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# Property Tax Capitalization *within* a National Historic District versus Property Tax Capitalization *outside* that National Historic District: Another Application of the Tiebout Hypothesis

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## Abstract

This study has two objectives. First, it seeks to apply a hedonic pricing model to determine whether, in the spirit of Tiebout (1956), Oates (1969), and Tullock (1971), property taxes have been capitalized into the prices of single family homes located *within* in the Savannah Historic Landmark District in Savannah, Georgia. A total of 593 home sales over the 2000-2005 period are considered, with the housing prices and the property tax expressed in 2005 dollars. Second, this study seeks to apply that very same model to prices of some 1908 single family homes within the metropolitan Savannah area but *outside* the Savannah Historic Landmark District. Estimating the model in semi-log form, after allowing for a variety of housing characteristics, reveals that the natural log of the *real* sales price of single-family houses *within* the Savannah Historic Landmark District as well as those *outside* the Savannah Historic Landmark District were in fact negatively affected by the city and county property tax level.

**Keywords:** Housing prices, Property tax capitalization, Savannah Historic Landmark District

**JEL:** R14; R13; R11

## 1. Introduction

Hedonic pricing models have been used in a number of studies to assess the impacts of historic district designation and a host of other factors on property values (Coffin, 1989; Ford, 1989; Asabere & Huffman, 1994; Asabere, Huffman & Mehdian, 1994; Clark & Herrin, 1997; Coulson & Leichenko, 2001; Leichenko, Coulson & Listokin, 2001; Coulson & Lahr, 2005; Sirmans, Macpherson & Zeitz, 2005; Cebula, 2009). This study seeks to extend the literature by applying the hedonic pricing model to the prices of single-family homes both *within* and then, separately, *outside* of, the Savannah Historic Landmark District located in Savannah, Georgia, with emphasis on the question of whether, in the spirit of Tiebout (1956), Tullock (1971), and Oates (1969), property taxes are capitalized into housing prices.

This study accounts not only for property taxes but also for a number of other factors influencing the housing market within the Savannah Historic Landmark District and outside of that District. For example, housing characteristics such as the number of baths, the number of fireplaces, the number of rooms, square footage, brick or stucco exterior, the presence of a sprinkler system, the number of garage spaces, the presence of an apartment in a house, and whether a house is new are all taken into consideration.

In the next section of this study, the Tiebout (1956) hypothesis is briefly reviewed. Subsequently, the hedonic pricing model is provided, along with a description of the variables. Following conventional practice in the literature, the model is estimated in semi-log form. The results for single family homes within the Savannah Historic Landmark District are provided first and analyzed in the subsequent section of the study. In the following section the results for the single family homes outside the Savannah Historic Landmark District are provided and considered. The conclusion provides a summary of the findings.

## 2. The framework of the analysis

This section of the study provides the framework within which the hedonic pricing model is applied to housing sales in the city of Savannah. Tiebout (1956, p. 418) hypothesized that "...the consumer-voter may be viewed as picking that community which best satisfies his set of preferences for public goods...the consumer-voter moves to that community whose local government best satisfies his set of preference..." As Tullock (1971, p. 917) observes, this hypothesis can be extended so it more clearly stresses that, *ceteris paribus*, the "...individual deciding where to live will take into account the private effects upon himself of the bundle of government services and taxes..." Thus, Tullock (1971), more explicitly than Tiebout (1956), emphasizes that the consumer-voter evaluates the tax burden at potential locations of choice. Following Oates (1969), a number of studies have investigated whether property taxes are capitalized into housing prices. Such is the focus of the present study.

The basic premise of the hedonic pricing model is that a house constitutes a bundle of both desirable and undesirable attributes to utility-maximizing consumers, all of which contribute to the market value of the house as revealed through a market transaction, i.e., a home sale. The hedonic pricing model decomposes the transaction price into various components such as interior and exterior features, or other traits of the house (including location, i.e., spatial considerations) that affect the final sale price. The estimated parameters of the model provide information about the relative contribution of any given house feature.

