AMENITY PRICE DIFFERENTIALS OF GATED COMMUNITIES IN RESIDENTIAL SUBDIVISIONS: THE MEMPHIS EXPERIENCE

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Abstract

Using hedonic models, we examine differences in residential housing values between gated and a matched sample of non-gated communities in Shelby County, TN. Controlling for unique attributes, we find that single family homes in gated communities carried significant price premiums relative to homes in non-gated communities. Medium size gated communities had higher premiums than larger and smaller gated communities; whereas, high end gated communities carried premiums before 2008, but not after the onset of the financial crisis. Unlike non-gated communities, gated communities usually have higher infrastructure and service costs, thus premiums result from net benefits of living in gated communities.

Keywords: Housing Values, Gated communities, Hedonic Modeling

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AMENITY PRICE DIFFERENTIALS OF GATED COMMUNITIES IN RESIDENTIAL SUBDIVISIONS: THE MEMPHIS EXPERIENCE

I. Introduction

Gated communities are residential developments characterized by physical security measures such as gates, walls, guards and closed-circuit television cameras. A common feature is a perimeter wall/fence which encloses the entire development. Vehicular access is usually restricted by a gate or boom, controlled by access cards, pin codes, remote controls or security personnel. Inside the development protection is ensured through various means, including 24-hour security guard patrols, 'back-to-base' alarm systems and panic buttons, closed-circuit television cameras, guard dogs, electric fencing, spikes and other forms of anti-intruder perimeter treatments.

This paper examine empirically whether a price premium exists for single family houses located in private, gated residential communities relative to housing values in similar non-gated neighborhoods in Memphis and Shelby County, Tennessee. We select a sample of gated communities where houses are relatively homogeneous within each gated community. Each gated community is subsequently matched with a carefully selected control sample of similar houses in geographically adjacent or close proximity neighborhood.

Using a data set from 2000 through 2012 of housing sales provided by the Shelby County Assessor's Office, we apply hedonic modeling similar to Sunderman and Birch (1988), Spahr and Sunderman (2009), Sunderman and Spahr (2004, 2006), and Asabere and Huffman (1991), and consider modifications suggested by Bao and Wan (2007), Sirmans, and Zietz (2005) and Zuehlke (1989). We apply hedonic modeling to determine if houses in gated communities command economically as well as statistically significant price premiums while controlling for

and valuing other value determining attributes.

Even though we use data from Memphis and Shelby County, Tennessee, we anticipate that our results will be applicable to other locations in the United States because of the ethnic, racial and economic diversity of Shelby County. To emphasize wide applicability of our results, we find that our results are generally consistent with LaCour-Little and Malpezzi (2009) and previous work of Helsley and Strange (1999).

We contribute to literature by first, applying hedonic pricing models to estimate the value of amenities associated with gated communities impacting property values while controlling for unique aspects of individual houses and other specific amenities offered to its residents (such as club house, public swimming pool, tennis court, guard building). We find that, while controlling for other factors, single family homes in gated communities generally command a statistically significant price premium over similar non-gated communities. Also, we study the impact of gated community's relative size on the value premiums. We find that the size of the gated community impacts property values within the community. Medium-sized gated communities appear to carry the highest price premium as compared to small and large gated communities. Additionally, we cover the entire housing cycle using sales data from 2000-2012. We examine empirically whether gate premiums are sustained both before and after the 2008-2009 subprime crisis and the bursting of the housing bubble. Also, we find that high end and low end priced gated communities retained value differently before and after the financial crisis period. Prior to the crisis, high end gated communities carried significant price premiums over non-gated communities; whereas, evidence of a price premium is mixed for low end gated communities. Subsequent to the bursting of the housing bubble, however, we found that neither high end nor lower end gated communities command statistically significant price premiums over their

matched non-gated counterparts.

Also, we test empirically for the accuracy of the county assessor's assessments of gate premiums as well as testing the accuracy of assessment values for both gated and non-gated communities by comparing assessed values to actual arms-length sale prices. We find that assessed values are relatively accurate in accounting for the presence of a gate as well as for other property attributes; where, assessed values are 98% correlated with sale prices. These finding suggest fairness and accuracy in property assessed values for both gated and non-gated communities.

Section II describes the review of the literature, Section III presents data and methodology, Section IV discusses results and robustness test of results and Section V concludes.

II. Review of the Literature

Given the relatively recent proliferation of gated communities in Memphis and Shelby County and evidence of similar popularity of gated communities in other parts of the United States, we strive to determine not only the economic significance of this trend, but also why gated communities are proliferating.

LaCour-Little and Malpezzi (2009) find the existence of price premiums for houses located in a gated community. Price premiums, if present, result from positive tradeoffs in gated communities between higher costs and potential benefits. Helsey and Strange (1999) studied these tradeoffs using a microeconomic framework attributing benefits to reduced crime levels in gated communities relative to non-gated communities. However, we take a more general approach regarding potential tradeoffs between benefits and higher costs by measuring whether price premiums exist.

Within gated communities, homeowners typically own undivided interests in streets and sidewalks in addition to fee simple ownership of land under their homes (see LaCour-Little and Malpezzi, 2009). Homeowner's associations generally manage the streets, sidewalks and common areas, where regular and occasional assessments are imposed on property owners to fund maintenance. As compensation for added costs, residents of gated communities gain control of the streets, thereby restricting access, reducing traffic, noise and possibly crime. Thus, despite the additional costs associated with living in gated communities, the benefits obviously outweighed the costs if home values are increased. Approximately 57,000,000 Americans reside in housing units that are located within such communities, including planned unit developments, condominiums, and cooperatives (Community Association Institute, 2007). Gated communities have grown to the point in the United States where such developments now account for roughly 11 per cent of all new housing.[1] It has been pointed out that gated communities and residents' associations are not just an American phenomenon.[2] Gated communities have also experienced growth in Argentina, Brazil, Chile, China, France, Russia, Serbia and the U.K.

It is generally concluded that the motivation for gated communities results from fear, anxiety, and insecurity for urban inhabitants. The causes may be diverse including factors such as economic restructuring, global terrorism, crime, immigration, the privatization of public services and a perceived undermining of democratic processes. To protect themselves from perceived risk and uncertainty, homeowners may desire to create a buffer between themselves and their families and society at large.

LaCour-Little and Malpezzi (2009) and Bible and Hsieh (2001) posit a number of reasons for gated communities affecting property values; however, the most common reason cited in the literature is security. The notion that gated communities reduce crime, at least within the

community, is defined by the concept of 'defensible space' credited to Newman (1972, 1980, 1992, 1995). Newman initially studied the incidence of crime in gated communities that were located very near a high crime housing project in St. Louis and found that the gated communities remained trouble free and fully occupied throughout the period of study. Based on the data from American Housing Survey for fee-paying gated and non-gated neighborhoods, Chapman and Lombard (2006) find that the level of resident satisfaction with their neighborhood strongly depends on the perception of a lack of crime.

Wilson-Doenges (2000) studied gated versus non-gated communities in both high income and low income neighborhoods in Southern California. As may be expected, personal safety and community safety perceptions per capita were higher in the high income gated versus non-gated community. However, perceptions of differences in crime rates between gated and non-gated communities were not statistically significant in both high and low income communities.

Hardin and Cheng (2003) investigate the impact of security and crime protection afforded by gated access and look at the effect on garden apartment rents. They find that rents are positively related to the presence of gated access constraints. Thus, not only home owners, but also renters are willing to pay for additional security of a gate.

Owners of commercial property also may value the security features that gated properties provide. For example, Benjamin et al. (2007), while controlling for physical characteristics and type of ownership-management of commercial properties determine that gated properties yield premium effective rent as compared to non-gated commercial properties.

