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CITY OF WHITEWATER

HOUSING ANALYSIS

by

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CITY OF WHITEWATER
HOUSING ANALYSIS

EXECUTIVE SUMMARY

The City of Whitewater Housing Analysis was designed to gather information on housing patterns in Whitewater, Wisconsin to help the City plan for future growth and development. The survey questionnaire was designed by the City of Whitewater, interested members of the Whitewater community, and the University of Wisconsin-Whitewater's Center for Fiscal and Economic Research. The survey was conducted by mail between October, 2011 and December, 2011. Surveys were mailed to City employees, University faculty, and employees of participating local businesses. In addition, data on single family home sales between 2000 and 2010 were collected and analyzed from Whitewater, Fort Atkinson, and Milton. The major findings of the analysis include:

a. Houses sold in Milton experienced discounts of 8.0 percentage points for an additional bedroom compared to an additional bedroom in Whitewater prior to 2007 and discounts of 11.0 percentage points after 2007, while homes sold in Fort Atkinson experienced a discount of 2.7 percentage points prior to 2007 and no difference for an additional bedroom after 2007.

b. Fort Atkinson experienced a premium for an additional bathroom over an additional bathroom in Whitewater of 4.1 percentage points prior to 2007 and this premium did not remain after 2007, while Milton experienced no difference in valuation prior to 2007 and a premium of 6.2 percentage points after 2007.

c. Fort Atkinson experienced a premium over Whitewater for increasing the size of an attached garage of 2.8 percentage points prior to 2007 and a premium of 0.5 percentage points after 2007, while Milton experienced no difference in valuation prior to 2007 and a premium of 8.9 percentage points after 2007.

d. There was no significant change in valuation of additional bedrooms or bathrooms in Whitewater between before 2007 and after 2007, however there was a significant increase in valuation of increasing the size of an attached garage of after 2007.

e. There exist Southwest and East sub-markets within Whitewater that are affected differently by the presence of campus.

f. The Southwest sub-market experiences no impact from the presence of campus while the East sub-market experiences a negative impact from campus.

g. This negative impact grows in magnitude as distance from campus increases up to 1.17 miles, after which the negative impact decreases in magnitude and disappears at 2.35 miles from campus. a perceived decline in employment opportunities, the downtown business district, and the condition of streets/traffic

h. The four most important factors when choosing a place of residence include crime rate/safety, proximity to work, cost of the house, and quality of the schools.

i. The large student population did not negatively impact the decision to move to Whitewater. strong support for the retention, attraction and encouragement of businesses

j. Preferences in residential location are consistent despite varying income and education levels.

It is crucial to keep in mind that these results reflect a static response given at one point in time. These views may vary with changing circumstances.

Introduction

With the recent housing market changes and amount of foreclosures there is a further need for housing market research. Recent housing research has extended into spatial analysis with the combination of using hedonic analysis to examine the determinants of housing prices. Within this spectrum of analysis this study applies both new and previous research to study the housing values in the City of Whitewater with two specific focuses; the differences in valuation of particular housing characteristics between Whitewater and neighboring towns, the effect of the University of Wisconsin Whitewater campus on local housing values. The analysis also examines patterns in important aspects of residential location decision for employees in the Whitewater area.

The hedonic analysis focuses on the examination of the differences in value attributed to bedrooms and bathrooms in different locations as well as how those differences have changed between before the financial crisis and after. It is anticipated that the change in value from an additional bedroom or bathroom is evaluated differently when comparing Whitewater to Fort Atkinson and Milton. With this determination it may also expected that residents choose their residential location with this acknowledgement. This analysis also expands into the willingness to pay for an additional bedroom or bathroom in each housing market and furthermore housing stock preferences between towns

The second focus of this study is determining the affects of proximity to campus on housing prices. This is shown through the housing values as to how far the residents of Whitewater perceive campus to be. If someone lives next to campus the valuation of the housing is going to be higher, this effect diminishes as the space between increases. This is anticipated to be from the convenience of living right next to campus. There is also the potential to rent out the

housing and ask for a premium for the convenience in the form of a higher rent. As the distance from campus increases the value of the convenience of living near campus decreases, while still living near college students and rental units up until the location goes past the point where college students will choose to reside. The valuation of housing in the between area where the value of the convenience of being near campus is lower than the value of the other inconveniences of living in a college town will experience lower housing value until the distance of the housing is out of the inconvenience.

Within the field of study for most rental housing markets the valuation of a house may typically be found through a function of rent. Within the study of the City of Whitewater it's anticipated that there may be a segmented housing market. A segmented part of the market may form the price of a house, or rent for this matter on the perceived distance from campus. Rather than the number of units as studied in much apartment market research. The remainder of this paper will continue as follows; related literature reviewed for this analysis with titled sub-sections, explanation of the models and methodologies, summary of the data used for the analysis, interpretation of the empirical results, and final conclusions.

Literature Review

This section of the paper reviews literature relevant to this research. In particular there is a focus on hedonic analysis, spatiality and residential location determinants. Sub-section a. covers traditional hedonic analysis. Sub-section b. is apartments and universities. Sub-section c. is spatial literature.

a. Traditional Hedonic

Hedonic analysis has roots in the early 1900's in non housing studies; however, it is traditionally used in real estate studies, the consumer price index (CPI), and in housing analysis.