In this study, the hedonic pricing model takes the following general form:

$$\ln \text{RSALESPR}_j = f(I_j, E_j, O_j)$$

where:

$\ln \text{RSALESP}_j$  = the natural log of the *real* price of house  $j$ , where the price of the  $j^{\text{th}}$  house is expressed in 2005 dollars;

$I_j$  = a vector of interior physical characteristics for house  $j$ ;

$E_j$  = a vector of external physical characteristics for house  $j$ ; and

$O_j$  = a vector of other factors associated with house  $j$ , including property taxes and spatial control variables.

The present study applies the hedonic pricing model to home sales *within* the Savannah Historic Landmark District and then *outside* the Savannah Historic Landmark District over the six-year period from 2000 through 2005. The area of the historic district is approximately 2.5 square miles and is bordered on the south by Victory Drive, on the north by the Savannah River, on the east by Truman Parkway and on the west by West Boundary Street. To promote uniformity and preserve the architectural character of the District new construction, renovations and improvements are subject to strict building codes. Hence, relative to other areas, single family homes in the Savannah Historic Landmark District provide an especially homogenous sample for this study, whereas those outside the Savannah Historic Landmark District are far more heterogeneous. Indeed, unlike the results for a different time frame by Cebula (2010), the present study does not combine all housing sales in Savannah. In point of fact, the reason in the present study for *not* combining all housing units into the same estimation is based on this homogeneity-heterogeneity feature of single family homes in Savannah.

Data for 593 single family home sales for which there was sufficient information for analysis during this time frame *within* the Savannah Historic Landmark District and data for some 1,908 single family homes outside the Savannah Historic Landmark District were obtained from the Savannah Board of Realtors' Multiple Listing Service (Dubin, 1998). Property tax data for all of the single-family houses in the study were obtained through the Chatham county Property Tax Assessors Office and the City of Savannah Property Tax Assessment Office. Interestingly, unlike the city of Savannah outside the Savannah Historic Landmark District, where 659 homes sales, i.e., 34.5 percent, involved new homes, the vast majority of the observations for the Savannah Historic Landmark District represent re-sales of existing homes; only 40 Historic District sales (6.7 percent of studied home sales) were newly built structures. In order to permit comparison of sales prices across the study period, all housing prices and property taxes were converted to and expressed in 2005 dollars using the *price index for single-family homes* from the U.S. Census Bureau (2007, Table 710).

There were a variety of interior and exterior physical characteristics available for each house sold as well as other factors associated that were available and expressly included in the analysis. Naturally, for each of the impacts of the explanatory variables on housing price in the model, the expected sign is proffered in the discussion provided below under the assumption of *ceteris paribus*. Several of the explanatory variables are binary variables, so that they assume a value of 1 if they exhibit a trait in question and a value of 0 if they do not.

The interior physical characteristics of house  $j$  include the following: BATHS, the *total* listed number of baths (full plus half baths); FIREPLACES, the total number of listed fireplaces; ROOMS, the total number of listed rooms; SQFT, the total number of square feet of finished interior living space; and APT (=1 or 0), a binary (dummy) variable indicating whether house  $j$  has an apartment.

As observed in Sirmans, Macpherson & Zeitz (2005) and Boyle & Kiel (2001), and based on a variety of other studies including Ford (1989), Clark & Herrin (1997), Coulson & Leichenko (2001), Leichenko, Coulson & Listokin (2001), Laurice & Bhattacharya (2005), Decker, Nielsen & Sindt (2005), Coulson & Lahr (2005), and Cebula (2009), the real sales price (RSALESPR) of house  $j$  is expected to be an increasing function of the number of desirable internal and external physical housing characteristics.

For example, RSALESPR is expected to be an increasing function of the number of bathrooms and fireplaces. It also is expected to be an increasing function the number of rooms and the square footage of finished living space. By contrast, the presence of an apartment in a single family home in the Savannah Historic Landmark District is expected to detract from the value of that home by virtue of its adverse impact upon the “prestige” associated with location in the “District.”

