SCHOOL QUALITY CAPITALIZATION IN SUBURBAN HOUSING MARKETS: EVIDENCE FROM ALPHARETTA, GEORGIA

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Abstract
This study investigates the effects of structural features and High School Assignments on residential property prices. We use hedonic regressions for single-family homes in Alpharetta, Georgia, to estimate how public high school zoning impacts prices. After controlling for lot size, interior area, age, and other structural features, homes zoned to Alpharetta, Cambridge, Innovation Academy, and Milton sell for about 17 to 21 percent more than similar homes zoned to Centennial. The estimates remain strong even after log transformations and tests for multicollinearity. Structural characteristics have expected effects, showing that school quality and accessibility are both considered in suburban housing values.

Keywords: *Hedonic Regression, Correlation, Housing Prices, Real Estate*

Clasificare JEL : *R3*

1. Introduction

Housing markets are complex economic systems that reflect the intricate interplay among physical property characteristics, neighborhood attributes, and broader socioeconomic dynamics (Rosen, 1974; Sheppard, 1999). Understanding the determinants of residential property values has significant implications for multiple stakeholders, including prospective homebuyers, real estate investors, property developers, and policymakers formulating housing and urban development strategies (Malpezzi, 2003; Sirmans et al., 2005). Within this context, the city of Alpharetta, Georgia, emerges as a particularly compelling case study for examining the drivers of housing prices and the role of educational quality in shaping residential market dynamics.

Located approximately 25 miles north of downtown Atlanta, Alpharetta has transformed from a small southern town into one of the most dynamic suburban communities in the southeastern United States. Over the past two decades, the city has experienced remarkable growth characterized by sustained residential development, consistently appreciating property values, and substantial demographic transformation (U.S. Census Bureau, 2020). The city's appeal stems from multiple factors, including its highly rated public school system, a robust commercial base anchored by technology and corporate headquarters, superior municipal services, and an exceptional quality of life. These attributes have collectively positioned Alpharetta as one of the region's most desirable

residential markets, attracting families and professionals seeking suburban amenities within reasonable commuting distance of metropolitan Atlanta's economic opportunities.

Despite Alpharetta's prominence in regional real estate markets, academic research examining the specific determinants of housing prices within this community remains notably limited. While the broader literature on housing economics has extensively documented the influence of various property and neighborhood characteristics on residential values (Sirmans et al., 2005; Zietz et al., 2008), context-specific analyses are essential for understanding local market dynamics. The relative importance of different value drivers can vary substantially across geographic areas due to differences in market maturity, demographic composition, variation in school quality, and regional economic conditions (Bourassa et al., 1999). This research seeks to address this gap by providing a systematic empirical analysis of housing price determinants specific to Alpharetta, with particular attention to the role of school quality.

The hedonic pricing framework, which conceptualizes housing as a bundle of distinct characteristics each contributing to overall property value, provides the theoretical foundation for this investigation (Rosen, 1974). Within this framework, physical property attributes such as the number of bedrooms and bathrooms, total living area, lot size, and structural age have consistently demonstrated significant explanatory power in predicting residential values across diverse market contexts (Malpezzi, 2003; Goodman and Thibodeau, 2003). Additional features such as garage capacity can substantially influence market valuations by providing practical benefits, including vehicle protection, additional storage space, and enhanced home security (Dehring et al., 2008).

However, housing values reflect not merely the physical characteristics of individual properties but also the broader neighborhood context and the quality of local public services, most notably educational institutions (Nguyen-Hoang and Yinger, 2011). The relationship between school quality and residential property values has received considerable attention in urban economics research, with numerous studies documenting significant capitalization effects of school performance measures into housing prices (Black, 1999; Kane et al., 2006; Figlio and Lucas, 2004). Black (1999) employed a boundary discontinuity design to isolate the causal effect of elementary school quality on housing prices, finding that a 5% increase in test scores was associated with a 2.5% increase in housing values. Similarly, Kane et al. (2006) documented that homes within attendance zones of higher-rated schools in North Carolina sold for significant premiums.

In the context of Alpharetta, where the Fulton County School District operates highly rated schools, several of which consistently rank among Georgia's top-performing institutions (Georgia Department of Education, 2023), the influence of educational quality on property values warrants careful empirical examination. Understanding the magnitude of these school-related premiums and how they compare to the value contributions of physical property characteristics provides important insights for both theoretical models of housing markets and practical real estate decision-making.

