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Finding the Missing Premium: An Explanation of Home Values within Residential Community Associations

Jeremy R. Groves

ABSTRACT. *Supporters of Residential Community Associations (RCA) argue that one of the advantages of living in an RCA is an increase in property values. Using a unique dataset comprised of 124,878 home sales spanning ten years, this paper, in one of the first empirical studies of RCAs, finds that the higher home values believed to exist, while present in a comparison of means, disappear when characteristics are controlled for. The explanation of this unexpected result is that the gain from living within an RCA is hidden by the homogeneity of the homes within RCAs.* (JEL R21, R31)

I. INTRODUCTION

Residential Community Associations (RCAs) are becoming increasingly popular among newer residential subdivisions. The Community Associations Institute (CAI) estimates that the number of RCAs has doubled each of the last three decades. As of 2003, it is estimated that over 19.9 million homes (more than 15% of the U.S. housing stock) are located within some type of RCA development (CAI 2000) and explanations for this growth vary. Developers argue that RCAs allow them to differentiate their product by varying the rules governing the development and services offered by the RCA (McKenzie 1994). The CAI website cites the increased popularity of RCAs as an increased desire to "protect home values, provide affordable ownership opportunities, [and] help meet the increased privatization of services as local governments cut back."[1] A paper by F. Frederic Deng argues that the increase in RCAs is attributed to the existence of a holdout problem to new development between homeowners and local government created by public zoning laws that is best solved through the private zoning that is the cornerstone of RCAs (Deng 2003).

Whatever the reason for the use of Residential Community Associations in many newer residential developments, a known fact is that they are growing at a substantial rate. The CAI estimates that almost 60% of all new construction is part of some type of RCA and that many of those developments are providing members with several goods classified as local public goods (CAI 2000). Furthermore, the increase in the popularity of RCAs has peaked interest in the use of RCA type institutions as a means for urban renewal or privatization of government provision of public goods (Nelson 2005). Before these institutions can be suggested as methods of economic or political reform, it is necessary to fully understand their current impacts, both intended and unintended, on the local economy.

A small group of studies, both in the economics and popular literature, have looked at the impact of RCAs on local communities either analytically or anecdotally. Foldvary (1994) looks at several case studies of the RCA acting as a private provider of public goods. Two articles by

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[1] http://www.caionline.org.

Helsley and Strange (1998, 2000) focus on the potential competition between the RCA and local government in the provision of public goods and its effect on welfare and levels of public good provision. Blakely and Snyder (1997) look specifically at gated communities in the urban landscape and find they tend to secede, either literarily or figuratively, from the larger community due to a sense of separation created by the gates and walls. Helsley and Strange look at a model of gated communities and their role in crime prevention (Helsley and Strange 1999). The model predicts that while crime is diverted to other communities, gated communities do have a negative effect on crime rates as a whole, under certain conditions. The only current empirical work focusing specifically on RCAs is a 2004 paper analyzing the effect of RCA assessments, involvement, and service provision within six RCAs located in the State of Virginia (Langbein and Spotswood-Bright 2004). The authors find that RCAs governed by members tend to charge higher assessments and provide larger quantities of services than those governed by management agencies. A pair of papers by Hughes and Turnbull (1998a, 1998b), while not looking at specifically RCAs, test the willingness-to-pay for restrictive covenants, the enforcement of which makes up a large portion of the role of RCAs. In these papers, the authors find that people are willing to pay a premium for homes that are subject to certain restrictions and this premium increases when the strictness of the restrictions increase.

This paper begins to fill the gap in the empirical literature concerning RCAs by testing the assertion that RCAs increase the value of homes located within them. Proponents of RCAs argue that the rules and regulations set forth by RCAs protect residential investments, provide residents with well maintained and planned developments, and services at a lower cost.[2] If this is the case, then these factors should be capitalized into the value of RCA properties resulting in, all else equal, RCA properties commanding a higher price than homes not located within an RCA.[3] A unique dataset is created by merging Geographic Information Systems information with manually collected RCA data is created for Saint Louis County containing 124,878 observations spanning ten years of home sales (1992–2001). This data is used to estimate a hedonic price function for housing including both homes within and outside of RCAs.

The results show that, while there is a positive and significant difference in the observed mean values between RCA and non-RCA homes, once other factors are controlled for, the average home will see either no change or a very small, and sometimes negative, change in value when placed in an RCA development. The RCA effect is smaller still when spatial autocorrelation and endogenous variable bias in the data are controlled for using methods proposed by Pace et. al. (1998) and Kelejian and Prucha (1998). In an effort to reconcile these results with the theoretical expectations and beliefs of consumers, the value of certain housing characteristics are allow to differ by whether they are located within an RCA or not. With these specifications the results show that while there may be some initial positive impact from locating within an RCA, the net RCA effect is found to be almost zero due to the homogenous nature of the RCA development. More specifically, the results show that the most commonly occurring house style in the data sees a net decrease in value of about 8% when placed in an RCA while the least commonly occurring housing style sees a 19% increase in value.

The remainder of this paper is outlined as follows. Section 2 gives a brief introduction to the institutions of RCAs and an informal theory as to the expected impact of placing a home within an RCA. Section 3 outlines the statistical techniques for the model estimated and Section 4 reviews the data.

[2] http://www.caionline.org.

[3] For a review of the capitalization literature see Yinger et. al.(1988).

Section 5 reports the results of the empirical analysis and section six concludes with general comments and prospects for future research.

II. ECONOMIC IMPACT OF RESIDENTIAL COMMUNITY ASSOCIATIONS (RCAS)[4]

Residential Community Associations (RCAs) are a type of Common Interest Development (CID) and are also known as Homeowners Associations (HOAs) or private governments. Residential Community Associations (as they are hereafter referred) are generally governed by a board of trustees made up of residents who own homes within the given residential development. Authority is granted to the board via the Covenants, Conditions, and Restrictions (CC&Rs) that are filed with the local municipality when the development plans are submitted for approval. Covenants, Conditions and Restrictions have been attached to developments for many years and generally contain information regarding the land upon which the development is built and any restrictions or easements[5] on the property. The CC&Rs also create the RCA board of trustees, determine the rights and responsibilities of the board, sets up the institutions governing the board, and sets the rules regarding the annual membership assessment and provision of services by the RCA. These boards generally have two primary jobs: the provision and management of common areas and elements (hereafter referred to as public good provision), and the enforcement of the deed restrictions tied to the parcels that make up the subdivision.

Early RCA public good provision was limited to street maintenance in an attempt to compensate for the poorly maintained streets of the municipality.[6] Over time, RCA public good provision has expanded to include goods such as green spaces, gates and walls, trash collection, water provision, and other common-use amenities (McKenzie 1994). A survey conducted by the CAI in 2000 shows that more than half of developments with 150 or more housing units provide swimming pools and/or clubhouses for use by the residents and many developments of all sizes provided members common areas such as playgrounds, park areas, and/or lakes. Other commonly provided services include trash collection and street and sidewalk maintenance. The public goods provided by the RCA are excludable to non-residents but are truly public goods for the residents of the association and are funded by annual assessments that are provided for in the CC&Rs filed with the land.

The literature on capitalization, surveyed by Yinger et. al. (1988), shows that the public goods provided to residents of any neighborhood will be incorporated into the value of homes within that neighborhood. While the literature is unable to show full capitalization in all cases, there is an agreement that desired public goods will increase the value of homes that have access to those public goods. It then follows that any type of public good to RCA members should increase the value of their property compared to non-RCA homes that do not have access to those same public goods. One might also expect a more clear capitalization of RCA public goods compared to public good provided by the government given the clearly defined geographic scope of their direct benefits.

Another role of the RCA board is the enforcement of the deed restrictions imposed on the land by the developer. Hughes and Turnbull (1996b) show that the existence of neighborhood externalities and their uncertainty can reduce the value of

[4] This is a summary of information from a variety of sources including McKenzie (1994), CAI Web site, information gathered during the data collection stages of this project by the author, and the author's own experience with RCAs.

[5] An easement is a right-of-way granted to either the municipality or utility service by the owner of a parcel of land to allow for the construction of infrastructure.

