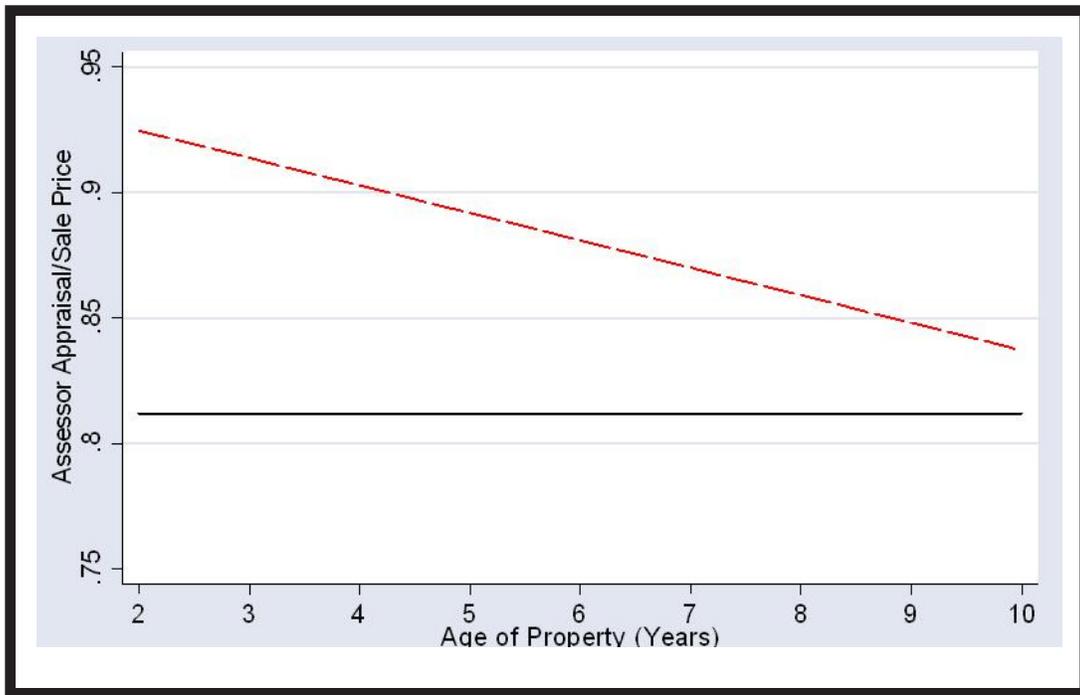




More than Their Fair Share: Understanding How the Age of Homes Affects Property Taxes in the St. Louis Metropolitan Area



Conducted by

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PUBLIC POLICY RESEARCH CENTER

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EXECUTIVE SUMMARY

This report is the result of research conducted in six Missouri counties by the Public Policy Research Center at the University of Missouri – St. Louis (PPRC) on behalf of the Home Builders Association of St. Louis and Eastern Missouri (HBA). It seeks to answer one research question: Were property taxes for new and relatively new homes based on a higher percentage of market value than the average single-family home as of the 2003 reassessment? In other words, did those home-owners of newer homes pay more than their fair share of the property tax burden? The counties examined are Franklin, Jefferson, Lincoln, St. Charles, St. Louis and Warren. Results are based on results as of January 2003, which may (or may not) reflect results from the 2005 reassessment or the coming results from the upcoming reassessment of January 2007.

The report is divided into four major sections:

Section I is a brief final report that compares findings across the six counties studied.

Section II is a brief summary of findings by county preceded by a concise layman’s guide to reviewing the individual county chapters.

Section III provides a description of the methods used in our analysis. It highlights and documents our methodology.

The Appendix provides detailed results by county. It assumes some understanding of the statistical tests used to draw the conclusions provided in the previous sections.

We found that results varied substantially depending on the county. One consistent result was that new homes were not assessed above market value in any county. However, in some counties, assessment levels vary widely for properties of different ages. Generally, the assessment levels of single-family properties decrease with the age of the property when controlling for market value and other factors such as the location of the property. In every county, our findings are statistically significant, though the difference in St. Charles County is not material and may be explained by other factors. The effect of assessing buyers of new homes at a higher percentage of market value is that these taxpayers pay a premium representing more than their fair share of the tax burden. Our conclusion is that while new homes are not over-assessed, older homes are under-assessed, with the exception of St. Charles County.

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I. Overall Results

In every county studied, statistically significant evidence exists that owners of newer homes pay more than their share of the property tax burden, though for St. Charles County, the difference is miniscule. This section summarizes results for the six counties studied and identifies themes that persist across county boundaries. Furthermore, it explains the effects of relative over-assessment for newer properties.

1. Premium Levels: The primary research question examined in this study is: do owners of new homes pay more than their fair share¹ of property taxes? The first numerical column in Table 1 reports the overall (median) assessment level² for single-family properties within each county. The next column reports the estimated assessment level for a new home from our study, and the final column computes the increased tax burden imposed on a new home, as of the 2003 assessment cycle.