This study employs multiple regression analysis to quantify the relationships between housing prices and their potential determinants in Alpharetta, Georgia. By modeling sale prices as a function of both structural property characteristics and school quality measures, this research aims to estimate the marginal contribution of each factor while controlling for the influence of other variables (Malpezzi, 2003). The analysis utilizes comprehensive data on residential property transactions, physical characteristics, and associated school performance metrics to construct a robust empirical model. The findings contribute to the broader literature on real estate economics by providing context-specific evidence on housing price determinants in a rapidly growing southern suburban market and illuminating the relative importance of educational amenities compared to physical property characteristics (Nguyen-Hoang and Yinger, 2011). The quantitative estimates generated provide practical guidance to real estate professionals, investors, developers, and local officials in their decision-making.

The remainder of this paper is organized as follows. Section 2 provides a review of the existing literature on housing price determinants. Section 3 outlines the methodology employed in the study. Section 4 describes the data sources, the variables used in the study, and presents descriptive statistics for key variables. Section 5 presents empirical results and their interpretations. Finally, Section 6 concludes with concluding remarks and discussions and provides directions for future research.

2. Literature Review

The exploration of housing price factors began with Kain and Quigley's 1970 research in St. Louis. They found that the number of bedrooms, bathrooms, lot size, and neighborhood schools had a significant impact on property values. The hedonic price model, based on the work of Lancaster (1966) and Rosen (1974), remains the main approach for examining how housing attributes affect prices. This is because controlled experiments are not feasible in real estate research, as noted by Chau and Chin in 2003. The hedonic pricing method, for which multiple regression is the standard econometric approach, is well established in the real estate literature. Rosen's (1974) foundational work laid out the microeconomic bases for hedonic price analysis and showed how implicit prices for property features can be derived from observed market transactions.

Traditional multiple regression analysis has seen several advancements. Bin showed in 2004 that semi-parametric regression models provided better price predictions than parametric models, based on 2,595 home sales in North Carolina, using GIS data. Quantile regression has emerged as an effective alternative. It shows that buyers value characteristics differently across price ranges. For example, square footage is more critical to high-end buyers, according to Zietz et al. (2008) and Chen (2013). Artificial neural networks have also outperformed multiple regressions, especially with larger datasets, as demonstrated by Nghiep and AI in 2001.

Research consistently highlights key structural factors. The number of bedrooms and bathrooms plays a crucial role in price differences across markets, as shown by Kain and Quigley (1970), Cebula (2009), and Selim (2009). Square footage is vital: larger homes fetch higher prices, according to Jafari and Akhavian in 2019 and Bui in 2020. Lot size has been significant in both St. Louis and Los Angeles County, as Kain and Quigley noted in 1970 and Yuan pointed out in 2019. The age of houses affects market values in countries like Sri Lanka, as Randeniya et al. (2017) highlighted. Research in Turkey has shown that swimming pools and nearby amenities, such as shopping malls, also affect prices, as noted by Cebula in 2009.

Location is often cited as the most impactful factor. In Kuala Lumpur, it alone accounted for 80% of price variation, according to Yusof and Ismail in 2012. Distance from city centers significantly influences prices. In Ho Chi Minh City, apartments have shown negative correlations with distance from the center but positive associations with nearby shopping malls and amenities, as reported by Bui in 2020. The quality of infrastructure and proximity to roads are also important, as shown in Sri Lankan markets, according to Randeniya et al. in 2017.

Panel data from metropolitan areas in Ontario identified interest rates, immigration, unemployment, household size, and income as key determinants of prices, as discussed by Nistor and Reianu in 2018. An analysis in the UK used cointegration models to show that construction costs, credit availability, GDP, interest rates, and unemployment positively influenced housing prices, while disposable income and the money supply negatively influenced housing prices, according to Xu and Tang in 2014. Cross-country research has found that rent levels, price-to-income ratios, urbanization, per capita GDP, and inflation all positively impacted housing prices, as noted by Tripathi in 2019.

School quality significantly influences housing prices through various channels. In areas with limited school choice, families must buy homes within certain attendance zones, which directly affects prices, as Kane et al. (2006) highlighted. Standardized test scores reflect education quality to parents and influence valuations, as noted by Machin in 2011 and Turnbull et al. in 2018.