The concept for the empirical hedonic analysis was developed around the idea that homogenous things are actually comprised of a multitude of differentiated components. Through this concept, hedonic analysis is often used to estimate the contribution derived from the individual components of a unit, and the value offered by the components to the overall value of the unit (Rosen, 1974). Importantly hedonic analysis can capture the contribution implicitly and explicitly from the analysis of the sub components that comprise the unit. To do so a majority of hedonic models follow either a semi-log or linear format for use in a hedonic analysis.

Within the demographic of home buyers the perceived value of housing characteristics varies based on the value attributed from individual components. This is from the unique utility derived from the components by different buyers. Any home then provides a total utility based upon the utility yielded by the characteristics of these differentiated characteristics which may then be considered goods (Harding et al., 2003). The market for single-family housing units is not only determined by a supply of homogeneous homes. More over it is determined rather by differentiated components and meeting between supply and demand of homes determined on the purchasing side of the market (Epple, 1987; Rugg et al, 2002).

Within the tradeoff between selling price and time on the market for homes a seller may decrease the time on the market by lowering the price or increase the time on market by raising the price. Increased selling time was noticed to have a negative effect on the final sale price of a house. This may be due to over estimation of the house value or over valuing the house by the seller. Initial asking price can impact the time on market, which can in turn affect the house's value under a variety of circumstances and with varying severity over time (Asabre and Huffman, 1993; Knight, 2002; Anglin et al., 2003).

The valuing of these individual housing characteristics is intrinsically important in order to determine the overall value of these properties (Rosen, 1974). Thus the importance of using hedonic analysis and utilizing observations of housing values and specific real estate characteristics to obtain implicit prices for individual elements (i.e. bedrooms, square footage, bathrooms, etc.). According to Sirmans et al. (2005) in their analysis of roughly 125 studies they found commonly that age had a negative coefficient, square foot had a positive coefficient, and none had a negative coefficient for lot size or presence of a garage. In conducting a hedonic analysis there are multiple ways for incorporating measures of quantity of housing attributes. These measurement methods include binary dummy variables, or complex dummy variables, or on the other hand utilizing a count to indicate quantity of more than a unit. The variation of measures in hedonic models throughout the spectrum of hedonic literature can create complications for comparing hedonic literature results.

Location can be a beneficial or detrimental role for the value of a house. Determining what causes the impact on the value of a house based on location can prove difficult. In turning location into a variable the variable for location can become influenced by different variables other than location its self (Malpezzi, 2003). The potential for omitted variable bias within hedonic analysis can show issues. The extrinsic framework with hedonic analysis can aid in determining how the value of the location is accumulated. Li and Brown (1980) utilized relatively linear models that incorporated structural and site characteristics, neighborhood population characteristics, neighborhood environmental characteristics, affects of central business districts, and local public services and costs. Upon comparing models that included and excluded different variables the affects were able to be analyzed and quantified in some instances. Gibbons (2004) used a hedonic regression model to analyze how crime affects the

value of homes on the basis of location. School quality was shown to affect the value of location by Bogart and Cromwell (2000), which also shows it to have an impact on the value attributed from location. Furthermore within an urban environment employment opportunities are an attribute for the value of a house on an individual basis (Ottensman et al., 2008). Many characteristics of location can influence the value of the location of a house including the implicit implications of air quality (Nelson, 1978).

Changes in conditions and differences of environmental characteristics can impact the value of property. The extent of the impact can be studied through utilizing a difference and indifference analysis. By comparing value changes for lake front property to non lake front property, with the primary difference between the two consisting of the degradation of water level and the quality of the lake water the anticipated appreciation can be determined. With the property in the Town of Dover and the lake front property of Eagle Lake Kashian (2009) showed the significance of the environmental effects of the decline in water level and water quality on the anticipated appreciation of the properties. In addition there are further affects proposed from the degradation for implications towards the city and county. With a hedonic analysis Eiswerth et al. (2005) found that $177,000 of the total appreciation for lake shore property on Delevan Lake from 1987 to 2003 was from improving the water quality during the Delevan Lake Rehabilitation project of 1989-1993. Therefore, the impact of environmental characteristics can have significant impact on the property values and further on the local community and region.

b. **Apartments and Universities**

Gunterman and Norrbin (1987) bring light to important differences in hedonic studies between housing valuation and rent valuation. Renting offers a different variety of housing

stocks that the inclusion or exclusion of amenities which may impact the rent. Utilities may be included or excluded with rent; in modeling this may be handled with dummy variables. Within the university submarket students they propose students may place less weight on condition while still significant, more on amenities, while also placing even more weight on the proximity to the university.

Waddell et al. (1993) found that certain amenities including Universities and Colleges have significance on the valuation of property over distance with a varying extent. Interestingly Rosiers and Thériault (1995) suggest within a low price-elasticity of demand market land lords may maintain higher rents for university students that lack mobility. Depending on the market and housing opportunities students may combine their resources to pay higher rents and this also may occur with housing that offers fewer accommodations; an explanation is the consideration of housing as temporary housing for college (Christie et al., 2002; Rugg et al., 2002).