Table 1. County Assessment levels for New Homes and Tax Premiums, 2003 New Homes

County	Median Assessment Level	New Home Assessment Level Estimates	Increased Tax Burden ³
Franklin	81.2%	94.7%	17%
Jefferson	65.4%	77.8%	19%
Lincoln	78.0%	88.2%	12%
St. Charles	96.6%	97.9%	1%
St. Louis	79.8%	89.8%	13%
Warren	72.5%	82.4%	14%

The assessment levels for neither the overall county level nor new homes reach 100% of market value in any county. Professional standards state that an overall assessment level of 90% is considered within an acceptable range, a standard met only in St. Charles County. On the other hand, the 90% standard is met, for new homes, in Franklin County and nearly met in Lincoln and St. Louis Counties. Only in Warren and Jefferson Counties are new homes appraised by the assessor substantially below professional standards.

The final column of Table 1 reports the estimated tax burden. Owners of new homes paid more than their share of the property tax burden in each county. In five of the six counties, this increased burden was substantial, ranging from 13% to 19%.

In Table 2 we begin to examine the question of whether this increased burden persists for newer, but not brand new, homes. The results reflect the estimated assessment level for homes built⁴ in 1998. In every county, the increased burden declines. In both Lincoln and St. Charles this burden disappears. However, the increased burden persists at a substantial level in the other four counties.

¹ By fair share, we mean whether home-owners pay taxes based on a higher level of assessment than what is paid at the county median assessment level.

² Assessment level represents the portion of market value reflected by the assessor's valuation. Note that this study uses the median level, comparable to other assessment levels determined by the PPRC in other more rigorous analyses.

³ The premium is calculated by subtracting the median assessment level from the new home assessment level and dividing the result by the overall (median) assessment level.

⁴ We use the year built to reflect age. A home may actually have been completed in the following year, or even later.

Table 2. County Assessment levels for New Homes and Tax Premiums, 1998 New Homes

County	Median Assessment Level	Home (when 5 years old) Assessment Level	Increased Tax Burden
Franklin	81.2%	89.2%	10%
Jefferson	65.4%	74.3%	14%
Lincoln	78.0%	77.2%	3%
St. Charles	96.6%	96.9%	0%
St. Louis	79.8%	86.3%	8%
Warren	72.5%	78.4%	8%

Table 3 continues the analysis of the persistence of the tax burden for newer homes by examining homes built in 1993 (approximately 10 years old).

Table 3. County Assessment levels for New Homes and Tax Premiums, 1993 New Homes

County	Median Assessment Level	Home (when 10 years old) Assessment Level	Increased Tax Burden
Franklin	81.2%	83.7%	3%
Jefferson	65.4%	70.8%	9%
Lincoln	78.0%	66.2%	-6%
St. Charles	96.6%	95.9%	0%
St. Louis	79.8%	82.8%	4%
Warren	72.5%	74.4%	3%

In Lincoln County, the declining trend continues, actually resulting in a tax benefit for owners of these homes. As before, there is no meaningful difference for St. Charles County. However, the increased burdens for the other four counties persist, most markedly in Jefferson County, even after 10 years. These homes were subjected to a reassessment, along with all others in the counties five times (1995, 1997, 1999, 2001 and 2003) yet their assessment levels are still not fully in line with those of other single family properties.

In sum, with the previously noted examples, the trend of over-taxation for new and newer homes represents a pattern that extends well beyond the decade after a new property is placed on the books.

2. Inverse Relationship between Assessments and Tax Rates: The relationship between assessment levels and tax rates has consequences on how much taxes are paid by home-owners, both for new and older homes. Under Missouri law, when overall assessment levels are increased by more than an inflation factor, taxing authorities must reduce tax rates commensurately⁵. Suppose that assessment levels in the five counties where assessments do not meet professional standards were increased to an appropriate level and all properties were assessed at the same level regardless of property age. In that circumstance, the assessments of new and newer homes would not decrease, but their share of the tax burden would be more equitable because they would no longer be compensating for the understated burden of older properties.

⁵ There are some limited exceptions, but those circumstances are too complex to include in this report – nor are they relevant to the questions being examined.

3. Determining Causes for Declining Assessment Levels: When conducting our analysis, we needed to determine whether property age was actually the causal factor in producing different assessment levels. Other causes such as location or price level could theoretically produce the same result, without age being truly statistically significant. In our analysis, we used location as a control variable⁶. Table 4 reports the results of several regression analyses used to examine the effect of age, when controlling for location.

Table 4. Regression Analysis Significance of Age and Location on Assessment Levels

County	Age		Location	
	1993-2001	Prior to 1993	1993-2001	Prior to 1993
Franklin	*	-	-	*
Jefferson	*	*	*	*
Lincoln	*	*	-	-
St. Charles	*	*	*	-
St. Louis	*	*	-	*
Warren	-	*	-	-

* Statistically Significant at least at the 0.1 level

- Not statistically significant.