The degree of school-quality capitalization varies across methodologies. Studies using boundary discontinuity designs typically find smaller effects than those in cross-sectional analyses. One standard deviation improvement in school quality usually leads to a 3-4% price increase, while the quality of district administration accounts for 5-8% of home values, according to Collins and Kaplan in 2017. The effects of school quality are more pronounced in wealthier neighborhoods, where families can afford educational advantages, as shown by Kane et al. (2006) and Turnbull et al. (2018). Owner-occupied homes tend to show greater premiums for school quality than rentals, reflecting higher liquidity and less volatility in better school districts, as noted by Beracha and Hardin in 2018.

Recent research suggests nonlinear relationships. Price premiums for higher-quality schools increase as quality rises, driven by heightened competition among top-tier zones, according to Chiodo et al. (2009). In contrast, below-average schools rarely cause significant price decreases because alternatives like private or magnet schools exist, as noted by Welton in 2011. The internet and federal accountability measures have made school information more accessible. However, the impact of this disclosure has decreased as information costs have fallen, according to Carrillo et al. in 2010.

Cebula's 2009 study of Savannah found that structural features, location, and schools were crucial to property values. Devkota (2023)'s research on Cumming, Georgia, which analyzed 123 single-family home sales, identified bathrooms, square footage, garage spaces, and high school attendance zones (Denmark HS, Forsyth Central HS, North Forsyth HS) as significant predictors of price. In Metro Atlanta, higher-income residents and millennials cite housing features and amenities as major price drivers, while working-age residents and renters focus on supply-side constraints. School quality significantly influences property values, and higher-income residents view local schools as a critical housing factor. In Alpharetta, another affluent Atlanta suburb similar to Cumming, evidence indicates that housing prices are shaped by high household incomes, job growth, quality amenities, and school attendance zones. Geographic location, distance to job centers and transportation, local policies, zoning laws, and public infrastructure all play significant roles in the housing market, as highlighted by Beck et al. in 2012.

The relationship between school quality and housing prices in affluent suburbs may deepen residential segregation. Higher costs in areas with better schools can exclude lower-income families. This creates challenges for educational equity and housing affordability in rapidly growing metropolitan areas. Comparisons across Turkey, Sri Lanka, Vietnam, Malaysia, and the UK show that while structural features, location, and amenities are consistently important, their relative importance varies by local context, regulations, and stages of economic development.

The remainder of this paper is organized as follows. Section 2 provides a review of the existing literature on housing price determinants. Section 3 outlines the econometric methodology employed. Section 4 describes the data sources and presents descriptive statistics for key variables. Section 5 presents empirical results and their interpretations. Finally, Section 6 concludes with summary findings and directions for future research.

3. Methodology

As noted in the literature review, previous studies have used various methods to estimate residential property prices across different geographic markets. These methods include hedonic price models, quantile regression, spatial econometric techniques, and machine learning algorithms (Sirmans et al., 2005; Zietz et al., 2008). For this study, we chose multiple linear regression as our primary analytical tool. This choice is backed by both theory and practical use in real estate economics.

Multiple linear regression is especially suited for modeling housing prices. Residential property values depend on many distinct factors that work together. This method allows researchers to analyze how several independent variables, such as square footage, number of bedrooms, number of bathrooms, location features, property age, and neighborhood amenities, affect the dependent

variable, the market value of the house (Malpezzi, 2003; Pace, 1995). This approach can include all relevant property characteristics in one model, estimating their individual contributions while statistically controlling for the effects of other variables (Wooldridge, 2015).

The multiple regression method has several benefits. First, it gives clear estimates of the relationships between each independent variable and the dependent variable. This results in easy-to-understand coefficients that translate into dollar values for changes in property features (Halvorsen & Palmquist, 1980). Second, this method helps control for confounding variables that could bias the estimated relationships, thereby addressing the omitted-variable bias (Kennedy, 2008). Third, multiple regression is straightforward to compute and widely understood among researchers and practitioners, making it easier to communicate results (Anglin & Gencay, 1996). Fourth, the regression framework provides a strong foundation for statistical inference, including hypothesis testing and assessing overall model fit with standard diagnostic tools (Greene, 2018).

