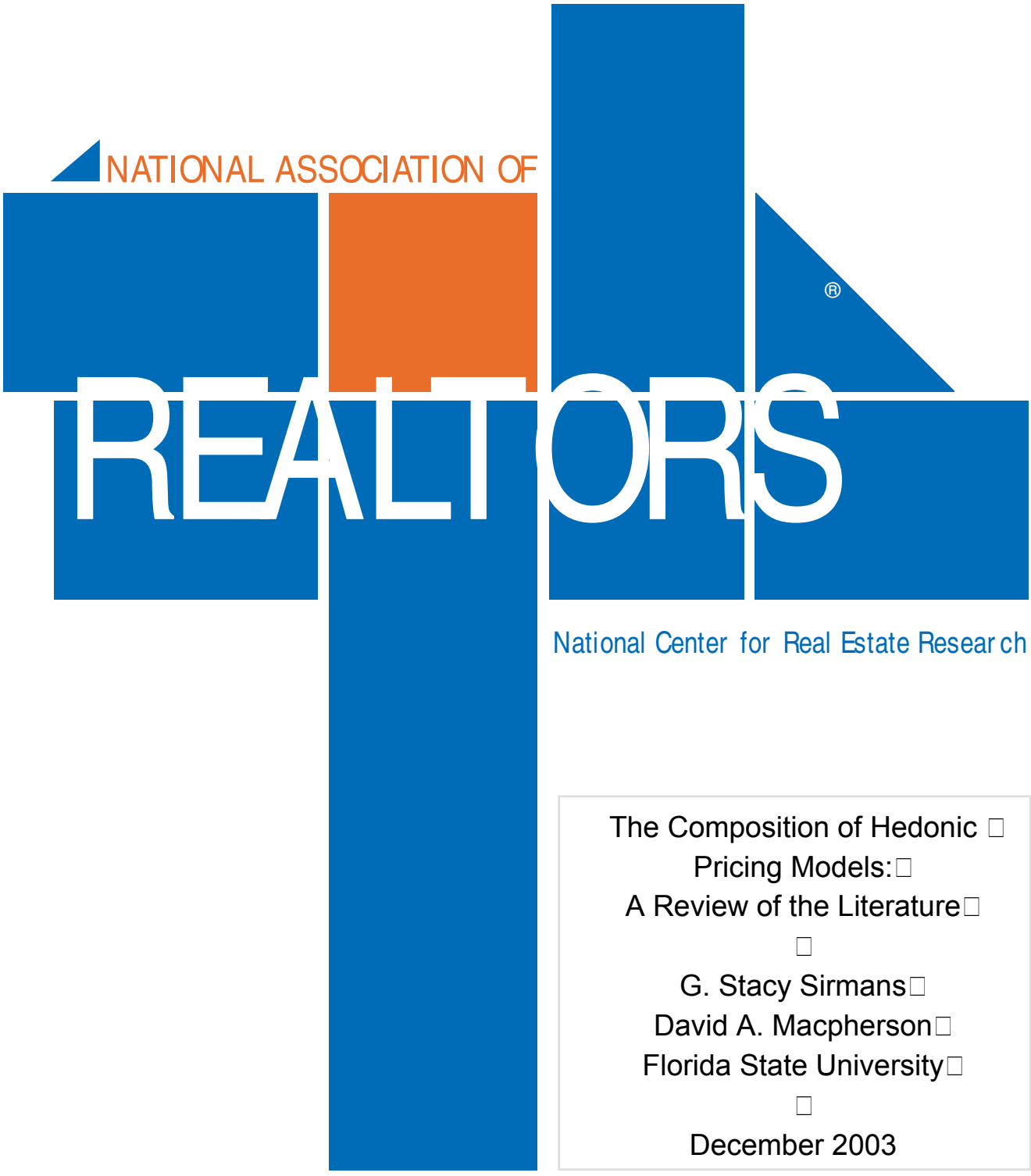

National Center for Real Estate Research

The Composition of Hedonic Pricing Models: A Review of the Literature

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December 2003

NATIONAL ASSOCIATION OF REALTORS®
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THE COMPOSITION OF HEDONIC PRICING MODELS:

A REVIEW OF THE LITERATURE

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EXECUTIVE SUMMARY

THE COMPOSITION OF HEDONIC PRICING MODELS:

A REVIEW OF THE LITERATURE

A house is made up of many characteristics, all of which may affect its value. A house has been compared to a bundle of groceries in that the bundles come in different sizes and may contain different items. Unlike groceries however, the price of individual housing characteristics cannot be directly observed. Hedonic regression analysis is typically used to estimate the marginal contribution of individual characteristics to the total value of the property. Understanding the marginal effect of individual characteristics can be valuable to a number of market participants including homebuyers, real estate agents, developers, and real estate appraisers.

This study provides a review of recent studies that have used hedonic modeling to estimate house prices. The paper is made up of several discussions: the early history of hedonic modeling, the relationship between selling prices and time on the market, and recent studies using hedonic modeling. Even though Court (1939) is often viewed as the father of hedonic modeling, earlier hedonic studies that examined the value of farmland date back to Haas (1922) and Wallace (1926). Later studies developed the microeconomic foundation for estimating the value of utility-generating characteristics (Lancaster, 1966) and for nonlinear hedonic pricing (Rosen, 1974).

Selling price and time on the market tend to be interactive, thus specifying models for these variables in a simultaneous framework is often difficult. Time on the market is generally negative when estimated in a selling price equation. This implies that a longer selling time results in a lower selling price. When selling price is included in a time on the

market equation, the results are less clear. Some models show that houses with higher selling prices sell faster while other studies show that houses with higher selling prices have longer selling times. Listing price is generally thought to be a major factor in time on the market and studies show that a higher listing price results in a longer time on the market, that housing liquidity depends on market participants' search effort that is partially determined by listing price, and that it is expensive to overprice a house initially.

Using the recent literature, the characteristics that are most frequently included in hedonic pricing models are identified. These include lot size, square feet, age, the number of stories, the number of bathrooms, the number of rooms, the number of bedrooms, fireplace, central air conditioning, basement, garage, deck, pool, brick exterior, distance to CBD, time on the market, and a time trend. These variables generally have the expected sign although in some instances they are not significant. Due to the large number of variables, categories are created and the top characteristics from each category are identified. The categories and characteristics are: **structural features**: lot size, square feet, age, number of bathrooms, and number of bedrooms; **internal features**: full baths, half baths, fireplace, air conditioning, hardwood floors, and basement; **external features**: garage spaces, deck, pool, porch, carport, and garage; **natural environmental features**: lake view, lake front, ocean view, and good view; **neighborhood and location**: location, crime, distance, golf course, and trees; **public services**: school district, percent of school district minority, public sewer; **marketing, occupancy, and selling factors**: assessor's quality, assessed condition, vacant, owner-occupied, time on the market, and time trend; and **financing**: FHA financing, VA financing, foreclosure, favorable financing, and property taxes. Most of the characteristics

have a positive effect on selling price. Those characteristics that have had a negative effect on price include age, crime, percent of school district minority, and if a property is vacant.

Following are some other interesting variables that are seen to affect selling price. Those that have a **positive effect** include a slanted versus flat roof, a sprinkler system, a garden bath, a separate shower stall, a double oven, and a gated community. Other characteristics that have a **negative effect** on selling price include not having attic space, living in an earthquake zone, proximity to a hog farm, proximity to a landfill, proximity to high voltage lines, corporate owned properties, and properties that require flood insurance.

The study compares estimated coefficients across geographical regions for selected characteristics. Some major conclusions are:

- the effect of square footage on selling price does not have a great deal of variation across regions. The greatest effect was in the Southwest and the lowest average effect was in the Midwest;
- the effect of lot size was generally consistent across regions;
- age was consistently negative and the effect on price seems to be consistent across regions;
- for studies primarily from the Northeast and Southwest, each additional bathroom increased selling price in the 10 to 12 percent range;
- for studies limited to the Northeast and Southwest, the effect of bedrooms on price was greater in the Northeast than in the Southwest;
- a fireplace had a positive effect on selling price in the six to 12 percent range and was generally consistent across regions, except for the West;

- central air conditioning was consistently important in all regions with the greatest price effect in the Southwest;
- a basement added significant value to selling price in most studies in the 12 to 16 percent range;
- a swimming pool was a consistently significant characteristic with the effect on price being the greatest in the Southwest and Southeast;
- the value of a garage was consistent across regions in the six to 12 percent range; and
- perceived school quality consistently had a significant effect on selling price.

THE COMPOSITION OF HEDONIC PRICING MODELS:

A REVIEW OF THE LITERATURE

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THE COMPOSITION OF HEDONIC PRICING MODELS:

A REVIEW OF THE LITERATURE

A. Introduction

Home is defined as the social unit formed by a family or by one or more unrelated individuals residing together. A house, on the other hand, is a bundle of characteristics such as size, quality, and location. For a number of reasons, valuing a house is difficult. Being a physical asset, each house has its own specific location. Also, a house is a long-term durable good with a long life, which means that houses with substantially different ages can exist at the same time in the same market. Each house has its own unique set of characteristics that affect value. In addition, certain housing characteristics may be valued differently across different geographical areas. For example, a garage may have a greater value in a colder climate whereas a swimming pool may have a greater value in a warmer climate.

In addition to the presence of different characteristics across houses, homebuyers possess unique utility functions causing them to value characteristics differently. For example, one homebuyer may place a greater value on hardwood floors than another buyer. Thus, a certain house with a given set of characteristics may be valued differently by different buyers.

All these factors tell us that housing is not a homogeneous good. Different bundles of characteristics make valuation difficult. The fact that buyers may value individual characteristics differently further complicates the process. Nonetheless, a substantial body of historical research has attempted to explain the value of housing by valuing its individual components. The typical method used to do this is the hedonic pricing model, because it allows the total housing expenditure to be broken down into the values of the individual

components. One caveat in using hedonic pricing models is that the results are location specific and are difficult to generalize across different geographic locations. On the other hand, comparing studies across areas may at least establish those characteristics that are consistently valued (either positively or negatively) by homebuyers. Because of this, hedonic pricing models are generally used to gain insight into the workings of a particular market.

Comparing studies that use hedonic models is complicated since each of them define and measure variables differently. For example, one study may measure bedrooms as simply the number of bedrooms whereas another study may use binary variables (a dummy variable if the house has one bedroom, a second dummy variable if the house has two bedrooms, etc.) The comparability of previous hedonic pricing studies is also complicated and/or limited because of different empirical specifications. Typically, hedonic pricing equations have been estimated using linear or semi-log models.

Even with its problems, however, hedonic modeling can be (and has been) useful in addressing a number of issues in housing valuation. It has been used in valuing not only the obvious components such as square footage, bathrooms, etc. but it also has been useful in measuring the effect of other issues such as school quality, proximity to a landfill or high voltage lines, and the effect of non-market financing.