Several results are worthy of note:

- In Franklin County, the significance of age disappears after approximately 10 years and location instead becomes the determining factor.
- In Jefferson County, both age and location are significant in the short and long run.
- In Lincoln County, age is significant throughout the analysis, but the pattern differs depending on the time period examined.
- In St. Charles County, statistical significance was found, but in each case the materiality of the differences was miniscule. This can result in statistical analysis when the sample size is large.
- In St. Louis County, property age is significant throughout the periods examined, while location is only a factor for older properties.
- In Warren County the regression analyses do not show that property age is a statistically significant factor. On the other hand, other statistical tests did show newer age groups are statistically different than the rest of the county. We believe that the small size and distribution of our sample contributed to these results.

⁶ In ratio studies, the use of at least two factors that affect property value is considered sufficient. Even though price level, size, condition, etc. are not specifically included, the use of two factors generally supplies sufficient input of all major factors into the analysis.

What factors explain differences in assessment levels varies by county. In some counties, property age provides a substantial part of that explanation, while in others, location matters. In some counties, both factors offer plausible explanations for differences in assessment levels.

4. **Conclusions:** Based on the analysis provided in this study, we can conclude the following:

- Estimated assessment levels for new homes are much higher than the county median assessment level.
- Assessment levels decline significantly as properties get older.
- As a result of declining assessment levels, new homes pay a high tax premium.
- Tax premiums tend to decline over time, but even after ten years, newer home-owners still paid a premium.
- In certain counties, other factors such as the location of a property can have a significant impact on its overall assessment level.
- In every county, there is no statistical evidence that new homes are assessed above market value.

More complete analysis of county trends and results are reported in the following sections.

II. County Results

This section provides summaries of the analysis for each county.

Each county report includes the following:

- The conclusion regarding whether newer single-family homes bear more than their fair share of the tax burden, and if so, the extent of the burden.
- A table that provides a comparison of assessment levels for single-family homes grouped according to the year they were built.
- The results of statistical tests to determine whether the differences noted in the previous table are statistically significant and material.
- Graphs of the results of regression analyses to determine whether property age is the key determinant for differences in assessment levels are provided for two age groupings:
 - Homes built from 1993 to 2001
 - Homes built from 1950 to 1992.
- A table that illustrates the results of a regression model that estimates the level of assessment of new and newer homes and reports whether this results in a tax premium.

For those familiar with sales ratio studies and/or statistical analyses, the methodology section (Section III) provides additional detail regarding the methodology used in our study. Furthermore, the results of all (substantive) statistical tests we base our conclusions on are reported in the appendix.

1. Franklin County

1.1 Conclusions: Our analysis concludes that buyers of new homes paid more than their fair share of property taxes. Whereas the median assessment level for single-family homes in Franklin County was 80.8%, our estimate is that new homes were assessed at 94.7% of market value. This represented a 17% property tax premium on new homes. Furthermore, the pattern of paying more than their fair share persists for at least ten years.

1.2. Initial Results: Table 1.1 lists the median assessment level for nine property age groups. The five groups where homes were built prior to 1985 have medians below the overall value. Conversely, properties within the four groups built subsequent to 1985 show results above the overall median.

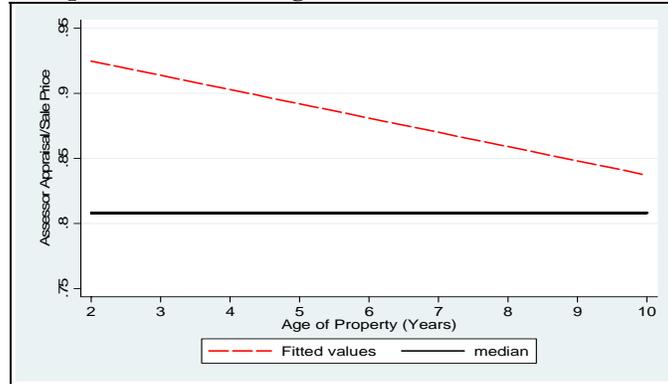
Table 1.1 Assessment Levels (Median) for Age Strata

Age Group	Median Value	N
2000-2001	92.2%	52
1995-1999	86.3%	148
1990-1994	82.5%	21
1985-1989	80.9%	68
1980-1984	79.3%	32
1970-1979	77.5%	154
1960-1969	76.8%	123
1950-1959	77.6%	84
Before 1950	76.9%	194
Overall	80.8%	976

1.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest two property groups are both statistically significant and material. Furthermore, analysis for properties built since 1993 confirms that age is the statistically significant explanation for differences in assessment level. The additional analysis also shows that for older properties, location differences rather than property age provides a statistically significant explanation of differences in assessment levels.