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We start our analysis by creating a correlation matrix to look at the strength and direction of linear relationships between all variable pairs in our dataset. This initial diagnostic step helps identify potential multicollinearity issues that could impact the stability of regression estimates. It also provides preliminary evidence about which variables are most closely linked to housing prices (Gujarati & Porter, 2009). We evaluate multicollinearity using variance inflation factors (VIFs) and the correlation matrix (O'Brien, 2007).

Next, we estimate a multiple linear regression model to predict residential property prices using the number of bedrooms, bathrooms, square footage, lot size, property age, parking spaces, and assigned public high school district as independent variables. This setup follows standard hedonic pricing models and includes the key structural and neighborhood features that theory and empirical data suggest affect property values (Sirmans et al., 2005).

Following prior research, we use the following multiple linear regression model in our analysis:

$$House\ Price_i = \beta_0 + \sum_{i=1}^{7} \gamma_j D_i + \beta_1 \text{Lot Size}_i + \beta_2 \text{Sqft}_i + \beta_3 \text{Bedroom}_i + \beta_4 \text{Bathroom}_i + \beta_5 \text{House Age}_i + \beta_6 \text{Garage}_i + \varepsilon_i \quad \text{[Eq. 1]}$$

where $House\ Price_i$ represents the price of a house i; $\beta_0$is the intercept; $D_i$are dummy variables for school districts (with Centennial High School as reference); $\gamma_i$are coefficients representing price premiums or discounts for each school district relative to the reference category; $\beta_1$through $\beta_6$are coefficients for the continuous variables representing marginal effects on house price; and ε_i is the error term assumed to be independently and identically distributed. The model is estimated using ordinary least squares (OLS), which yields Best Linear Unbiased Estimators under classical assumptions (Wooldridge, 2015).

4. Data and Variables used in the study

This study uses 500 single-family homes in Alpharetta, Georgia, for 2025. All data were collected from www.Realtor.com. We examined several variables, including house price (the dependent variable), number of bedrooms, number of bathrooms, square footage, lot size, property age, garage capacity, and the public high school district assigned by the county. These variables are consistent with existing hedonic pricing research (Rosen, 1974; Sirmans et al., 2005).

Table 1 Summary Statistics

Variables	N	Mean	SD	p25	Median	p75
House Price	500	949342.000	565198.478	589000.000	790000.000	1137000.000
Alpharetta	500	0.086	0.281	0.000	0.000	0.000
Cambridge	500	0.158	0.365	0.000	0.000	0.000
Chattahoochee	500	0.104	0.306	0.000	0.000	0.000
Innovation	500	0.218	0.413	0.000	0.000	0.000
Johns Creek	500	0.084	0.278	0.000	0.000	0.000
Milton	500	0.050	0.218	0.000	0.000	0.000
North View	500	0.112	0.316	0.000	0.000	0.000
Centennial	500	0.184	0.388	0.000	0.000	0.000
Lot Size	500	14961.592	8302.238	8712.000	14375.000	19820.000
Sqft	500	3604.130	1646.503	2350.000	3295.000	4710.500
Bedroom	500	4.354	1.084	4.000	4.000	5.000
Bathroom	500	3.640	1.177	2.500	3.500	4.500
House Age	500	28.654	13.192	22.000	30.000	37.000
Garage	500	2.296	0.726	2.000	2.000	3.000

This table presents summary statistics for the variables used in our main analysis. House Price denotes the transaction price of each residential property, measured in U.S. dollars. The variable of interest includes indicator variables for high school zones, including Alpharetta, Cambridge, Chattahoochee, Innovation, Johns Creek, Milton, North View, and Centennial, each coded as 1 when the property belongs to the respective zone and 0 otherwise. Lot Size is the total land area of the parcel, and SqFt represents the heated interior living area of the dwelling. Bedroom and Bathroom indicate, respectively, the number of legally recognized bedrooms and the number of full and half bathrooms on the property. House Age measures the age of the dwelling in years at the time of sale, and Garage captures the number of enclosed vehicle spaces.