The exterior physical characteristics of house  $j$  include the following: BRICK (=1 or 0), whether the exterior is made principally of brick; DECK (=1 or 0), whether the house has a deck; CRTYD (=1 or 0), whether the house has a private courtyard; SPRINKLER (=1 or 0), whether the house has an underground sprinkler system; STORIES, the number of stories in the house structure; STUCCO (=1 or 0), whether the house exterior is principally of stucco construction; GARAGESP, the number of garage car spaces (not carports) that are included as part of the house; BALCNY (=1 or 0), indicating whether a home has a balcony; and POOLTUB (=1 or 0), whether the house has a hot-tub and/or a swimming pool.

The RSALESPR of house  $j$  is expected to be an increasing function of whether the house exterior is brick and the number of stories of the structure. In addition, RSALESPR is expected to be an increasing function of the presence of a deck, the presence of a pool or hot-tub, the presence of a balcony, and the number of garage spaces. It also is hypothesized here that a stucco exterior (rather than one of wood or vinyl) may enhance RSALESPR. Finally, the presence of a private courtyard is expected to enhance the RSALESPR for house  $j$ , as would the presence of an underground sprinkler system.

Another factor associated with house  $j$  is NEW (=1 or 0), i.e., whether the house was new at the time of sales. Arguably, a *new* house is often considered highly desirable because in part it is in need of little or no repair and is generally cleaner and brighter and equipped with new and modern appliances; hence, a *new* house *per se* is expected to command a higher sales price (Coulson & Lahr, 2005; Cebula, 2009).

There are two spatial control variables included in the model. Savannah’s Historic Landmark District includes numerous well maintained park-like “squares”. Indeed, there are a number of such park-like squares to be found in the metropolitan Savannah area. It is hypothesized that houses that are located across from or adjacent to a park or square, PARKSQ (=1 or 0), or houses that are located on a corner, CORNER (=1 or 0), may be more appealing and hence command a higher price.

In the spirit of the Tiebout hypothesis, there is the property tax variable, PROPTX $_j$ , which is defined as the annual city plus county property tax liability associated with house  $j$ , whether the house is located within or outside of the Savannah Historic Landmark District. This study hypothesizes, in the spirit of the Tiebout (1956) hypothesis, as well as Tullock (1971) and Oates (1969), that residential property taxes are capitalized into housing prices such that housing prices are expected to be a decreasing function of property taxes, *ceteris paribus*.

### **3. Findings for Single Family Homes *within* the Savannah Historic Landmark District**

Estimating the hedonic model outlined above for single family homes *within* the Savannah Historic Landmark District, with the White (1980) procedure adopted to correct for heteroskedasticity, semi-log estimation results are provided in Table 1. In columns (a) and (b) of Table 1, 18 estimated coefficients are provided, with 12 being statistically significant with the expected sign at the one percent level, two being statistically significant with the expected sign at the five percent level or beyond, and two being statistically significant at the ten percent level. The estimated coefficients for the variables POOLTUB $_j$ ,

PARKSQ<sub>j</sub>, CORNER<sub>j</sub>, and BALCNY<sub>j</sub> fail to be statistically significant at the five percent level, although PARKSQ<sub>j</sub> is significant at the ten percent level. The coefficient of determination (0.62) and the adjusted coefficient of determination both indicate that the model explains fully three-fifths of the variation in the dependent variable (lnRSALESPR). Finally, the F-statistic of 53.11 is significant at far beyond the one percent level, providing evidence of the overall strength of the model. The results shown in columns (c) and (d) of Table 1, where statistically insignificant variables from columns (a) and (b) have been dropped, affirm their counterpart results in columns (a) and (b). Thus, this additional set of findings attests to the robustness of the results in columns (a) and (b) of Table 1.