[6] This is common in older RCAs found in St. Louis County. Much of the historic literature cites St. Louis as one of the birthplaces of RCA type developments.

homes located in a given neighborhood. The authors also show, both analytically and empirically using data from Louisiana, that deed restrictions can lower this uncertainty and thus increase the value of homes. The key is the strictness of the restrictions which includes the likelihood that it will be enforced. Without a board of directors or some other group with the defined purpose and supplied resources to enforce the restrictions, it is up to the individual landowners to enforce the CC&Rs via the court system, which imposes high costs on the individual landowners seeking to enforce the restrictions. The boards that control RCAs are specifically given the task of the enforcement of the restrictions and are granted the power to impose monetary penalties for the violation of the CC&Rs. Furthermore, the courts have expressed, through precedent, full support of this power of RCA boards. The boards are also granted the resources to enforce the restrictions via the annual assessments charged to members.[7] Therefore, it should be more likely that members of an RCA development will adhere to the CC&Rs and thus limit neighborhood externalities more so than non-members. This, therefore, increases the strictness of the restrictions and, according to the Hughes and Turnbull model, should increase the value of homes located within an RCA.

III. THE HEDONIC PRICE FUNCTION AND THE ROLE OF GEOGRAPHIC SPACE

If one wishes to determine the price, demand parameters, or supply parameters of a good, one need only look at the market for that good. This becomes difficult, however, if the good in question is a component of a larger good and has no explicit market in and of itself. Such is the nature of the housing market. If one is interested in the price of an additional bedroom, for example, one can not look at the market for bedrooms given that the market does not exist. One method to determine the equilibrium price of a bedroom implicitly is to estimate the hedonic price function. The hedonic price function expresses the price of the composite good as a function of its individual components and, in the housing market, takes the form:

$$P_j = f(\mathbf{C_j}, \mathbf{N_j}), \quad [1]$$

where

P_j = price of the home j;
$\mathbf{C_j}$ = a vector of characteristics for home j;
$\mathbf{N_j}$ = a vector of characteristics for the location within which home j is located.

Rosen (1974) shows that the hedonic price function estimates the locus of all of the price-quantity pairs where the consumer's bid function is tangent to the producer's offer function. The coefficients from the empirical estimation of equation [1] yields the equilibrium price of the given attribute or component.[8] If there is a positive, nonzero price for the attribute (in this case, living in an RCA), then a homeowner searches for that attribute when purchasing a home. If, however, the value is zero or negative, the homeowner either does not consider that attribute in their housing decision or considers the attribute to be a "bad" respectively.

A problem faced when estimating the hedonic price function for the housing market is that the location of a given

[7] In many cases, the maximum amount the board can assess a member in any given year is explicitly stated in the CC&Rs and generally requires the approval of a supermajority of the residents to increase that maximum. It is, however, becoming more common (especially during the late 1990s) for CC&Rs to tie the maximum assessment to a measure of inflation such as the CPI.

[8] These coefficients can then be used to determine the parameters of the demand or supply function for that particular attribution in which case a series of identification issues are noted by Bartik (1987) and Epple (1987). Given that only the marginal price of the good is of interest, the identification concerns are not addressed in this paper.

observation in space must be addressed or the results will suffer from spatial autocorrelation. When using OLS estimation it is assumed that the error terms are independent of each other yielding zeros on the off-diagonal of the covariance matrix. In the housing market, however, the sale price of a home is not only a function of the characteristics of the home itself, its neighborhood, and the preferences of the potential homeowner, but is also a function of the attributes of nearby homes. Failure to account for these surrounding homes in the hedonic price function results in the dependency of the error terms across observations and thus autocorrelation caused by "space." The resulting coefficient estimates of the hedonic price function are biased and the standard errors are incorrect.

One method of addressing this problem is to include some sort of general "neighborhood" control variable. The main problem with this method is the question of how to define a neighborhood. One way is to use some type of political or geographic boundary as a means for defining a neighborhood. Possible candidates include city boundaries, school district borders, or some level of census data area. For the purposes of this paper, all three are used with the census data area being defined as the block group. One complaint with this solution is that these borders are somewhat arbitrary and may not capture more localized property effects.

Another solution to the problem of localized effects is to spatially lag the dependent variable as one would temporally lag a dependent variable in a time series analysis. Several methods of spatially lagging the dependent variable are discussed in Anselin (1988), however, for the purpose of this paper, a spatial weight matrix is used that denotes an observation's 15 closest neighbors based on Euclidean distance. After using this matrix to spatially lag the dependant variable and adding this to the hedonic price function, it predicts price as a function of a home's own characteristics, its neighborhood, and a weighted average of the sale price of its 15 nearest neighbors.[9]

If the data being used covers more than just one year of sales, the creation of the weight matrix is complicated slightly. If the weight matrix is created using typical methodology, it is possible that a price from an observation sold in 2001 will be used to determine the price of a home sold in 1979. Clearly, this temporal inconsistency is unacceptable and must be controlled for.[10] An article by Pace et al. (1998) uses the STAR (spatiotemporal autoregressive) class of models where the spatial weight matrix is created by first sorting the observations by date of sale from oldest to most recent. The distance between the current observation and all previous observations is calculated and used to create the weight matrix. This new matrix is used in place of the typical weight matrix and denotes an observation's 15 nearest neighbors sold in the current or previous years. The spatial weight matrix (S) is then multiplied by the variable to be spatially lagged and the first m observations are removed to ensure that the observations listed as neighbors are, in fact, located close to the current observation.[11]

In addition to the autocorrelation among the error terms, most spatial data also exhibit heteroskedasticity. Several estimators exist to produce consistent estimates in the presence of heteroskedasticity; however, the size of the data set used for this paper renders those methods unusable.[12] For the

[9] It should be noted that other weighting schemes were investigated including using more neighbors or fewer neighbors and the results were not significantly different. Also investigated, but not shown, was the use of various definitions of how the localized effects impacted the error term. Those tests showed that using the spatially lagged dependent variable yielded the best fit to the data and is the most natural specification given the nature of the housing market.

[10] Anselin (1988) surveys several space-time models. However, these methods are only suited for panel data. Obtaining a panel with home sales severely limits the number of observations.

[11] For the purpose of this paper, $m = 2{,}499$. Altering this value does not change the final results.

[12] The complication comes from attempting to invert a matrix with over 100,000 columns and rows.

purpose of this paper the GMM estimation technique proposed by Kelejian and Prucha (1998) is used. This methodology calls for the hedonic price function to be estimated using a two-stage, least squares process with a set of instruments composed of the characteristics of an observation and a spatial lag of those characteristics.

A final spatial concern is that of spatial heterogeneity or the case where the coefficients of some variables differ by location. A detailed discussion can be found in Anselin (1988) with an empirical application found in Can (1990) where an expansion equation is added to the model to capture the spatial drift of several variables. The expansion equation allows the hedonic equation to yield a direct effect from a given characteristic and a marginal effect for that characteristic in a specific location. For the purpose of this paper, the characteristics of a home are interacted with the RCA variable to determine whether characteristics are valued differently when that home is located within an RCA as a result of the relatively homogenous nature of RCA developments. Once these concerns are introduced to the hedonic model, the final model is defined as

$$P_j = f[\mathbf{C_j}, \mathbf{N_j}, SP, g(\mathbf{C_j})], \qquad [2]$$

where

$P_j\ \mathbf{C_j}, \mathbf{N_j}$	defined as before;
SP	spatially lagged dependent variable;
$g(\mathbf{C_j})$	expansion equation measuring marginal valuation of the characteristics (in this case an interaction with the RCA variable).

IV. HOUSING OBSERVATIONS FROM SAINT LOUIS COUNTY, MISSOURI

The Integrated Assessment System (IAS) Database

The data used in this study includes all single family, detached homes sold in Saint Louis County, Missouri, between 1992 and 2001. The house characteristics and sales data are taken from the Saint Louis County Department of Revenue's 2002 Integrated Assessment System (IAS) database. This database includes the assessment information for all properties located within the county and also includes most of the sales data from 1979 until 2001. The public use database also includes several characteristic variables and uniquely identifies each home by use of a parcel identification number.

The initial IAS database includes about 330,000 properties. Once the database is limited to single family, detached housing units, the database contains 267,806 observations. The data is limited further to include only homes with a reported valid sale in the IAS database[13] bringing the observation count to 226,572. Due to computer limitations in compiling the spatial weight matrix, the sample was further restricted to homes sold in 1992 or later bringing the final observation count to 124,878.

The RCA Database

To determine if a home is located within a Residential Community Association, it was necessary to undertake an original data gathering effort to construct a database of RCAs. Formally, a subdivision is defined as having an RCA if a board of trustees is created by the CC&Rs and if there is an annual assessment charged to residents of the subdivision.[14] Using the IAS database, a list of subdivisions containing 10 or more homes was compiled and investigated to

[13] The sales database includes information on who reported the price (i.e., buyer, seller, agent) and whether the price and sale has been validated. Only those observations that were recorded as having been validated are included in this paper.