Table 1 reports summary statistics for 500 residential property transactions and indicates substantial variation across both prices and housing attributes. The average sale price is 949,342 dollars (SD 565,198 dollars), with an interquartile range from 589,000 to 1,137,000 dollars and a median of 790,000 dollars, suggesting a right-skewed price distribution. The average property is spacious, with a mean square footage of 3,604, ranging from 564 to 8,883 sqft. On average, homes have 4.35 bedrooms, with a range from 2 to 7, and 3.64 bathrooms, ranging from 2 to 7.5. Lot sizes vary widely, from 436 to 39,748 square feet, with an average of 14,961 sq ft. Properties range in age from 0 to 61 years, with a typical house age of about 30 years. Garage spaces vary from 0 to 6.

The distribution of observations across school attendance zones is broad, with properties represented in all eight public high-school zones. The largest shares of the sample are located in the Innovation Academy (21.8%) and Centennial (18.4%) zones, followed by Cambridge (15.8%),

Northview (11.2%), Chattahoochee (10.4%), Johns Creek (8.8%), Alpharetta (8.6%), and Milton (5.0%), ensuring adequate cross-sectional variation for identifying school-zone effects.

The chosen variables match residential real estate pricing models. Bedrooms and bathrooms are standard features that affect housing prices (Sirmans et al., 2005; Malpezzi, 2003). Square footage is a crucial factor in property value (Colwell & Dilmore, 1999; Janssen et al., 2001). Lot size has a positive effect on values, especially in suburban areas (Theriault et al., 2002; Anderson & West, 2006). Property age usually has a negative impact on prices because of depreciation (Coulson & Lahr, 2005; Goodman & Thibodeau, 1995). Garage capacity indicates convenience and storage options that are important in suburban areas (Vandell & Lane, 1989).

Most importantly, school quality, as measured by high school district assignment, strongly affects residential property values (Black, 1999; Kane et al., 2006; Figlio & Lucas, 2004). Black (1999) showed significant capitalization of school quality using a boundary discontinuity design, and Gibbons and Machin (2003) found similar results in the UK. This method follows established techniques to assess the impact of educational quality on property values (Downes & Zabel, 2002; Bayer et al., 2007).

The primary variables of interest are a set of indicator variables for the major high-school attendance zones in the Alpharetta area: Alpharetta, Cambridge, Chattahoochee, Innovation, Johns Creek, Milton, Northview, and Centennial. Each indicator equals 1 if a property is located within the corresponding school zone and 0 otherwise, enabling estimation of the marginal effect of school-zone assignment on housing prices. Centennial High School serves as the omitted (reference) category because it is located farthest from the Alpharetta city center, and dummy variables are included for the remaining seven zones, consistent with standard econometric practice (Wooldridge, 2015). The coefficient on each school-zone dummy thus captures the average difference in house prices between that zone and Centennial, holding all other observed characteristics constant, allowing the analysis to identify the capitalization of school-district assignment into property values (Haurin & Brasington, 1996; Brasington & Haurin, 2006).

5. Results and Interpretations

5.1 Correlation Analysis

Table 2 reports the Pearson correlation coefficients among the explanatory variables and highlights several strong associations among structural housing characteristics. In particular, the correlations between bedrooms and bathrooms, bedrooms and square footage, and bathrooms and square footage all exceed 0.70 in absolute value, indicating that these variables capture closely related dimensions of dwelling size and capacity and may therefore introduce multicollinearity into the regression models (Anderson et al., 2014; Bowerman et al., 2014). By contrast, the remaining pairs of regressors exhibit more moderate correlations (below 0.70 in absolute value), suggesting that linear dependence among most covariates is unlikely to be problematic. Although these patterns raise preliminary concerns about multicollinearity among the size-related variables, a more formal assessment based on variance inflation factors (VIFs) is required to determine whether multicollinearity meaningfully inflates standard errors or undermines the precision of the estimated coefficients.