Based on the estimate in Table 1, the *real* sales price (expressed in natural log form) of single-family houses in the city of Savannah is a positive function of the number of bathrooms, fireplaces, rooms, garage spaces, stories in structure, and the number of square feet of finished living space in the house. By contrast, the presence of balcony does not enhance the value of a home in his context. Next, the presence of an apartment in the house in the District actually appears to *reduce* its market value, as hypothesized. In addition, the presence of a deck, a private courtyard, or an underground sprinkling system adds to the sales price. An exterior construction of brick or stucco, and “new” construction also tend to increase the sale price of the house, although the presence of a pool or hot-tub apparently does not. Location across from or adjacent to a park or square appears not to enhance sales price; similarly, corner location also does not appear to significantly influence housing price. Finally, and most importantly in terms of the objective of this study are the results for the Tiebout (1956) hypothesis. As shown in Table 1, the natural log of the real sales price of house *j* is found to be (as hypothesized) a decreasing function of the property tax liability associated with the house.

As for the specific contributions of the statistically significant variables on lnRSALESPR, there are 14 effects that can be summarized. In a semi-log functional form with the dependent variable being expressed in natural log terms, a one unit change in a *non-binary* independent variable has a percentage effect on the dependent variable that is given by one hundred percent multiplied by the estimated coefficient, *ceteris paribus*. For example, with respect to the interior features of house *j*, the presence of an additional bathroom causes the real sales price of house *j* to increase by roughly 14.6 percent. This factor generates the largest positive sales price response for *interior* features. By comparison, according to this estimate, the presence of an additional room yields a positive housing price response of roughly 3.4 percent. This is followed by a more modest price increase for an additional fireplace of roughly 6.1 percent. The effect of the SQFT variable on the real sale price of house *j* is handled somewhat differently because the scale of measurement is per square foot. In particular, the mean square footage is 2,329, and the standard deviation increase in the square footage is 1,493. This translates into situation in which, on the average, the real housing price rises by roughly \$32 (in 2005 dollars) for each additional square foot of finished living space, which lies roughly in the middle of the range for other recent similar studies (Coulson & Leichenko, 2001; Bin & Polasky, 2004 not in references; Cebula, 2009). As for the presence of a rental apartment in a home, a housing price reduction of roughly 15.2 percent can be expected.

Regarding the response of the lnRSALESPR of house *j* to exterior features, we focus first on the number of stories present in house *j* and the number of garage spaces on the premises of house *j*. Based on the results in Table 1, one additional story for house *j* yields a roughly 19.5 percent higher sales price, and one additional garage space yields an approximately 10.6 percent higher sales price.

In interpreting the coefficients on the dummy (binary) variables, we follow the procedure in Halvorsen & Palmquist (1980). Accordingly, to begin, it is observed that the cladding type of house  $j$  appears to exercise a large effect. For example, holding other things constant, a house with a brick exterior commands a roughly 25 percent higher sales price than one without a brick exterior, whereas a house with a stucco exterior commands a roughly 35 percent higher sales price than one without. Other things held constant, a house with a private courtyard commands an approximately 21 percent higher sales price than a house without one, whereas a house with an underground sprinkler system commands a roughly 21.5 percent higher sales price than one without one. Furthermore, other things held constant, a house with a deck commands a roughly 14.4 percent higher sales price than one without one. It is worth observing that the results for each of the last three variables considered, namely, courtyard, underground sprinkler system, and deck might seem rather high. This could be attributable to the fact that a variable reflecting lot size (which is unavailable for most of the Historic Landmark District houses) is, of practical necessity, omitted from the analysis. As for the sales-price response of house  $j$  to other non-interior and non-exterior features, it appears (other things held the same) that is house  $j$  that is of new construction, it sells with a premium of nearly 30 percent as compared to other existing (not-new) houses.

Finally, the estimated coefficient of the property tax variable is negative, as expected, and statistically significant at the one percent level. This finding provides strong empirical support for the Tiebout (1956) hypothesis that higher property taxation reduces the price of housing, *ceteris paribus*, presumably because the property tax liability is capitalized into the housing price (Oates, 1969). Raising the property tax by an average of \$1,000 per home *inside* the Savannah Historic Landmark District would reduce the real price of the average house in the District by roughly \$10,597 [2005 dollars].