[14] This is to differentiate an RCA from a subdivision with either CC&Rs and an architectural control committee or subdivisions with only CC&Rs and no enforcement group. In the case of an architectural control committee, the committee is used to approve floor plans and designs for homes during a new construction phase. For many of these committees, the developer or their appointees serve as the members and no institutions are in place for the continuation of the committee once the developer vacates. The case of a subdivision with CC&Rs and no formal enforcement groups is discussed in the literature on restrictive covenants.

determine if a CC&R was on file and, if so, whether it created an RCA as define previously.[15]

There are a few possible sources of measurement error inherent in this process. First, a subdivision may have been excluded due to the "ten units or less" criteria. It is not impossible for a subdivision to be both an RCA and have fewer than ten units. If one believes that these smaller RCAs are easier to control due to their small membership, then not including these observations in the sample will result in the RCA coefficient being understated. Secondly, if there was an error on the part of the Recorder of Deeds office in maintaining their catalog, then subdivisions with RCAs may not be included as RCA developments or subdivisions that have dissolved their RCA may be included in the sample as RCA developments. Given the conflicting effect that this type of error may have on the coefficient estimates, it is impossible to determine whether this error overstates or understates the RCA effect. Unfortunately, due to the massive number of subdivisions in the IAS dataset and the lack of official record keeping regarding RCA status or board membership, there is no effective way to control for these sources of error and they must therefore be kept in mind when interpreting the results.

Saint Louis County Preliminary Data Analysis

Table 1 shows the summary statistics for the housing characteristics[16] used in the estimation of the hedonic price function. The first set of columns shows the summary statistics for the full sample. The average home is about 28 years old when it is sold and has a full basement with no attic and is one story with three bedrooms and almost two full bathrooms. Twenty-eight percent of the homes are aluminum construction while about 25% of the homes are brick and 20% of the homes are wood frame construction. Just over 40% of the homes are ranch style while another 32% are classified as "other." The average sale price for a home in St. Louis County over the period 1992–2001 was $96,339. The second and third columns break the full sample into RCA and non-RCA only sub-samples. Residential Community Association homes are shown to sell, on average, for about $114,483 over the ten-year period covered by the data, while non-RCA homes only sold for an average price of $77,810. A difference of means test shows that this difference is statistically significant at the one percent level. Table 2 shows the average sale price for each of the sub-samples in each of the years included in the data. In each year RCA homes sold for a significant premium over non-RCA homes. Another interesting observation from Table 2 is that the RCA sub-sample accounts for about 50% of the observations in each year of the data.

Looking at the characteristic means between the two sub-samples yields a first glimpse into a possible explanation for the large difference in the sale price of the two types of homes. One possible explanation is that RCA homes tend to be younger at the time of sale with an average age of 18 years, whereas non-RCA homes are twice as old at 39 years when sold.[17] Since age has a negative effect on the price of a home, it is no surprise that non-RCA homes should sell for a lower price, on average than an RCA home. A second important observation is that RCA homes tend to be larger than non-RCA homes along several measures. There tend to be fewer one-story homes in the RCA sub-sample and those homes tend to have more bedrooms, more full and half bathrooms, and have a family room. Residential Community Association homes also tend to have a fireplace more frequently then homes not located within an RCA.

[15] There are approximately 3,520 subdivisions with ten or more units in Saint Louis County.

[16] A complete list of summary statistics including school district and city variables is available from the author upon request.

[17] This shows that RCA homes tend to be newer; however, if one looks at the range of ages, RCA homes range from zero to 175 years old and non-RCA homes range from zero to 169 years old.

These differences in the attributes included in the home will also result in differences in the final sale price of the homes.[18]

Regarding the style of home in each of the sub-samples, there is not much of a difference. The ranch and other styles are the most common across both sub-samples with there being slightly more ranch style homes in the non-RCA sample and slightly more homes classified as other in the RCA sub-sample. Of interest is that the third most common non-RCA home style, the bungalow, appears less than one-sixth as often in the RCA sample than in the non-RCA sample. Other than these differences, the remaining housing styles are about equally represented across the sub-samples. The most glaring difference in housing construction across the sub-samples is the fact that 50% of the homes in the RCA sub-sample are of either frame or masonry construction whereas only 30% of the non-RCA sub-sample are of these types. Another 37% of the non-RCA homes are of block construction compared to only 15% of the RCA homes. While there may be some endogenous variable bias regarding a home being part of an RCA and the type of construction material used (as dictated by the CC&Rs), these characteristics do not play a major role in the results and it is thought that any problem would be minimal based on the low occurrence of this type restriction in the CC&Rs used for this study likely do the fact that construction material is more a measure of the preferences of the developer or contractor building the home.

Also included in the data are the average characteristics of the homes in the census block groups that the homes are located in. Which block group a home is located in was determined using Geographic Information Systems (GIS) software and maps provided by the St. Louis County Department of Planning. These census variables are used to serve two purposes in the analysis. The first is as an added control for unobserved localized housing price factors. For this purpose, the variables used include average home value, average age of home, average size, percentage of owner tenure, and vacancy percentage. The second use of the census variables is to control for the preferences of individuals residing in the homes being studied. For this purpose, the variables used include the percentage white, percentage black, percentage married, percentage married with children, percentage single mothers, median household income, percentage of homes with social security income, percentage of homes with public assistance income, and per capital income. The summary statistics for these variables are shown in Table 3.

V. THE EFFECT OF RCAS ON HOME VALUES

Estimation without Characteristic Drift

The base model estimated to determine the effect of RCA control on a home is[19]

$$\ln \mathbf{P} = \alpha + \sum \beta_j \mathbf{C_j} + \sum \delta_j \mathbf{Year_j} + \sum \phi_j \mathbf{L_j} + \sum \eta_j Census_j + \gamma\, \mathbf{RCA} + \varepsilon, \quad [3]$$

where

$\mathbf{P}$ = a vector of observed home sale prices adjusted to 1982–1984 dollars;
$\mathbf{C_j}$ = a vector of home characteristics;
$\mathbf{Year_j}$ = a vector denoting the year the home was sold;
$\mathbf{L_j}$ = a vector of location characteristics measured by either the school

[18] While not shown, a difference of means test is performed on the RCA and non-RCA sub-sample means and all of the means are significantly different at the 5% level.

[19] One of the major concerns when estimating the hedonic price function is the choice of functional form. While there is not theoretical motivation for the functional form used simulations by Cropper, Deck, and McConnell (1988) show that in the presence of missing variable bias, the semi-log functional form is just as actuate as other methods.

TABLE 1
SUMMARY STATISTICS

	Full Sample N = 124,878				RCA Subsample N = 63,101				Non-RCA Subsample N = 61,777			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Price (adjusted)	96,336.27	79,682.86	1,571.84	2,043,143.00	114,482.60	77,654.47	8,266.78	1,591,201.00	77,801.05	77,430.82	1,571.84	2,043,143.00
RCA	0.51	0.50	0	1	1.00	0.00	1	1	0.00	0.00	0	0
Split Foyer	0.03	0.18	0	1	0.05	0.21	0	1	0.02	0.15	0	1
Split Level	0.01	0.11	0	1	0.01	0.10	0	1	0.01	0.11	0	1
Ranch	0.42	0.49	0	1	0.40	0.49	0	1	0.44	0.50	0	1
Contemp	0.01	0.10	0	1	0.01	0.11	0	1	0.01	0.08	0	1
Old Style	0.05	0.21	0	1	0.02	0.13	0	1	0.08	0.27	0	1
Bungilow	0.09	0.28	0	1	0.02	0.15	0	1	0.16	0.36	0	1
Colonial	0.02	0.12	0	1	0.02	0.13	0	1	0.01	0.12	0	1
Cape Cod	0.01	0.08	0	1	0.00	0.05	0	1	0.01	0.10	0	1
Other	0.32	0.47	0	1	0.40	0.49	0	1	0.24	0.43	0	1
PUD	0.03	0.17	0	1	0.05	0.21	0	1	0.01	0.10	0	1
Conventional	0.02	0.13	0	1	0.02	0.16	0	1	0.01	0.10	0	1
No Attic	0.93	0.25	0	1	0.96	0.19	0	1	0.90	0.29	0	1
Unfin. Attic	0.01	0.11	0	1	0.00	0.07	0	1	0.02	0.14	0	1
Partly Fin. Attic	0.02	0.12	0	1	0.01	0.08	0	1	0.02	0.15	0	1
Full Fin. Attic	0.02	0.15	0	1	0.01	0.11	0	1	0.03	0.18	0	1
Wall Ht Attic	0.01	0.12	0	1	0.01	0.11	0	1	0.02	0.13	0	1
No Basement	0.05	0.21	0	1	0.03	0.16	0	1	0.06	0.25	0	1
Crawl Space	0.00	0.05	0	1	0.00	0.03	0	1	0.00	0.06	0	1
Partial Basement	0.02	0.15	0	1	0.01	0.12	0	1	0.03	0.17	0	1
Full Basement	0.93	0.25	0	1	0.96	0.20	0	1	0.90	0.30	0	1
Age At Sale	28.40	21.50	0	175	18.06	16.40	0	175	38.96	20.96	0	169
(Age At Sale)^2	1,268.93	1,601.13	0	30,625	594.93	920.28	0	30,625	1,957.38	1,838.24	0	28,561
# Stories	1.29	0.46	1	3	1.40	0.49	1	3	1.19	0.39	1	3
# Bedrooms	3.14	0.79	0	9	3.38	0.71	1	9	2.89	0.79	0	9
# Family Rooms	0.55	0.51	0	3	0.70	0.47	0	3	0.41	0.50	0	2
# Full Bath	1.75	0.69	0	8	1.99	0.63	0	7	1.50	0.67	0	8
# Half Bath	0.47	0.55	0	6	0.57	0.56	0	4	0.36	0.53	0	6
Add Fixtures	0.64	1.12	0	11	0.92	1.25	0	11	0.36	0.89	0	9
# Fireplace Openings	0.38	0.63	0	8	0.39	0.65	0	8	0.36	0.62	0	8
# Fireplace Stacks	0.33	0.53	0	5	0.34	0.53	0	4	0.33	0.52	0	5
# Fireplaces	0.35	0.52	0	7	0.49	0.55	0	5	0.20	0.43	0	7