Malpezzi, Ozanne, and Thibodeau (1980) compare housing to a bundle of groceries in that some bundles are bigger than others and contain different items. Housing is a bundle of bedrooms, bathrooms, and other amenities and the particular bundle of a house distinguishes it from other houses. However, unlike groceries, the price of individual features cannot be directly observed. Hedonic modeling can be used to price these individual

features by employing multiple regression analysis on a pooled sample of many dwellings. As these authors point out, using this model assumes that consumers derive utility (and therefore value) from various housing characteristics and that the value of this utility can be priced. In housing consumption, consumers will pursue maximization of utility within their budget constraint.

The hedonic model generally takes this form:

Price = *f*(Physical Characteristics, Other Factors)

This equation says that the price of the house is a function of its physical characteristics (square footage, bathrooms, age, location, various amenities, etc.) and other factors such as school quality and external factors. The regression estimates give the implicit prices of each variable or characteristic. A complication is that these values are not likely to be the same for all price ranges of houses. For example, the value added of a bedroom might be greater for a $500,000 house than for a $100,000 house. For this reason, the hedonic pricing model is often estimated in semi-log form with the natural log of price used as the dependent variable. The resulting coefficient estimates allow one to calculate the percentage change in price for a one-unit change in the given variable.

The remainder of the paper reviews recent studies that have estimated hedonic pricing models. After a brief discussion of the early history of hedonic models, this review describes studies that, for the most part, have been published over the last decade. The major objectives are to determine variables that are consistently significant in explaining price, compare the coefficients of some variables by geographic location, and examine the relationship between house price and time on the market.

B. The Theoretical Development of Hedonic Pricing Models

In his 2002 paper, Malpezzi presents an excellent review of the theoretical developments behind hedonic pricing models. As he points out, the hedonic model is a way to estimate the value of individual characteristics of the house. Hedonic equations have also been used to measure the effect of various factors of special interest on house prices.

Hedonic models are typically estimated as single-stage equations. That is, the model simply estimates the effect of characteristics on price and does not examine the structural parameters of the individual characteristics. Hedonic models also are estimated in various ways with regard to the dependent variable, the house price. Price may be specified as an absolute, untransformed amount (unlogged) or as a variable that has been transformed by taking its natural log. The typical model structure historically has been the semi-log form, with the price specified in natural logs and regressed against unlogged independent variables. This allows for variation in characteristic prices across different price ranges within the sample.

B.1. Theoretical Underpinnings of the Hedonic Model

As Malpezzi (2002) discusses, the hedonic model arises because of a heterogeneous housing stock and heterogeneous consumers. Not only does each house contain different housing characteristics, but these characteristics may be valued differently by different consumers.

Econometrics has always faced the problem of identification, i.e., distinguishing between supply and demand. In the typical supply and demand model, the price of the good is exogenous and the consumer, being a price-taker, decides how much to consume based on

the price. In a nonlinear hedonic model where the price varies with the quantity, the consumer chooses both a quantity and price.

B.2. Specification Problems

Due to difficulties in the practical application of hedonic models, the functional form of the model and the variables included in the model can often seem ad hoc. This can be traced back to the original papers of Lancaster (1966) and Rosen (1974) that present models of housing characteristics but don't specifically identify what those characteristics are. In practical applications, the dependent variable in the model is usually a recent selling price, standing as a proxy for the value of the house. Using the observed price is generally thought to better minimize bias as compared to other measures such as an owner's self-assessment of the house value.

There are almost a limitless number of independent variables that can be included in a hedonic model. The high correlation of some of these variables with each other can create estimation problems even if all the variables are not included in the model. For example, a location variable may appear to be highly significant in the model but may actually be reflecting something else, such as school quality. Because of this, interpretation of the individual coefficients can be more difficult.

Studies have wrestled with the problem of correct functional form. Follain and Malpezzi (1980) found that the semi-log specification has some advantages over the linear form. Three of these advantages are: (1) a semi-log specification allows for variation in the dollar value of each characteristic; (2) the coefficients can be easily interpreted as the percentage change in the price given a one-unit change in the characteristic; and (3) the semi-log model helps minimize the problem of heteroscedasticity.

C. The Early History of Hedonic Models

Identifying the "father" of hedonic modeling is not easy. In his review, Malpezzi (2002) points out that a study by Court (1939) is often cited as the beginning of hedonic modeling, although this study actually developed a hedonic price index for automobiles and not for housing. As Goodman (1998) discusses, although popularized by Griliches (1958) in his work on the demand for fertilizer, the term "hedonic" dates back to the 1939 Court article and Court is generally cited in most articles. Goodman argues that, as a hedonic price analysis, Court's work stands up quite well under contemporary standards. Court, as an economist for the Automobile Manufacturers' Association from 1930 to 1940, recognized that a single variable could not explain automobile demand. His hedonic model used to explain price included three variables: dry weight, wheelbase, and horsepower. Today, his modeling would be considered modern in that he used a semi-log form, accounted for cars that actually sold, and estimated the models over different time periods.

A 1999 study by Colwell and Dillmore, however, points out that it is highly unlikely that Court is the original source of hedonics. Seventeen years prior to the Court study a monograph by Haas (1922) at the University of Minnesota used a hedonic model to estimate the value of farmland. Also, a 1926 study by Wallace examined the value of farmland in Iowa. Colwell and Dillmore connect Court to Haas (and Wallace) this way: Court developed his idea for a hedonic model from discussions with the chief of the Bureau of Labor Statistics who probably knew of the work by Wallace and maybe the work by Haas.

Later studies important to hedonic modeling are Lancaster (1966) who provided a microeconomic foundation for estimating the value of utility-generating characteristics (with a natural application to housing) and Rosen (1974) who focused on characteristics with less

emphasis on utility and more on price determination. Rosen's work provided the basic foundation for nonlinear hedonic pricing models.

D. The Relationship Between Selling Price and Time on the Market

Typically, a seller's goal is to sell the house at the highest possible price in the shortest possible time. These two objectives are generally reconciled with the setting of the listing price. A listing price that is too high may have the effect of both lengthening the selling time and limiting the pool of potential buyers. Setting the listing price too low may minimize the selling time but may also result in a selling price lower than what otherwise could be attained.

Since selling price and time on the market tend to be interactive variables, some studies have estimated simultaneous or two-stage models to capture the effect. Specifying such models for selling price and time on the market is difficult since they tend to be very similar. This section discusses some recent studies that have followed this procedure.

When time on the market is included and statistically significant in the selling price equation, it is generally negative. This indicates that a longer selling time results in a lower selling price. When selling price is included in a time on the market estimation, the results are much less clear. In some cases, a higher selling price leads to a longer selling time whereas in others, a higher selling price results in a shorter selling time.

The following are some recent studies that have examined the relationship between selling price and time on the market. Jud, Seaks, and Winkler (1996) examine the impact of brokers, brokerage firms, and marketing strategy on time on the market using a duration model. They find duration dependence to be positive, indicating that the probability of

selling the property increases with time on the market. Their results show that higher listing prices result in a longer time on the market whereas reducing the listing price decreases time on the market. The results also show that atypical homes have a longer time on the market.

A 1996 study by Forgey, Rutherford, and Springer estimates a two-stage least squares model of house prices and time on the market. Their results show that housing liquidity depends on market participants' search effort, which is determined by market conditions, physical characteristics of the property, the size of the brokerage firm, and listing price. They find that houses with higher liquidity sell for higher prices and that selling prices increase with sellers' search effort.

In testing real estate agents' comments, Haag, Rutherford, and Thomson (2000) estimate ordinary least squares models for selling price and time on the market. They find that time on the market has a significant negative effect on selling price. Their time on the market equation includes list price, which is shown to be not significant. They find that motivated sellers accept lower selling prices but have a longer selling time and that updated properties produce a higher selling price and a shorter selling time. However, they find that some other improvements such as new paint and roof work decrease price and increase time on the market.

In examining exclusive agency and exclusive right to sale contracts, Rutherford, Springer, and Yavas (2001) estimate a simultaneous equations model for selling price and time on the market. The first stage regresses time on the market against various factors and the second stage regresses selling price against a similar set of factors. The results show a positive relationship between selling price and selling time and that exclusive agency listings and builder-owned listings have a shorter selling time than exclusive right to sale

listings and owner-held properties. However, exclusive agency listings are associated with lower selling prices while builder-owned properties have higher selling prices. Another 2001 study by Johnson, Salter, Zumpano, and Anderson examines the effect of artificial stucco on house prices and selling time. They first use a probit model to relate the presence of artificial siding to explanatory variables. Next, they estimate the selling price using typical explanatory variables with artificial stucco included. Then, they use duration modeling to measure the effect of artificial stucco on selling time. Their results suggest that properties with artificial stucco sell at a premium although the selling time is longer.

Knight (2002) uses a maximum-likelihood probit model and information on price changes during a home's marketing period to examine the selling price and time on the market relationship. He finds that it is expensive to overprice the house initially. Homes that had large percentage adjustments in listing price not only had longer selling times but also ultimately sold at lower average selling prices. A 2003 study by Anglin, Rutherford, and Springer also examines the importance of setting the initial listing price and the marketability of the property. The paper measures the degree of overpricing as the percentage difference between the actual listing price and the expected listing price. Their theoretical models shows that there is no direct tradeoff between selling price and selling time but that market conditions affect how the expected selling price and the expected selling time vary jointly based on the initial listing price. They find that increases in the listing price increase time on the market. Their results also show the importance of changing marketing conditions on selling time.

These studies illustrate the difficulty in specifying the relationship between selling price and time on the market. Because of this, most studies involving hedonic pricing

models have chosen to ignore these problems by estimating a simpler OLS model, although time on the market is sometimes included as an explanatory variable.

E. Review of Recent Hedonic Pricing Model Studies

This section discusses some studies published over the last decade that have used hedonic modeling.

E. 1. The Top Twenty Characteristics

Table 1.1 shows the top twenty characteristics that have been used to specify hedonic pricing equations. The table shows the total number of times a characteristic has been used and the number of times its estimated coefficient has been positive, negative, or not significant. Age shows up most frequently in hedonic models and typically has the expected negative sign although it is positive and not significant in some studies. Square footage is the next most used characteristic and typically has the expected positive effect on selling price. Other characteristics that appear frequently are garage, fireplace, and lot size. Each typically has the expected positive effect. Garage never has a negative sign but it has been not significant in a number of studies. Fireplace shows up negative in only a few studies and lot size never shows up with a negative coefficient.

Other characteristics that show up frequently are bedrooms, bathrooms, swimming pool, and basement. Bedrooms have a negative coefficient in some studies but bathrooms almost never do. A swimming pool never has a negative effect on selling price although it has been not significant in some studies. Basement is usually positive but it has been shown to be negative or not significant in some studies.