The environment created by gated communities is sometimes criticized by academics, the media and the wider community. Criticisms generally focus on the potential that gated communities cause divisions within the community and the greater society. For example,

Kennedy (1995) argues that residential associations (including gated neighborhoods) carry negative externalities for nonmembers in the form of discrimination on race and class, limiting a right to travel on private streets (raising a possibility of harassment by security guards or police), and even reduce free speech rights. If, however, gated communities address the fears and anxieties of homeowners by enhancing personal safety, the security of material goods, as well as protecting homes from unwanted intrusions, the value of these attributes may outweigh the additional cost of gated communities thereby increasing property values. Further, the physical design and control of these neighborhoods may assist in fostering a sense of community and common purpose among residents (McKenzie, 1994; and Lang and Danielsen, 1997).

Several studies have looked at valuation of properties within gated communities. Most notably, Bible and Hsieh (2001) apply hedonic pricing modeling and determine that relative location of a property within a gated community increases value. In contrast to Bible and Hsieh, we control for additional features that may be available within the gated communities such as clubhouses, community swimming pools, tennis courts, basketball courts and small lakes or ponds within the gated community.

LaCour-Little and Malpezzi (2009) further confirm a positive value created by the gate while also controlling for other neighborhood controls, such as presence of homeowners' association[3] and privately owned streets. They found that price premiums range from 7% to 24% for gated neighborhoods in Southern California and 13% for gated neighborhoods in St. Louis over non-gated counterparts. Pompe (2008) uses hedonic pricing finds that a gate carries a premium while also controlling for a beach amenity. He finds that being located on a beach is more valuable to residents of gated communities, as compared to residents of comparable non-gated communities. Le Goix (2007) using a dataset of a metropolitan Los Angeles, California

from 1990-2000 constructs an index of discontinuity finding that large and high-end gated communities maintained property value and justified private governance over the decade studied, whereas less affluent gated communities ("middle class" gated communities) did not. Contrary to our finding, Le Goix and Vasselinov (2013) using data through 2008 conclude that properties located within gated communities are more immune to unexpected decrease in values during periods of financial distress as compared to non-gated properties. However, they found some evidence that price premiums in gated communities and the presence of a gate had negative effects on nearby financially distressed non-gated community property values. Their contention was that the presence of a gated community within a financially stressed neighborhood may destabilize prices of nearby non-gated communities. We find that both high end and low end gated communities failed to sustain price premiums after the 2008-2009 financial crisis.

III. Data and Methodology

Data for this study were obtained from the 2013 Certified Assessment Roll for Shelby County, Tennessee. The data includes descriptions of single family residential properties in Shelby County Tennessee sold from January, 2000 through December, 2012. The final sample includes 11 fully gated communities from several different areas of Shelby County. Data also include sales from 16 comparable neighborhoods, where each gated community was matched with non-gated communities with very similar locations and property characteristics. The communities deemed to be comparable to gated communities were assessed based on Location (proximity to a gated neighborhood), Total Living Area (measured in square feet), Sale Price, and Age of the property. The lowest priced gated community had a mean house sale price of $185,763 and the highest priced gated neighborhood had a mean sale price of $1,315,490 in our sample. Several observations were eliminated due to missing data.

////////// Insert Table 1 about Here //////////

Table 1 contains summary statistics on both the gated and the comparable non-gated communities. As can be seen from Table 1, gated communities (community numbers in bold letters) have been comparatively matched with non-gated communities. For example, Location 7 has a gated community identified as "00903D30" matched with two non-gated communities identified as "00903D01" and "00903E01" all located in the close proximity to each other. These three locations have similar mean sale price ($392,528, $312,594, and $314,546 respectively), as well as mean total living area (4,060 ft^2, 3,364 ft^2, and 3,225 ft^2), average lot/land areas (15,201 ft^2, 18,357 ft^2, 18,344 ft^2), and average age (20.6 years, 16.7 years, and 17.4 years).

The final data set contains 4,422 valid observations for the study period – 877 (19.83%) observations coming from the gated communities. Only single-family residential properties located in Shelby County, Tennessee were included in the sample. The gated and non-gated communities excluded zero lot properties, thus only properties with sizable lots were used. The valid sales used in the study were those that were listed as "Land and Buildings" and classified as "Warranty Deed", "Special Warranty Deed", and "Trustee Deed". All other sale types and instruments of sale types are excluded from the final sample. The mean house sale price in our sample of properties in both gated and non-gated communities was $340,100.

Twelve years of data over the 2000-2012 time period provide a large sample of sales in both gated and non-gated communities, including the subprime mortgage crisis housing crash. To allow for market movements and trends, a time (date of sale) variable is incorporated in the model to control for changing market conditions and prices throughout the study period. The sale date control method used was originally employed by Bryan and Colwell (1982).[4] In this method, each date of sale is defined as a linear combination of the end points of the year in

which the sale occurs. Date of sale variables, B(y), are the proportional weights assuming that each sale occurs in the middle of the month. For example, if a sale occurred in September 2002, then the variable B02 is given a weight of 3.5/12 (or .292), and B03 weighting is 8.5/12 (or .708) and all other B(y) variables are zero. Since the sale was closer to the beginning of 2003 than to the beginning of 2002, B03 is given more weight than B02. This technique allows the rate of change in prices to be different for each year and allows for a monthly price continuum rather than a step function.

Two additional criteria are used to eliminate very unusual sales.[5] Sales are deleted if sale price is greater than three standard errors above or below the predicted price. This large predictive error may result from model misspecification, a lack of sufficiently detailed information regarding the property and/or incorrect sales data. The second criterion eliminates any sales with unusually large absolute values for Cook's distance (>1.00). This indicates that the property has one or more characteristics that are quite different from other sales, and whose presence has an unduly large influence on the overall predicted values generated by the model.[6] These additional criteria result in the removal of 68 observations or less than 1.5% of all data.[7]

The data set includes numerous property characteristics for each property sale used in the analysis. The variables in the models are defined in Table 2 and selected summary statistics for these variables are shown in Table 3.

////////// Insert Table 2 and Table 3 about Here //////////

In our hedonic models sale price is the dependent or predicted variable. Sale price is assumed to represent the estimate of market value, and is explained/predicted by selected independent-explanatory variables. Several different types of explanatory variables are generally employed when multiple regression (hedonic modeling) is used to estimate improved residential

property values. The models used follow this practice, and variables include such property characteristics as style of building, wall construction, size, and grade of construction. Also included are variables for other property characteristics, including age of the improvements. There are additional variables (date of sale characteristics) employed to estimate year to year changes in the market level over the time span the data cover. Additionally, we employ variables to control for other important amenities of gated communities available to its residents that may affect property values such as presence of clubhouse, public swimming pool, tennis court, basketball court, pond, guard building, and golf course.[8]

As previously discussed, we estimate the impact of gated communities on property values by identifying eleven gated neighborhoods that were each carefully matched with one or two comparable non-gated neighborhoods. Each gated neighborhood and its associated comparable neighborhood(s) were treated as separate locations and assigned a unique value of LOC_x. This set of dummy variables allows us to control for affects of each of the eleven different locations. Differences in the property and site characteristics are controlled with independent variables.

IV. Empirical Results for Hedonic Pricing Model

Referring to Table 4, the hedonic model (Model 1) represents a good fit where the adjusted R^2 is 0.9157. Due to concerns over possible multicollinearity among independent variables, variance inflation factors (VIF) were run on all model variables. We found that all variables were highly acceptable (VIF <10.0), the exceptions did not appear to impact the dummy variable controlling for the presence of a gate.[9] A dummy variable controlling for the presence of a gate measures its impact on property and amenity values. Empirical results indicate that properties located in gated neighborhoods sell for a price premium of $29,996 relative to comparable properties in non-gated communities in Memphis and Shelby County. The price

premium is statistically significant at the 99 percent confidence level.

As is the case with gated communities in most cities, the residents of gated neighborhoods are responsible for upkeep of roads, drainage and other maintenance that would be covered by the municipality for non-gated communities, thus the $29,996 increase in value is the net increase above the additional associated costs.

////////// Insert Table 4 about Here //////////

Other notable attributes affecting value are the size of the lot, where each additional square foot is worth $0.47. Also, property values decline by $2,048.42 per year as properties age. This variable, however, may be somewhat misleading since the average age of properties studied was 10.9 years and may not be representative of property values in older communities located in Shelby County.