With assessing rent values in Portland, Oregon, Frew and Wilson (2002) were able to find multi-centric rent value gradients. The gradients consisted of high valued locations inside the center of a city and outside of the considered city zone. Including separate economic centers such as suburbs with freeways going through the down town also had higher land appraisal. It was also proposed that locations away from the prime rent locations had lower valued rents based on the distance of the inconvenience. From a local investment stand point Wheaton and Nechayev (2005) found that location lacks importance when there is rising vacancy and slow growing rents are high; although, with rents in submarkets location is important with the notion of variation in rental growth over time.

c. **Spatiality**

The concept of spatiality is that the distance between locations matters. Within this concept quantifying the space and utilizing it for analysis enables the impact to be measured. Spatiality research has been used in many forms of analysis to determine the effects that the space induces. Housing values in general are affected by the distance the house is from vital locations. The concept that closeness to a University affects housing values is similar to the spatial hedonic analysis of open space. The distance from open space depending on the type can be diminishing or beneficial to housing value with a hedonic analysis. Hedonic value studies of farmland show evidence that preserved farmland provide value to residents within proximity and that busy parks can have a negative impact on the valuation of nearby housing (Irwin, 2002; McConnell and Walls, 2005).

Geoghegan et al. (1997) in studying open space showed that diversity of land usage places a positive externality for the housing value within the immediate area of a central business district and outside the central business district, while the space in-between the immediate and outside has detrimental externalities. Cho et al. (2007) used a spatial configuration to analyze the proximity effects of a variety of open spaces on housing prices in addition to proposing that a local model is more effective than a global model with the adjusted R^2 for local (0.82) and the global (0.78).

With sheriff sales, the sale of foreclosed single family condominiums as researched by Kashian and Carroll (2011) found a significant negative impact on the value of condominiums within the local area of the sheriff sale. The impact is largest on the condominiums within the same building, and is stronger if sold soon after rather than long after; however, the impact diminishes marginally over time and distance. The log-linear model utilized spatially geocoded

property sales by address for distance and a time frame of 0-12 months with the addition of control variables to identify the implicit price elasticity of a condominium near the sheriff sale.

Model and Methodology

a. Hedonic Models

$$\mathbf{V_i = \alpha + \sum \beta_j (City_i) + \sum \delta_j (X_i) + \sum \phi_j (Year_i) + \varepsilon_i} \qquad \mathbf{(H1)}$$

V_i is the natural log of selling price of home i. α is a constant term. $City_i$ is a vector of dummy variables including Fort Atkinson and Milton (Whitewater is omitted to avoid perfect multi-colinearity) equal to one if the home is located within that city. X_i is a vector of physical home characteristics including age of house in years, number of stories, number of bathrooms, number of bedrooms, square feet, a squared term of square feet, size of detached garage in number of cars, size of attached garage in number of cars, and a dummy variable equal to one if the home is located next to a body of water. $Year_i$ is a vector of dummy variable time indicators from 2001 through 2010 (2000 is omitted to avoid perfect multi-colinearity) equal to one if the sale occurred in that year. ε_i is a stochastic error term with expected mean of zero. B_j, δ_j, and ϕ_j are vectors of estimated coefficients corresponding to the City, X, and Year vectors respectively.

$$\mathbf{V_i = \alpha + \sum \beta_j (City_i * Epoch_i) + \sum \delta_j (X_i) + \varepsilon_i} \qquad \mathbf{(H2)}$$

V_i is the natural log of selling price of home i. α is a constant term. $City_i * Epoch_i$ is a vector of interaction terms between City dummy variables mentioned in (H1) and a pair of dummy variables including pre-2007 and post-2007 equal to one if the sale occurred in that time

period (WW*Pre-2007 is omitted to avoid perfect multicolinearity. X_i is a vector of physical home characteristics including Age of house in years, number of stories, number of bathrooms, number of bedrooms, square feet, a squared term of square feet, size of detached garage in number of cars, size of attached garage in number of cars, and a dummy variable equal to one if the home is located next to a body of water. ε_i is a stochastic error term with expected mean of zero. B_j and δ_j are vectors of estimated coefficients corresponding to the City*Epoch and X vectors respectively.

$$\mathbf{V_i = \alpha + \sum \beta_j (City_i * Characteristic_i) + \sum \delta_j (X_i) + \sum \phi_j (Year_i) + \varepsilon_i} \qquad \mathbf{(H3)}$$

V_i is the natural log of selling price of home i. α is a constant term. $City_i$* $Characteristic_i$ is a vector of interaction terms between City dummy variables mentioned in (H1) and physical characteristics of interest including number of bedrooms, number of bathrooms, and size of attached garage in number of cars.(WW*Bedroom, WW*bathroom, and WW*Attached Garage are omitted to avoid perfect multi-colinearity). X_i is a vector of physical home characteristics including Age of house in years, number of stories, number of bathrooms, number of bedrooms, square feet, a squared term of square feet, size of detached garage in number of cars, size of attached garage in number of cars, and a dummy variable equal to one if the home is located next to a body of water. $Year_i$ is a vector of dummy variable time indicators from 2001 through 2010 (2000 is omitted to avoid perfect multi-colinearity) equal to one if the sale occurred in that year. ε_i is a stochastic error term with expected mean of zero. B_j, δ_j, and ϕ_j are vectors of estimated coefficients corresponding to the City*Characteristic, X, and Year vectors respectively.

$$\mathbf{V_i = \alpha + \sum \beta_j (City_i * Characteristic_i * Epoch_i) + \sum \delta_j (X_i) + \varepsilon_i} \qquad \mathbf{(H4)}$$

V_i is the natural log of selling price of home i. α is a constant term. $City_i$* $Characteristic_i$*$Epoch_i$ is a vector of interaction terms between City dummy variables mentioned in (H1), physical characteristics of interest mentioned in (H3), and Epoch dummy variables mentioned in (H2)(WW*Bedroom*Pre-2007, WW*bathroom*Pre-2007, and WW*Attached Garage*Pre-2007 are omitted to avoid perfect multi-colinearity). X_i is a vector of physical home characteristics including Age of house in years, number of stories, number of bathrooms, number of bedrooms, square feet, a squared term of square feet, size of detached garage in number of cars, size of attached garage in number of cars, and a dummy variable equal to one if the home is located next to a body of water. β_j, δ_j, and ϕ_j are vectors of estimated coefficients corresponding to the City*Characteristic*Epoch and X vectors respectively.