Time on the market shows up in eighteen studies and is not significant most often. When it is significant, it is negative to positive eight to one. This tends to support the argument that the longer a house is on the market, the more willing the seller is to concede on the selling price. The opposing theory is that the longer a house in on the market, the more likely the seller is to find the one buyer willing to pay a higher price.

Table 1.1

The Twenty Characteristics Appearing Most Often in Previous Hedonic Pricing Model Studies

Variable	# of Appear-ances	# Times Positive	# Times Negative	# Times Not Significant
Lot Size	52	45	0	7
Ln Lot Size	12	9	0	3
Square Feet	69	62	4	3
Ln Square Feet	12	12	0	0
Brick	13	9	0	4
Age	78	7	63	8
# Stories	13	4	7	2
# Of Bathrooms	40	34	1	5
# Rooms	14	10	1	3
Bedrooms	40	21	9	10
Full Baths	37	31	1	5
Fireplace	57	43	3	11
Air Conditioning	37	34	1	2
Basement	21	15	1	5
Garage Spaces	61	48	0	13
Deck	12	10	0	2
Pool	31	27	0	4
Distance	15	5	5	5
Time On Market	18	1	8	9
Time Trend	13	2	3	8

Other characteristics that have been commonly used to specify selling price include distance variables, brick exterior, the number of stories, and a time trend. Brick exterior is consistently positive but the other variables have different signs. This could be at least partially a function of the method of specification.

E.2. Typical Characteristics by Category

Table 1.2 shows the top characteristics used in previous hedonic studies in each of eight categories. The most common structural characteristics are lot size, square feet, age, number of bathrooms, and bedrooms. All characteristics except age typically have the expected positive sign.

Internal features that appear most frequently are full bathrooms, half bathrooms, fireplace, air conditioning, hardwood floors, and basement. These characteristics rarely have negative coefficients although they sometimes are not significant.

External features used most frequently in explaining selling price are garage/garage spaces, deck, pool, porch, and carport. None of these characteristics had negative coefficients except carport. One study reported a negative sign on carport.

Characteristics provided by the natural environment consistently have a positive effect on selling price. These include lakefront or view, ocean view, and a "good view".

Environmental characteristics created by location or neighborhood include location, crime, distance, golf course, and trees. Location is generally measured as a neighborhood identifier, zip code, etc. and typically has a positive effect on price. Crime is usually measured as the crime rate for a given area and typically has a negative effect on price. Distance is typically measured as distance from the city center and the estimated coefficient has been both positive and negative. Golf course is usually measured as being on or near a golf course and, as expected, consistently has a positive effect on selling price. Trees usually mean a wooded lot versus an open lot and also has consistently had a positive effect on price.

Table 1.2

The Top Characteristics By Category From Previous Hedonic Pricing Model Studies

Category	Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
1	**Construction & Structure**				
	Lot size	52	45	0	7
	Sq ft	69	62	4	3
	Age	78	7	63	8
	# of bathrooms	40	34	1	5
	Bedrooms	40	21	9	10
2	**House Internal Features**				
	Full baths	37	31	1	5
	Half baths	7	6	0	1
	Fireplace	57	43	3	11
	Air conditioning	37	34	1	2
	Hardwood floors	7	5	0	2
	Basement	21	15	1	5
3	**House External Amenities**				
	Garage spaces	61	48	0	13
	Deck	12	10	0	2
	Pool	31	27	0	4
	Porch	9	5	0	4
	Carport	4	1	1	2
	Garage	4	3	0	1
4	**Environmental--Natural**				
	Lake view	5	5	0	0
	Lake Front	5	5	0	0
	Oceanview	4	4	0	0
	"good view"	4	3	0	1
5	**Environmental-Neighborhood & Location**				
	Location	9	7	2	0
	Crime	7	1	4	2
	Distance	15	5	5	5
	Golf course	9	9	0	0
	Trees	6	6	0	0
6	**Environmental-Public Service**				
	School district	10	3	7	0
	% School District Minority	7	0	5	2
	Public Sewer	2	1	1	0
7	**Marketing, Occupancy & Selling Factors**				
	Assessors Quality	6	5	0	1
	Assessed Condition	8	7	0	1
	Vacant	10	0	9	1
	Owner-Occupied	6	4	0	2
	Time On Market	18	1	8	9
	Trend	13	2	3	8

Table 1.2 (continued)
The Top Characteristics By Category From Previous Hedonic Pricing Model Studies

Category	Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
8	**Financing**				
	FHA Ffin	3	0	3	0
	VA Fin	3	0	3	0
	Foreclosure	5	0	5	0
	Favorable Financing	3	0	0	3
	Property Tax	3	0	1	2

Environmental characteristics resulting from public services include the school district, percent minority in school district, and access to a public sewer. In general, the consistent significance of the school district variable indicates that perceived school quality has a significant effect on house prices. An increasing minority population in schools has a consistent negative effect on selling price.

Marketing, occupancy, and selling characteristics include the assessor's judgment of quality, the assessed condition of the house, whether the house is vacant at the time of sale, whether the house is owner-occupied, the time on the market, and a time trend. Measures of quality and condition have a positive effect on price. Being owner-occupied also has a positive effect. Being vacant and for sale is not good for the selling price. Generally, time on the market has a negative effect and the time trend variables have been not significant.

The last category, financing, includes types of financing (FHA, VA, favorable), whether a house is in foreclosure, and property taxes. Studies show that houses with FHA or VA financing sold for less than houses with conventional financing. Being in foreclosure has a negative effect on price. Studies on property taxes are mixed. One study shows a negative effect while two studies show property taxes are not significant.

E.3. All Characteristics by Category

Table 1.3 presents a comprehensive list of the characteristics that have appeared in hedonic models. A large of number of diverse variables has been used to define selling price. This section discusses some interesting variables that have not been previously discussed. For example, structural characteristics such as roof type, having a sprinkler system, or not having attic space affect selling price. Interior amenities such as having a garden bath, a separate shower stall, and a double oven in the kitchen have a consistent

Table 1.3
Characteristics By Category From Previous Studies

Category 1
Construction and Structure Variables

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Lot Size	52	45	0	7
Ln Lot Size	12	9	0	3
Acreage	1	1	0	0
Ln Frontage Feet	1	1	0	0
Small Lot	1	0	0	1
Large Lot	1	1	0	0
Plot Size In Meters	1	1	0	0
Plot Depth In Meters	1	1	0	0
Square Feet	69	62	4	3
Ln Square Feet	12	12	0	0
Square Feet Squared	1	0	1	0
Living Area	6	6	0	0
Ln Living Area	2	0	2	0
Other Area	2	2	0	0
Square Feet Of House Foundation	1	1	0	0
Net Area (improvements)	2	2	0	0
Year Built	4	2	1	1
Ln Year Built	2	2	0	0
Age	78	7	63	8
Age Squared	8	8	0	0
Ln Age	8	0	6	2
New Construction	2	1	0	1
New House	1	0	1	0
Stucco	3	1	1	1
Brick	13	9	0	4
Vinyl	7	4	0	3
Frame	8	1	6	1
Synthetic Stucco	2	2	0	0
Siding	2	2	0	0
Brick Home Exterior	2	1	0	1
Painted Exterior Wall	1	0	1	0
Stone/Brick Exterior	1	1	0	0
Roof Type	8	6	0	2
Composite, Wood Shingle or Buildup roof	1	0	0	1
Tile Roof	1	0	0	1
No Attic	3	0	2	1
Attic	2	1	0	1
High Ceilings	1	0	0	1
Two-Story	6	4	1	1
2.5 Stories	1	1	0	0
3 Or More Floors	1	0	0	1
# Stories In Building	13	4	7	2
Split Level	4	2	1	1
Dummy For Colonial Style Home	7	2	1	4
Ranch Style	2	1	0	1

Category 1 (continued)
sConstruction and Structure Variables

Variable	# of Appear-ances	# Times Positive	# Times Negative	# Times Not Significant
Sprinkler system	2	2	0	0
Holes In Floor	1	0	1	0
Low Quality Home	1	0	1	0
High Quality (Design and Materials)	3	2	0	1
Dummy For Renovated Property	2	2	0	0
Outlier	1	0	1	0
Updated	2	2	0	0
New Paint	1	0	1	0
Amps for Remodeling	1	1	0	0
Fixer Upper	1	0	1	0
Slab Foundation	2	0	1	1
Pier and Beam Foundation	1	1	0	0
Asphalt Road	1	0	1	0
Lake Water	3	0	2	1
Cape Cod	1	0	0	1

Category 2
Internal House Features

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
# Rooms	14	10	1	3
# Bedrooms and Bathrooms	1	1	0	0
Bedrooms	40	21	9	10
Ln Bedrooms	4	4	0	0
# of Bathrooms	40	34	1	5
One Bedroom	1	0	1	0
2 Bedrooms	1	0	1	0
3 Bedrooms	1	1	0	0
4 Bedrooms	2	2	0	0
Five or More Bedrooms	2	2	0	0
Master Bedroom Traffic Free	1	1	0	0
Ln (# of Baths)	2	2	0	0
Full Baths	37	31	1	5
Ln Full Bathroom	2	2	0	0
Third Baths	4	4	0	0
Half Baths	7	6	0	1
1.5 Baths	1	1	0	0
Two baths	2	2	0	0
2.5 Baths	1	1	0	0
3 or More Baths	1	1	0	0
Sauna	1	1	0	0
Garden Bath	3	3	0	0
Shower Separate	2	2	0	0
Ceramic Tub	1	1	0	0
Tile Bath	1	1	0	0
Dining Area	4	3	0	1
Ln Dining Area	2	2	0	0
Dining Rooms	2	1	0	1
Ln Kitchen Area	2	2	0	0
Kitchen Wallpaper	1	0	0	1
Double Oven	2	2	0	0
Microwave	1	0	0	1
Disposal	1	0	0	1
Refrigerator	1	0	0	1
Fireplace	57	43	3	11
Air Conditioning	37	34	1	2
Central Air	1	1	0	0
No Air Conditioning	2	0	2	0
Window AC	4	1	3	0
Forced Air Heat	5	5	0	0
Electric Heat	1	1	0	0
Gas Heating System	4	1	3	0
Oil Heat	1	0	0	1
Central Heating	6	5	0	1
Heat	1	1	0	0
Water Heat/ Heat Pump	1	1	0	0
Ceiling Fan	1	1	0	0
Basement	21	15	1	5
Dummy for No Basement	6	0	3	3