table continued on following page

TABLE 1 *Continued*

	Full Sample N = 124,878				RCA Subsample N = 63,101				Non-RCA Subsample N = 61,777			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Frame	0.20	0.40	0	1	0.26	0.44	0	1	0.15	0.35	0	1
Brick	0.26	0.44	0	1	0.15	0.36	0	1	0.37	0.48	0	1
Masonary	0.18	0.39	0	1	0.24	0.43	0	1	0.12	0.33	0	1
Block	0.00	0.03	0	1	0.00	0.01	0	1	0.00	0.04	0	1
Stucco	0.01	0.08	0	1	0.00	0.05	0	1	0.01	0.10	0	1
Aluminum	0.29	0.45	0	1	0.31	0.46	0	1	0.27	0.44	0	1
Stone	0.00	0.05	0	1	0.00	0.02	0	1	0.00	0.06	0	1
Asbestose	0.06	0.24	0	1	0.04	0.19	0	1	0.08	0.27	0	1
Concrete	0.00	0.01	0	1	0.00	0.01	0	1	0.00	0.01	0	1

Note: Italics denotes a dichotomous variable. Sale price in terms of 1982–84 dollars.

TABLE 2
AVERAGE SALE PRICE AND DIFFERENCE OF MEANS TESTS SALE PRICE ($)

Year	Sample	Mean	Std. Dev.	N	p-Value	RCA (%)
1992	Non-RCA Only	75,899	64,389	6,304	0	53
	RCA Only	103,065	59,968	7,057		
1993	Non-RCA Only	79,246	80,805	6,389	0	51
	RCA Only	105,715	63,312	6,733		
1994	Non-RCA Only	75,660	71,189	7,111	0	51
	RCA Only	109,932	70,325	7,409		
1995	Non-RCA Only	74,048	72,738	5,939	0	51
	RCA Only	111,446	78,331	6,079		
1996	Non-RCA Only	76,729	78,041	6,573	0	51
	RCA Only	112,028	75,156	6,951		
1997	Non-RCA Only	78,458	74,343	6,385	0	52
	RCA Only	115,278	80,353	6,819		
1998	Non-RCA Only	77,592	77,360	8,257	0	49
	RCA Only	116,467	81,059	7,866		
1999	Non-RCA Only	77,269	73,902	8,060	0	48
	RCA Only	121,434	86,654	7,408		
2000	Non-RCA Only	82,364	96,397	5,764	0	50
	RCA Only	130,189	91,612	5,691		
2001	Non-RCA Only	100,758	109,844	995	0	52
	RCA Only	157,613	97,717	1,088		
Full Sample	Non-RCA Only	77,801	77,431	61,777	0	51
	RCA Only	114,483	77,654	63,101		

Note: assuming unequal variances.

district or the city in which the home is located;

$Census_j$ = and/or characteristics from the Census Block Group in which the home is located;

RCA = a vector with the element equal to one if the home is within an RCA.

As discussed previously, if there are unobserved neighborhood characteristics or location amenities that are not fully captured by the census characteristics or the variables for school district or city location, then the assumption that ε is i.i.d. is violated. To correct this effect, a spatially lagged dependent variable is added to

TABLE 3
SUMMARY STATISTICS FOR CENSUS VARIABLES

	Full Sample N = 124,878			
	Mean	Std. Dev.	Min.	Max.
Average value ($)	154,542.40	104,671.00	12,446.05	1,214,880.00
Average age	36.28	16.70	7.33	90.81
Average percentage of owner tenure	0.92	0.06	0.29	0.99
Average size	1,741.26	637.67	857.54	5,099.05
Percentage white	0.82	0.24	0.00	1.00
Percentage black	0.14	0.24	0.00	1.00
Percentage married	0.80	0.14	0.08	1.00
Percentage married w/ children	0.38	0.12	0.00	0.66
Percentage single mothers	0.15	0.27	0.00	7.40
Median household income ($)	63,907.39	29,194.30	17,227.00	200,001.00
Percentage of homes with SS income	0.25	0.11	0.02	0.72
Percentage of homes with PA income	0.02	0.03	0.00	0.23
Per capita income ($)	29,196.25	13,474.84	5,749.00	1,77,237.00
Percentage vacant	0.04	0.03	0.00	0.34

Source: Bureau of the Census, 2000 U.S. Census, by Census Tract Block Groups.

equation [3] yielding [4]

$$\ln \mathbf{P} = \rho \mathbf{SP} + \alpha + \sum \beta_j \mathbf{C_j} + \sum \delta_j \mathbf{Year_j} + \sum \phi_j \mathbf{L_j} + \sum \eta_j Census_j + \gamma \mathbf{RCA} + \varepsilon \quad [4]$$

where

ρ = the spatial autocorrelation coefficient;
S = a lower triangular weight matrix.

For the purpose of this analysis, each of the non-zero elements of S is set equal to 1/15 and denotes one of the 15-nearest neighbors sold before the current observation. Also, to allow the first observations to have as many neighbors sold before them as possible, the first 2,499 observations are removed after the vector **SP** is determined bringing the final count of observations used to estimate the hedonic price function to 122,379.[20] To control for possible endogenous variable problems, equation [4] is estimated using the GMM technique proposed by Kelejian and Prucha (1998) with the spatial lag of the housing characteristics added as instruments.

The results from the estimates of equations [3] and [4] using the school district boundary as a neighborhood control are shown in Table 4, which shows that most of the coefficient estimates are significant at the 10% level while many are significant at the 1% level.[21] The values and signs of the coefficients follow expectations within the housing market literature. Homes with split foyer, split level, bungalow or other style see lower sale values, while homes of the remaining styles see an increase in their sale value compared to those of the ranch style.

The coefficients for the type of attic and basement do seem to suffer from some inconsistencies in the estimates of equation [3] that may be due to a correlation with the style variable or the lack of information concerning the surrounding topography.[22] The relative size of the coefficients is more in line with expectations in last two columns corresponding to the estimation of equation [4], with and without census controls. The remaining coefficient estimates also follow expectation with results such as the age of a home decreases its value by about 1% per year and this rate increases over time. An added bedroom raises the value of the home by about 6% to 7%, an additional story adds about 4% and an extra bathroom adds between 11% and 17%, depending on the model specification. A brick home is valued between 7% and 12% higher than a wood-frame home and a stone home commands a premium between 15% and 19% higher than a wood-frame home. A home constructed from block or asbestos sees a decrease in value of about 8% and 3%, respectively.

The move from column one, where only school districts are used as a location control, to column two where census controls are also included tends to support the need to correct for spatial effects in the data given the increased R^2. This is supported further by the additional increases in the R^2 when the spatially lagged dependent variable is added to the model and the significance and magnitude of the spatial coefficient. Additional support for the use of these spatial controls is shown in the improvement of both the magnitude and relative sizes of the school district effects (not shown) when compared to the simple OLS estimates.