Equation (H1) estimates the differences in value between a house sold in Whitewater and an identical house sold in Fort Atkinson or Milton. Equation (H2) estimates the change in these differences between pre-2007 and post-2007 time periods. Equation (H3) estimates the difference in valuation of number of bedrooms, number of bathrooms, and size of attached garage in number of cars between Whitewater, Fort Atkinson, and Milton. Equation (H4) estimates the change in these differences between pre-2007 and post-2007 time periods.

b. Spatial Model

$$\mathbf{V_i = \alpha + \beta_1 (Distance_i) + \beta_2 (Distance_i^2) + \sum \delta_j (X_i) + \sum \phi_j (Time_i) + \varepsilon_i} \qquad \mathbf{(S1)}$$

V_i is the natural log of selling price of home i. α is a constant term. $Distance_i$ is the distance from the home to campus measured in feet and $Distance_i^2$ is the squared value of the distance term. Xi is a vector of physical home characteristics including Age of house in years,

number of stories, number of bathrooms, number of bedrooms, square feet, a squared term of square feet, size of detached and attached garages in number of cars, and a dummy variable equal to one if the home is located next to a body of water. β_1 and β_2 are estimated coefficients corresponding to distance and squared distance terms respectively. δ_j, and ϕ_j are vectors of estimated coefficients corresponding to distance, squared distance, X , and time indicator vectors respectively.

This equation is used to analyze three sample sets. The first analysis uses the full sample of house sales in the City of Whitewater from 2000 through 2010. The second and third analyses use sub-samples of home sales in the southwest area of Whitewater and eastern area of Whitewater respectively. This equation estimates the effect of the University of Wisconsin-Whitewater campus on home prices in the City of Whitewater as distance from campus increases. The analysis of sub-samples estimates this effect in two different sub-markets of Whitewater.

Data Collection

a. Hedonic Data

The data for the Hedonic Analysis consists of single-family home sales in Whitewater, Fort Atkinson, and Milton from 2000 through 2010. Summary statistics are shown in Table1.1. The data consists of 2606 observations with 566 in Whitewater, 1395 in Fort Atkinson, and 645 in Milton. The analysis also separates the data by epoch; pre-2007 and post-2007. The pre-2007 data consists of 370 observations for Whitewater, 927 observations for Fort Atkinson, and 220 observations for Milton, for a total of 1517 observations. The data for post-2007 consists of 196 observations for Whitewater, 468 observations for Fort Atkinson, and 425 observations for Milton, for a total of 1089 observations. Data was also collected for age of house, number of

stories, number of bathrooms, number of bedrooms, square feet, size of detached and attached garages in number of cars, and whether or not the home was located next to a body of water.

A series of Welch's T-tests data indicated that average home price in Whitewater was higher than average home price in Fort Atkinson. The analysis did not find sufficient evidence, however, to suggest any difference in average home price between Whitewater and Milton. The analysis also found that homes sold in Whitewater had a significantly higher average number of bedrooms compared to Fort Atkinson but did not find sufficient evidence to suggest any difference in average number of bedrooms between Whitewater and Milton.

Additional analysis of home sales indicated that the average age of homes in Whitewater was significantly higher than both Fort Atkinson and Milton. When comparing Whitewater and Fort Atkinson, the analysis did not find sufficient evidence to suggest any difference in average square feet, number of bathrooms, or size of attached garage. When comparing Whitewater and Milton, however, the analysis found that average square feet, number of bathrooms, and size of attached garage were all significantly higher in Milton than the averages in Whitewater.

b. Spatial Data

The data for the Spatial Analysis consists of single-family home sales in the City of Whitewater from 2000 through 2010. Summary statistics are shown in Spatial Tables 1.1, 1.2, and 1.3. The full sample consists of 544 observations, the southwest sub-sample consists of 188 observations, and the eastern sub-sample consists of 356 observations. Distance away from campus was defined as the distance from the home to the nearest major academic building. Four buildings were selected for distance analysis; Greenhill Center of the Arts, Hyland Hall, Upham Hall, and Anderson Library. Home addresses and academic building locations were matched to

decimal degree latitude and longitude coordinates using ArcGIS software. Distances to each of the four buildings were then estimated using the Haversine formula (see below) and the shortest distance was selected as distance from campus.

$$a = sin^2\left(\frac{\Delta latitude}{2}\right) + \cos\left(latitude_1\right) \times \cos\left(latitude_2\right) \times sin^2\left(\frac{\Delta longitude}{2}\right)$$

$$c = 2 \times atan2(\sqrt{a}, \sqrt{1-a})$$

$$distance = Radius \times c$$

Where latitude and longitude are measured in decimal degrees and the Radius is the average radius of the Earth (6,371 km).

c. Survey

The survey data consists of 209 returned surveys from City of Whitewater employees, University of Wisconsin-Whitewater Faculty, and employees of participating local businesses. A copy of the survey can be found in Appendix C. Of the 209 respondents, 83 currently lived in Whitewater. 27 respondents were City employees, 181 were University Faculty, and 1 was an employee of a local business. The most common choice for most important home characteristic, neighborhood characteristic, city characteristic, and city service were cost of the house, crime rate/safety, proximity to work, and Quality of schools, respectively. 40 respondents indicated that the student population affected their choice of location, and 129 respondents indicated student population did not affect their location choice.