Category 2 (continued)
Internal House Features

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Basement Finished	4	2	0	2
Recroom in Basement	1	1	0	0
Hardwood floors	7	5	0	2
Carpet	3	3	0	0
New Carpet	1	0	0	1
Tile	1	1	0	0
Molding	1	0	0	1
Cable TV	1	0	1	0
Skylights	1	0	0	1
Wet Bar	4	3	0	1
Family Room/ Main Floor	1	1	0	0
Panel	2	0	0	2
Wood paneling	1	0	0	1

Category 3
External House Features

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Garage Spaces	61	48	0	13
One Car garage Space	1	1	0	0
2 or More Car Garage Spaces	1	1	0	0
Carport	4	1	1	2
Garage	4	3	0	1
No Garage	2	0	1	1
Detached Garage	3	3	0	0
Deck	12	10	0	2
Pool	31	27	0	4
Tennis Court	1	0	0	1
Separate Shop Space	1	1	0	0
Storage	1	1	0	0
Porch	9	5	0	4
Covered Porch Area	1	1	0	0
Landscaping	3	3	0	0
Fence	2	0	0	2

Category 4
Natural and Environmental Variables

Variable	# of Appear-ances	# Times Positive	# Times Negative	# Times Not Significant
Gated Community	1	1	0	0
"Good View"	4	3	0	1
Lake View	5	5	0	0
Lake/River View	2	1	0	1
Lake Front	5	5	0	0
Ocean Front	2	2	0	0
Ocean View	4	4	0	0
Oceanview1	1	1	0	0
Oceanview2	1	1	0	0
Oceanview3	1	1	0	0
Oceanview4	1	1	0	0
Distance to Nearest Beach	1	0	1	0
Width of Nearest Beach	1	1	0	0
Mountain View	2	0	0	2
Bay Front	1	1	0	0
Next to Stream	2	1	0	1
Groundwater Contamination in Neighbor-hood	1	0	0	1
Oil Spill on Waterfront Lot	1	0	1	0
Oil Spill on Interior Lot	1	0	1	0
Magnitude of Largest Earthquake	2	0	2	0
Special Studies Zone for Earthquake	1	0	1	0
Flood Plain	1	0	1	0
Riparian Buffer Width in Trees	1	0	0	1
Soil Type	1	1	0	0
Airport Noise	1	0	1	0
Air Quality	1	0	0	1
Air Pollution	1	0	0	1
Ln Manure Index	1	0	1	0

Category 5
Environmental Neighborhood and Locational Factors

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Location	9	7	2	0
Good Location	1	0	0	1
Golf Course	9	9	0	0
Located on Alley Way	3	0	1	2
On 2-Way Street	1	1	0	0
Busy Street	2	0	0	2
Interstate	3	0	3	0
Arterial Road	1	0	0	1
High Traffic Area	3	0	2	1
In City	1	1	0	0
Close	3	0	0	3
Distance	15	5	5	5
Distance Squared	2	1	1	0
Travel Time to Work	1	0	1	0
Hwy Time to CBD	4	2	2	0
Distance from Waste	4	2	1	1
Distance to School	1	1	0	0
Distance to Landfill	1	1	0	0
Metro Within 1/4 Mile	1	0	1	0
1/2 Mile to Hwy Interchange	1	0	0	1
1/2 to 1 Mile to Hwy Interchange	1	0	0	1
1-2 Miles to Interchange	1	1	0	0
2-3 Miles to Interchange	1	1	0	0
1/4 Mile to Metro Station	1	0	1	0
1/4 to 1/2 Mile to Station	1	0	0	1
1/2 to 1 Mile to Station	1	0	0	1
1-2 Miles to Station	1	1	0	0
2-3 Miles to Station	1	1	0	0
Railroads	1	0	1	0
Train Station	1	1	0	0
Stream	1	0	0	1
Bay	1	1	0	0
Crime	7	1	4	2
Bad Crime Level	1	0	0	1
Murder Rate	1	0	1	0
Correctional Facility	1	0	0	1
Abandoned Bldgs in Area	1	0	1	0
# Houses in Neighborhood Boarded Up	1	0	1	0
Neighborhood Density	4	1	1	2
Neighborhood Noise	1	0	0	1
Noise Control Level	1	0	1	0
Bad Trash in Area	1	0	0	1
Neighborhood Odor Bad	1	0	0	1
Trees	6	6	0	0
R1 Zoning	2	2	0	0
R2 Zoning	2	2	0	0
R3 Zoning	2	0	0	2

Category 5 (Continued)
Environmental Neighborhood and Locational Factors

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Lot Density	1	1	0	0
Lot Density	1	1	0	0
Baptist	1	0	1	0
Catholic	1	0	1	0
Church of Jesus Christ of Latter Day Saints	1	1	0	0
Distance to Group Home	1	0	1	0

Category 6
Environment – Public Service Amenities

Variable	# of Appear-ances	# Times Positive	# Times Negative	# Times Not Significant
School District	10	3	7	0
In Local School District	1	0	0	1
School Quality	1	1	0	0
If Public Elem. School OK	1	0	0	1
Improvements in Elem School	0	0	0	0
Private School	1	0	1	0
% School District Minority	7	0	5	2
Special Education	1	0	0	1
Percent of Gifted Students	1	1	0	0
Percent Change in School Enrollment	1	0	1	0
Percent of School Age Children	1	0	0	1
Rate of Turnover in Student Pop Each Year	1	1	0	0
Average Attendance per Student	1	0	1	0
% High School	3	1	0	2
Avg Math Score	1	1	0	0
Avg Reading Score	1	1	0	0
Pass Rate for Elementary School Test	2	1	0	1
Dollar Expenditures per Student for Instruction	1	0	0	1
Dollar Expenditures per Student for Administration	1	0	0	1
Dollar Expenditures per student for operation	1	0	0	1
Dollar Expenditures per student for staff	1	0	0	1
Support Dollar Expenditures per Student	1	0	0	1
Free Lunch in School	1	0	1	0
Public Sewer	2	1	1	0
Public Assistance	1	0	0	1
Exterminator Service	1	0	1	0
Power Lines	1	0	1	0
Commercial Activities	1	0	0	1
Adequate Shopping Area	1	1	0	0
Public Transportation OK	1	0	1	0
Ln Quality of Public Service	1	1	0	0
Commute Time	1	0	0	1
Drugs	1	0	0	1
Deed Restrictions	1	1	0	0

Category 7
Marketing, Occupancy and Selling Factors

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Assessors Quality	6	5	0	1
Assessed Condition	8	7	0	1
Quality1	1	0	1	0
Quality2	1	0	1	0
Condition1	1	0	1	0
Condition2	1	0	1	0
Condition3	1	1	0	0
Condition4	1	1	0	0
Average condition	1	1	0	0
Good Condition	5	4	0	1
Dollar Repairs at Closing	1	0	0	1
Owner-Occupied	6	4	0	2
Non-Owner Occupied	1	0	1	0
Tenant	1	0	1	0
% Renters	2	1	1	0
Occupied Units	1	0	1	0
Previously Occupied Dummy	1	0	0	1
Vacant	10	0	9	1
% Vacant	4	0	1	3
DOM X Vacant	1	1	0	0
Avg Income in Area	2	1	0	1
Median Income	3	0	1	2
Median Household Income	3	1	0	2
Two Income	1	0	1	0
Household Income	2	1	1	0
% Blue Collar	3	0	2	1
% Poverty	1	0	1	0
Unemployment Rate	4	0	0	4
Proximity to Employment	1	0	0	1
Manufacturing Employment Density	1	0	1	0
Retail Employment Density	1	0	1	0
Real Estate Agent is Used (Dummy)	1	0	0	1
Exclusive Agency	1	0	1	0
Exclusive Agency Sell by Owner	1	1	0	0
Listing Contract Period	3	2	0	1
Contract Expiration Days	2	1	0	1
# of Days from Contract to Closing	2	0	0	2
Listing Brokerage Firm	3	1	1	1
Buyer's Broker	1	0	0	1
Buyer Agent	1	0	0	1
Listed in Fall	1	0	1	0
Listed in Spring	1	0	1	0
Listed in Summer	1	0	1	0
Offer Open 1 Day or Less	1	1	0	0
First Time Homebuyer	1	0	0	1
New Resident in Area	1	0	0	1
Seller Eager	1	0	1	0
Motivated Seller	1	0	0	1

Category 7 (continued)
Marketing, Occupancy and Selling Factors

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Motivated	1	0	1	0
Buyer must sell house	1	0	0	1
Seller Relocated	1	0	1	0
Corporate Owned	2	0	2	0
Corporate Sale	1	0	1	0
Intra-Family Sale	1	0	1	0
Bank Sale	1	0	1	0
Estate Sale	1	0	1	0
Time on Market	18	1	8	9
Total Days on Market	4	0	2	2
Ln TOM	5	1	2	2
Date of Sale (Time)	1	1	0	0
Time Trend	13	2	3	8
Time Trend Squared	1	0	0	1
Sale Year	1	1	0	0
Year Dummy	1	0	1	0
Continuous Month-of Sale Variable	1	1	0	0
Cash Sale	4	0	4	0
Good Buy	1	0	1	0
Builder Owned	1	1	0	0
CPI for Fuel	1	1	0	0
Percent Asian	1	0	1	0
Percent Black	4	0	3	1
Percent Hispanic	2	0	2	0
Percent Back or Hispanic	1	0	1	0
Percent White	1	1	0	0
Population Percent >62	1	1	0	0
Historic Façade Easement	1	0	1	0
Federal Historic District	1	1	0	0
Distant Moves	1	1	0	0
Employer Pays Moving	1	1	0	0
New Household	1	0	1	0
No Experience	1	0	1	0
Family Size	1	0	0	1
Age of Buyer	1	1	0	0
Population Change	1	0	0	1
Population Density	1	0	1	0
Points Paid by Seller in $	1	1	0	0
Closing Cost Paid by Seller in $	2	0	0	2
Perceived Risk	1	0	1	0
# of Media Articles	1	1	0	0

Category 8
Financing

Variable	# of Appearances	# Times Positive	# Times Negative	# Times Not Significant
Mortgage Rate	2	1	1	0
Conventional Financing	1	0	1	0
FHA Financing	3	0	3	0
VA Financing	3	0	3	0
Owner Financing	1	0	1	0
Other Financing	2	0	0	2
Foreclosure	5	0	5	0
Financing Premium	1	1	0	0
Favorable Financing	3	0	0	3
Seller Pays Closing Costs	1	0	0	1
Flood Insurance	1	0	1	0
Selling Bonus	1	0	0	1
# Days in Rental Process	1	1	0	0
Property Tax	3	0	1	2
Superfund	1	1	0	0
Eminent Domain Purchase	1	1	0	0

positive effect on price. On the other hand, having a fence has not been shown to affect price.[1]

Natural environmental characteristics related to earthquake magnitude or earthquake zones have a negative effect on selling price while living in a gated community has a positive effect. One study, examining the effect of proximity to a hog farm found that selling price decreases as the manure index increases.