Of primary interest is the value added to a home if it is located within an RCA. Column one in Table 4 shows that residing in an RCA increases the value of a home by about 1.96%, all else equal. This equates to about a $1,507 increase in the sale price of

[20] It should be noted that this also does not change the mix of RCA and non-RCA observations within the sample. Of the 2,499 observations removed, 45% are from the non-RCA sample.

[21] This is a direct result of the large number of observations and independent variables in the estimation.

[22] This is an example of the possibility of spatial autocorrelation, especially concerning the existence and type of basement given that certain topographies are not ideal for the basements of various types. Topography is clearly a location specific variable that, in this analysis, is unobserved.

TABLE 4
SCHOOL DISTRICT FIXED EFFECTS (NO SPATIAL DRIFT)

	Column One		Column Two		Column Three		Column Four	
	No Spatial–No Interactions		No Spatial–No Interactions		Spatial–No Interactions		Spatial–No Interactions	
R^2	0.8755		0.9103		0.9271		0.9314	
N = 124,878								
Variable	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic
RCA	0.0196	12.46***	0.0119	8.75***	−0.0040	−3.24***	0.0020	1.68*
S15*Y					0.4971	213.84***	0.3891	124.97***
Constant	10.5529	1531.88***	9.5683	387.69***	5.1181	197.13***	5.8477	158.55***
Split Foyer	−0.1529	−40.94***	−0.1138	−35.66***	−0.0821	−28.13***	−0.0825	−29.04***
Split Level	−0.0524	−8.02***	−0.0504	−9.08***	−0.0254	−5.03***	−0.0335	−6.81***
Contemporary	0.0212	3.04***	0.0207	3.49***	0.0285	5.27***	0.0223	4.25***
Old Style	0.1068	23.60***	0.0571	14.74***	0.0584	16.67***	0.0407	11.89***
Bungalow	−0.0931	−33.76***	−0.0629	−26.52***	−0.0525	−24.51***	−0.0475	−22.57***
Colonial	0.1168	19.32***	0.0783	15.20***	0.0638	13.61***	0.0546	11.98***
Cape Cod	0.0793	9.46***	0.0302	4.24***	0.0412	6.33***	0.0196	3.10***
Other	−0.0543	−23.37***	−0.0434	−21.83***	−0.0432	−23.97***	−0.0365	−20.72***
PUD	−0.0029	−0.62	−0.0386	−9.71***	0.0054	1.50	−0.0226	−6.41***
Conventional	−0.0035	−0.63	0.0054	1.14	0.0289	6.71***	0.0159	3.78***
Unfin. Attic	0.0639	10.46***	0.0594	11.45***	0.0533	11.30***	0.0529	11.55***
Partly Fin. Attic	0.0386	7.03***	0.0443	9.51***	0.0407	9.55***	0.0433	10.47***
Full Fin. Attic	0.0384	8.14***	0.0451	11.25***	0.0442	12.11***	0.0451	12.73***
Wall Ht Attic	0.0027	0.47	0.0300	6.17***	0.0342	7.69***	0.0406	9.39***
Crawl Space	−0.0481	−3.48***	−0.0220	−1.87*	−0.0426	−3.99***	−0.0308	−2.97***
Partial Basement	0.1652	29.73***	0.1342	28.34***	0.1038	24.11***	0.1022	24.37***
Full Basement	0.1574	48.22***	0.1382	49.31***	0.1183	46.65***	0.1151	46.26***
Age	−0.0114	−84.54***	−0.0123	−101.99***	−0.0069	−65.21***	−0.0095	−87.56***
Age^2	6.5E-05	44.58***	7.2E-05	57.30***	4.1E-05	36.30***	5.6E-05	50.26***
# Stories	0.0508	17.82***	0.0373	15.33***	0.0399	18.04***	0.0345	16.04***
# Bedrooms	0.0726	56.69***	0.0619	56.71***	0.0591	59.46***	0.0573	59.25***
# Family Rooms	0.0717	43.96***	0.0535	38.14***	0.0416	32.69***	0.0430	34.56***
# Full Bath	0.1785	117.25***	0.1301	98.21***	0.1133	92.94***	0.1064	89.49***
# Half Bath	0.1047	66.15***	0.0762	56.30***	0.0692	55.97***	0.0625	51.96***
Add Fixtures	0.0784	85.87***	0.0608	77.25***	0.0433	59.51***	0.0429	60.25***
# Fireplace Openings	0.1279	38.48***	0.0997	35.20***	0.0837	32.39***	0.0802	31.92***
# Fireplace Stacks	0.1037	25.92***	0.0653	19.14***	0.0554	17.81***	0.0513	16.95***
# Fireplaces	0.0732	41.68***	0.0709	47.32***	0.0564	41.42***	0.0612	46.13***
Brick	0.1185	52.04***	0.0923	47.07***	0.0774	43.60***	0.0692	39.65***
Masonry	0.0582	26.98***	0.0501	27.14***	0.0362	21.58***	0.0355	21.68***
Block	−0.0837	−3.32***	−0.0552	−2.58***	−0.0918	−4.75***	−0.0707	−3.77***
Stucco	0.1379	16.97***	0.0919	13.31***	0.0785	12.46***	0.0627	10.26***
Aluminum	−0.0007	−0.36	0.0050	3.01***	0.0086	5.62***	0.0040	2.68***
Stone	0.1944	13.87***	0.1689	14.18***	0.1582	14.56***	0.1477	13.99***
Asbestos	−0.0328	−10.25***	−0.0236	−8.62***	−0.0119	−4.80***	−0.0195	−8.05***
Concrete	0.0557	0.77	0.0643	1.04	0.0657	1.18	0.0696	1.29
Census Block Groups	No		Yes		No		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	

Note: *t*-statistics are asymptotic.
* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

the average home. Estimating the same effect after including the location and preference controls with the census variables, this coefficient shrinks to 1.2%. Column three reports the results for equation [4] without census controls and column four shows the results from the same equation when census controls are included. In both cases the coefficient is essentially zero and its sign alternates from negative to positive between the two columns respectfully. These results are much smaller than expected and, in the case of column three, do not always have the expected sign.[23] Even if we choose not to fully accept the coefficients from the spatial estimations, the results in columns one and two do not display the expect magnitude of the impact of RCAs on home value that is predicted by theory or consumer beliefs.

A possible critique of these results is that using school district as a measure of locational characteristic is too coarse and is not accurately picking up the impact of government-funded public goods and programs. An alternative is to use the city boundary as a measure of locational characteristic, especially if one views the RCA as a solution to a public goods provision or hold-out problem.[24] In Saint Louis County there are 92 incorporated municipalities in addition to the un-incorporated areas of the county. The results from estimating equations [3] and [4] replacing the school district matrix with a matrix denoting the municipality within which the home is located is reported Table 5.[25] Table 5 shows that many of the direct characteristic effects vary in size compared to the results from Table 4 and the R^2 for the estimation of equation [3] is slightly larger than its counterpart in column one and there are no changes in the signs of characteristics and most are significant at the 1% level.

The results on the city variables (not shown) are also consistent with expectations regarding the effect city has on home values in Saint Louis County. The prime real estate in Saint Louis County is found in cities of Ladue and Clayton and the results show that homes within these cities, all else equal, see the largest increases in value. Areas in the northern part of the county are generally through to be less desirable and this is also seen in the results. Again when the equation is estimated using the census and spatial controls the relative size of many of the coefficients falls and are relatively more consistent with expectations, more are significant, and there are no sign changes. The coefficient on the spatially lagged variable is about the same size as in columns three and four as they were in Table 4 showing the presence of spatial autocorrelation in the model even when city is used as the location control variable.

The effect of living in an RCA when using the city as a location control increases in column one to 3.2%, or about $3,000. One may think this larger result, compared to its counterpart in Table 4, is likely due to the fact that using the city as a location control variable is more likely to allow the RCA variable to measure what it is actually doing; resolving failures of the local government in terms of building controls and public good provision. When the census controls are added, however, placing a home within an RCA only increases the value about 1.3% which is more consistent with the estimates from Table 4. This seems to imply that the city variables are not picking up enough of the "neighborhood" and/or consumer preferences when compared to school districts. When spatial autocorrelation is controlled for, the impact from living in an RCA is again about zero. The results from Tables 4 and 5 causes one

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[23] Care must be taken in interpreting the results from columns three and four given that they are assuming a specific from of spatial autocorrelation, however the assumed form does seem to be in line with the expectations in the housing market.

[24] A referee suggested also using both city and school district borders at the same time; however, this is not possible given that cities are completely contained within school district borders causing the independent variable matrix to not be of full rank.

[25] It should be noted that to avoid multicollinearity, unincorporated St. Louis County is withheld from the matrix.