#### **4. Findings for Single Family Homes *outside* the Savannah Historic Landmark District**

Estimating the hedonic model outlined above for single family homes *outside* the Savannah Historic Landmark District, with the White (1980) procedure adopted to correct for heteroskedasticity, semi-log estimation results are provided in Table 2. In column (a) of Table 2, 18 estimated coefficients are provided, with nine being statistically significant with the expected sign at the one percent level, four being statistically significant with the expected sign at the five percent level or beyond, and one being statistically significant at the ten percent level. There are several differences involving coefficient size and coefficient significance between the results shown in Table 1 and those shown in Table 2. The existence of these differences provides the rationale for estimating the model for homes within the Savannah Historic Landmark District *separately* from those outside the Savannah Historic Landmark District.

In any case, arguably the two most obvious differences between the results in Tables 1 and 2, aside from the coefficient sizes on the property tax variables, involve the variable  $APT_j$ , which was negative and statistically significant at the five percent level in Table 1 but which is now only positive but fails to be statistically significant at even the ten percent level in Table 2 and the variable  $POOLTUB_j$ , which failed to be statistically significant in Table 1 at even the ten percent level but which is statistically significant at the four percent level (and positive) in Table 2. Finally, the F-statistic of 39.55 is significant at far beyond the one percent level, providing evidence of the overall strength of the model. The results shown in columns (c) and (d) of Table 2, where statistically insignificant variables from columns (a) and

(b) have been dropped, affirm their counterpart results in columns (a) and (b). This set of findings attests to the robustness of the results in columns (a) and (b) of Table 2.

As for the property tax variable, in Table 2, it exhibits the expected negative sign and is statistically significant at the one percent level in both estimates. On the other hand, the coefficient sizes for this variable in Table 2 are only approximately 66 percent the size of their counterparts shown in Table 1. Thus, whereas all of the estimates in this study provide support for the capitalization of property taxes (Tiebout, 1956; Oates, 1969; Tullock, 1971), there appears to be a significant disparity between the degree of property tax capitalization *within* the Savannah Historic Landmark District and the degree of property tax capitalization *outside* the Savannah Historic Landmark District. As for the property tax applied *outside* the Savannah Historic Landmark District, raising the property tax by an average of 1,000 per home would reduce the real price of the average house by approximately \$7,185 [2005 dollars], which is roughly a 32 percent lower impact than for houses *inside* the District, i.e., \$10,597 [2005 dollars]. Although the reason for this disparity is unknown, it is plausible that residents of homes *within* the Historic District may expect on average to reside there (or at least own) over a longer time period than residents of homes *outside* the Historic District and therefore have a longer time period over which they themselves must pay the higher property taxes. Thus, the discounted present value of the increased property taxes would be computed over a longer time frame and therefore be a higher figure.

## 5. Conclusion

The purpose of this study was to investigate the Tiebout (1956) hypothesis that property taxes are capitalized into real housing prices, using house-price data for single family homes *within* the Savannah Historic Landmark District and for single family homes *outside* the Savannah Historic Landmark District in Savannah, Georgia. The principal findings of the present study, given its objective, include the result that the natural log of the *real* sales price of a single family house in Savannah over the 2000-2005 period was negatively impacted by higher property taxes, implying that as hypothesized) property taxes are capitalized into real housing prices. Although this study of the Savannah housing market provides strong empirical support for the Tiebout (1956) hypothesis, it also reveals that the degree of property tax capitalization may not be uniform, even within a given metropolitan area.

## Data Appendix

This Data Appendix provides, for the reader's convenience, a composite list of all of the variables used in the analysis. These are summarized in Table 3.