Interestingly, multi-story homes sell for less. A multiple story house would sell for approximately $5,550 less per floor than a single story house. Pools carry value with a poured concrete pool having the most value and worth $80.43 per square foot. Many of the newer houses contained in the sample were built on concrete slabs. However, a house with a crawlspace rather than a concrete slab increases in value by $21,669.

Properties in communities, whether gated or non-gated, with a golf course sell for $11,497 more than for neighborhoods without a golf course. These findings are consistent with Do and Grudnitski (1995), Grudnitski (2003), and Shultz and Schmitz (2009).[10]

Each square foot of living area was worth $44.42. As expected, higher quality construction adds value. Quality of construction varies from average (the base variable on which each higher quality of construction variable is compared) to good, good plus, very good minus, very good and best. As expected a “good” construction quality house sells for an additional

$6.88 per square foot when compared to a house with average quality of construction. Values for good plus, very good minus, very good and best are $15.07, $24.02, $55.27 and $94.63, respectively. As a result, a home built with the best quality of construction would be worth $139.05 per square foot.

Date of sale variables compare annual market values to the base year, 2000. Since the Memphis region did not experience the significant run up in market value that were experienced in other parts of the country, generally, except for 2001, market prices remained above the 2000 price. However, because of the excess supply of houses on the market and the financial crisis, values began declining from a peak in 2007 ($73,919 above the price in 2000) to a value in 2010 of only $31,737 above 2000 prices. By the end of 2012 home prices had rebounded to $41,989 above 2000 prices.

We also control for additional amenities that gated communities provide for its residents. We control for a presence of a clubhouse, community swimming pool, cabana, tennis courts, basketball courts, and small ponds/lakes. We also control for a guard building installed with the gate. Interestingly, we find that these additional amenities carry a highly significant negative value. Presence of additional amenities within gated communities reduces sale price of the house by $19,534. These results may be explained by the burden of maintenance costs associated with such additional amenities provided to residents of a gated communities. It would appear that whereas a gate has value, additional neighborhood amenities do not.

A location variable compares and controls for price level differences between each of the other ten gated communities and comparable neighborhoods with Chapel Creek, the gated community, and its comparable Woodchase (Location 8). See Figure 1 as an example of the location of comparables relative to the gated neighborhood. Other location price levels ranged

from -$40,849 to $177,958. For example, the location 1 price level was $40,849 less than the Chapel Creek neighborhood; whereas, location 10 price levels were $177,958 above the Chapel Creek neighborhood.

///////// Insert Figure 1 about Here /////////

Other variables (attributes) may be observed in Table 4. Overall, the hedonic model behaved as expected and not surprisingly, the variable of specific interest in this study, Gate, demonstrated a significant impact on property values. Gated properties sell for $29,996 above similar parcels in non-gated neighborhoods.

In Model 2, we further explore the impact of a gate on residential communities by introducing three separate dummy variables. Each dummy variable captures the relative size (based on number of homes) in the gated community.[11] Results are shown in Table 4. Similar to Model 1, Model 2 represents a good fit where the adjusted R^2 is 0.9160. Variance inflation factors (VIF) were run on this model and it was found that all variables were highly acceptable (VIF <10.0). There were also no major changes in the overall model.

Model 2 finds that a medium size community carried the highest premium of $33,775 for the presence of a gate. In both small and large gated communities not as much value was added by the gate. Small size gated community and large size gated community carry the price premiums of $21,849 and $22,068 respectively. These Model 2 variables were all statistically significant. As in Model 1, the additional features of gated communities are negatively statistically significant with an estimate of $14,372. Again, age of the house and number of stories of the house carry a negatively significant impact on the value of the property. Results indicate that there may be an optimal gated neighborhood size.

Model 3, shown in Table 5, attempts to determine if the gate value varies through time. In

addition, we would like to see if more affluent gated communities hold their value better through time as compared to less affluent gated communities. Further, we want to see if the relationships held through the period of financial turbulence. To measure this, we broke the date of sale variables, B(y), into HGB(y), HNGB(y), LGB(y), LNGB(y). We also separated our sample of gated communities into "High End" and "Low End" communities based on the median sale price over the sample period. If a gate exists and a property is located in the "High End" gated community then HGB(y) would take the value of B(y) and HNGB(y) would be zero. For high end non-gated communities, HNGB(y) would take the value of B(y) and HGB(y) would be zero. If a gate exists and a property is located in "Low End" gated community then LGB(y) would take on the value of B(y) and LNGB(y) would be zero. Similarly for non-gated communities, LNGB(y) would take the value of B(y) and LGB(y) would be zero for properties in "Low End" part of the sample. These values are graphed and shown in Figure 2.

////////// Insert Table 5 and Figure 2 about Here //////////

As previously indicated, if gated communities carry price premiums, the premium suggests a positive benefit to cost ratio; where, despite additional costs associated with living in gated communities, the benefits obviously outweighed the costs. Results indicate that prior to the subprime crisis period (shaded in the figure from 2008 to 2009) gated communities carried a significant premium over non-gated communities. Starting in 2008, the premium for high end gated communities declined; however, in 2012 high end gated communities seem to have an upward value trend. Even though typically the low end gated communities carried a premium over non-gated low end communities, the premium was not as great as was found with high end gated communities. The subprime crisis period impacted values for all the communities in our sample; however, the decline in value was the strongest for the high end gated communities.

Further, these differences between estimates for each year between high end gated and high end non-gated as well as low end gated and low end non-gated communities were tested for significance using an F-test. In the table under Figure 2, we observe that gated premiums for high end gated versus high end non-gated communities were statistically significantly different during seven out of eight years (years 2000-2008) and were only statistically significant from each other one out of four years after the financial crisis. Whereas for low end gated communities versus low end non-gated communities show a different picture: only in three out of eight years were gated premiums statistically significantly different from each other prior to subprime mortgage crisis (years 2007-2008) and no statistically significant differences after the crisis. However, for both high end gated and low end gated communities, even for years when the gated premium was not statistically significant, values associated with a gate still covered additional costs associated with living in gated communities.

Table 6 explores how gated communities and their additional features are currently being appraised by the Shelby County Assessor's Office. Model 4 includes, as independent variables, only the Assessor's appraised property value and date of sale variables.[12] The coefficient on the appraisal variable is 0.98 and the overall model has an adjusted R^2 of .8912. Results indicate that appraised values compare very closely to market value.

Model 5 is the same as Model 4 except it contains all previously used control variables. This model has an adjusted R^2 of .9246. In Model 6, all insignificant control variables were removed from Model 5. This resulted in the adjusted R^2 increasing slightly to .9249.

In regression analysis it is assumed that coefficients of linear independent variables represents the variable's impact on the dependent variable assuming all other factors are held constant. In each of the three models independent variable coefficients, other than the Assessor's

appraised values, indicate whether properties' attributes were either over or under valued by the County Assessor. A positive coefficient indicates that the attribute is under appraised and a negative coefficient indicates that the attribute is over appraised. Independent variables that are insignificant indicate attributes are properly valued by the Assessor. Regression models similar to 5 and 6 may be used to provide a sense of accuracy of assessed values for individual housing characteristics. These results may assist assessors in fine tuning their assessment process. For example, our data estimates that a full bath is under appraised by $6,722, whereas, a half bath is not significant, indicating that it was property appraised. Concrete swimming pools were also under appraised, but other types of pool were appraised correctly.

In Model 6 we observe that age of the property is over appraised by the assessor by the amount of $1,333.78 per additional year of age for the property. In addition, presence of crawl space is undervalued by $17,264. The location of the property near the golf course is undervalued by the amount of $9,677.53. Area of the garage is undervalued by $14.26 per square foot. In addition, in Model 6, the gate coefficient is $17,671 and the variable for additional features in a gated neighborhood was -$10,087. These results indicate that the assessor is under valuing a gated neighborhood, yet over valuing the additional amenities. We observed that in Shelby County a gate may be a positive feature since it adds value, but the additional value may not be fully captured by the Assessor's estimate of appraised value.