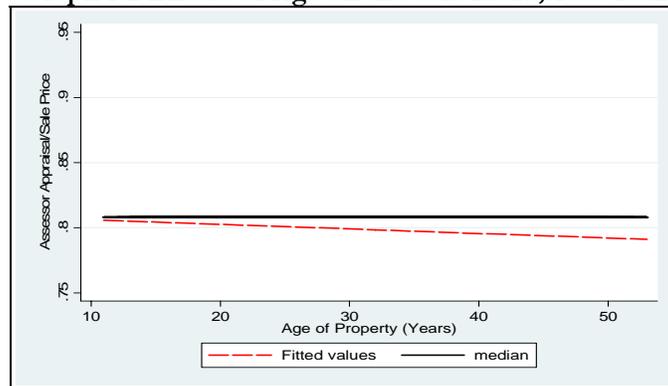
1.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 1.1 shows how assessment levels decline from above 90% for the most recently built properties. Even ten years after construction, newer homes continued to show assessment levels greater than the overall county level.

Graph 1.1 Effects of Age on the Sale Ratio, 1993-2001



1.5 Effect of Property Age for Older Properties: Graph 1.2 illustrates that assessment levels continued to decline over the long term, though the rate of decline abated.

Graph 1.2 Effects of Age on the Sale Ratio, 1950-1992



1.6 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 1.2.

Table 1.2 Franklin County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
94.7%	NEW	17%
89.2%	1998	10%
83.7%	1993	3%

We estimate that a typical new home was assessed at 94.7% of market value in 2003, resulting in payment of a 17% property tax premium.

2. Jefferson County

2.1 Conclusions: Our analysis concludes that buyers of new homes paid more than their fair share of property taxes. Whereas the median assessment level for single-family homes in Jefferson County was 65.4%, our estimate is that new homes were assessed at 77.8% of market value. This represented a 19% property tax premium on new homes. Furthermore, the pattern of paying more than their fair share persists for at least ten years.

2.2. Initial Results: Table 2.1 lists the median assessment level for nine property age groups. The five groups where homes were built prior to 1985 have medians below the overall value. Conversely, properties within the three groups built subsequent to 1985 show results above the overall median.

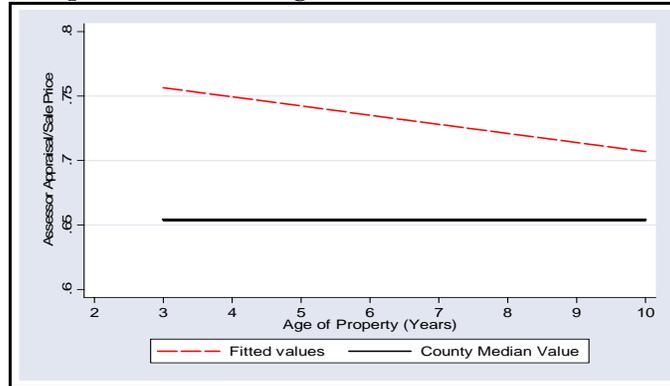
Table 2.1 Assessment Levels (Median) for Age Strata

Age Group	Median Value	N
2000-2001	75.3%	43
1995-1999	72.3%	278
1990-1994	70.2%	191
1985-1989	68.6%	210
1980-1984	64.9%	75
1970-1979	60.1%	335
1960-1969	56.2%	218
1950-1959	57.2%	140
Before 1950	48.7%	119
Overall	65.4%	1609

2.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest four property groups are both statistically significant and material. Furthermore, analysis for properties built since 1993 confirms that property age is the statistically significant explanation for differences in assessment level. Particular locations in Jefferson County also have a statistically significant effect, albeit less of an effect than age. The additional analysis also shows that for older properties, both location differences and property age provide a statistically significant explanation of differences in assessment levels.

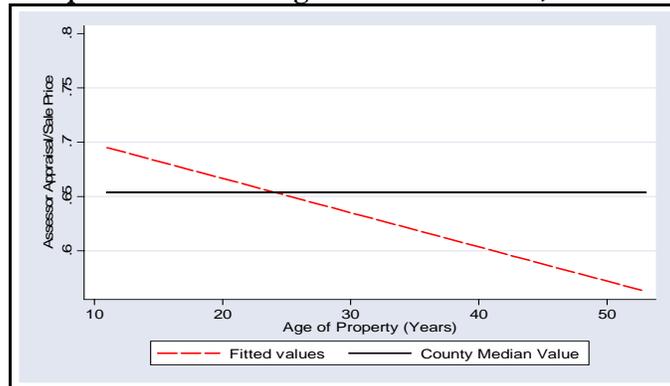
2.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 2.1 shows how assessment levels decline from above 75% for the more recently built properties. Even ten years after construction, newer homes continued with assessment levels greater than the overall county level.