Interesting neighborhood characteristics include proximity to a metro station, distance to a landfill, and proximity to a religious building. Prices are shown to not be higher for houses closer to a metro station. Likewise, selling prices increase with distance from a landfill. Being located close to a religious building has been shown to both increase and decrease price.

One study shows that being located in proximity to high voltage power lines reduces selling price while the percent of gifted students in the school increases price.

Studies have shown that houses that are corporate owned have lower selling prices. Studies also show that selling prices decrease as the percentage of Blacks/African Americans or Hispanics/Latinos in the area increases.

Studies measuring financing characteristics show that owner financed homes sell for less. Also, houses that require flood insurance sell for less.

E.4. Comparing Coefficient Estimates by Geographical Area

Table 1.4 shows coefficient estimates for selected characteristics by geographical area. The coefficients are from studies that used semi-log models and were consistent in their measurement of these characteristics.

As shown, estimations are somewhat consistent across areas. For example, the coefficients for square feet do not have a great deal of variation across regions. They are normally in the 0.0004 to 0.0007 range. Square footage seems to have the greatest effect on price in the Southwest where, on average, each additional square foot adds about 0.05 percent to value. The lowest average effect seems to be in the Midwest. The coefficients for the Southeast and West average approximately 0.045 percent. Remember that this coefficient is measuring the percentage change in price with each additional square foot. Likewise, the coefficients for lot size are generally consistent across geographical regions.

Age consistently has a negative effect on selling price. There is some variation in the coefficient estimates but there does not seem to be a discernable pattern of differences across regions. The average effect of age on value seems to be about one percent or less.

Bathrooms generally have a significant effect on selling price. Studies discussed here that have included the number of bathrooms tend to be limited to Northeast and Southwest data. The bathroom coefficient for the Northeast falls in the 0.13 - 0.18 range indicating that each additional bathroom adds 13 to 18 percent to the price of the house. The coefficients for the Southwest have a wider variation ranging from 0.015 to 0.18. The average effect on price is in the 10 to 12 percent range.

As with bathrooms, studies included here that have estimated the effect of bedrooms are limited to the Northeast and Southwest. The effect of an additional bedroom seems to be somewhat greater in the Northeast than in the Southwest.

Table 1.4
Coefficient Estimates from Hedonic Pricing Models for Selected Characteristics by Geographical Area

Region	Square Feet	Lot Size	Age	Bathrooms	Bedrooms
Northeast	0.06	0.0000132	-0.00294 -0.010	0.127 -0.004	0.157 0.13
Southeast	0.000352 0.000419 0.00040 0.00070 0.00040	0.0000021 0.0000029	-0.009 -0.005 -0.012 -0.019	0.099	x
Midwest	0.00015 0.00040	0.0000044 0.0000070	-0.017	x	x
Southwest	0.00040 0.00060 0.00040 0.00070	0.0000070 0.00020	-0.012 -0.015 -0.0002 -0.008	0.161 0.015 0.044 0.18	0.022 0.035 0.31
West	0.00050 0.00060 0.00030 0.00040	0.000017 0.00001 0.0000014	-0.006 -0.003 -0.020 -0.0032	x	x
Coefficient Estimates From Recent Sirmans and Macpherson Study	0.0003	0.015 (in acres)	-0.050 (binary variables for age)	0.216 (full baths) 0.139 (half baths)	0.041

Table 1.4 (continued)
Coefficient Estimates from Hedonic Pricing Models for Selected Characteristics by Geographical Area

Region	Fireplace	Air Conditioning	Time on the Market	Basement	Swimming Pool
Northeast	0.143 0.095 0.033	0.048 0.040 0.070 0.090 0.090 0.050 0.131	0.00 0.00 0.00 -0.099	x	0.037 0.058 0.056
Southeast	0.127 0.133 0.067 0.145 0.037	0.129 0.101	-0.0002 -0.0001 -0.0220 -0.0002 -0.0003	0.120	0.098 0.090 0.048 0.077
Midwest	0.078 0.110 0.085 0.078 0.045	0.129 0.099 0.060 0.075 0.070 0.129	0.00	0.158 0.120 0.121 0.05	0.060 0.059
Southwest	0.128 0.067 0.120 0.146 0.011	0.16 0.15 0.26	-0.0003	x	0.134 0.104 0.128 0.097 0.093 0.083 0.104
West	0.054 0.106 0.053 0.024	0.007 0.048	x	0.143 0.059	0.134 0.046 0.058 0.090 0.065
Coefficient Estimates From Recent Sirmans and Macpherson Study	0.113	0.117	-0.015	-0.087	0.076 (Inground pool)

Table 1.4 (continued)
Coefficient Estimates from Hedonic Pricing Models for Selected Characteristics by Geographical Area

Region	Garage Spaces	School District
Northeast	0.070	0.045
	0.230	
	0.113	
	0.060	
	0.113	
	0.079	
	0.121	
Southeast	0.063	-0.128
	0.070	-0.086
	0.067	
	0.055	
	0.100	
	0.143	
Midwest	0.106	-0.030
	0.120	
	0.096	
	0.106	
	0.036	
Southwest	0.072	x
	0.057	
	0.074	
	0.107	
West	0.045	0.054
	0.024	-0.184
	0.039	0.148
	0.014	-0.020
	0.025	
	0.051	
	0.170	
	0.080	
	0.138	
Coefficient Estimates From Recent Sirmans and Macpherson Study	0.121	x

A number of studies have included fireplace in hedonic models. The presence of a fireplace consistently has a significant positive effect on selling price. Casual observation shows that a fireplace generally affects selling price in a range from six percent to 12 percent and this effect is consistent across regions, except for the West. The estimated coefficients for the studies from the West seem to be, on average, less than for studies from other areas.

Central air conditioning generally is significant and has a positive effect on price. Several studies from the Northeast produce models where air conditioning is significant with an average effect on price in the seven percent range with coefficients ranging from four percent to nine percent. Several studies from the Midwest also show air conditioning to be important with the effect in a higher range from six percent to 13 percent. Although fewer in number, studies from the Southeast and West show air conditioning to be important with the effect on selling price in the 12 percent and three percent range, respectively. The effect on price in the Southwest is in the 15 to 19 percent range.

Basement is seen to have a significant positive effect on selling price. A study from the Southeast shows that a basement adds about 12 percent to value. Several studies from the Midwest show that a basement affects value in the 12 percent to 16 percent range. A couple of studies from the West show a basement adds from six percent to 14 percent to house prices.

Swimming pool is an often-included characteristic in hedonic models. It is generally positive and significant. In the Northeast, a pool adds four percent to six percent to value. In the Southeast, the effect is in the five percent to 10 percent range. The effect in the Midwest is similar to the effect in the Northeast with the average effect on value about six percent. A

pool seems to affect price the most in the Southwest, where studies show the effect to be between eight percent and 13 percent. A pool also is important in the West but the effect on value is less consistent than other areas. In the West, the average effect on value ranges from five percent to 13 percent.

Garage is generally specified in pricing models as the number of garage spaces. This characteristic is included often and has a significant positive effect on selling price. In the Northeast, most studies show that each garage space adds between six percent and 12 percent to value. Garage spaces are priced similarly in the Southeast with the value added between six percent and 14 percent of selling price. In the Midwest, the effect on value is between four percent and 12 percent while the effect in the Southwest is between six percent and 11 percent. Garage space seems to add the least in the West where a number of studies show a one percent to five percent addition to value.

Some studies have attempted to examine the importance of schools by including one or more school identifiers. The typical measure is to identify the home's school district. These measures consistently show perceived school quality to be important. The estimated coefficients are sometimes positive and sometimes negative depending on perceptions. Overall, the effect on price seems to range between three percent and 18 percent.

The results from the recent study by Sirmans and Macpherson (2003) examining the value of housing characteristics also are given at the bottom of Table 1.4. In general these results are consistent with the results from previous studies.

F. Summary

This study was made up of several parts: the early history of hedonic modeling was discussed, the relationship between selling price and time on the market was discussed, and recent studies using hedonic modeling were reviewed. Even though Court (1939) is often viewed as the father of hedonic modeling, earlier hedonic studies that examined the value of farmland date back to Haas (1922) and Wallace (1926). Later studies developed the microeconomic foundation for estimating the value of utility-generating characteristics (Lancaster, 1966) and for nonlinear hedonic pricing (Rosen, 1974).

Selling price and time on the market were seen to be interactive making specification of these variables in a simultaneous framework difficult. Time on the market was generally negative when estimated in a selling price equation. This implies that a longer selling time results in a lower selling price. When selling price is included in a time on the market equation, the results are less clear. Some models show that houses with higher selling prices sell faster while other studies show that houses with higher selling prices have longer selling times. Studies were discussed that show listing price as a major factor in time on the market.

Using the recent literature, the characteristics that are most frequently included in hedonic pricing models were identified. These include lot size, square feet, age, the number of stories, the number of bathrooms, the number of rooms, the number of bedrooms, fireplace, central air conditioning, basement, garage, deck, pool, brick exterior, distance to CBD, time on the market, and a time trend. These variables generally have the expected signs although in some instances they are not significant. Due to the large number of variables, categories were created and the top characteristics from each category were identified. The categories and characteristics are: **structural features**: lot size, square feet,

age, number of bathrooms, and number of bedrooms; **internal features**: full baths, half baths, fireplace, air conditioning, hardwood floors, and basement; **external features**: garage spaces, deck, pool, porch, carport, and garage; **natural environmental features**: lake view, lake front, ocean view, and good view; **neighborhood and location**: location, crime, distance, golf course, and trees; **public services**: school district, percent of school district minority, and public sewer; **marketing, occupancy, and selling factors**: assessor's quality, assessed condition, vacant, owner-occupied, time on the market, and time trend; and **financing**: FHA financing, VA financing, foreclosure, favorable financing, and property taxes. Most of the characteristics have a positive effect on selling price. Those characteristics that have had a negative effect on price include age, crime, percent of school district that is minority, and an indicator that the home is vacant.

Some other interesting variables that affected selling price were discussed. Those that have a **positive effect** include slanted versus flat roof, sprinkler system, garden bath, separate shower stall, double oven, and gated community. Some other characteristics that have a **negative effect** on selling price include not having attic space, living in an earthquake zone, proximity to a hog farm, proximity to a landfill, proximity to high voltage lines, corporate owned properties, and properties that require flood insurance.