We perform several robustness checks finding that our main conclusions associated with Models 1 and 2 are still valid and that all of the variables carry the same sign and remain significant. First, we reduce our sample by excluding the most expensive gated community and its comparable community (gated community in location 10 has a highest average sale price of $1,315,490). This provides assurance that gated Location 10 community is not substantially

changing our results.[13] Also, Anselin (1998) and others have pointed to potential problems with real estate data (such as house sale prices and neighborhood characteristics). He suggests that real estate data tend to lack independence among properties and may demonstrate spatial autocorrelation or spatially and serially clustered residuals, thus results may lead to incorrect conclusions. Moulton (1990) provides an example showing data units that share same observable characteristics may also share unobservable characteristics that would lead to serial correlation in residuals and downward bias for coefficients within those groups. In order to correct this possible problem of serial correlation of residuals, Figlio and Lucas (2004) correct standard errors in their regression model through clustering at both location and time level when dealing with housing sales data. Others including Genesove and Mayer (2001) have used this econometric approach to adjust clustered standard errors to resolve for problems of autocorrelation[14].

We adjust for possible effects of clustered standard errors in initial Models 1 and 2 following Petersen (2009)[15]. First, we estimate models using clustering by one dimension-neighborhood[16]. To duplicate our initial dataset used in Models 1 and 2, we again remove observations if sale price is greater than three standard errors above or below the predicted price and sales with unusually large absolute values for Cook's distance (>1.00)[17,18]. Coefficients for premiums of gated communities remained strongly positively significant, and all other control variables remained consistent in direction and significance. Further, as suggested by Thompson (2011), it may be appropriate to cluster standard errors by two dimensions in order to deal with serial as well as spatial correlation. Thus, we cluster standard errors in our model by two dimensions - neighborhood and time (represented by a variable Year of Sale). Once again, our previous findings are confirmed with consistent directions and significance of the explanatory

variables. Results for clustered standard errors by one and multiple dimensions are not reported here but are readily available per request.[19]

V. Conclusion

This study applies hedonic modeling to assess the impact of gated communities on residential real estate values. From a data set of housing sales from the Shelby County Tennessee Assessor's Office, we select a sample of eleven gated communities in Memphis and Shelby County and a sample of similar non-gated properties in nearby or adjacent neighborhoods that serve as the control sample. Thus, we formulate a relatively homogeneous sample of single family residential properties, excluding properties with zero lots, both in gated communities and a control sample of housing located in non-gated communities. The resulting hedonic models all had adjusted R^2 greater than 0.9000. While also controlling for other factors, we find that homes in gated communities command an economically and statistically significant price premium of $29,996. Premiums most likely result from perceived benefits associated with additional privacy provided by gated communities, stronger home owner associations within gated communities that impose tighter controls on maintenance, home design and other externalities and the added insurance against crime and other undesirable activities in a community. Also, since gated communities must provide for their own streets and other services provided to non-gated communities by the city or county, the significant increase in values result from the net benefits versus additional homeownership cost incurred by residents of a gated community.

We also further explored gated neighborhood price effects by determining if neighborhood size has an impact on value. We found that a medium sized neighborhood had the highest price premium relative to either a small or large gated neighborhood. We also found that the gate value has varied through time, and after the 2008–2009 subprime crisis period,

premiums no longer exist.

Comparing assessed values with sale prices, we measure the County Assessor's accuracy in assessing residential properties concluding that assessed values are relative close to sale price.

Table 1: Descriptive Statistics of the Houses Sold Included In the Final Sample

Neighborhood Number	Sale Price	Total Living Area (ft^2)	Land Area (ft^2)	Age of House (Years)
Location 1 (loc1)				
00610A30	**$229,470**	**2,860.0**	**9,287.3**	**1.8**
00610A02	$205,297	2,888.6	11,216.5	3.4
00610A03	$293,632	3,668.5	17,734.6	3.1
Location 2 (loc2)				
00912A35	**$311,738**	**3,434.8**	**12,685.2**	**13.1**
00903G07	$260,261	2,975.5	16,058.9	13.2
Location 3 (loc3)				
00904A34	**$476,075**	**4,087.4**	**13,984.4**	**4.1**
00904A31	$401,675	3,930.3	19,456.2	8.7
00904A36	$501,625	4,326.3	19,349.4	2.7
Location 2.1 (loc2)				
00912A36	**$382,673**	**3,575.9**	**13,085**	**6.7**
00903G05	$348,976	3,969.6	19,244.2	18.7
Location 4 (loc4)				
00605D32	**$185,763**	**2,301.3**	**7,743.1**	**9.1**
00605D03	$210,899	2,839.9	10,594.3	8.6
00605D05	$172,047	2,280.1	10,973.5	6.9
Location 5 (loc5)				
00406A08	**$481,832**	**3,880.9**	**15,668.2**	**1.5**
00406A06	$382,947	3,678.4	20,995.5	2.0
Location 6(loc6)				
00906D36	**$342,826**	**3,678.3**	**23,189.1**	**2.4**
00906E01	$251,824	3,300.3	20,254.2	32.6
Location 7 (loc7)				
00903D30	**$392,528**	**4,060.7**	**15,201.5**	**20.6**
00903D01	$312,594	3,364.9	18,357.3	16.7
00903E01	$314,546	3,255.4	18,344.3	17.4
Location 8 (loc8)				
00605A04	**$494,872**	**4,930.7**	**37,979.0**	**9.8**
00605A01	$284,253	3,708	24,462.4	17.3
Location 9 (loc9)				
00901G32	**$240,399**	**2,350.4**	**7,531.6**	**17.8**
00901G01	$362,888	3,457	14,194.7	9.9
00901G03	$296,223	2,907.7	10,494.3	10.0
Location 10 (loc10)				
00901A30	**$1,315,490**	**6,406.1**	**20,883.7**	**4.5**
00901C01	$675,169	5,132.9	31,908.0	22.1

Numbers represent mean values for each neighborhood. Gated communities are in bold and comparable neighborhoods are not. Gated communities '00912A35' and '00912A36' and respective comparable communities are located in the same proximate location. Age of the house was calculated as the difference between the year of sale and the year house was built. Name of each gated community is provided by request.