Table 2 Correlation Matrix

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15
(1) House Price	1														
(2) Alpharetta	0.02	1													
(3) Cambridge	0.10**	-0.13***	1												
(4) Chattahoochee	-0.08*	-0.10**	-0.15***	1											
(5) Innovation	0.09**	-0.16***	-0.23***	-0.18***	1										
(6) Johns Creek	0.05	-0.10**	-0.13***	-0.11**	-0.16***	1									
(7) Milton	0.00	-0.07	-0.10**	-0.08*	-0.12***	-0.07	1								
(8) North View	-0.03	-0.11**	-0.15***	-0.12***	-0.19***	-0.11**	-0.08*	1							
(9) Centennial	-0.15***	-0.15***	-0.21***	-0.16***	-0.25***	-0.15***	-0.11**	-0.17***	1						
(10) Lot Size	0.28***	-0.15***	-0.17***	-0.04	-0.01	0.12***	0.11**	0.04	0.12***	1					
(11) Sqft	0.68***	-0.04	-0.10**	-0.01	-0.01	0.15***	-0.11**	0.11**	0.00	0.44***	1				
(12) Bedroom	0.42***	-0.10**	-0.16***	0.04	0.01	0.09**	-0.12***	0.18***	0.04	0.41***	0.74***	1			
(13) Bathroom	0.68***	-0.02	-0.01	-0.06	0.01	0.11**	-0.13***	0.09*	-0.02	0.32***	0.84***	0.75***	1		
(14) House Age	-0.45***	-0.14***	-0.23***	0.05	-0.08*	0.10**	0.11**	-0.11**	0.31***	0.34***	-0.25***	-0.11**	-0.38***	1	
(15) Garage	0.45***	-0.01	-0.05	0.05	-0.04	0.02	0.00	0.02	0.02	0.29***	0.42***	0.26***	0.35***	-0.15***	1

This table reports the Pearson correlations. Variable definitions are provided in Table 1.

5.2 Regression Results and Parameter Interpretation

Table 3 shows the parameter estimates from the multiple regression model for housing prices in Alpharetta, Georgia. The results highlight some important trends about how structural features and school district assignments affect property values. Model 1 in Table 3 includes only school dummies and shows that most high-performing schools are associated with significantly higher prices than Centennial, the omitted category and the school farthest from central Alpharetta. For example, relative to Centennial, houses zoned to Cambridge are about 310,000 dollars more expensive and those zoned to Innovation Academy about 279,000 dollars more expensive, while Alpharetta and Johns Creek also carry large positive premia; these effects are statistically significant at conventional levels. The results in Model 1 indicate that school zone alone explains only a modest share of price variation, as expected in a heterogeneous housing market.

Model 2 presents regression results using Eq. 1, which includes structural housing features besides the main variable of interest, which significantly improve the model's explanatory power. This indicates the combined specification explains about two-thirds of the differences in housing prices. The estimated coefficients for the school district indicators are positive and statistically significant. This shows clear differences in property values across high school attendance zones, with Centennial High School as the baseline.

Table 3: Effects of Structural Features and High School Zonings on House Price

Variables	*Dependent Variable: House Price*	
	Model 1	*Model 2*
Intercept	768912.902***	146545.155
	(13.244)	(1.284)
Alpharetta	212749.865**	106486.659
	(2.068)	(1.623)
Cambridge	310450.883***	207626.197***
	(3.635)	(3.683)
Chattahoochee	44750.521	29122.191
	(0.463)	(0.488)
Innovation	278862.501***	182736.136***
	(3.537)	(3.666)
Johns Creek	264823.439***	49118.148
	(2.595)	(0.787)
Milton	191915.098	291139.334***
	(1.528)	(3.750)

North View	131565.651	-67528.469
	(1.394)	(-1.125)
Lot Size		10.061***
		(4.070)
Sqft		139.973***
		(7.385)
Bedroom		-104863.981***
		(-4.364)
Bathroom		150326.966***
		(5.353)
House Age		-10688.582***
		(-6.582)
Garage		116625.156***
		(4.928)
Observations	500	500
R-squared	0.043	0.655

This table presents the results of the effect of school districts on house prices. The dependent variable is house price. T-stats reported in parentheses are based on robust standard errors. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. Variable definitions are provided in Table 1.

Specifically, the coefficient estimates for Cambridge (207,626.197; t = 3.683), Innovation Academy (182,736.136; t = 3.666), and Milton High School (291,139.334; t = 3.75) suggest that, controlling for structural features, properties in these zones have significant price premiums compared to similar homes in the Centennial zone. These premiums reflect perceived quality differences among schools and highlight how educational reputation affects residential property values (Black, 1999; Kane et al., 2006). On the other hand, the coefficients for Alpharetta, Chattahoochee, Johns Creek, and Northview High Schools are not statistically significant at standard levels ($p > 0.10$). This means the effects of these school districts on housing prices are not noticeably different from that of Centennial High School, though small sample sizes in some attendance zones might contribute to the lack of significance.