Results

a. Hedonic Analysis

Results of the Hedonic Analysis are shown in Hedonic Analysis Tables 1.2 contained in Appendix A. Over the full time period, the analysis estimated discounts of 4.3% for a home sold in Fort Atkinson and 17.7% for a home sold in Milton as compared to an identical home sold in Whitewater. When divided between pre-2007 and post-2007 time periods, however, the analysis did not find sufficient evidence to suggest any difference in sale price between Fort Atkinson and Whitewater in either period, while Milton experienced a 7.9% discount prior to 2007 and a 13.8% discount after 2007. The analysis did not find sufficient evidence to suggest that prices in Whitewater changed between the pre-2007 and post-2007 time periods.

The analysis of the full time period found that both Fort Atkinson and Milton homes sold experienced discounts for an additional bedroom of 3.3 percentage points and 11.2 percentage points, respectively, compared to the value attributed to an additional bedroom in Whitewater. Prior to 2007, the analysis found these discounts to be 2.7 percentage points and 8.0 percentage points respectively. The analysis did not find sufficient evidence to suggest that the value attributed to an additional bedroom in Whitewater, holding all else equal, changed after 2007. The analysis did not find sufficient evidence to suggest the discount for an additional bedroom in Fort Atkinson remained after 2007. In Milton, the discount for an additional bedroom increased after 2007 to 11.0 percentage points.

The analysis of the full time period found that homes sold in Fort Atkinson experienced a premium for an additional bathroom of 2.5 percentage points, compared to the value attributed to an additional bathroom in Whitewater. The analysis did not find sufficient evidence to suggest that, over the full time period, there was any difference in the value attributed to an additional

bathroom between homes sold in Milton and homes sold in Whitewater. Prior to 2007, the analysis found the premium for an additional bathroom in Fort Atkinson to be 4.1 percentage points. The analysis did not find sufficient evidence to suggest that the premium for adding an additional bathroom between Fort Atkinson and Whitewater remained after 2007. The analysis did not find sufficient evidence to suggest that that the value attributed to an additional bathroom increased in Whitewater after 2007. The analysis did not find sufficient evidence to suggest that homes sold in Milton before 2007 experienced any difference in value attributed to additional bathrooms compared to an additional bathroom in Whitewater prior to 2007, however the analysis did find a significant premium of 6.2 percentage points premium for adding an additional bathroom in Milton after 2007.

The analysis of the full time period found that homes sold in both Fort Atkinson and Milton experienced premiums for increasing the size of an attached garage of 2.9 percentage points and 10.5 percentage points respectively, compared to the value of increasing the size of an attached garage in Whitewater. Prior to 2007, the analysis found the premium in Fort Atkinson to be 2.8 percentage points. The analysis did not find sufficient evidence to suggest any difference in value of increasing the size of an attached garage between Milton and Whitewater prior to 2007. The analysis found that the value of increasing the size of an attached garage in Whitewater after 2007 increased by 4.3 percentage points compared to before 2007. After 2007, the premium for an additional bedroom in Fort Atkinson remained but decreased to 0.5 percentage points. After 2007, Milton experienced a premium over Whitewater for increasing the size of an attached garage of 8.9 percentage points.

b. Spatial Analysis

Results of the spatial analysis are shown in Spatial Analysis Tables 2.1-2.3. The analysis of the city as a whole estimated that campus had a negative impact on prices for homes within 2.2 miles of campus. The impact of campus on home prices reached its most negative point, a $14,131.65 discount, at 1.1 miles from campus. Also, the analysis did not find sufficient evidence to suggest that there was any difference in a home sold in 2010 and an identical home sold in 2000, indicating that, on average, home values in Whitewater returned to 2000 levels by 2010.

Analysis of homes sold in the Southwest sub-market of Whitewater did not find sufficient evidence to suggest that campus had any impact on selling price. Homes sold in the East sub-market of Whitewater, however, experienced a negative impact from campus that reached 2.35 miles and reached its most negative point, a discount of $21,799.08, at 1.17 miles. The analysis did not find sufficient evidence to suggest that there was any difference in selling price between a home sold in the East sub-market during 2000 and an identical home in 2010. The analysis did, however, find a significant increase in selling price of $30,096.70 for homes sold in the Southwest sub-market between 2000 and an identical home sold in 2010.