Graph 2.1 Effects of Age on the Sale Ratio, 1993-2001



2.5 Effect of Property Age for Older Properties: Graph 2.2 illustrates that assessment levels continued to decline over the long term, reaching the county median level for 25-year old properties and lower assessment levels for older properties.

Graph 2.2 Effects of Age on the Sale Ratio, 1950-1992



2.6 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 2.2.

Table 2.2 Jefferson County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
77.8%	NEW	19%
74.3%	1998	14%
70.8%	1993	9%

We estimate that a typical new home was assessed at 77.8 % of market value in 2003, resulting in payment of a 19% property tax premium.

3. Lincoln County

3.1 Conclusions: This analysis concludes that buyers of new homes paid more than their fair share of property taxes. Whereas the median assessment level for single-family homes in Lincoln County was 78.0%, our estimate is that new homes were assessed at 87.0% of market value. This represented a 12% property tax premium on new homes. Furthermore, the pattern of paying more than their fair share persists for at least five years.

3.2. Initial Results: Table 3.1 lists the median assessment level for seven property age groups. The five groups where homes were built prior to 1995 have medians below the overall value. Conversely, properties within the two groups built subsequent to 1995 show results above the overall median.

Table 3.1 Assessment Levels (Median) for Age Strata

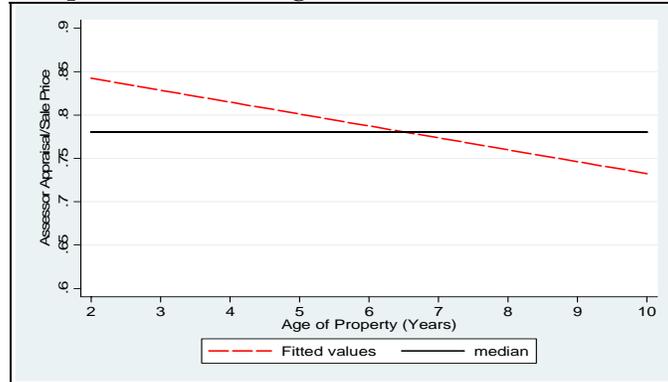
Age Group	Median Value	N
2000-2001	81.6%	26
1995-1999	80.9%	44
1990-1994	77.1%	25
1985-1989	65.9%	26
1980-1984	62.9%	15
1970-1979 ⁷	71.2%	19
Before 1970	43.3%	32
Overall	78.0%	187

3.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest two property groups are both statistically significant and material. Furthermore, analysis for properties built since 1993 confirms that property age is the statistically significant explanation for differences in assessment level. The additional analysis shows that for older properties, age provides a statistically significant explanation of differences in assessment levels.

⁷ The median for this age group is much higher than adjacent groups, which might be attributed to the relatively small size of the group itself.

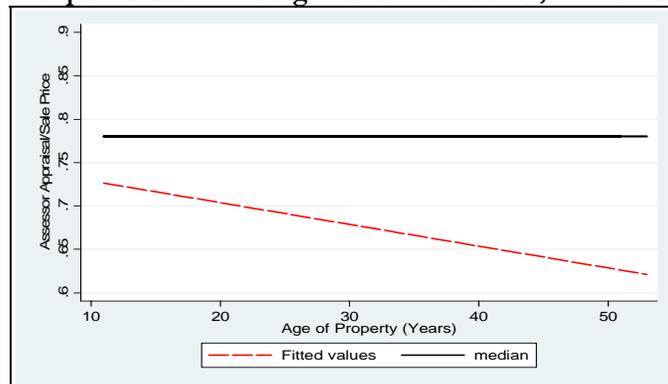
3.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 3.1 shows how assessment levels decline from around 85% for the more recently built properties. Assessment levels drop below the median for properties built in the mid-1990s, and ten years after construction, assessment levels continued to fall below the overall county level.

Graph 3.1 Effects of Age on the Sale Ratio, 1993-2001



3.5 Effect of Property Age for Older Properties: Graph 3.2 illustrates that assessment levels continued to decline over the long term below the county median level.

Graph 3.2 Effects of Age on the Sale Ratio, 1950-1992



3.6 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 3.2.

Table 3.2 Lincoln County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
87.0%	NEW	12%
80.0%	1998	3%
73.0%	1993	-6%

We estimate that a typical new home was assessed at 87.0 % of market value in 2003, resulting in payment of a 12% property tax premium.

4. St. Charles County

4.1 Conclusions: This analysis concludes that buyers of new homes paid slightly more than their fair share of property taxes. Whereas the median assessment level for single-family homes in St. Charles County was 96.6%, our estimate is that new homes were assessed at 97.9% of market value. This represented a 1% property tax premium on new homes.⁸

4.2. Initial Results: Table 4.1 lists the median assessment level for nine property age groups. The seven groups where homes were built prior to 1995 have medians below the overall value. Conversely, properties within the three groups built subsequent to 1995 show results above the overall median.