TABLE 5
CITY FIXED EFFECTS (NO SPATIAL DRIFT)

	Column One		Column Two		Column Three		Column Four	
	No Spatial–No Interactions		No Spatial–No Interactions		Spatial–No Interactions		Spatial–No Interactions	
R^2	0.8758		0.9123		0.9254		0.9317	
N = 124,878								
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
RCA	0.0315	19.43***	0.0127	9.16***	0.0032	2.53***	0.0036	2.92***
S15*Y					0.4637	188.16***	0.3653	114.95***
Constant	10.4569	1578.08***	9.6312	380.18***	5.4388	200.20***	6.1121	160.58***
Split Foyer	−0.1030	−27.32***	−0.1104	−34.72***	−0.0677	−22.79***	−0.0829	−28.98***
Split Level	−0.0179	−2.73***	−0.0390	−7.10***	−0.0089	−1.74*	−0.0269	−5.48***
Contemporary	0.0133	1.91*	0.0204	3.47***	0.0275	5.00***	0.0223	4.24***
Old Style	0.0733	16.12***	0.0304	7.88***	0.0467	13.10***	0.0247	7.18***
Bungalow	−0.1119	−40.15***	−0.0769	−32.36***	−0.0603	−27.39***	−0.0572	−26.84***
Colonial	0.0707	11.64***	0.0594	11.62***	0.0451	9.47***	0.0429	9.39***
Cape Cod	0.0553	6.58***	0.0209	2.96***	0.0321	4.86***	0.0138	2.18**
Other	−0.0450	−19.23***	−0.0399	−20.21***	−0.0370	−20.14***	−0.0349	−19.75***
PUD	−0.0430	−9.30***	−0.0413	−10.49***	−0.0093	−2.56***	−0.0268	−7.61***
Conventional	−0.0011	−0.19	0.0071	1.49	0.0353	8.06***	0.0172	4.09***
Unfin. Attic	0.0779	12.73***	0.0635	12.34***	0.0602	12.58***	0.0558	12.17***
Partly Fin. Attic	0.0494	9.01***	0.0444	9.63***	0.0467	10.81***	0.0441	10.65***
Full Fin. Attic	0.0349	7.37***	0.0365	9.16***	0.0432	11.63***	0.0408	11.46***
Wall Ht Attic	0.0157	2.74***	0.0328	6.81***	0.0415	9.18***	0.0432	9.99***
Crawl Space	−0.0368	−2.66***	−0.0058	−0.50	−0.0417	−3.85***	−0.0213	−2.05**
Partial Basement	0.1585	28.41***	0.1292	27.46***	0.1077	24.59***	0.1023	24.32***
Full Basement	0.1513	45.79***	0.1373	49.00***	0.1215	46.76***	0.1176	46.80***
Age	−0.0138	−102.94***	−0.0123	−102.67***	−0.0084	−77.10***	−0.0098	−89.68***
Age^2	8.5E-05	58.64***	7.5E-05	59.95***	5.4E-05	47.27***	6.0E-05	53.50***
# Stories	0.0540	18.81***	0.0352	14.52***	0.0424	18.83***	0.0339	15.67***
# Bedrooms	0.0673	52.60***	0.0630	58.35***	0.0560	55.64***	0.0577	59.74***
# Family Rooms	0.0677	41.34***	0.0543	38.98***	0.0426	33.02***	0.0442	35.37***
# Full Bath	0.1570	102.12***	0.1266	96.49***	0.1088	88.20***	0.1056	88.94***
# Half Bath	0.0938	59.01***	0.0742	55.28***	0.0668	53.12***	0.0619	51.38***
Add Fixtures	0.0681	74.36***	0.0601	77.08***	0.0425	58.03***	0.0436	61.22***
# Fireplace Openings	0.1011	30.24***	0.0896	31.82***	0.0753	28.67***	0.0749	29.74***
# Fireplace Stacks	0.1100	27.41***	0.0709	20.90***	0.0636	20.12***	0.0560	18.47***
# Fireplaces	0.0941	53.31***	0.0713	47.65***	0.0637	45.67***	0.0622	46.41***
Brick	0.1145	50.16***	0.0856	43.79***	0.0808	44.90***	0.0667	37.97***
Masonry	0.0558	25.79***	0.0491	26.80***	0.0359	21.07***	0.0353	21.49***
Block	−0.0836	−3.32***	−0.0602	−2.84***	−0.0874	−4.46***	−0.0730	−3.89***
Stucco	0.1207	14.83***	0.0862	12.60***	0.0729	11.42***	0.0605	9.89***
Aluminum	−0.0019	−0.99	0.0039	2.35***	0.0074	4.79***	0.0030	2.02**
Stone	0.1971	13.67***	0.1550	12.79***	0.1519	13.44***	0.1348	12.45***
Asbestos	−0.0504	−15.66***	−0.0281	−10.35***	−0.0261	−10.34***	−0.0244	−10.05***
Concrete	0.1959	2.69***	0.0984	1.61	0.1571	2.77***	0.1170	2.16**
Census Block Groups	No		Yes		No		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	

Note: t-statistics are asymptotic.
* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

to question why a premium with theory predicts and consumer's attest to can not be seen in the data. The explanation pursued in this paper is that RCAs, by their very nature, hide this premium within their construction.

Estimation with Characteristic Drift

In a paper by Can (1990), the author shows that the value of certain housing characteristics differ across space, based on the quality of the neighborhood within which that home is located; this phenomenon is called spatial drift. When estimating an equation with spatial drift there is a direct and a marginal effect from each characteristic. The direct effect is the base increase in the value of a home from that characteristic and the marginal effect corrects for any increase or decrease in the value of that characteristic in a given location. For example, one would expect that a large yard may be more valued in a neighborhood with more children than in a neighborhood with more seniors.

This method can also be applied to the case of RCAs which, by there very nature, collect rather homogenous populations into a given geographic area. This is done both through the rules and restrictions of the RCA and the fact that many RCAs are developed as large tracts by a single developer with little variation of housing style (so as to limit the developer's costs). As a result there may be a supply effect from certain characteristics that are being incorporated in the results from equations [3] and [4] depressing the RCA effect. To control for this, equations [3] and [4] are estimating again by incorporating an expansion equation into the model allowing the spatial drift of housing characteristics. The new model is shown in equations [5] and [6] below:

$$\ln \mathbf{P} = \alpha + \sum \left(\boldsymbol{\beta}_{\mathbf{j0}} + \boldsymbol{\beta}_{\mathbf{j1}}\mathbf{RCA}\right)\mathbf{C_j} + \sum \delta_j \mathbf{Year_j} + \sum \phi_j \mathbf{L_j} + \sum \eta_j Census_j + \gamma\, \mathbf{RCA} + \varepsilon. \quad [5]$$

$$\ln \mathbf{P} = \rho\mathbf{SP} + \alpha + \sum \left(\boldsymbol{\beta}_{\mathbf{j0}} + \boldsymbol{\beta}_{\mathbf{j1}}\mathbf{RCA}\right)C_j + \sum \delta_j \mathbf{Year_j} + \sum \phi_j \mathbf{L_j} + \sum \eta_j Census_j + \gamma\, \mathbf{RCA} + \varepsilon. \quad [6]$$

In this specification, the vector of regression coefficients denoted by $\boldsymbol{\beta}_{\mathbf{j0}}$ estimate the direct effects of housing characteristics and the vector $\boldsymbol{\beta}_{\mathbf{j1}}$ estimates the marginal effect of these characteristics for homes within an RCA. Table 6 reports the results from estimating equations [5] and [6] with and without census controls when the school district is used as a location control. While the marginal effects are not listed, the variable labeled *RCA(Total)* denotes the sum of the direct effect (labeled *RCA(Direct)*) and the marginal effects evaluated at the means from the RCA sub-sample shown in Table 1.

Before looking at the RCA variables, note that there is little change in the remaining coefficients when compared to their counterparts in Table 4. Also important to note is that the R^2 for each equation is slightly higher in Table 6 showing improved estimates and the coefficient on the spatially lagged variables does not change significantly when spatial drift is added to the model. This implies that these results are rather robust to specification and that the RCA variables are measuring what they are supposed to be measuring.

In all of the estimates of the spatial drift model, the direct RCA effect is extremely high. Residing within an RCA according to column one with no spatial or census controls should increase the value of a home by about 35%. Adding census controls decreases this to about 24% and estimating the model with a spatially lagged dependent variable lowers the impact slightly more to 21% and 18%, respectively. In the least conservative estimation the direct RCA effect equates to about a \$26,000 increase in value while the most conservative model shows the RCA effect to equate to about \$13,800. These estimates seem to be more consistent with the expectations regarding the role of RCA controls and provision on the value of a home.