The analysis also produced an interesting story of average home price appreciation during the time period. Note that all values of appreciation are the average difference in price between a home sold in the year stated and an identical home sold in 2000. The southwest region first showed significant average appreciation of $21,011.60 in 2002 and fell in value, on average, to $16,949.29 and $14,923.60 during the years 2003 and 2004 respectively. The eastern submarket did not show significant appreciation in value until 2004 at a value of $28,128.80, indicating a premium associated with the southwestern submarket up to that time. The analysis indicated a

premium associated for the eastern submarket beginning in 2004 through 2008. The eastern submarket reached its peak of $43,818.30 in 2006, earlier and larger than the southwestern submarkets peak of $37,231.70 in 2007. In 2009, the premium returned to the southwestern submarket as its appreciation reached a value of $29,843.30 compared to the eastern submarkets value of $25,140.80. While the southwestern submarket retained much of its value in 2010, with an appreciation of $30,096.70, the eastern submarket fell drastically, showing no significant appreciation, on average, from 2000.

c. Survey

The results of the survey were analyzed in SPSS statistical analysis software using cross tabulation and chi-square tests. Each respondent was asked to rank the most important factors in four different categories. Home Characteristics, and City Services. The three most commonly selected as most important for each category; Neighborhood Characteristics, City Characteristics, Home Characteristics, and City Services were as follows: crime rate/safety, natural environment/open space, streets/traffic; Proximity to work, Employment Opportunities, Population/City Size; Cost of the house, Number of bedrooms, size of yard; Quality of schools, water quality, Emergency Services, and Medical Care. The majority of respondents claim that the large student population did not impact their choice of homes. This stays consistent despite varying income and education levels. A cross tabulation and chi-squared test was run on price of residence and annual household income. The results had an impressive P-Value of 0.001. This demonstrates that people of different incomes spend varying amounts on homes. Even more specifically, people with a higher income, spend a larger amount on their place of residence.

Conclusion

According to the survey, the four most important factors when choosing a place of residence include crime rate/safety, proximity to work, cost of the house, and quality of the schools. In addition, the large student population did not negatively impact the decision to move to Whitewater. Additionally, the average worker is someone who values family, safety and education; wants to be close to work while making sure his or her children are in a good environment; and has no negative feelings towards the student population as long as students do not negatively impact the other important factors.

In particular, patterns found in home sales within Whitewater and the surrounding areas of Fort Atkinson and Milton illustrate the dynamic tradeoffs between particular housing characteristics and price. The survey results represent a snapshot of the preferences of Whitewater employees taken at the time of their decision and are limited in the ability to quantify these preferences. Hedonic analysis of home sales, however, is able to examine the change in home price attributed to changes in home characteristics, painting a more detailed picture of personal preferences and their change over time. The analysis indicated a complex series of differences in valuations of particular home characteristics between Whitewater, Fort Atkinson, and Milton, as well as indicating that some of these valuations have changed over time.

Though the survey results indicated that the majority of Whitewater employees were not affected by student population in their location decision, further spatial analysis of home sales in Whitewater indicated that the University of Wisconsin-Whitewater campus did indeed have a significant, negative, non-linear affect on home sale prices. The analysis determined, however, that the effect of campus on home prices was not evenly distributed through the city. When divided between Eastern and Southwestern sub-markets, the analysis found that while the eastern

sub-market still experienced the negative impact of campus, the southwestern sub-market experienced no significant effect of campus on home sale prices. Overall, Whitewater has a complex, dynamic housing market that has and continues to adapt over time to the changing preferences of those purchasing homes.

Appendix A

Table 1.1: Summary Statistics – Hedonic Analysis

	Mean	Std. Dev.	Count
Sold Price ($)	146992	77542.8	-
Age of House	53.6721	40.1990	-
# of Stories	1.39740	0.440040	-
# of Bathrooms	1.52957	0.643154	-
# of Bedrooms	3.08177	0.718310	-
Square Feet	1614.23	654.375	-
Detached Garage (# of cars)	0.693269	0.946863	-
Attached Garage (# of cars)	1.02135	1.05961	-
On Water (1 if yes)	0.0663853	0.249002	-
Pre 2007	0.582118	0.493305	1517
Post 2007	0.417882	0.493305	1089
Whitewater	0.217191	0.412413	566
Fort Atkinson	0.535303	0.498848	1395
Milton	0.247506	0.431646	645
WW*Pre	0.141980	0.349097	370
FA*Pre	0.355718	0.478822	927
MN*Pre	0.0844206	0.278071	220
WW*Post	0.0752111	0.263782	196
FA*Post	0.179586	0.383916	468
MN*Post	0.163085	0.369514	425
WW*Bedrooms	0.684190	1.34365	-
WW*Bathrooms	0.328473	0.689050	-
FA*bedrooms	1.63378	1.60244	-
FA*bathrooms	0.779570	0.853789	-
MN*Bedrooms	0.763239	1.38582	-
MN*Bathrooms	0.420952	0.810018	-
WW*Attached	0.200499	0.620504	-
WW*Bedrooms	0.684190	1.34365	-