Table 2: Independent Variables	
Variable Name	**Description**
Gate	Equals 1 if community Is Gated; 0 otherwise
Sgate	Equals 1 if gated community has between 38 and 42 houses; 0 otherwise
Mgate	Equals 1 if gated community has between 65 and 106 houses; 0 otherwise
Lgate	Equals 1 if gated community has between 126 and 181 houses; 0 otherwise
other_gate	Equals 1 if gated community has either clubhouse, swimming pool, cabana, tennis court, basketball court, pond, or guard building; 0 otherwise
Fixbath	Number of full baths fixtures
Fixhalf	Number of half baths fixtures
sf_land	Total area of the property (ft^2)
Age	Age= Year of Sale- Year Built
Stories	Number of stories
gunite_pool	Area of a gunite swimming pool (ft^2)
vinyl_pool	Area of a vinyl swimming pool (ft^2)
fiber_pool	Area of a fiberglass swimming pool (ft^2)
concrete_pool	Area of a concrete swimming pool (ft^2)
Fireplace	Number of pre-fabricated fireplaces
cabana_area	Area of a cabana (ft^2)
Crawl	Equals 1 if property has a crawl space; 0 otherwise
Carport	Area of a carport (ft^2)
Garage	Area of a garage (ft^2)
stone_patio	Area of a stone patio (ft^2)
Golf	Equals 1 if property has an access to the golf course; 0 otherwise
Stucco	Equals 1 if exterior wall material is stucco; 0 otherwise
Vinyl	Equals 1 if exterior wall material is vinyl; 0 otherwise
Composite	Equals 1 if exterior wall material is composite; 0 otherwise
Brick	Equals 1 if exterior wall material is brick; 0 otherwise
Stone	Equals 1 if exterior wall material is stone; 0 otherwise
Colonial	Equals 1 if building style is colonial; 0 otherwise
English	Equals 1 if building style is English; 0 otherwise
European	Equals 1 if building style is European; 0 otherwise
Oldstyle	Equals 1 if building style is old style; 0 otherwise
Ranch	Equals 1 if building style is ranch; 0 otherwise
Raisedranch	Equals 1 if building style is raised ranch; 0 otherwise
Capecod	Equals 1 if building style is Cape Cod; 0 otherwise
contemporary	Equals 1 if building style is contemporary; 0 otherwise
sfla	Total living area (ft^2)
sf_good	Total living area (ft^2) multiplied by a dummy variable representing a quality of construction that was “good”
sf_good_plus	Total living area (ft^2) multiplied by a dummy variable representing a quality of construction that was “good plus”
sf_verygood_minus	Total living area (ft^2) multiplied by a dummy variable representing a quality of construction that was “very good minus”
sf_verygood	Total living area (ft^2) multiplied by a dummy variable representing a quality of construction that was “very good”
sf_best	Total living area (ft^2) multiplied by a dummy variable representing a quality of construction that was “best”
Swarranty	Equals 1 if sale instrument is special warranty deed; 0 otherwise
Trustee	Equals 1 if sale instrument is trustee deed; 0 otherwise
Waterfront	Equals 1 if waterfront property; 0 otherwise
b01- b13	Date of sale as a linear combination of the end points of the year in which the sale occurs
hgb01- hgb12	Date of sale in High End gated community as a linear combination of the end points of the year in which the sale occurs
hngb01- hngb12	Date of sale in High End non- gated community as a linear combination of the end points of the year in which the sale occurs
lgb01- lgb12	Date of sale in Low End gated community as a linear combination of the end points of the year in which the sale occurs
lngb01- lngb12	Date of sale in Low End non- gated community as a linear combination of the end points of the year in which the sale occurs
loc1-loc10	Dummy variable representing a particular location of a property
Rtotapr	Total Appraisal Value (USD)

Table 3: Descriptive Statistics of the Full Sample					
Variable	**Number of Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Price (USD)	4,422	340,100	152,287	21,000	2,403,300
Land Area (ft^2)	4,422	17,382	9,836	5,750	328,372
Age (Years)	4,422	10.9	9.2	1	62
Total Living Area (ft^2)	4,422	3,544	847	1,675	10,860

Number of Properties by Location		
Variable	**Number of Observations**	**Percent of Total Sample**
Properties in Gated Communities	877	19.83%
Location 1	533	12.05%
Location 2	472	10.67%
Location 3	1,100	24.86%
Location 4	501	11.33%
Location 5	412	9.32%
Location 6	289	6.54%
Location 7	747	16.89%
Location 8	169	3.82%
Location 9	94	2.13%
Location 10	105	2.38%

Table 4: Results of a Hedonic Regression Model The dependent variable is the price of the property.				
	Model 1		**Model 2**	
	Adjusted R^2 = 0.9157		**Adjusted R^2 = 0.9160**	
Independent Variables	**Coefficient Estimate**	**t-statistic**	**Coefficient Estimate**	**t-statistic**
Intercept	23,400	2.41***	24,058	2.49***
Gate (1/0)	**29,996**	**8.82*** **	-	-
Small Gated Community (1/0)	-	-	**21,849**	**4.67*** **
Medium Gated Community (1/0)	-	-	**33,775**	**9.07*** **
Large Gated Community (1/0)	-	-	**22,068**	**4.23*** **
Additional Features in Gated community	-19,534	-4.92***	-14,372	-3.10***
Full Baths Fixtures	11,686	9.25***	11,555	9.14***
Half Baths Fixtures	3,275.72	2.54**	3,112.61	2.37**
Lot Square Footage	0.47	5.17***	0.48	5.28***
Age	-2,048.42	-13.96***	-1988.68	-13.23***
Number of Stories	-5,550.09	-2.72***	-6,365	-3.14***
Area of a gunite swimming pool	20.77	7.80***	20.38	7.71***
Area of a vinyl swimming pool	14.89	4.93***	14.02	4.66***
Area of a fiberglass swimming pool	8.47	0.97	6.76	0.78
Area of a concrete swimming pool	80.43	5.43***	81.26	5.53***
Number of pre-fabricated fireplaces	1,299.71	1.26	1,697.73	1.65*
Area of a cabana	73.81	4.16***	98.28	5.32***
Crawl space (1/0)	21,669	3.80***	21,871	3.87***
Area of carport	49.16	4.75***	45.65	4.42***
Area of garage	38.55	7.30***	37.28	7.11***
Area of a stone patio	29.80	2.01**	30.30	2.06**
Golf (1/0)	11,497	6.22***	9,953.42	5.27***
Stucco exterior wall (1/0)	11,949	1.79*	12,717	1.92*
Vinyl exterior wall (1/0)	23,653	1.45	24,816	1.54
Composite exterior wall (1/0)	14,288	0.52	14,054	0.52
Brick exterior wall (1/0)	17,043	3.03***	17,379	3.11***
Stone exterior wall (1/0)	123,720	3.28***	117,493	3.13***
Building style is Colonial (1/0)	2,575.65	0.90	2,059.43	0.72
Building style is English (1/0)	6,644.74	1.66*	6,208.30	1.55
Building style is European (1/0)	4,318.20	1.25	4,270.08	1.25
Building style is Old Style (1/0)	15,040	2.54**	14,850	2.53**
Building style is Ranch (1/0)	2,879.48	0.24	3,312.03	0.28
Building style is Raised Ranch (1/0)	-34,897	-2.56**	-34,864	-2.58***
Building style is Cape Cod (1/0)	11,406	0.61	10,035	0.54
Building style is Contemporary (1/0)	-25,617	-2.57***	-25,450	-2.57***
Total living area	44.42	23.98***	44.25	23.86***
Total Living Area * Good construction (1/0)	6.88	9.25***	7.12	9.43***
Total Living Area * Good Plus construction (1/0)	15.07	15.91***	15.25	16.14***
Total Living Area * Very Good Minus construction (1/0)	24.02	22.21***	24.31	22.50***
Total Living Area * Very Good construction (1/0)	55.27	24.00***	55.77	24.45***
Total Living Area * Best construction (1/0)	94.63	47.30***	95.37	47.23***
Special warranty deed (1/0)	-65,795	-24.81***	-65,099	-24.68***
Trustee deed (1/0)	-54,432	-20.88***	-53,257	-20.50***
Waterfront property (1/0)	34,467	5.33***	36,564	5.59***
Date of sale: 2000 - 2001 (b01)	-3,046.92	-0.54	-3,579.63	-0.65
Date of sale: 2001 - 2002 (b02)	6,213.69	1.39	6,196.71	1.40
Date of sale: 2002 - 2003 (b03)	9,713.76	1.98**	8,731.85	1.80*
Date of sale: 2003 - 2004 (b04)	26,510	5.69***	26,322	5.69***
Date of sale: 2004 - 2005 (b05)	39,599	8.34***	39,079	8.28***
Date of sale: 2005 - 2006 (b06)	63,140	13.28***	62,729	13.28***

Table 4: Continued				
Independent Variables	**Coefficient Estimate**	**t-statistic**	**Coefficient Estimate**	**t-statistic**
Date of sale: 2006 - 2007 (b07)	73,919	15.10***	73,404	15.08***
Date of sale: 2007 - 2008 (b08)	66,766	12.96***	65,791	12.85***
Date of sale: 2008 - 2009 (b09)	51,683	9.55***	50,455	9.37***
Date of sale: 2009 - 2010 (b10)	31,737	5.88***	30,389	5.66***
Date of sale: 2010 - 2011 (b11)	34,485	6.25***	33,459	6.09***
Date of sale: 2011 - 2012 (b12)	32,915	5.96***	31,862	5.79***
Date of sale: 2012 - 2013 (b13)	41,989	6.60***	41,792	6.60***
Location 1	-40,849	-10.00***	-40,169	-9.84***
Location 2	41,397	10.59***	43,813	10.78***
Location 3	55,413	14.49***	56,731	14.84***
Location 4	-26,763	-5.79***	-23,901	-5.07***
Location 5	22,485	5.20***	24,813	5.66***
Location 6	36,175	7.67***	37,899	7.50***
Location 7	53,354	14.53***	54,910	14.89***
Location 9	63,025	11.48***	65,163	10.86***
Location 10	177,958	26.39***	174,029	25.94***
***, **, * indicate significance at the 0.01, 0.05 and 0.10 level respectively				

