Proximity	Number of houses in range
Golf course 1	Abutting	16
Golf course 2	300 – 1100 feet	78
Park Type 1: Small basic	Within 300 feet	31
	300 – 500 feet	100
	500 – 1500 feet	481
Park Type 2: Small attractive	Within 600 feet	132
	600 – 1500 feet	287
Park Type 3: Medium attractive	Within 200 feet	5
	200 – 1500 feet	13
Park Type 4: Medium basic	Within 600 feet	
	600 – 1200 feet	81
		441
Schools		
Elementary school	Within half mile (2640 feet)	1242
	Half mile to one mile (2640 – 5280 feet)	1227
	One mile to two miles (5280 – 10560 feet)	889
Middle school	Within two miles (10560 feet)	3194
High school	Within two miles (10560 feet)	2316

Table 3: School Rank Categories

School	Rank	# of houses in rank
Elementary schools:	Below average	97
	Average	1083
	Good	1367
	Excellent	1230
Middle schools:	Below average	171
	Average	1958
	Above average	1648
High schools:	Below average	109
	Average	507
	Above average	3161
All schools	Below average	268
	Average and Above average	3509

Table 4: Estimation results: dependent variable log of Price (n = 3731)

Variables	Model 1		Model 2		Model 3		Model 4	
Intercept	2.28*	(0.13)	2.27*	(0.13)	2.23*	(0.13)	2.09*	(0.13)
Quality	0.06*	(0.003)	0.05*	(0.003)	0.06*	(0.003)	0.06*	(0.003)
Quality squared	-0.00033*	(0.00002)	-0.00033*	(0.00002)	-0.00033*	(0.00002)	-0.00033*	(0.00002)
# of Bathrooms	0.22*	(0.013)	0.22*	(0.013)	0.22*	(0.013)	0.22*	(0.013)
Square footage	0.0009*	(0.00004)	0.0009*	(0.00004)	0.0009*	(0.00004)	0.0009*	(0.00004)
Square footage squared	-1.14E-7*	(8.95E-9)	-1.14E-7*	(8.95E-9)	-1.14E-7*	(8.95E-9)	-1.14E-7*	(8.95E-9)
Air conditioning	0.036**	(0.015)	0.036**	(0.015)	0.036**	(0.015)	0.036**	(0.015)
Garage	0.054*	(0.022)	0.054*	(0.022)	0.054*	(0.022)	0.054*	(0.022)
1 to 4 acres	0.079*	(0.034)	0.09*	(0.034)	0.079*	(0.034)	0.079*	(0.034)
Over 4 acres	0.1*	(0.047)	0.13*	(0.046)	0.1*	(0.047)	0.1*	(0.047)
April – September sales	0.03**	(0.013)	0.03**	(0.013)	0.03**	(0.013)	0.03**	(0.013)
Annual dummies								
1995	0.003	(0.024)	0.003	(0.024)	0.003	(0.024)	0.003	(0.024)
1996	0.06*	(0.023)	0.06*	(0.023)	0.06*	(0.023)	0.06*	(0.023)
1997	0.1*	(0.023)	0.1*	(0.023)	0.1*	(0.023)	0.1*	(0.023)
1998	0.15*	(0.023)	0.15*	(0.023)	0.15*	(0.023)	0.15*	(0.023)
1999	0.22*	(0.023)	0.21*	(0.023)	0.21*	(0.023)	0.22*	(0.023)
2000	0.22*	(0.03)	0.21*	(0.03)	0.21*	(0.03)	0.22*	(0.03)
Abutting golf course	0.23*	(0.1)	0.25*	(0.1)	0.25*	(0.1)	0.27*	(0.1)
300 – 1100 feet of golf course	0.13*	(0.06)	0.15*	(0.05)	0.15*	(0.06)	0.18*	(0.05)
Within 300 feet of type 1	-0.18**	(0.08)	-0.18**	(0.08)	-0.13**	(0.08)	-0.14**	(0.08)
300 – 500 feet from type 1	0.016	(0.04)	0.016	(0.04)	0.07	(0.04)	0.042	(0.04)
500 – 1500 feet from type 1	-0.04	(0.02)	-0.04	(0.02)	0.01	(0.02)	-0.01	(0.02)
Within 600 feet from type 2	0.13*	(0.05)	0.13*	(0.05)	0.16*	(0.05)	0.17*	(0.05)
600 – 1500 feet from type 2	0.07*	(0.03)	0.07*	(0.03)	0.12*	(0.03)	0.11*	(0.03)
Within 200 feet from type 3	0.2*	(0.06)	0.2*	(0.06)	0.18*	(0.05)	0.19*	(0.05)
200 – 1500 feet from type 3	0.01	(0.02)	0.01	(0.02)	0.001	(0.02)	0.01	(0.02)
Within 600 feet from type 4	-0.45*	(0.18)	-0.40*	(0.18)	-0.46*	(0.18)	-0.37*	(0.17)
600 – 1200 feet from type 4	-0.23*	(0.12)	-0.22*	(0.12)	-0.26*	(0.11)	-0.17*	(0.11)
Schools								
Elementary: within 2640 feet	0.18*	(0.03)					0.16*	(0.03)
2640 – 5280 feet	0.17*	(0.03)					0.14*	(0.03)
5280 – 10560 feet	0.07*	(0.03)					0.10*	(0.03)
Middle: within 10560 feet			0.16*	(0.02)			0.18*	(0.02)
High: within 10560 feet					0.12*	(0.01)	0.11*	(0.01)
Rank categories:								
Elementary Average	0.01	(0.05)						
Good	0.12*	(0.05)						
Excellent	0.1*	(0.05)						
Middle Average			0.31*	(0.04)				
Above average			0.23*	(0.04)				
High Average					0.09	(0.05)		
Above average					0.12*	(0.05)		
All Above average							0.19*	(0.03)
Neighborhood Characteristics:								
Housing unit density	-0.0002*	(0.000012)	-0.0002*	(0.000013)	-0.0002*	(0.000012)	-0.0002*	(0.000012)
Average household size	-0.11*	(0.02)	-0.1*	(0.02)	-0.11*	(0.02)	-0.11*	(0.02)
Median value	2.5E-6*	(2.88E-7)	2.5E-6*	(2.66E-7)	2.5E-6*	(2.88E-7)	2.5E-6*	(2.88E-7)
Adjusted R-square	0.70		0.71		0.71		0.71	

Standard errors are in parentheses. Significance levels *** = .1, ** = .05, * = .01.

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