Estimated coefficients for selected characteristics were compared across geographical regions. The results from the recent Sirmans and Macpherson (2003) paper entitled "The Value of Housing Characteristics" were compared to these results and found to be consistent. Some major conclusions were:

- the effect of square footage on selling price does not have a great deal of variation across regions. The greatest effect was in the Southwest and the lowest average effect was in the Midwest;
- the effect of lot size was generally consistent across regions;
- age was consistently negative and the effect on price was consistent across regions;
- for studies primarily from the Northeast and Southwest, each additional bathroom increased selling price in the 10 to 12 percent range;
- for studies limited to the Northeast and Southwest, the effect of bedrooms on price was greater in the Northeast than in the Southwest;
- fireplace had a positive effect on selling price in the six to 12 percent range and was consistent across regions, except for the West;
- central air conditioning was consistently important in all regions with the greatest price effect in the Southwest;
- a basement added significant value to a home's selling price in most studies, in the 12 to 16 percent range;
- a swimming pool was a consistently significant characteristic with the effect on price being the greatest in the Southwest and Southeast;
- the value of a garage was consistent across regions in the six to 12 percent range; and
- perceived school quality consistently had a significant effect on selling price.

ENDNOTE

[1]A full listing of studies and coefficient estimates by category and region are given in Appendix One. The coefficient estimate is given if it was statistically significant. The coefficients vary and are not necessarily directly comparable due to differences in measurement.

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ABOUT THE AUTHORS

Dr. G. Stacy Sirmans is the Kenneth G. Bacheller Professor of Real Estate at the Florida State University. He has published extensively in the real estate area on a variety of topics. His work has appeared in academic journals such as *The Journal of Financial and Quantitative Analysis, Journal of Real Estate Finance and Economics, National Tax Journal,* and *Journal of Real Estate Research*. He is the co-author of two books: *Real Estate Finance Theory and Practice, 4th Edition* and *Learning Real Estate Finance*. He has also completed a number of research grants for various agencies including the Florida Real Estate Commission, the Florida Department of Transportation, the University of South Carolina Real Estate Center, the Texas A&M University Real Estate Center, and the Federal Home Loan Bank Board.

Relative to this project, Dr. Sirmans has experience in estimating hedonic pricing models. He is lead author on a substantial number of papers that used hedonic pricing models to examine the effect of assumption financing on house prices. This required using hedonic models to hold constant the effects of housing characteristics other than financing. He has also published a number of papers using hedonic models to estimate the determinants of apartment rent. This also required using hedonic models to measure the effect of a number of factors that affect rent. He also has experience using other types of models such as probit models to measure the effect of firm characteristics on affinity relationships within real estate brokerage firms. Recently, he has used probit models to estimate housing cost burdens for both home owners and renters in Florida.

Dr. David A. Macpherson is the Abba Lerner Professor of Economics at the Florida State University. He published many articles in the areas of applied labor economics and

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Relative to this project, Dr. Macpherson has experience in estimating empirical models. He is an author on numerous papers that use hedonic pricing models in the areas of labor economics and real estate. He also has experience with the Oaxaca decomposition method.

APPENDIX ONE

Estimated Coefficients by Category for Selected Characteristics by Region

Regions: Nat = national, SE = southeast, W = west, NE = northeast, MW = midwest, SW = southwest

Table A

Construction and Structure

	AUTHOR	LOT SIZE	SQ FT	AGE	# OF BATHROOMS	BED-ROOMS
NAT	Elder, Zumpano and Baryla (2000)				0.18	0.06
SE	Hughes and Sirmans (1992)	2.1E-06	0.000352	-0.0092		
SE	Shilling, Sirmans, Turnbull and Benjamin (1992)		0.000419	-0.005		
SE	Shilling, Sirmans and Benjamin (1989)	0	0.449	-0.0167		
SE	Turnbull and Sirmans (1993)		1.16			
SE	Nguyen and Cripps (2001)		0.04	0.04		-0.18
SE	Johnson, Anderson and Webb (2000)		4.61	-59.65		4733
SE	Harrison, Smersh, and Schwartz (2001)	1067	37.5	-613		830
SE	Pace (1998)			-0.003		
SE	Black and Nourse (1995)		41			
NE	Lusht and Hansz (1994)	0.173		-0.094		
SE	Walden (1990)		0.0003			
SE	Bowes and Khlanfeldt (2001)	0.001			0.176	0.099
SE	Hughes and Turnbull (1996)		0.373		0	-0.025
SE	Palmquist, Roka and Vukina (1997)	0.0414	0.0004	-0.0119	0.0994	
SE	Knight and Sirmans (1996)		0.000711	-0.0189	0.00264	
SE	Sirmans, Turnbull, and Dombrow (1995)		0.000483	-0.011		
SE	Rinehart and Pompe (1994)					
SE	Hughes and Sirmans (1993)	2.9E-06	0.000337	-3.721		
SE	Dombrow, Rodriguez and Sirmans (2000)		0.000802	-0.02063		
W	Mooney and Eisgruber (2001)	0.1475				
W	Clark and Herrin (2000)	1.44E-06	0.000492	-0.00561		-0.018179
W	Zietz and Newsome (2002)					0
W	Knight, Micelli and Sirmans (2000)	0.162	0.058	-0.003		-0.061
W	Benson, Hansen, Schwartz and Smersh (1999)	0.436	0.453	-0.001		
W	Benson, Hansen, Schwartz and Smersh (1997)	0.001	0.416	0		
W	Carroll, Clauretic and Neill (1997)			-0.007		-0.026
W	Knight (2002)		0.00089	-0.001	0.03	-0.029
W	Kiel and Zable (1999)			-0.01	0.14	0.1
W	Murdoch, Singh and Thayer (1993)	0.0005		0.0006	0	

W	Clauretie and Neill (2000)	1.67E-05	3.37E-04	-0.02	-0.02	-0.02
W	Benson, Hansen, Schwartz and Smersh (1998)		0.7465	-0.1182		
W	Carroll, Clauretie and Jensen (1996)			-0.0061	0.0192	0
W	Guidry and Do (1998)	2.5E-06	0.00029	0		
W	Grudnitski and Do (1997)	0.00001	0.0004	-0.0032		0
W	Benson, Hansen and Schwartz (2000)	0.3926				
NE	Linneman and Voith (1991)			0.011		
NE	Asabere, Huffman and Johnson (1996)			-0.005	0	0.11
NE	Benjamin and Chinloy (2000)	0.036	-0.221	0		0
NE	Yang and Yavas (1995)		0.001			
NE	Benjamin and Chinloy (1995)	0.021	0			0.093
NE	Thayer, Albers and Rohmatian (1992)	0.001	0.0002	0.0008		
NE	Yavas and Yang (1995)	0.43			0.07	
NE	Clapp, Kim and Gelfand (2002)			-0.002	0.078	
NE	Kiel and Zable (1999)			-0.01	0.13	0.06
NE	Asabere, Huffman and Mehidian (1992)			-0.004	0.127	0.157
NE	Asabere, Huffman and Johnson (1996)			-0.005	0	0.11
NE	Poor, Boyle, Taylor and Bouchard (2001)		0		69991	
NE	Poor, Boyle, Taylor and Bouchard (2001)		6770		27004	
NE	Poor, Boyle, Taylor and Bouchard (2001)		8220		0	
NE	Kiel (1995)		0.0006	-0.006		
NE	Rush and Bruggink (2000)	1.32E-05		-0.00294		0
NE	Asabere and Huffman (1996)					0.3571
MW	Galster and Williams (1994)	0.001	0.0105		0.0974	
MW	Galster and Williams (1994)	0	0.0142		0.0725	
MW	Bond, Seiler and Seiler (2002)	2.02	47.88	0		
MW	Smith (2000)	4.45E+06	1.52E+04			0.08
MW	Brasington (1999)	15.3	0.001	-0.62		
MW	Simons, Quemia and Maric (1998)	0.001	10.06			
MW	Reichert, Small and Mebanty (1992)	0.55	9	-284		
MW	Dotzour and Levi (1992)	0.000007	0.0004	-0.017		
MW	Larsen (1991)	0.11		-0.1		0
MW	Mooney (1990)	2.77	33.78	0		0
MW	olwell (1990)	0.085				
MW	Sonderman, Caneaday and Colwell (1990)	0	15.01	-364		
MW	Glower, Haurin and Hendershott (1998)	430		-224	8188	
MW	Kiel and Zable (1999)			-0.01	0.15	0.07

MW	Colwell, Dehring and Lash (2000)		0.00022	0.082	0.133	
MW	Galster and Williams (1994)	0.0069	0.0105		0.0974	
MW	Reichert (1999)		0.3377	-0.1066		0.0244
MW	Dotzour (1997)	0.0003		0.0052		
MW	Dotzour and Levi (1993)	0	0.0004	-0.0168		
SW	Springer (1996)		0.0347	-0.012		0.0218
SW	Forgey, Rutherford and Vanbuskirk (1994)		0.0004	-0.014		-0.027
SW	Rutherford, Springer and Yavas (2001)		0.00036	-0.015	0.161	0.035
SW	Thibodeau (2003)			-0.397	0.14	
SW	Forgey, Rutherford and Springer (1996)		0.000696	-0.00845	0.18	0.31
SW	Coulson and Leichenko (2001)	7.29E-06	5.68E-04		1.46E-01	
SW	Man and Bell (1996)		0.027		0.028	
SW	McCluskey and Rausser (2001)		0.000561		0.052	
SW	Dale, Murdoch, Thayer and Waddell (1999)	0.0002	0.0004	-0.0002	0.0437	
SW	Goodman and Thibodeau (1998a)			-0.0441	0.1503	
SW	Waddell, Berry and Hoch (1993)		0.001	-0.001		