Table 5: Property Values in Gated Vs. Non-gated Communities from 2000-2012 (Model 3) The dependent variable is the price of the property. Adjusted R^2 = 0.9294		
Independent Variables	**Coefficient Estimate**	**t-statistic**
Intercept	39,354	3.96***
Property value in "High End "gated community : 2000 - 2001 (hgb01)	25,982	2.15**
Property value in "High End " gated community: 2001 - 2002 (hgb02)	2,259.94	0.24
Property value in "High End " gated community: 2002 - 2003 (hgb03)	-10,999	-0.96
Property value in "High End " gated community: 2003 - 2004 (hgb04)	49,450	4.44***
Property value in "High End " gated community: 2004 - 2005 (hgb05)	69,137	6.23***
Property value in "High End " gated community: 2005 - 2006 (hgb06)	137,522	16.35***
Property value in "High End " gated community: 2006 - 2007 (hgb07)	101,713	10.78***
Property value in "High End " gated community: 2007 - 2008 (hgb08)	125,437	10.19***
Property value in "High End " gated community: 2008 - 2009 (hgb09)	71,329	5.21***
Property value in "High End " gated community: 2009 - 2010 (hgb10)	41,368	3.58***
Property value in "High End " gated community: 2010 - 2011 (hgb11)	10,035	0.77
Property value in "High End " gated community: 2011 - 2012 (hgb12)	62,921	5.19***
Property value in "High End " non-gated community : 2000 - 2001 (hngb01)	-46,995	-7.86***
Property value in "High End " non-gated community: 2001 - 2002 (hngb02)	-17,428	-3.42***
Property value in "High End " non-gated community: 2002 - 2003 (hngb03)	-14,211	-2.73***
Property value in "High End " non-gated community: 2003 - 2004 (hngb04)	4,662.19	0.97
Property value in "High End " non-gated community: 2004 - 2005 (hngb05)	25,544	5.10***
Property value in "High End " non-gated community: 2005 - 2006 (hngb06)	47,973	9.41***
Property value in "High End " non-gated community: 2006 - 2007 (hngb07)	70,700	13.40***
Property value in "High End " non-gated community: 2007 - 2008 (hngb08)	54,260	9.74***
Property value in "High End " non-gated community: 2008 - 2009 (hngb09)	52,718	8.45***
Property value in "High End " non-gated community: 2009 - 2010 (hngb10)	25,362	3.95***
Property value in "High End " non-gated community: 2010 - 2011 (hngb11)	25,539	4.30***
Property value in "High End " non-gated community: 2011 - 2012 (hngb12)	33,968	5.27***
Property value in "Low End "gated community : 2000 - 2001 (lgb01)	-2,549.02	-0.21
Property value in "Low End " gated community: 2001 - 2002 (lgb02)	5,868.98	0.58
Property value in "Low End " gated community: 2002 - 2003 (lgb03)	10,134	0.95
Property value in "Low End " gated community: 2003 - 2004 (lgb04)	27,441	2.66***
Property value in "Low End " gated community: 2004 - 2005 (lgb05)	11,378	1.15
Property value in "Low End " gated community: 2005 - 2006 (lgb06)	45,722	5.49***
Property value in "Low End " gated community: 2006 - 2007 (lgb07)	36,323	3.98***
Property value in "Low End " gated community: 2007 - 2008 (lgb08)	48,544	5.08***
Property value in "Low End " gated community: 2008 - 2009 (lgb09)	11,878	1.19
Property value in "Low End " gated community: 2009 - 2010 (lgb10)	13,304	1.5
Property value in "Low End " gated community: 2010 - 2011 (lgb11)	12,167	1.22
Property value in "Low End " gated community: 2011 - 2012 (lgb12)	9,222.68	0.74
Property value in "Low End " non-gated community : 2000 - 2001 (lngb01)	-12,367	-1.64
Property value in "Low End " non-gated community: 2001 - 2002 (lngb02)	-9,166.38	-1.45
Property value in "Low End " non-gated community: 2002 - 2003 (lngb03)	-6,477.75	-0.93
Property value in "Low End " non-gated community: 2003 - 2004 (lngb04)	6,219.61	0.92
Property value in "Low End " non-gated community: 2004 - 2005 (lngb05)	14,170	2.09**
Property value in "Low End " non-gated community: 2005 - 2006 (lngb06)	27,339	3.97***
Property value in "Low End " non-gated community: 2006 - 2007 (lngb07)	39,322	5.68***
Property value in "Low End " non-gated community: 2007 - 2008 (lngb08)	19,408	2.51**
Property value in "Low End " non-gated community: 2008 - 2009 (lngb09)	15,415	2.01**
Property value in "Low End " non-gated community: 2009 - 2010 (lngb10)	4,214.65	0.54
Property value in "Low End " non-gated community: 2010 - 2011 (lngb11)	176.42	0.02
Property value in "Low End " non-gated community: 2011 - 2012 (lngb12)	7,171.46	0.79
Additional Features in Gated community	-1,646.96	-0.42
Full Baths Fixtures	12,914.00	10.31***

Table 5: Continued		
Independent Variables	**Coefficient Estimate**	**t-statistic**
Half Baths Fixtures	7,262.98	5.59***
Lot Square Footage	0.65	7.42***
Age	-2,150.42	-15.12***
Number of Stories	-4,289.41	-2.11**
Area of a gunite swimming pool	17.70	6.62***
Area of a vinyl swimming pool	12.92	4.27***
Area of a fiberglass swimming pool	-13.79	-1.39
Area of a concrete swimming pool	77.78	5.39***
Number of pre-fabricated fireplaces	2,872.75	2.85***
Area of a cabana	72.23	4.09***
Crawl space (1/0)	22,910.00	4.19***
Area of carport	35.24	3.55***
Area of garage	29.22	5.7***
Area of a stone patio	48.58	3.39***
Golf (1/0)	9,988.04	4.51***
Stucco exterior wall (1/0)	14,063.00	2.12**
Vinyl exterior wall (1/0)	27,809.00	1.81*
Composite exterior wall (1/0)	11,843.00	0.46
Brick exterior wall (1/0)	16,602.00	2.98***
Stone exterior wall (1/0)	100,593.00	2.79***
Building style is Colonial (1/0)	1,245.83	0.44
Building style is English (1/0)	1,456.70	0.33
Building style is European (1/0)	4,162.24	1.19
Building style is Old Style (1/0)	13,058.00	2.34**
Building style is Ranch (1/0)	-5,142.81	-0.46
Building style is Raised Ranch (1/0)	-29,461.00	-2.29**
Building style is Cape Cod (1/0)	3,706.74	0.21
Building style is Contemporary (1/0)	-20,163.00	-2.13**
Total living area	44.05	23.86***
Total Living Area * Good construction (1/0)	4.43	6.17***
Total Living Area * Good Plus construction (1/0)	12.47	12.88***
Total Living Area * Very Good Minus construction (1/0)	21.48	20.01***
Total Living Area * Very Good construction (1/0)	49.71	22.94***
Total Living Area * Best construction (1/0)	87.62	44.42***
Special warranty deed (1/0)	-56,524.00	-21.44***
Trustee deed (1/0)	-47,651.00	-18.62***
Waterfront property (1/0)	14,627.00	2.26**
Location 1	-27,063.00	-3.67***
Location 2	43,746.00	5.63***
Location 3	60,462.00	15.38***
Location 4	-19,158.00	-2.46**
Location 5	19,032.00	4.44***
Location 6	49,211.00	6.39***
Location 7	58,268.00	16.69***
Location 9	72,377.00	8.90***
Location 10	181,176.00	28.08***
***, **, * indicate significance at the 0.01, 0.05 and 0.10 level respectively		

Table 6: Assessed Valuation Using a Hedonic Regression Model

The dependent variable is the sale price of the property.