Table 4.1 Assessment Levels (Median) for Age Strata

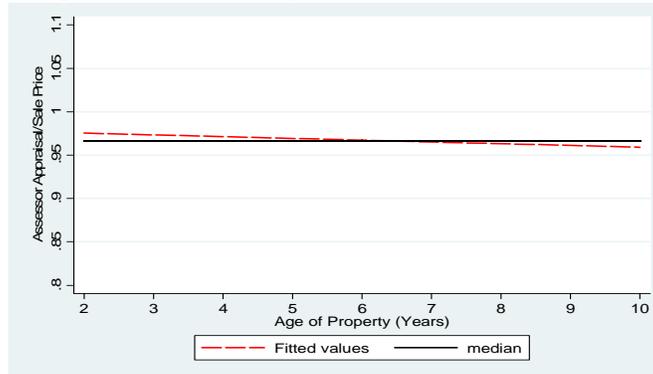
Age Group	Median Value	N
2000-2001	97.4%	1151
1995-1999	97.0%	1105
1990-1994	96.5%	709
1985-1989	95.9%	887
1980-1984	95.2%	493
1970-1979	96.3%	815
1960-1969	94.5%	384
1950-1959	92.8%	181
Before 1950	95.2%	158
Overall	96.6%	5883

4.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest two property groups are statistically significant although the material effect is negligible on assessment levels. Furthermore, analysis for properties built since 1993 confirms that property age is the statistically significant explanation for differences in assessment level, however the effect is so small that it could be accounted for by many other reasons not explored in this limited analysis. Particular locations in St. Charles County also have a statistically significant effect, although it appears this effect is immaterial. The additional analysis shows that for older properties, age alone provides a statistically significant explanation of differences in assessment levels, although they appear to have no material effect on assessment levels.

⁸ While our results were statistically significant, this finding may be a result of the large sample used and/or more perfect information available to the assessor for the newest homes.

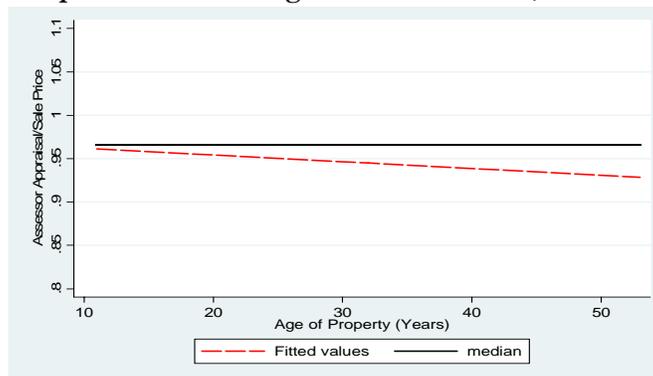
4.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 4.1 shows how assessment levels decline from over 95% for the more recently built properties. Assessment levels drop below the median for properties built in the mid-1990s, and ten years after construction, newer homes continued with assessment levels slightly lower than the overall county level.

Graph 4.1 Effects of Age on the Sale Ratio, 1993-2001



4.5 Effect of Property Age for Older Properties: Graph 4.2 illustrates that assessment levels continued to decline over the long term, although the actual decline was less than 10% over the next 50 years.

Graph 4.2 Effects of Age on the Sale Ratio, 1950-1992



4.6 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 4.2.

Table 4.2 St. Charles County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
97.9%	NEW	1%
96.9%	1998	< 1%
95.9%	1993	< 0%

We estimate that a typical new home was assessed at 97.9 % of market value in 2003, resulting in payment of a 1% property tax premium.

5. St. Louis County

5.1 Conclusions: This analysis concludes that buyers of new homes paid more than their fair share of property taxes. Whereas the median assessment level for single-family homes in St. Louis County was 79.8%, our estimate is that new homes were assessed at 89.8% of market value. This represented a 13% property tax premium on new homes. Furthermore, the pattern of paying more than their fair share persists for at least ten years.

5.2. Initial Results: Table 5.1 lists the median assessment level for nine property age groups. The three groups where homes were built prior to 1970 have medians below the overall value. Conversely, properties within the six groups built subsequent to 1970 show results above the overall median.