Table 1.2: Regression Results – Hedonic Analysis

	Simple City Comparison		City Comparison Between Time Periods		Characteristic Comparison		Characteristic Comparison between Time Periods	
	Coefficient	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*
constant	11.06***	216.2109	11.2092***	226.7329	11.1434***	256.484	11.3022***	297.3752
Fort Atkinson	**-0.0443641*** **	**-3.6464**	-	-	-	-	-	-
Milton	**-0.195358*** **	**-10.0267**	-	-	-	-	-	-
FA*Pre2007	-	-	**-0.0174807**	**-1.1915**	-	-	-	-
MN*Pre2007	-	-	**-0.0821153*** **	**-3.2328**	-	-	-	-
WW*Post2007	-	-	**0.0277082**	**1.1972**	-	-	-	-
FA*Post2007	-	-	**0.0106567**	**0.6024**	-	-	-	-
MN*Post2007	-	-	**-0.148106*** **	**-6.1710**	-	-	-	-
FA*Bedroom	-	-	-	-	**-0.0336811*** **	**-5.1276**	-	-
MN*Bedroom	-	-	-	-	**-0.118845*** **	**-6.1630**	-	-
FA*bathroom	-	-	-	-	**0.0245602** **	**2.0831**	-	-
MN*Bathroom	-	-	-	-	**0.0476805**	**1.6154**	-	-
FA*attached	-	-	-	-	**0.0288505*** **	**3.0033**	-	-
MN*Attached	-	-	-	-	**0.0995821*** **	**5.6407**	-	-
FA*bed*pre	-	-	-	-	-	-	**-0.027189*** **	**-3.6415**
MN*bed*pre	-	-	-	-	-	-	**-0.0838206** **	**-2.4319**
WW*bed*post	-	-	-	-	-	-	**-0.00983631**	**-0.5675**
FA*bed*post	-	-	-	-	-	-	**-0.0224048**	**-1.6377**
MN*bed*post	-	-	-	-	-	-	**-0.116132*** **	**-4.8977**
FA*bath*pre	-	-	-	-	-	-	**0.0397822*** **	**3.0418**
MN*bath*pre	-	-	-	-	-	-	**0.0913811**	**1.3846**
WW*bath*post	-	-	-	-	-	-	**0.0400143**	**1.1877**
FA*bath*post	-	-	-	-	-	-	**0.0348706**	**1.4361**
MN*bath*post	-	-	-	-	-	-	**0.0604712***	**1.8582**
FA*Pre*Attach	-	-	-	-	-	-	**0.0275715** **	**2.4902**
MN*Pre*attach	-	-	-	-	-	-	**0.052915788**	**2.1253**
WW*Post*Attach	-	-	-	-	-	-	**0.0422804** **	**2.0088**
FA*Post*Attach	-	-	-	-	-	-	**0.0466913*** **	**2.8275**
MN*Post*Attach	-	-	-	-	-	-	**0.124213*** **	**5.5236**
Age of House	-0.00341029***	-13.4347	-0.00324332***	-12.1822	-0.00410717***	-17.7203	-0.00386327***	-15.5173
# of Stories	0.0511269***	3.1331	0.0445889***	2.6021	0.0514139***	3.3225	0.043648***	2.6495
# of Bathrooms	0.068938***	6.4635	0.0824462***	7.3573	0.00047905***	14.6308	0.000482726***	14.5916
# of Bedrooms	-0.00466295	-0.3362	-0.00603095	-0.4183	-3.77844e-08***	-5.8935	-4.07264e-08***	-6.4687
Square Feet	0.000361215***	11.7217	0.000378109***	12.3274	0.0401893***	4.0056	0.0395654***	3.6870
Square Feet^2	-2.68275e-08***	-4.6552	-3.04616e-08***	-5.5192	0.107542***	2.7158	0.121343***	3.0513
Detached Garage (# of cars)	0.0721356***	5.3490	0.0656021***	4.8455	0.0596135	1.5218	-0.00386327***	-15.5173
Attached Garage (# of cars)	0.094814***	7.5983	0.0925596***	7.2207	0.126216***	4.4008	0.043648***	2.6495
On Water (1 if yes)	0.132507***	3.4968	0.13984***	3.6648	0.128208***	4.5180	0.000482726***	14.5916
	*, **, and *** represent probabilities of type 1 error of .10, .05, and .01 respectively							

Appendix B

Table 2.1: Summary Statistics – Spatial Analysis

	All		Southwest		East	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Sold Price	185117.00	129036.00	164572.	54108.5	194160.0	149798.00
Distance (feet)	7287.26	6777.87	3494.91	3659.00	8956.47	7154.48
Age of House	61.1283	42.8620	44.9755	31.3608	69.0503	45.8299
# of Stories	1.40954	0.450877	1.28199	0.425226	1.46436	0.450909
# of Bathrooms	1.60322	0.672122	1.65351	0.628358	1.58108	0.689931
# of Bedrooms	3.15550	0.768475	3.22368	0.731880	3.12548	0.782848
Square Feet	1625.64	631.269	1659.72	580.625	1607.34	656.850
Detached Garage (# of cars)	0.729223	1.02276	0.500000	0.910052	0.830116	1.05373
Attached Garage (# of cars)	1.01810	1.07753	1.37281	0.955650	0.861969	1.09189
On Water (1 if yes)	0.132530	0.339293	0.0789474	0.270250	0.191120	0.393563
2000	0.0790885	0.270058	0.0745614	0.263260	0.0791506	0.270235
2001	0.0656836	0.247894	0.105263	0.307567	0.0617761	0.240981
2002	0.108579	0.311319	0.0964912	0.295913	0.110039	0.313240
2003	0.101877	0.302689	0.0877193	0.283509	0.104247	0.305876
2004	0.112601	0.316316	0.127193	0.333922	0.123552	0.329388
2005	0.109920	0.312999	0.0921053	0.289811	0.102317	0.303357
2006	0.0991957	0.299125	0.0877193	0.283509	0.102317	0.303357
2007	0.0898123	0.286105	0.0833333	0.276994	0.0907336	0.287508
2008	0.0737265	0.261501	0.0833333	0.276994	0.0694981	0.254545
2009	0.0737265	0.261501	0.0833333	0.276994	0.0694981	0.254545
2010	0.0857909	0.280243	164572.	54108.5	0.0868726	0.281921

Spatial Analysis Table 2.2: Regression Results

(Heteroskedasticity-robust standard errors)