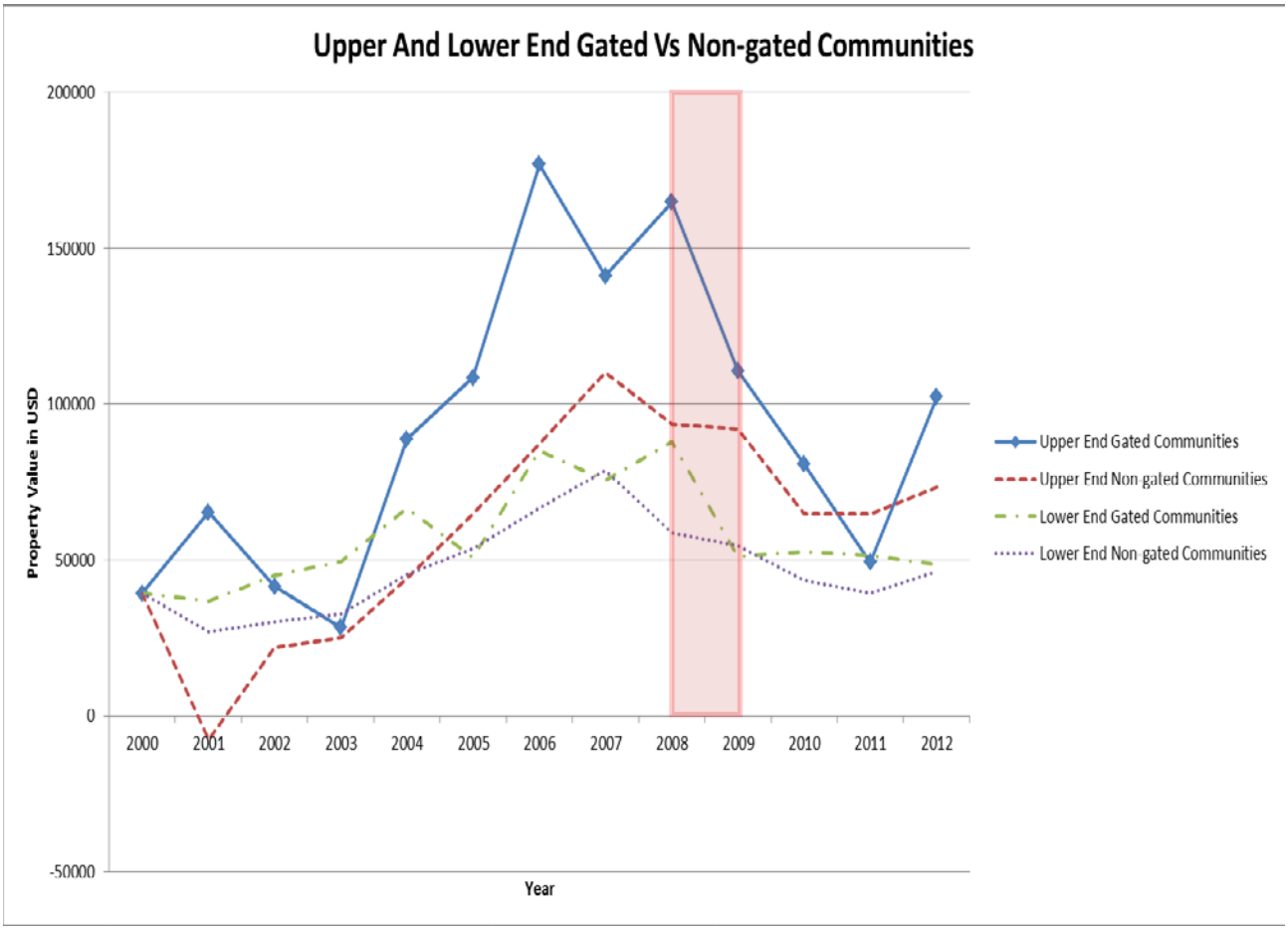
	Model 4		Model 5		Model 6	
	Adjusted R^2 = 0.8912		Adjusted R^2 = 0.9246		Adjusted R^2 = 0.9249	
Independent Variables	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Intercept	-2,000.03	-0.41	30,335	3.27***	26,870	3.07***
Gate (1/0)			**17,776**	**5.40*** **	**17,671**	**5.42*** **
Appraisal Value	**0.98**	**184.60*** **	**0.59**	**28.14*** **	**0.60**	**30.88*** **
Date of sale: 2000 - 2001 (b01)	-8,554.18	-1.31	-2,352.70	-0.44	-2,427.12	-0.46
Date of sale: 2001 - 2002 (b02)	6,909.55	1.33	8,084.76	1.89*	7,912.07	1.86*
Date of sale: 2002 - 2003 (b03)	-7,614.72	-1.34	5,029.45	1.07	5,399.17	1.16
Date of sale: 2003 - 2004 (b04)	17,898	3.32***	27,192	6.11***	27,301	6.16***
Date of sale: 2004 - 2005 (b05)	30,825	5.60***	38,963	8.57***	38,842	8.58***
Date of sale: 2005 - 2006 (b06)	53,207	9.77***	60,606	13.30***	60,766	13.41***
Date of sale: 2006 - 2007 (b07)	55,484	9.93***	70,300	14.98***	69,787	14.98***
Date of sale: 2007 - 2008 (b08)	41,958	7.11***	60,919	12.32***	61,335	12.48***
Date of sale: 2008 - 2009 (b09)	21,941	3.58***	46,838	9.05***	46,534	9.04***
Date of sale: 2009 - 2010 (b10)	4,726.96	0.78	26,954	5.20***	26,875	5.23***
Date of sale: 2010 - 2011 (b11)	-1,940.46	-0.31	26,435	4.99***	26,379	5.03***
Date of sale: 2011 - 2012 (b12)	2,183.95	0.36	27,367	5.17***	27,513	5.25***
Date of sale: 2012 - 2013 (b13)	4,314.84	0.61	32,090	5.27***	32,222	5.35***
Additional Features in Gated community			-10,316	-2.71***	-10,087	-2.70***
Full Baths Fixtures			6,722.53	5.51***	6,834.50	6.05***
Half Baths Fixtures			88.49	0.07		
Lot Square Footage			-0.02	-0.29		
Age			-1,344.34	-9.42***	-1,333.78	-10.10***
Number of Stories			-1,837.70	-0.94		
Area of a gunite swimming pool			2.48	0.94		
Area of a vinyl swimming pool			2.86	0.97		
Area of a fiberglass swimming pool			-8.34	-1.00		
Area of a concrete swimming pool			66.90	4.71***	66.68	4.73***
Number of pre-fabricated fireplaces			1,125.84	1.14		
Area of a cabana			39.82	2.35**	39.13	2.33**
Crawl space (1/0)			17,557	3.30***	17,264	3.26***
Area of carport			13.00	1.30		
Area of garage			16.29	3.20***	14.26	3.15***
Area of a stone patio			-11.33	-1.00		
Golf (1/0)			9,736.26	5.48***	9,677.53	5.51***
Stucco exterior wall (1/0)			13,553	2.14**	13,723	2.17**
Vinyl exterior wall (1/0)			26,541	1.70*	28,289	1.82*
Composite exterior wall (1/0)			17,553	0.67	19,791	0.75
Brick exterior wall (1/0)			18,475	3.46***	19,410	3.64***
Stone exterior wall (1/0)			65,893	3.09***	93,564	3.63***
Building style is Colonial (1/0)			6,150.64	2.23**	6,235.13	2.29**
Building style is English (1/0)			6,361.10	1.64	6,115.30	1.59
Building style is European (1/0)			5,703.75	1.73*	7,410.15	2.28**
Building style is Old Style (1/0)			15,281	2.69***	15,030	2.67***
Building style is Ranch (1/0)			-1,751.53	-0.15	-2,357.46	-0.21
Building style is Raised Ranch (1/0)			-32,062	-2.45**	-30,125	-2.33**
Building style is Cape Cod (1/0)			33,819	1.88*	34,020	1.89*
Building style is Contemporary (1/0)			-20,030	-2.15**	-17,080	-1.81*
Total living area			14.70	6.92***	14.78	7.17***
Total Living Area * Good construction (1/0)			6.17	8.63***	5.92	8.32***
Total Living Area * Good Plus construction (1/0)			11.24	12.26***	11.10	12.18***
Total Living Area * Very Good Minus construction (1/0)			13.71	12.51***	13.48	12.39***
Total Living Area * Very Good construction (1/0)			30.67	14.64***	29.74	14.41***
Total Living Area * Best construction (1/0)			48.17	21.26***	47.32	21.46***
Special warranty deed (1/0)			-61,938	-24.28***	-62,706	-24.60***
Trustee deed (1/0)			-52,685	-20.93***	-52,835	-21.04***
Waterfront property (1/0)			2,555.11	0.41		
Location 1			-44,664	-11.53***	-44,406	-11.90***
Location 2			-19,162	4.54***	-20,335	-5.08***
Location 3			-27,395	-5.84***	-28,534	-6.46***
Location 4			-41,139	-9.32***	-40,960	-9.65***
Location 5			-35,744	-7.70***	-36,353	-8.13***
Location 6			-15,779	-3.26***	-14,539	-3.13***
Location 7			-20,165	-4.64***	-21,596	-5.24***
Location 9			-7,752.04	-1.34	-7,882.07	-1.43
Location 10			17,246	2.16**	13,961	1.83*