Table B

Internal House Features

	AUTHOR	FULL BATHS	HALF BATHS	FIRE-PLACE	AIR CONDITION-ING	HARDWOOD FLOORS	BASE-MENT
SE	Johnson, Salter, Zumpano and Anderson (2001)			0.127			
SE	Nguyen and Cripps (2001)	0.21					
SE	Gordon, Salter and Johnson (2002)			0.133			
SE	Johnson, Anderson and Webb (2000)	4848		6579			
SE	Harrison, Smersh and Schwartz (2001)	3757					
SE	Pace (1998)	0.07		0.067	0.129		
SE	Black and Nourse (1995)	26923					12.5
SE	Walden (1990)	0.062		0		0.026	
SE	Bowes and Khlanfeldt (2001)			0.145			0.12
SE	Palmquist, Roka and Vukina (1997)			0.0365			
SE	Sirmans, Turnbull and Dombrow (1995)			0			
SE	Hughes and Sirmans (1993)				0.1013		
SE	Dombrow, Rodriguez and Sirmans (2000)			0			
W	Clark. and Herrin (2000)	0.034901	0	0.054069			
W	Zietz and Newsome (2002)	0.061	0.03	0	0.007	0.036	0
W	Benson, Hansen, Schwartz and Smersh (1999)						0.143
W	Benson, Hansen, Schwartz, and Smersh (1997)						0.059
W	Carroll, Clauretie and Neill (1997)	0.061		0.106			
W	Knight (2002)			0.053			
W	Kiel and Zable (1999)				-0.01		
W	Murdoch, Singh and Thayer (1993)			0.024			
W	Clauretie and Neill (2000)			0			
W	Carroll, Clauretie			0.0694			

	and Jensen (1996)						
W	Guidry and Do (1998)	0.08		0			
W	Grudnitski and Do (1997)	0			0.048		
NE	Linneman and Voith(1991)	0.32			0.11		0
NE?	Asabere, Huffman, and . Johnson (1996)			0.097			
NE	Benjamin and Chinloy (2000)	0.193		-0.159	0.048		
NE	Yang and Yavas (1995)	6732			9289		
NE	Benjamin and Chinloy (1995)	0		0	0.04		
NE	Thayer, Albers and Rohmatian (1992)	0.206		0.143	0.07		
NE	Yavas and Yang (1995)				0.09		
NE	Kiel and Zable (1999)				0.09		
NE	Asabere, Huffman and Johnson (1996)			0.097			
NE	Asabere and Huffman (1996)			0.033234	0.05014		
NE	Asabere and Huffman (1997)			0.032076	0.048838		
NE	Rush and Bruggink (2000)	0.1302		0	0.1307		
NE	Asabere and Huffman (1996)			0.0948			
MW	Galster and Williams (1994)			0.0784	0.1291	0	0
MW	Galster and Williams (1994)			0	0.099	0.0736	0.1575
MW	Bond, Seiler and Seiler (2002)				0		0
MW	Smith (2000)	4.00E-02	0.05				0.12
MW	Brasington (1999)	0.12		0.11	0.06		
MW	Simons, Quercia and Maric (1998)	960		4923			-1136
MW	Reichert, Small and Mehanty (1992)	0		5231	0		8204
MW	Dotzour and Levi (1992)			0			0.0002
MW	Larsen (1991)	0		0.085	0.075		0
MW	Mooney (1990)	11713		9507			
MW	Colwell (1990)	0.09					0.121
MW	Sunderman, Cannaday and Colwell (1990)	2008		1157	2555		
MW	Glower, Haurin,		3420	4352	4909		

	and Hendershott (1998)						
MW	Kiel and Zable (1999)				0.07		
MW	Galster and Williams (1994)			0.0781	0.1291	0	
MW	Reichert (1998)	0.0834		0.0451			0.0525
MW	Dotzour and Levi (1993)			0			0.0019
SW	Springer (1996)	0.1215		0.1276			
SW	Forgey, Rutherford and VanBuskirk (1994)	0.083		0.067			
SW	Rutherford, Springer and Yavas (2001)			-0.15			
SW	Forgey, Rutherford and Springer (1996)			0.12			
SW	Coulson and Leichenko (2001)				6.58E-01		
SW	Man. and Bell (1996)				0.16		
SW	Dale, Murdoch, Thayer and Waddell (1999)			0.1456	0.1532		
SW	Goodman and Thibodeau (1999)			-0.1568	0.2618		
SW	Waddell, Berry and Hoch (1993)		5.06	0.011			

Table C

External House Features

	AUTHOR	GARAGE SPACES	DECK	POOL	PORCH	CARPORT	GARAGE
SE	Shilling, Sirmans, Turnbull and Benjamin (1992)					0.000169	0.000222
SE	Johnson, Salter, Zumpano and Anderson (2001)	0.063		0.098			
SE	Nguyen and Cripps (2001)	0.07					
SE	Gordon, Salter and Johnson (2002)	0.067		0.09			
SE	Johnson, Anderson and Webb (2000)	9829		4278			
SE	Pace (1998)	0.055					
SE	Black and Nourse (1995)	0	66.7		66.7		
NE	Lusht and Hansz (1994)	0.07					
SE	Walden (1990)	0.1	0.086		0		
SE	Palmquist, Roka and Vukina (1997)	0.1413	0.0894				
SE	Knight and Sirmans (1996)			0.0479			
SE	Sirmans, Turnbull and Dombrow (1995)			0.077			
W	Zietz and Newsome (2002)	0.024	0				
W	Benson, Hansen, Schwartz and Smersh (1999)	0.039	0.031				
W	Benson, Hansen, Schwartz and Smersh (1997)	0.014	0.01				
W	Carroll, Clauretie and Neill (1997)	0.025		0.134			
W	Knight (2002)	0.051		0.046			
W	Kiel and Zable (1999)	0.17					
W	Murdoch, Singh and Thayer (1993)			0.058			
W	Clauretie and Neill (2000)	0.08		0.09			
W	Benson, Hansen, Schwartz and Smersh (1998)	0.1383	0.1688				
W	Carroll, Clauretie and Jensen (1996)			0.0649			
W	Guidry and Do (1998)						0
W	Grudnitski and Do (1997)	0.0446					
W	Benson, Hansen and Schwartz (2000)	0	0.0577				
NE	Linneman and Voith (1991)	0.23					
NE?	Asabere, Huffman and Johnson (1996)	0.113		0			
NE	Benjamin and Chinloy (2000)	0					
NE	Yang and Yavas (1995)	3680					
NE	Benjamin and Chinloy (1995)	0					

NE	Thayer, Albers and Rohmatian (1992)			0.037			
NE	Yavas and Yang (1995)	0.06					
NE	Kiel and Zable (1999)	0					
NE	Asabere, Huffman and Johnson (1996)	0.113		0			
NE	Asabere and Huffman (1996)	0		0.057977			
NE	Asabere and Huffman (1997)	0		0.05636			
NE	Rush and Bruggink (2000)	0.0791	0				
NE	Asabere and Huffman (1996)	0.1214					
MW	Galster and Williams (1994)	0.1056			0		
MW	Galster and Williams (1994)	0			0		
MW	Smith (2000)	2.1					
MW	Brasington (1999)	0.12	0.06	0.06			
MW	Simons, Quercia and Maric (1998)	9.34			868		
MW	Reichert, Small and Mehanty (1992)	9.45					
MW	Dotzour and Levi (1992)	0		0.059			
MW	Larsen (1991)	0.096					
MW	Mooney (1990)	0					
MW	Colwell (1990)	0.28	0.034				
MW	Sunderman, Cannaday and Colwell (1990)	18741					
MW	Glower, Haurin and Hendershott (1998)	3637	4541	1357			
MW	Kiel and Zable (1999)	0					
MW	Galster and Williams (1994)	0.1056			0		
MW	Reichert (1999)	0.0361					
MW	Dotzour and Levi (1993)	0		0			
SW	Springer (1996)			0.1386			0.0398
SW	Forgey, Rutherford and VanBuskirk (1994)	0.072		0.104			
SW	Rutherford, Springer and Yavas (2001)	0.057		0.128			
SW	Thibodeau (2003)			0.097		-0.043	
SW	Forgey, Rutherford and Springer (1996)			0.0934			
SW	Man and Bell (1996)	0.074		0.0003	0.062		
SW	Dale, Murdoch, Thayer and Waddell (1999)	0.1074		0.083			
SW	Goodman and Thibodeau (1998a)			0.1041		0	0.0735
SW	Waddell, Berry and Hoch (1993)			0.045			

Table D

Environmental – Natural Characteristics

	AUTHOR	LAKE VIEW	LAKE FRONT	OCEANVIEW	"GOOD VIEW"
SE	Rinehart and Pompe (1999)			0.9026	
W	Benson, Hansen, Schwartz and Smersh (1999)	0.001		0.448	
W	Benson, Hansen, Schwartz and Smersh (1997)			0.278	
W	Murdoch, Singh and Thayer (1993)				0.047
W	Benson, Hansen, Schwartz and Smersh (1998)	0.6759	3.5028		
W	Guidry and Do (1998)				0
W	Benson, Hansen and Schwartz (2000)	0.2301		0.4625	
NE	Poor, Boyle, Taylor and Bouchard (2001)		143		
NE	Poor, Boyle, Taylor and Bouchard (2001)		134		
NE	Poor, Boyle, Taylor and Bouchard (2001)		136		
MW	Bond, Seiler and Seiler (2002)	269.85			
SW	Rutherford, Springer and Yavas (2001)		0.012		

Table E

Environment – Neighborhood and Location

	AUTHOR	LOCATION	CRIME	DISTANCE	GOLF COURSE	TREES
NAT'L	Sirmans and Ferreira (1995)					
NAT'	Elder, Zumpano and Baryla (2000)					
NAT'L	Potepan (1996)		0			
NAT'L	Zumpano, Elder and Baryla (1996)					
SE	Hughes and Sirmans (1992)					
SE	Shilling, Sirmans, Turnbull and Benjamin (1992)					
SE	Shilling, Sirmans and Benjamin (1989)					
SE	Turnbull and Sirmans (1993)					
SE	Johnson, Salter, Zumpano and Anderson (2001)					
SE	Nguyen and Cripps (2001)					
SE	Gordon, Salter and Johnson (2002)					
SE	Johnson, Anderson and Webb (2000)					
SE	Harrison, Smersh and Schwartz (2001)					
SE	Pace (1998)		0			
SE	Jud, Seaks and Winkler (1996)					
SE	Black and Nourse (1995)			-3099		
NE	Lusht and Hansz (1994)	0.237				
SE	Walden (1990)			-0.005	0.086	
SE	Bowes and Khlanfeldt (2001)		-0.056	-0.024		
SE	Hughes and Turnbull (1996)					
SE	Palmquist, Roka and Vukina (1997)					
SE	Knight and Sirmans (1996)					
SE	Sirmans, Turnbull and Dombrow (1995)					
SE	Rinehart and Pompe (1999)				0.3324	
SE	Hughes and Sirmans (1993)					
SE	Dombrow, Rodriguez and Sirmans (2000)					0.018562
W	Mooney and Eisgruber (2001)					
W	Clark and Herrin (2000)					

W	Zietz and Newsome (2002)					
W	Knight, Micelli and Sirmans (2000)					
W	Benson, Hansen, Schwartz and Smersh (1999)					
W	Benson, Hansen, Schwartz and Smersh (1997)					
W	Carroll, Clauretic and Neill (1997)					
W	Knight (2002)					
W	Kiel and Zable (1999)					
W	Murdoch, Singh and Thayer (1993)		0.006			0.064
W	Clauretie and Neill (2000)					
W	Benson, Hansen, Schwartz and Smersh (1998)					
W	Carroll, Clauretie and Jensen (1996)			-1.22E-05		
W	Guidry and Do (1998)					
W	Grudnitski and Do (1997)				0.0467	
W	Benson, Hansen and Schwartz (2000)					
NE	Linneman and Voith (1991)					
NEW YORK	Weimer and Wolkoff (2001)					
NE?	Asabere, Huffman, and Johnson (1996)				0.092	
NE	Benjamin and Chinloy (2000)	-0.143				
NE	Yang and Yavas (1995)					
NE	Benjamin and Chinloy (1995)					
NE	Thayer, Albers and Rohmatian (1992)					
NE	Yavas and Yang (1995)					
NE	Clapp, Kim nd Gelfand (2002)					
NE	Voith (1999)					
NE	Kiel and Zable (1999)					
NE	Asabere, Huffman and Mehidian (1992)			0.013		
NE	Asabere, Huffman and Johnson (1996)				0.092	
NE	Asabere and Huffman (1996)					
NE	Asabere and Huffman (1997)					
NE	Poor, Boyle, Taylor and Bouchard (2001)			0		
NE	Poor, Boyle, Taylor and Bouchard (2001)			0		