TABLE 6
SCHOOL DISTRICT FIXED EFFECTS (SPATIAL DRIFT)

	Column One		Column Two		Column Three		Column Four	
	No Spatial–Interactions		No Spatial–Interactions		Spatial–Interactions		Spatial–Interactions	
R^2	0.8786		0.9120		0.9285		0.9324	
N = 124,878								
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
RCA (Direct)	0.3537	27.75***	0.2409	22.10***	0.2133	21.44***	0.1806	18.62***
RCA (Total)	0.0149		0.0016		−0.0156		−0.0078	
S15*Y					0.4973	215.28***	0.3881	125.54***
Constant	10.4044	1144.67***	9.5030	380.99***	5.0246	193.57***	5.8026	157.63***
Split Foyer	−0.1520	−23.29***	−0.1144	−20.56***	−0.0829	−16.31***	−0.0834	−16.85***
Split Level	−0.0409	−4.61***	−0.0363	−4.80***	−0.0141	−2.04**	−0.0204	−3.04***
Contemporary	0.0779	6.45***	0.0474	4.61***	0.0648	6.94***	0.0509	5.61***
Old Style	0.0381	7.42***	0.0232	5.28***	0.0223	5.60***	0.0151	3.88***
Bungalow	−0.1050	−33.86***	−0.0665	−24.87***	−0.0549	−22.69***	−0.0485	−20.42***
Colonial	0.0741	8.30***	0.0636	8.33***	0.0466	6.73***	0.0433	6.41***
Cape Cod	0.0163	1.70*	−0.0026	−0.32	0.0045	0.61	−0.0077	−1.07
Other	−0.0891	−28.53***	−0.0619	−23.08***	−0.0625	−25.76***	−0.0514	−21.62***
PUD	−0.0022	−0.22	−0.0649	−7.70***	−0.0237	−3.10***	−0.0653	−8.71***
Conventional	−0.0640	−6.76***	−0.0478	−5.90***	0.0287	3.90***	0.0004	0.05
Unfin. Attic	0.0643	9.59***	0.0559	9.78***	0.0524	10.10***	0.0506	10.02***
Partly Fin. Attic	0.0669	10.70***	0.0622	11.66***	0.0579	11.89***	0.0592	12.49***
Full Fin. Attic	0.0589	10.45***	0.0591	12.30***	0.0572	13.08***	0.0581	13.67***
Wall Ht Attic	0.0334	4.47***	0.0503	7.89***	0.0553	9.51***	0.0588	10.38***
Crawl Space	−0.0544	−3.52***	−0.0264	−2.01**	−0.0528	−4.42***	−0.0380	−3.27***
Partial Basement	0.1616	24.38***	0.1270	22.40***	0.0962	18.71***	0.0932	18.56***
Full Basement	0.1644	42.29***	0.1424	42.50***	0.1227	40.56***	0.1173	39.39***
Age	−0.0092	−49.13***	−0.0111	−67.60***	−0.0063	−43.18***	−0.0090	−61.67***
Age^2	4.2E-05	23.40***	5.9E-05	37.70***	3.3E-05	23.52***	5.0E-05	36.04***
# Stories	0.1537	36.65***	0.1120	31.18***	0.1011	30.98***	0.0911	28.58***
# Bedrooms	0.0820	48.19***	0.0722	49.77***	0.0690	52.16***	0.0673	52.30***
# Family Rooms	0.0779	34.25***	0.0590	30.30***	0.0467	26.35***	0.0484	27.98***
# Full Bath	0.1734	79.65***	0.1253	66.90***	0.1099	64.01***	0.1018	60.86***
# Half Bath	0.1033	47.02***	0.0717	38.21***	0.0669	38.96***	0.0585	35.01***
Add Fixtures	0.0696	45.29***	0.0561	42.59***	0.0383	31.82***	0.0393	33.42***
# Fireplace Openings	0.1385	28.18***	0.1100	26.23***	0.0925	24.17***	0.0902	24.21***
# Fireplace Stacks	0.0756	13.11***	0.0512	10.41***	0.0399	8.90***	0.0379	8.67***
# Fireplaces	0.0701	26.16***	0.0649	28.34***	0.0513	24.65***	0.0560	27.56***
Brick	0.1071	33.93***	0.0782	28.78***	0.0761	31.00***	0.0641	26.60***
Masonry	0.0651	17.97***	0.0401	12.92***	0.0345	12.25***	0.0279	10.16***
Block	−0.0840	−3.22***	−0.0595	−2.68***	−0.0851	−4.24***	−0.0684	−3.50***
Stucco	0.1164	12.65***	0.0762	9.72***	0.0692	9.67***	0.0528	7.58***
Aluminum	−0.0050	−1.63	−0.0079	−3.04***	0.0112	4.71***	0.0001	0.05
Stone	0.1832	12.26***	0.1436	11.27***	0.1440	12.40***	0.1265	11.19***
Asbestos	−0.0402	−9.55***	−0.0412	−11.46***	−0.0203	−6.21***	−0.0329	−10.33***
Concrete	0.0329	0.35	0.0715	0.90	0.1014	1.42	0.0904	1.30
Census Block Groups	No		Yes		No		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	

Note: t-statistics are asymptotic.
* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

This is, however, before the values of housing characteristics are considered. Basic supply and demand tells us that as the supply of a given good increase, the equilibrium price (or willingness-to-pay) for that good will fall. This is exactly what is seen in the market for housing characteristics within RCAs. The variable *RCA(To-*

tal) reports the value of the direct effect plus the marginal RCA effects evaluated at their full sample means. In the case of the school district estimations, the resulting total effects are consistent with the results shown in Table 4. In columns one the estimate is about 1.5% and in column two it is essentially zero. Once the spatial controls are added, the coefficients again go negative and are very close to zero. Table 7 shows similar results when city is used in place of school districts. Again the R^2s are slightly higher and the signs and magnitudes of the other, non-RCA variables remain approximately the same when compared to Table 5. As in the case of Table 6, the *RCA(Direct)* coefficient estimates range from about 35% to about 16% moving from columns one to four. Again, once the marginal effects are included, the *RCA(Total)* coefficient ranges from positive one to negative one with columns two and four showing a coefficient close to zero. It is therefore apparent that the near zero results found in Tables 4 and 5 are so because of supply affects in the RCA housing market pushing the prices of RCA home lower than they would be otherwise.

This result is likely occurring because RCAs are working exactly as they are meant to. The fact that the direct RCA effect is so large implies that there is likely some base advantage from residing within an RCA due to the enforcement of convents, provision of public goods, and other positive amenities as outlined above and as evident in Table 2. The indirect effects, however, seem to be evidence that some, if not all, of this increase is eaten away by the fact that RCAs do their job too well and result in a residential development of "cookie cutter" homes. Consider the following example. If one was to place a wood-frame constructed ranch style home with no attic, no basement, and other characteristics matching those of the average RCA home into an RCA, that home would loose about 8.5% in value than if it remained outside the RCA. Conversely, if one was to take a block home of the Cape Cod style with an unfinished attic, a crawl space, and all other characteristics matching the average RCA home and place it in an RCA, that home would see an increase in value equal to about 19%. This drastic change is simply the result of the fact that the Cape Cod style of home is the most uncommon example of an RCA home while the ranch is the most common.

It should be noted however, that this study does lack the ability to distinguish between types of RCAs. Gated and walled RCAs may actually increase values further, while RCAs providing only common ground or street maintenance have little or no effect on home values because they offer little advantage or may be indistinguishable from non-RCA developments. Further distinguishing between types of RCAs may actually allow for higher coefficients on the direct and marginal effects from residing in an RCA. Additionally, it is possible that the institutions governing most RCAs in the Saint Louis County area may be so rigid that RCAs loose their effectiveness over time and some may actually lower the value of the homes located within.[26] These are both questions that would be best addressed in further research with more specific data on the individual RCAs.

VI. CONCLUSIONS

During the past three decades, the number of residential developments including some type of Residential Community Association (RCA) has grown dramatically. One of the primary reasons given by supporters of RCAs for living in an RCA development is that the institutions of the RCA increase the value of a home over a

[26] Many of the CC&Rs limit the maximum amount a board can charge for an annual assessment and this maximum is not tied to any measure of inflation and at least a super-majority of residents is needed to approve an increase in the maximum. As a result the real amount of the assessment decreases over time resulting in a lower real operating budget for the board. For example a $100 maximum for an association built in 1980 is only worth $33 annually in 2005. This may then result in the quality of public goods such as street maintenance falling below that of even the local municipality's provision.