	All		Southwest		East	
	Coefficient	***t-ratio***	***Coefficient***	***t-ratio***	***Coefficient***	***t-ratio***
Constant	59709.9***	4.7780	92091.8***	4.4041	57466.4***	3.7483
Distance (feet)	**-4.86934*** **	**-3.2627**	**0.109138**	**0.0352**	**-7.04174*** **	**-3.7174**
Distance squared	**0.000419457*** **	**3.9964**	**0.000301744**	**0.6794**	**0.000568672*** **	**4.4927**
Age of House	-346.968***	-5.9330	-660.6***	-4.8284	-244.318***	-3.6405
# of Stories	4772.15	0.6578	6974.45	1.0259	9757.25	0.9320
# of Bathrooms	14792.7***	3.8579	18143.6***	3.5936	9852.41**	2.0242
# of Bedrooms	-1137.32	-0.2459	-11956**	-2.5266	283.018	0.0485
Square Feet	25.9387*	1.8928	32.2776	1.3450	14.3658	0.9269
Square Feet squared	0.00350963	1.1480	0.00375632	0.6879	0.00541677	1.5944
Detached Garage (# of cars)	7908.15*	1.8355	5449.33	1.2429	8644.35*	1.6552
Attached Garage (# of cars)	12955.8***	3.1370	5527.07	1.1450	10703.3**	2.1282
On Water (1 if yes)	59249.8***	3.9975	-	-	66786.8***	4.3363
2001	11855.9	0.7786	-4964.64	-0.6947	26076.1	1.1312
2002	12940.7**	2.2521	21011.6***	2.6682	11848.4	1.6479
2003	8637.17	1.5142	16949.288**	2.3896	6634.04	0.9179
2004	23302.78***	3.3729	14923.6*	1.8724	28128.8***	3.0312
2005	32666.68**	5.1039	28022.5***	3.0332	36268.4***	4.5337
2006	38356.7***	5.0175	30678.2***	4.0587	43818.3***	4.0552
2007	31516.2***	4.9187	37231.7***	3.8369	38361.1***	4.4484
2008	29149.9***	3.6748	30955.6***	3.5581	34682.2***	2.9670
2009	21104.6***	3.4786	29843.3***	4.4806	25140.8***	3.0076
2010	6048.03	0.7557	30096.7***	2.9562	4155.74	0.4007
	*, **, and *** represent probabilities of type 1 error of .10, .05, and .01 respectively					

Appendix C
Fiscal and Economic Research Center

Residential Location Survey

The following survey intends to ascertain the housing needs of employees in the city of Whitewater. Your participation will assist in developing a better understanding of the homebuyer's decision-making process that will be shared with the Whitewater Community Development Authority as well as the University of Wisconsin-Whitewater.
Please complete this survey as completely and as accurately as possible. Please check one box or circle one answer per question or characteristic. The survey should take you about 10-15 minutes to complete. Thank you for participating.

1. What is your Age? _____

2. What is your gender?

- O Male
- O Female

3. What is the highest level of education you have completed?

- O Less than high school degree
- O High school degree
- O 2-year college degree
- O Bachelor's degree
- O Graduate or professional degree

4. Where is your main residence located? (City, State) _____

5. Where did you move from? _____

6. In the tables below, please rank the issues in each category with the numbers 1 (most important) through 3 (third most important).

Neighborhood Characteristics	
Crime rate / safety	
Natural environment / open space	
Parks facilities	
Streets / traffic	
Recreational programs	
Shopping opportunities	

City Characteristics	
Population (City Size)	
Cost of living	
Employment opportunities	
Land use planning	
Property taxes	
Proximity to work	
Commuting Cost	

Home Characteristics	
Cost of the House	
Age of the House	
Square Footage	
Number of Bedrooms	
Number of Bathrooms	
Size of Yard	
Quality of Landscaping	
Ease of Maintenance	
Energy Efficiency	
Size of Garage	

City Services	
Emergency services (police, fire, ambulance)	
Medical care (doctors, hospitals, clinics)	
Quality of schools	
Library services	
Snow removal	
Recycling and trash collection	
Water Supply	
Water quality (lakes and rivers)	
Water quality (drinking water)	

What was the most important factor regarding choosing a school district when you made your move?

_____

7. **What was the population of the city you moved from?** _____

8. **What is the population of the city you moved to?** _____

9. **What is your first choice regarding city population?** _____

10. **Why did you choose to locate in Whitewater?**

_____

_____

11. **If you did not pick Whitewater, why did you choose the city you located to?**

_____

_____

12. **How much were you influenced by friends or colleagues about the quality of living in Whitewater?**

_____

_____

13. **Did the large UW-Whitewater student base population bother you when selecting a home?**

- O Yes
- O No

14. **Did the proximity of college rentals cause you to look at areas to live outside of Whitewater?**

- O Yes
- O No

15. **For how much did you purchase your residence?**

- O Less than $99,999
- O $100,000 – $174,999
- O $175,000 – $249,999
- O $250,000 – $349.999
- O $350,000 or More

16. **Which of the following ranges includes your annual household income?**

- O Less than $40,000
- O $40,000 - $59,999
- O $60,000 - $79,999
- O $80,000 - $99,999
- O $100,000 - $119,999
- O $120,000 or More

Thank you for your cooperation!

I understand that when I return the completed survey in the enclosed envelope I am providing voluntary consent to participate in this research, and I may refuse to participate or discontinue participation at anytime without penalty.

Every effort will be made to safeguard your identity and any information you provide from unauthorized access.