***, **, * indicate significance at the 0.01, 0.05 and 0.10 level respectively

Figure 1: Example of Gated and Non-gated Community Location

The gated neighborhood “Chapel Creek” is in red. Comparable neighborhood is in green

Figure 2: Property Values in Gated Vs. Non-gated Communities 2000-2012.



High End Gated Vs. High End Non-Gated Communities				Low End Gated Vs. Low End Non-Gated Communities			
Ho:	F-stat	Probability> F	2-tail Level of Significance	Ho:	F-stat	Probability> F	2-tail level of significance
hgb01=hngb01	38.09	0.0001	99%	lgb01=lngb01	0.7	0.4025	
hgb02=hngb02	4.39	0.0363	90%	lgb02=lngb02	2.17	0.1411	
hgb03=hngb03	0.08	0.7789		lgb03=lngb03	2.36	0.1245	
hgb04=hngb04	16.72	0.0001	99%	lgb04=lngb04	4.15	0.0416	90%
hgb05=hngb05	15.51	0.0001	99%	lgb05=lngb05	0.08	0.7783	
hgb06=hngb06	118.22	0.0001	99%	lgb06=lngb06	4.7	0.0301	90%
hgb07=hngb07	10.85	0.001	99%	lgb07=lngb07	0.1	0.7463	
hgb08=hngb08	32.78	0.0001	99%	lgb08=lngb08	7.98	0.0048	99%
hgb09=hngb09	1.71	0.1908		lgb09=lngb09	0.11	0.7385	
hgb10=hngb10	1.77	0.1831		lgb10=lngb10	0.89	0.3464	
hgb11=hngb11	1.31	0.252		lgb11=lngb11	1.2	0.2728	
hgb12=hngb12	6.04	0.014	95%	lgb12=lngb12	0.03	0.8739	

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[1] See, for example, Atkinson and Blandy (2005), Blandy, Lister, Atkinson and Flint, (2004), McKenzie, (1994), and Blakely and Snyder, (1997).

[2] See Webster, C., G. Glasze, and K. Frantz (2002), Maher (2006), Sabatini and Salcedo (2007), Hirt and Petrovic (2011), Atkinson and Flint (2004), Wu and Webber (2004), and Blinnikov et al. (2006).

[3] Previous study by Hughes and Turnbull (1996) uses hedonic pricing model to find that presence of various deed restrictions imposed by separate subdivisions (possibly HOA's) is positively capitalized into property values. Rogers (2010) further confirms a positive impact of deed restrictions on housing prices while controlling for other neighborhood characteristics. However, the author indicates that this positive impact disappears with the passage of time if restriction is not timely updated.

[4] In the Bryan and Colwell (1982) approach there is one variable to represent the beginning of each of the years in the analysis period. The two dummies closest to the sale date are assigned values that sum to unity, with the two values being proportionate in each case to the closeness of the sale to that year's beginning and end. The resulting estimated path of price is a point on a log linear function that moves smoothly from the beginning of each year to the beginning of the next year. Shifts in log linear slope occur only at the beginning of each new year. The system provides more annual flexibility than linear or quadratic movements, being essentially an unconventional piecewise linear technique, with nodes at each year end within the period analyzed.

[5] This approach was used by Spahr and Sunderman (1998), Sunderman and Birch (2002) and Spahr and Sunderman (2006).

[6] See Neter, Wasserman, and Kutner (1983) for a discussion of this concept.

[7] Removing the outliers resulted in an increase in adjusted R^2 from .8973 to .9157; however, all significant variables remained significant when outliers were removed. Removing sales outliers did not make a major change in results; however, since the objective of the model is to estimate the value of a gated community, it was our opinion that deleting the outliers improves the accuracy of the model even though coefficients may be biased relative to alternative coefficients estimated from the full sample.

[8] All of the gated and non-gated communities and additional amenities were carefully investigated/ matched using Google Maps. Also, the presence of additional amenities has been verified using Shelby County Assessor of Property 2012 Certified Roll data.

[9] Variance inflation factors, one for each explanatory variable, measure the extent to which variances of the estimated regression coefficients are inflated as compared to the variance if explanatory variables were not linearly related. The largest factor among the variables is used as the indicator of the severity of multicollinearity. For a discussion of VIF, see Neter et al. (1983).

[10] Do and Grudnitski (1995) find that single-family residential properties that are located adjacent to a golf course carry a sales price premium of 7.6% as compared to houses that are not located on a golf course. Grudnitski (2003) further investigates the value premium by golf course type. Shultz and Schmitz (2009) study the effect of different golf courses classified based on ownership and access characteristics on adjacent property values using GIS. They conclude that golf courses indeed have a positive effect on value of the adjacent single-family houses.

[11] Small Gated Community variable is assigned a value of 1 if gated community has between 38 and 42 houses, and 0 otherwise. Medium Gated Community variable is assigned a value of 1 if gated community has between 65 and 106 houses and 0 otherwise. Large Gated community variable is assigned a value of 1 if gated community has between 126 and 181 houses and 0 otherwise.

[12] The assessed value used is for 2012.

[13] This model is not reported but is available per request.

[14] In another application of dealing with possible serial autocorrelation of standard errors, Benefield et al. (2011) use clustering of standard errors on firm level technique in order to determine the impact of the limited service brokerages on selling price and time on the market of the property being sold. They find results similar to the original model used when standard errors were not clustered.

[15] Petersen (2009) provides and explains a set of alternative techniques to deal with biased OLS standard errors that arise when panel data is used in finance research. Specifically the author proposes clustering techniques using multiple dimensions in order to produce unbiased standard errors.

[16] Clustering by a much larger area - location instead of neighborhood has produced similar and consistent results in our analysis

[17]In contrast to “PROC REG” function in SAS with built-in capabilities of sub-functions automatically removing observations based on standard deviations and Cook’s distance (option “COOKD”), “PROC SURVEYREG” function lacks such capabilities therefore “manual” removal of such observations has been employed.

[18] Removing observations of Sale Price at 1% and 99% level has produced similar results - the estimates for explanatory variables were in the same direction and levels of significance have remained consistent.

[19] Alternatively, “PROC GENMOD” function in SAS has been used for clustering of errors and produced similar consistent results. Numbers are not reported but are available per request.