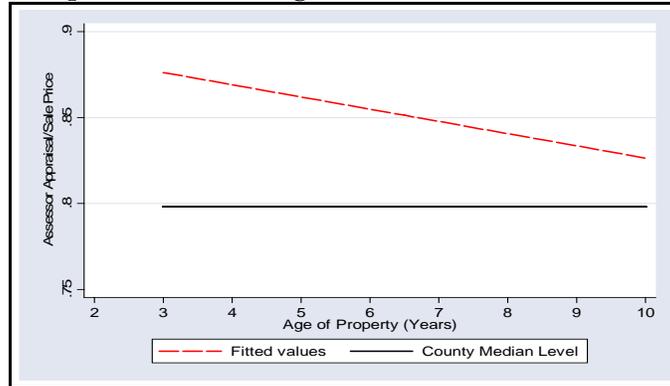
Table 5.1 Assessment Levels (Median) for Age Strata

Age Group	Median Value	N
2000-2001	88.5%	108
1995-1999	85.0%	844
1990-1994	82.7%	898
1985-1989	81.0%	1389
1980-1984	82.4%	645
1970-1979	79.9%	2128
1960-1969	79.7%	2918
1950-1959	78.7%	3604
Before 1950	76.3%	3219
Overall	79.8%	15,753

5.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest two property groups are both statistically significant and material. Furthermore, analysis for properties built since 1993 confirms that age is the statistically significant explanation for differences in assessment level. The additional analysis shows that for older properties, location differences in addition to property age provide a statistically significant explanation of differences in assessment levels.

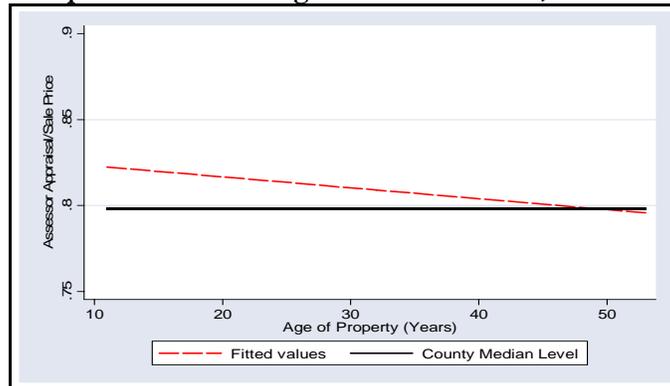
5.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 5.1 shows how assessment levels decline from below 90% for the more recently built properties. Even ten years after construction, newer homes continued with assessment levels greater than the overall county level

Graph 5.1 Effects of Age on the Sale Ratio, 1993-2001



5.5 Effect of Property Age for Older Properties: Graph 5.2 illustrates that assessment levels continued to decline over the long term toward the county median level, although the actual decline was less than 10% over the next 50 years.

Graph 5.2 Effects of Age on the Sale Ratio, 1950-1992



5.6 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 5.2.

Table 5.2 St. Louis County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
89.8%	NEW	13%
86.3%	1998	8%
82.8%	1993	4%

We estimate that a typical new home was assessed at 89.8 % of market value in 2003, resulting in payment of a 13% property tax premium.

6. Warren County

6.1 Conclusions: This analysis concludes that buyers of new homes paid more than their fair share of property taxes. Whereas the median assessment level for single-family homes in Warren County was 72.5%, our estimate is that new homes were assessed at 82.4% of market value.⁹ This represented a 14% property tax premium on new homes. Furthermore, the pattern of paying more than their fair share persists for at least five years.

6.2. Initial Results: Table 6.1 lists the median assessment level for seven property age groups. The four groups where homes were built prior to 1990 have medians below the overall value. Conversely, properties within the three groups built subsequent to 1990 show results above the overall median.

Table 6.1 Assessment Levels (Median) for Age Strata

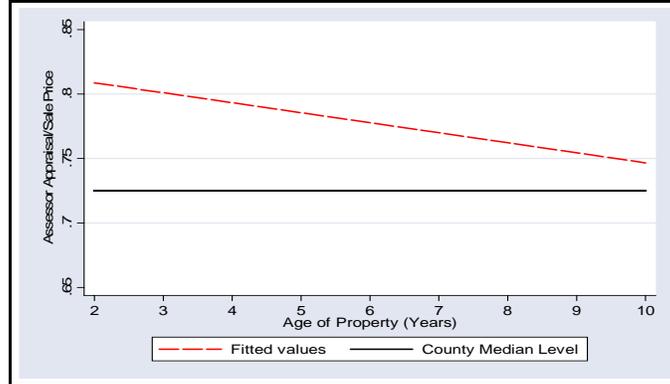
Age Group	Median Value	N
2000-2001	82.1%	14
1995-1999	77.9%	38
1990-1994	77.6%	22
1985-1989	71.2%	28
1980-1984	66.8%	23
1970-1979	67.8%	27
Before 1971	65.7%	20
Overall	72.5%	172

6.3 Determining the Statistical Significance of Property Age: The previous table provides an initial indication of assessment differences based on property age. We further examined results to determine whether the differences were statistically significant and material. Our statistical results conclude that the valuation differences for the newest three property groups are both statistically significant and material. Furthermore, analysis for properties built since 1993 suggests that age is a possible explanation for differences in assessment levels, although not statistically significant. Our additional analysis shows that for older properties, age provides a statistically significant explanation of differences in assessment levels.