The results also clarify how structural attributes influence housing prices. The estimated coefficient for the number of bedrooms is -104,863.98 (t = -4.364). This suggests that, all else being equal, adding an extra bedroom typically lowers the sale price by about $104,864. This finding agrees with previous research suggesting that, when accounting for square footage, extra bedrooms may indicate smaller room sizes or less layout flexibility (Boarnet and Chalermpong 2003; Devkota and Howington 2020). Although this seems counterintuitive, the negative coefficient likely results from multicollinearity among related housing features, like bedroom count, bathroom count, and living area. When these variables are modeled together, the bedroom coefficient may reflect that, while keeping total square footage and bathroom count the same, more bedrooms can mean smaller average room sizes or less efficient layouts, which buyers may view negatively (Sirmans et al., 2005). This aligns with previous evidence showing that correlated predictors can lead to surprising coefficient signs (Malpezzi, 2003).

Lot size has a positive but relatively small capitalization effect. The coefficient estimate of 10.06 (t = 4.07) indicates that each additional square foot of lot area adds about $10 to the sale price. Similarly, the coefficient for square footage is 139.973 (t = 7.39), meaning each extra square foot of living area increases property value by roughly $140, assuming other factors remain constant. This implicit price per square foot is consistent with earlier estimates for suburban housing markets (Malpezzi, 2003; Zietz et al., 2008).

The estimated coefficient for the number of bathrooms, 150,326.97 (t = 5.35), shows a strong positive link between the number of bathrooms and property values. After accounting for other housing features, each additional bathroom raises the sale price by about $150,000. This supports

earlier findings that buyers place a high value on bathroom amenities (Sirmans et al., 2005). The coefficient for property age is -10,688.582 (t=-6.582), indicating that home values drop by about $10,689 for each additional year. This reflects depreciation due to physical wear, outdated designs, and renovation needs (Malpezzi 2003; Sirmans et al. 2005; Clapp and Giaccotto 1998). Finally, the coefficient for garage capacity is 116,625.156 (t = 4.928). This shows that each additional parking space increases property value by about $116,625. This premium likely reflects both the benefits of covered parking in suburban areas and the strong connection between garage size and overall property quality.

Table 4: Effects of High School Ranking on House Price Alternative Estimation

Variables	Dependent Variable: Log[House Price]	
	Model 1	*Model 2*
Intercept	13.495***	8.396***
	(277.551)	(27.463)
Alpharetta	0.174**	0.167***
	(2.020)	(3.690)
Cambridge	0.189***	0.207***
	(2.644)	(5.292)
Chattahoochee	0.049	0.041
	(0.603)	(0.995)
Innovation	0.227***	0.172***
	(3.445)	(5.006)
Johns Creek	0.234***	0.050
	(2.739)	(1.164)
Milton	0.088	0.201***
	(0.837)	(3.776)
North View	0.170**	-0.016
	(2.151)	(-0.396)
Log[Lot Size]		0.154***
		(7.857)
Log[Sqft]		0.443***
		(9.818)
Bedroom		-0.065***
		(-3.782)
Bathroom		0.136***
		(7.480)
House Age		-0.009***
		(-7.505)
Garage		0.062***
		(3.771)
Observations	500	500
R-squared	0.034	0.764

This table presents the results of the effect of school districts on house prices. The dependent variable is log of house price. T-stats reported in parentheses are based on robust standard errors. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. Variable definitions are provided in Table 1.

Given the significant differences in house price, house size, and lot size, measurement error might affect the results. To tackle this issue, we transformed both the dependent variable (house price) and size measures using a log. Table 4 shows the results with log [house price] as the dependent variable, allowing the school coefficients to be understood roughly as percentage differences compared to the reference category, Centennial High School. In Model 2, which accounts for 76.4% of the variation in house prices, we controlled logged lot size, logged square footage, and other structural features. Zoning to Alpharetta (Coef. = 0.167, t = 3.690), Cambridge (Coef. = 0.207, t =

5.292), Innovation Academy (Coef. = 0.172, t = 5.006), and Milton High School (Coef. = 0.201, t = 3.776) is linked to estimated price increases of about 17-21% compared to Centennial. In contrast, the coefficients for Chattahoochee (Coef. = 0.041, t = 0.995), Johns Creek (Coef. = 0.050, t = 1.164), and Northview (Coef. = -0.016, t = -0.396) are not statistically significant, indicating that their impact on property values is similar to Centennial once we adjust for structural factors.