TABLE 7
City Fixed Effects (Spatial Drift)

	Column One		Column Two		Column Three		Column Four	
	No Spatial–Interactions		No Spatial–Interactions		Spatial–Interactions		Spatial–Interactions	
R^2	0.8788		0.9139		0.9268		0.9327	
N = 124,878								
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
RCA (Direct)	0.3497	27.33***	0.2081	19.22***	0.2013	19.89***	0.1607	16.53***
RCA (Total)	0.0172		0.0008		−0.0100		−0.0073	
S15*Y					0.4656	190.82***	0.3660	116.12***
Constant	10.3131	1142.45***	9.5930	375.62***	5.3348	197.38***	6.0731	160.01***
Split Foyer	−0.0930	−14.20***	−0.1100	−19.90***	−0.0609	−11.79***	−0.0822	−16.58***
Split Level	−0.0102	−1.15	−0.0255	−3.40***	0.0011	0.16	−0.0140	−2.09**
Contemporary	0.0595	4.92***	0.0466	4.57***	0.0574	6.07***	0.0491	5.41***
Old Style	0.0101	1.95*	−0.0010	−0.23	0.0142	3.49***	0.0004	0.11
Bungalow	−0.1238	−39.36***	−0.0821	−30.56***	−0.0632	−25.33***	−0.0596	−24.72***
Colonial	0.0533	5.95***	0.0516	6.82***	0.0381	5.41***	0.0343	5.08***
Cape Cod	0.0071	0.74	−0.0085	−1.05	0.0037	0.49	−0.0115	−1.58
Other	−0.0708	−22.36***	−0.0562	−20.94***	−0.0535	−21.46***	−0.0492	−20.50***
PUD	−0.0113	−1.15	−0.0682	−8.15***	−0.0240	−3.09***	−0.0699	−9.31***
Conventional	−0.0811	−8.56***	−0.0568	−7.07***	0.0199	2.68***	−0.0094	−1.31
Unfin. Attic	0.0759	11.29***	0.0586	10.33***	0.0589	11.17***	0.0528	10.43***
Partly Fin. Attic	0.0869	13.86***	0.0649	12.26***	0.0701	14.19***	0.0620	13.07***
Full Fin. Attic	0.0552	9.74***	0.0506	10.60***	0.0584	13.13***	0.0548	12.83***
Wall Ht Attic	0.0486	6.47***	0.0536	8.46***	0.0643	10.87***	0.0624	10.98***
Crawl Space	−0.0412	−2.66***	−0.0146	−1.12	−0.0489	−4.04***	−0.0303	−2.61***
Partial Basement	0.1584	23.75***	0.1198	21.22***	0.1022	19.50***	0.0921	18.27***
Full Basement	0.1572	39.81***	0.1381	41.07***	0.1247	40.10***	0.1173	38.90***
Age	−0.0126	−66.16***	−0.0116	−70.81***	−0.0083	−54.88***	−0.0096	−65.10***
Age^2	7.0E-05	38.30***	6.6E-05	42.12***	5.0E-05	34.93***	5.6E-05	40.28***
# Stories	0.1560	36.85***	0.1069	29.79***	0.1053	31.54***	0.0902	28.09***
# Bedrooms	0.0772	45.29***	0.0729	50.68***	0.0646	48.17***	0.0671	52.12***
# Family Rooms	0.0718	31.45***	0.0582	30.04***	0.0461	25.57***	0.0486	28.01***
# Full Bath	0.1489	67.98***	0.1197	64.38***	0.1036	59.50***	0.0996	59.51***
# Half Bath	0.0902	40.92***	0.0683	36.69***	0.0630	36.15***	0.0568	33.97***
Add Fixtures	0.0617	39.90***	0.0561	42.85***	0.0390	31.89***	0.0407	34.47***
# Fireplace Openings	0.1150	23.33***	0.1010	24.28***	0.0855	22.01***	0.0848	22.75***
# Fireplace Stacks	0.0904	15.62***	0.0561	11.49***	0.0487	10.69***	0.0427	9.76***
# Fireplaces	0.0893	33.18***	0.0669	29.33***	0.0585	27.54***	0.0578	28.34***
Brick	0.1178	37.03***	0.0794	29.24***	0.0863	34.45***	0.0661	27.17***
Masonry	0.0529	14.62***	0.0380	12.41***	0.0313	10.98***	0.0269	9.79***
Block	−0.0747	−2.86***	−0.0595	−2.71***	−0.0759	−3.73***	−0.0672	−3.45***
Stucco	0.1150	12.47***	0.0773	9.94***	0.0703	9.68***	0.0543	7.78***
Aluminum	−0.0032	−1.04	−0.0087	−3.37***	0.0102	4.25***	−0.0015	−0.64
Stone	0.1766	11.45***	0.1250	9.61***	0.1314	10.84***	0.1081	9.30***
Asbestos	−0.0521	−12.31***	−0.0418	−11.71***	−0.0302	−9.07***	−0.0355	−11.10***
Concrete	0.2999	3.21***	0.1769	2.25**	0.2672	3.67***	0.1972	2.82***
Census Block Groups	No		Yes		No		Yes	
Year Fixed Effects	Yes		Yes		Yes		Yes	

Note: t-statistics are asymptotic.
* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

home not within an RCA. In a survey sponsored by the Community Associations Institute,[27] 85% of the respondents believed that property values were rising in their community. Residential Community Associations are generally created ex-ante; the development of the subdivision and the institutions that govern the RCA and the rules protecting the homeowners are laid out as part of the Covenants, Conditions, and Restrictions (CC&Rs) filed by the developer when the subdivision is approved by the local municipality. While some research has analytically looked at the impact of RCAs and walled communities on crime, no work has empirically estimated the general effect on home values from the home being located within an RCA.

This paper creates a unique dataset using data from Saint Louis County, Missouri, and estimates a hedonic price function for homes sold from 1992–2001. The data obtained for this research includes characteristic, location, and appraisal information for all homes located within Saint Louis County and sale price for all homes sold since 1979. Whether a home is located within an RCA is determined by researching the individual CC&Rs of all subdivisions containing at least 10 units. Using a statistical method similar to that used in Pace et. al. (1998) and GMM methodology similar to that outlined in Kelejian and Prucha (1998), a hedonic price function is estimated correcting for the presence of spatial autocorrelation.

A simple comparison of the mean sale prices seems to support the claim and expectation that RCA homes will demand higher prices given the $36,000 difference in sale prices between RCA and non-RCA homes. Once home characteristics and spatial concerns are controlled for in the model, the results show that living in an RCA increases the value of a home by almost nothing. In an attempt to explain this unexpected result, an expansion equation is added to the model allowing the value of housing characteristics to differ depending on whether they are located within an RCA or non-RCA development. From these estimates, it appears that the benefit received from residing in an RCA is dependent on the style and size of home located within the RCA. Estimates show that the most frequently occurring housing style sees a decrease of about 8% from being located within an RCA, while the least frequently occurring housing style sees an increase in value of about 19%. This result seems to indicate that, while there is a benefit from RCAs, it is hidden in the data by the fact that many homes within an RCA are almost exactly alike. In other words, while RCA homes do sell for higher prices, if they were allowed to differ in design more than they currently are, they could possible sell for even more.

While this research does present several interesting and unexpected results, there is still room for future research. First, this data suffers from not being able to determine the specific services and amenities offered by the RCA within which a home resides. Further research should be done to determine whether all RCAs are created equally. RCAs that provide different levels and types of public goods and amenities will likely have different impacts on the value of the homes within that RCA. It may also be that the funding mechanisms built into the CC&Rs are not sufficient enough to maintain the RCA for a long period of time. If either of these factors is the case, then this study may simply be estimating the sum of the different RCA effects which just happen to wash out one another.

A second area of concern is the changing nature of RCAs. The RCA is created as part of the CC&Rs when the development is created. This analysis is not able to determine if the RCA still exists (some have possibly been released from their creating CC&Rs), if the institutions governing the RCA have changed, or if the residents of a development without an RCA have banned together to form an RCA.[28] If the data

[27] http://www.caionline.org.

[28] The author was able to find one such case in the Saint Louis area.

includes developments classified as part of an RCA that are no longer part of an RCA or visa versa, the results may be skewed. A final concern is that the age of the RCA matters. Younger RCAs may be more effective, only to lose their effectiveness after some time due to either lack of involvement or funding constraints. Unfortunately data collection regarding RCAs, their status, and activity levels is still very limited and costly, both in terms of time and expense, to engage in these extensions.

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