NE	Kiel (1995)			0.063		
NE	Rush and Bruggink (2000)					
NE	Asabere and Huffman (1996)				0.0759	
MW	Galster and Williams (1994)					
MW	Galster and Williams (1994)					
MW	Bond, Seiler and Seiler (2002)					
MW	Smith (2000)	0.42				
MW	Brasington (1999)		-0.01			
MW	Simons, Quercia and Maric (1998)		-96			
MW	Reichert, Small, and Mehanty (1992)					
MW	Dotzour and Levi (1992)	0.08				
MW	Larsen (1991)					
MW	Mooney (1990)					
MW	Colwell (1990)	0.001				
MW	Sunderman, Cannaday and Colwell (1990)					
MW	Glower, Haurin and Hendershott (1998)		-102297			
MW	Kiel and Zable					
MW	Colwell, Dehring and Lash (2000)					
MW	Galster and Williams (1994)					
MW	Reichert (1999)					
MW	Dotzour (1997)					
MW	Dotzour and Levi (1993)					
SW	Springer					0.0643
SW	Forgey, Rutherford and VanBuskirk (1994)	-0.001				
SW	Haag, Rutherford and Thomson (2000)				0.061	
SW	Rutherford, Springer and Yavas (2001).					
SW	Thibodeau (2003)					
SW	Forgey, Rutherford and Springer (1996)					
SW	Coulson and Leichenko (2001)					
SW	Man and Bell (1996)			-0.02		

SW	McCluskey and Rausser (2001)
SW	Dale, Murdoch, Thayer and Waddell (1999)
SW	Goodman and Thibodeau (1998a)
SW	Coulson and Leichenko (2001)
SW	Waddell, Berry and Hoch (1993)

Table F

Environment – Public Service

	AUTHOR	SCHOOL DISTRICT	% SCHOOL DISTRICT MINORITY	PUBLIC SEWER
NAT'L	Sirmans and Ferreira (1995)			
NAT'	Elder, Zumpano and Baryla (2000)			
NAT'L	Potepan (1996)			
NAT'L	Zumpano, Elder and Baryla (1996)			
SE	Hughes and Sirmans (1992)			
SE	Shilling, Sirmans, Turnbull and Benjamin (1992)			
SE	Shilling, Sirmans and Benjamin (1989)			
SE	Turnbull and Sirmans (1993)			
SE	Johnson, Salter, Zumpano and Anderson (2001)	-0.128		
SE	Nguyen and Cripps (2001)			
SE	Gordon, Salter and Johnson (2002)	-0.086		
SE	Johnson, Anderson and Webb (2000)	-8813		
SE	Harrison, Smersh and Schwartz (2001)			
SE	Pace (1998)			
SE	Jud, Seaks and Winkler (1996)			
SE	Black and Nourse (1995)			
NE	Lusht and Hansz (1994)			
SE	Walden (1990)			0
SE	Bowes and Khlanfeldt (2001)			
SE	Hughes and Turnbull (1996)			
SE	Palmquist, Roka and Vukina (1997)			
SE	Knight and Sirmans (1996)			
SE	Sirmans, Turnbull and Dombrow (1995)			
SE	Rinehart and Pompe (1999)			
SE	Hughes and Sirmans (1993)			
SE	Dombrow, Rodriguez and Sirmans (2000)			
W	Mooney and Eisgruber (2001)			

W	Clark and Herrin (2000)				
W	Zietz and Newsome (2002)	0.054			
W	Knight, Micelli and Sirmans (2000)	-0.184			
W	Benson, Hansen, Schwartz, Jr. and Smersh (1999)				
W	Benson, Hansen, Schwartz, Jr. and Smersh (1997)				
W	Carroll, Clauretic and Neill (1997)				
W	Knight (2002)	0.148			
W	Kiel and Zable (1999)			0	
W	Murdoch, Singh and Thayer (1993)				
W	Clauretie and Neill (2000)	-0.02			
W	Benson, Hansen, Schwartz, JR and Smersh (1998)				
W	Carroll, Clauretie and Jensen (1996)				
W	Guidry and Do (1998)				
W	Grudnitski and Do (1997)				
W	Benson, Hansen and Schwartz (2000)				
NE	Linneman and Voith (1991)				-0.29
NEW YORK	Weimer and Wolkoff (2001)				
NE?	Asabere, Huffman and Johnson (1996)				
NE	Benjamin and Chinloy (2000)				
NE	Yang and Yavas (1995)				1579
NE	Benjamin and Chinloy (1995)				
NE	Thayer, Albers and Rohmatian (1992)	0.045	-0.0028		
NE	Yavas and Yang (1995)				
NE	Clapp, Kim and Gelfand (2002)				
NE	Voith (1999)				
NE	Kiel and Zable			-0.44	
NE	Asabere, Huffman and Mehidian (1992)				
NE	Asabere, Huffman and Johnson (1996)				
NE	Asabere and Huffman (1996)				
NE	Asabere and Huffman (1997)				

NE	Poor, Boyle, Taylor and Bouchard (2001)		
NE	Poor, Boyle, Taylor and Bouchard		
NE	Poor, Boyle, Taylor and Bouchard		
NE	Kiel (1995)		
NE	Rush and Bruggink (2000)		
NE	Asabere and Huffman (1996)		
MW	Galster and Williams (1994)		
MW	Galster and Williams (1994)		
MW	Bond, Seiler and Seiler (2002)		
MW	Smith (2000)		
MW	Brasington (1999)		-1.4
MW	Simons, Quercia and Maric (1998)		
MW	Reichert, Small and Mehanty (1992)		
MW	Dotzour and Levi (1992)		
MW	Larsen (1991)		
MW	Mooney (1990)		
MW	Colwell (1990)		
MW	Sunderman, Cannaday and Colwell (1990)		
MW	Glower, Haurin and Hendershott (1998)		-12881
MW	Kiel and Zable (1999)		-0.52
MW	Colwell, Dehring and Lash (2000)		
MW	Galster and Williams (1994)		
MW	Reichert (1999)	-0.0304	
MW	Dotzour (1997)		
MW	Dotzour and Levi (1993)		
SW	Springer (1996)		
SW	Forgey, Rutherford and Vanbuskirk (1994)		
SW	Haag, Rutherford and Thomson (2000)		
SW	Rutherford, Springer and Yavas (2001)		
SW	Thibodeau (2003)		

SW	Forgey, Rutherford and Springer (1996)
SW	Coulson and Leichenko (2001)
SW	Man. and Bell (1996)
SW	McCluskey and Rausser (2001)
SW	Dale, Murdoch, Thayer and Waddell (1999)
SW	Goodman and Thibodeau (1998a)
SW	Coulson and Leichenko (2001)
SW	Waddell, Berry and Hoch (1993)
NAT'L	Sirmans and Ferreira (1995)
NAT'	Elder, Zumpano and Baryla (2000)
NAT'L	Potepan (1996)

Table G

Marketing, Occupancy and Selling Factors

	AUTHOR	ASSESSORS QUALITY	ASSESSED CONDITION	VACANT	OWNER-OCCUPIED	TIME ON MARKET	TREND
NAT'L	Sirmans, and Ferreira (1995)					0	
SE	Hughes and Sirmans (1992)					-0.0002	
SE	Shilling, Sirmans, Turnbull and Benjamin (1992)					-0.00014	
SE	Shilling, Sirmans and Benjamin (1989)					-0.022	0
SE	Turnbull and Sirmans (1993)					0	0
NE	Lusht and Hansz (1994)		0.085		0.082		
SE	Rinehart and Pompe (1999)						
SE	Hughes and Sirmans (1993)				0.0797	-0.0002	
SE	Dombrow, Rodriguez and Sirmans (2000)			-0.06362		-0.00027	
W	Clark and Herrin (2000)				0		
W	Benson, Hansen, Schwartz, Jr. and Smersh (1999)	0.223	0.066				
W	Benson, Hansen, Schwartz, Jr. and Smersh (1997)	0.348	0.156				
W	Knight (2002)			-0.073			0.005
W	Clauretie and Neill (2000)			0			-0.01
NE?	Asabere, Huffman and Johnson (1996)					0	
NE	Benjamin and Chinloy (2000)			-0.054			
NE	Benjamin and Chinloy (1995)				0	-0.099	
NE	Asabere, Huffman and Mehidian (1992)			-6.295			
NE	Asabere, Huffman and Johnson (1996)					0	0
NE	Asabere and Huffman (1996)						0
NE	Asabere and Huffman (1997)						0
NE	Asabere and Huffman (1996)					0	

MW	Galster and Williams (1994)		0.0106				
MW	Galster and Williams (1994)		0.0171				
MW	Smith (2000)		0.05				
MW	Simons, Quercia and Maric (1998)		11297				
MW	Reichert, Small and Mehanty (1992)	12005					
MW	Dotzour and Levi (1992)	0	0				
MW	Larsen (1991)					0	
MW	Galster and Williams (1994)	0.0106					
SW	Springer (1996)			-0.0248		-0.0003	
SW	Haag, Rutherford and Thomson (2000)			-0.042		-0.001	
SW	Rutherford, Springer and Yavas (2001)			-0.055			
SW	Forgey, Rutherford and Springer (1996)						0.0203
SW	Coulson and Leichenko (2001)				0.212		
SW	Man and Bell (1996)			-0.011			

Table H

Financing

	AUTHOR	FHA FIN	VA FIN	FORECLOSURE	FAVORABLE FINANCING	PROPERTY TAX
SE	Hughes and Sirmans (1992)				0	
SE	Turnbull and Sirmans (1993)			-0.132	0	
SE	Dombrow, Rodriguez and Sirmans (2000)				0	0
NE	Asabere and Huffman (1996)	-0.03291	-0.0348			
NE	Asabere and Huffman (1997)	-0.0317	-0.0335			
SW	Springer (1996)			-0.0373		
SW	Forgey, Rutherford and Vanbuskirk (1994)	-0.064	-0.058	-0.228		
SW	Haag, Rutherford and Thomson (2000)			-0.159		
SW	Forgey, Rutherford and Springer (1996)			-0.23		

Some coefficients may not be directly comparable due to differences in measurement.

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