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Table 1. Semi-log estimates: Housing prices inside the district

Variable/Column	(a) Coefficient	(b) t-value	(c) Coefficient	(d) t-value
BATHS	0.146	3.37	0.144	3.37
FIREPLACES	0.061	4.70	0.062	4.82
ROOMS	0.0336	2.10	0.0385	2.47
SQFT	0.000012	2.67	0.000128	2.90
APT	-0.152	-1.97	-0.155	-1.96
BRICK	0.25	4.04	0.254	4.16
DECK	0.144	3.32	0.146	3.36
CTYD	0.21	4.60	0.23	5.02
SPRINKLER	0.216	2.99	0.206	2.79
STORIES	0.195	3.10	0.188	3.17
STUCCO	0.35	5.60	0.366	5.82
GARAGESP	0.106	3.26	0.098	3.11
BALCNY	0.011	0.21		
POOLTUB	0.229	1.64		
NEW	0.296	4.20	0.289	4.09
PARKSQ	0.088	0.76		
CORNER	0.127	1.86		
PROPTX	-0.000058	-3.69	-0.000061	-3.90

$R^2 = 0.62$ ,  $\text{adj}R^2 = 0.61$ ,  $F = 53.11$

$R^2 = 0.62$ ,  $\text{adj}R^2 = 0.61$ ,  $F = 67.75$

Table 2. Semi-log estimates: Housing prices outside the district

Variable/Column	(a) Coefficient	(b) t-value	(c) Coefficient	(d) t-value
BATHS	0.121	3.07	0.122	3.09
FIREPLACES	0.06	3.82	0.061	3.69
ROOMS	0.032	2.14	0.033	2.55
SQFT	0.000011	2.65	0.00012	2.71
APT	0.0002	0.156		
BRICK	0.2	3.98	0.21	4.01
DECK	0.11	2.99	0.114	3.01
CTYD	0.09	2.11	0.11	2.23
SPRINKLER	0.24	3.15	0.242	2.87
STORIES	0.18	2.09	0.19	2.19
STUCCO	0.28	3.04	0.29	3.12
GARAGESP	0.11	3.05	0.11	3.14
BALCNY	0.01	0.56		
POOLTUB	0.16	2.18	0.17	2.21
NEW	0.302	3.97	0.31	4.01
PARKSQ	0.066	1.81		
CORNER	0.09	1.12		
PROPTX	-0.000039	-3.72	-0.00004	-3.77

$R^2 = 0.63$ ,  $\text{adj}R^2 = 0.61$ ,  $F = 39.55$

$R^2 = 0.61$ ,  $\text{adj}R^2 = 0.60$ ,  $F = 45.67$

Table 3. Variable definitions

<p>InRSALESPR = the natural log of the price of house j expressed in 2005 dollars</p> <p>BATHS = the total number of bathe (full plus half) in house j</p> <p>FIREPLACES = the number of fireplaces in house j</p> <p>BEDROOMS = the total listed number of rooms in house j</p> <p>SQFT = the total number of square feet of finished living space in house j</p> <p>APT = a binary variable indicating whether house j had a rental apartment on the premise (=1 if yes)</p> <p>BRICK = a binary variable indicating whether house j had a primarily or complete brick exterior (=1 if yes, =0 otherwise)</p> <p>DECK = a binary variable indicating whether house j had an exterior deck (=1 if yes)</p> <p>CRTYD = a binary variable indicating whether house j had a private courtyard (=1 if yes)</p> <p>SPRINKLER = a binary variable indicating whether house j had an underground sprinkler system (=1 if yes)</p> <p>STORIES = the number of stories/floors present in house j</p> <p>STUCCO = a binary variable indicating whether house j had a stucco exterior (=1 if yes)</p> <p>GARAGESP = the number of garages spaces that are part of house j</p> <p>BALCNY = a binary variable indicating whether house j had a balcony (=1 if yes)</p> <p>POOLTUB = a binary variable indicating whether house j had its own hot-tub and/or swimming pool (=1 if yes)</p> <p>NEW = a binary variable indicating whether house j was new at the time of sale (=1 if yes)</p> <p>HISTDES = a binary variable indicating whether house j was designed as a National Historic Landmark (=1 if yes)</p> <p>PARK?SQ = a binary variable indicating whether house ja was located across from or adjacent to a park or square, i.e., a small park (=1 if yes)</p> <p>CORNER = a binary variable to indicate whether house j was located on a corner (=1 if yes)</p> <p>PROPTX = annual property tax (county plus city) for house j paid to city and county governments in 2005 dollars</p>
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