The structural features show expected trends and significance. Larger lots (Coef. = 0.154, t = 7.857), more living area (Coef. = 0.443, t = 9.818), extra bathrooms (Coef. = 0.136, t = 7.480), and greater garage capacity (Coef. = 0.062, t = 3.771) link to higher values. On the other hand, older homes (Coef. = -0.009, t = -7.505) and additional bedrooms (Coef. = -0.065, t = -3.782) lower prices, consistent with effects of multicollinearity among interior features. The pattern of school effects also matches local geography. Cambridge and Innovation Academy, high-performing schools near Alpharetta's main employment and amenity area, show the strongest and most reliable coefficients. They are followed by Alpharetta and Milton, which are relatively close. In contrast, Northview and Chattahoochee, situated further from Alpharetta's center and serving overlapping Johns Creek areas, show weaker or insignificant effects. This suggests that buyers consider both educational quality and central access when valuing suburban homes.

To formally evaluate multicollinearity concerns arising from high bivariate correlations, Variance inflation factors (VIFs) were calculated to check for multicollinearity among independent variables (Table 3). Following Wooldridge (2015), VIFs over 10 indicate serious collinearity; in this model, all values are well below that mark, with the highest at 4.82. The slightly higher VIFs for bedrooms, bathrooms, and square footage show their natural interdependence but are still within acceptable limits. The full model in Table 4 reports a VIF of 4.27. These findings confirm that multicollinearity does not significantly impact the precision of coefficients (Wooldridge, 2015; Gujarati and Porter, 2009). The model's $R^2 = 0.764$ shows that about 66.4% of the variation in housing prices is explained by the included variables. This is consistent with the explanatory power typically seen in hedonic pricing analyses (Sirmans et al., 2005; Hill, 2013; Ngamsiriudom et al., 2024). These results indicate that our estimation results are robust.

6. Concluding Remarks and Discussions

This paper examines how public high school zoning influences suburban housing prices in Alpharetta, Georgia. The analysis uses a hedonic framework that considers detailed structural characteristics. The findings support the common economic view that the quality of local public schools is a valued amenity. Households incorporate this value into nearby real estate prices. Even after accounting for lot size, interior area, age, and other housing features, homes zoned to Alpharetta, Cambridge, Innovation Academy, and Milton command price premiums of about 17 to 21 percent compared to similar properties zoned to Centennial. This indicates families are willing to pay significantly more to live in specific high-performing school areas. Here, school zoning acts as a signal of neighborhood quality and a local public good that buyers factor into their location choices.

Structural features show expected and consistent effects. Larger lots, more square footage, additional bathrooms, and extra garage spaces raise prices. In contrast, older properties and more bedrooms (considered with total area) tend to decrease prices. Variance inflation diagnostics show that multicollinearity among interior attributes does not significantly affect the estimates. The preferred log-log specification achieves strong explanatory power, with an R^2 of approximately 0.76, aligning with earlier hedonic studies in housing and urban economics. The coefficients suggest that the biggest and most enduring premiums go to high-performing schools close to Alpharetta's job and amenity center. This reinforces the importance of school quality and accessibility in household location choices.

The results have clear implications for buyers and local governments. Homebuyers can use these estimates to understand the implicit prices of both structural attributes and school zoning when comparing properties. Real estate agents and appraisers can include localized capitalization estimates

in their listing strategies and valuation models. For policymakers, the findings suggest that investments in school quality may lead to higher property values and property tax revenues. Additionally, changes in school boundaries or performance could significantly impact neighborhoods. Overall, this analysis provides strong evidence that school districts and structural features together shape housing prices in Alpharetta. It highlights the crucial role of educational quality in suburban housing markets.

Several limitations suggest areas for future research. The analysis is based on a single year of transactions and a zoning-based measure of school quality, and it lacks more detailed performance indicators or household sorting dynamics. Future studies could use panel data, more robust school-quality measures, and neighborhood fixed effects to better identify causal impacts. They could also explore how capitalization changes over time in response to policy shifts, demographic changes, or disruptions in school performance. Such extensions would strengthen this area of research in housing economics and in discussions about local education and land-use policies.

7.References

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