⁹ Initial regression analysis indicated that age was not statistically significant for the age period used to produce the estimates, however other tests reported in the appendix are statistically significant.

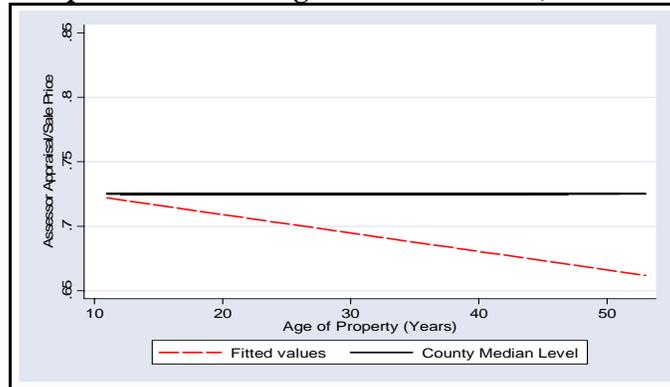
6.4 Effect of Property Age for Newer Properties: The following graphs provide a visual representation of the findings. Graph 6.1 shows how assessment levels decline from above 80% for the more recently built properties. Even ten years after construction, newer homes continued with assessment levels greater than the overall county level.

Graph 6.1 Effects of Age on the Sale Ratio, 1993-2001



6.5 Effect of Property Age for Older Properties: Graph 6.2 illustrates that assessment levels continued to decline over the long term below the county median level over the next 50 years.

Graph 6.2 Effects of Age on the Sale Ratio, 1950-1992



6.2 New Homes, Predicted Assessment Levels and Tax Burden: We use an additional regression model to examine the more recent historical period to estimate assessment levels for homes of various ages, which are reported in Table 6.2.

Table 6.2 Warren County Predicted 2003 Sale Ratio Values for Single Family Homes, Selected Years

Predicted Value	Year Built	Tax Premium
82.4%	NEW	14%
78.4%	1998	8%
74.4%	1993	3%

We estimate that a typical new home was assessed at 82.4% of market value in 2003, resulting in payment of a 14% property tax premium.

III. Methodology

1. Previous Work: The foundation for this study is a previous PPRC study conducted in 2006 for the Coalition to Fund Excellent Schools (CFES)¹⁰. The CFES Study included sales ratio studies for residential properties during the 2003 assessment cycle for 27 Missouri counties. That study was conducted in accordance with the standards of the International Association of Assessment Officers (IAAO) to produce demonstrably valid results. For this study, the research question was different; therefore some new analyses were required. Nevertheless, the data used in the CFES Study provided the foundation for this one. The CFES Study is cited in the references of this report and can be downloaded for anyone seeking a more detailed explanation of the original methodology, etc. Some common elements of both studies include:

- **Data:** Both studies use assessment and sales information from the 2003 assessment cycle. For four counties (Franklin, Jefferson, St. Charles, and St. Louis County), complete assessment rolls were available in electronic format and matched to sales information. Assessment rolls for two counties (Lincoln and Warren) were not available electronically, so sales information was matched to assessment information at the county assessor's office.
- **Sales Screening:** During the CFES Study, all sales that were matched with assessment information underwent a variety of screening processes in an attempt to ensure that the sales used were appropriate to a sales ratio study as explained in the IAAO Standard on Ratio Studies and further documented in the CFES study.

2. Variations from the CFES Study: This study is not a replication of the CFES Study presented in a different form. The methodology for any study is guided by the research question. In the CFES study the primary objective was to determine the overall level of assessment for all residential property. In this study, the primary objective is to determine whether new (and newer) homes bear a materially different portion of the tax burden than other single-family properties. The resultant differences and additions to the research performed include:

- Only single-family properties are included.
- Only properties where the year built could be determined are included.
- In the CFES study, some properties built in 2002 were included, but only for some counties. This was dependent on the availability of new construction information from the assessor. To provide more consistency, these were eliminated from this study, so that the data used is consistent, i.e. single family homes built in 2001 or before.
- **Overall Assessment Levels:** In this study, we use the median assessment level for single-family homes as the comparative. This is sufficient to the question. In the CFES Study, the purpose of the study required additional attention to the weighted mean.
- **Distribution of Data:** Three tests for normality (Shapiro-Francia Normality test, Shapiro-Wilk Normality Test, and the Skewness and Kurtosis Test where appropriate) were conducted to determine that sale ratios were normally distributed for the newly trimmed data. In all counties except Warren County, the sale ratio was distributed normally. For Warren, after careful examination, we concluded that the distribution was approximately so.

¹⁰ See Gardner (2006).

that it did not compromise our results. A histogram of the distribution of the sale ratio for each county is included in the appendix.

- **Stratification:** In this study the age stratification was expanded from that found in the CFES Study. For the four largest counties (Franklin, Jefferson, St. Charles, and St. Louis), sufficient data existed to divide properties into nine sub-groups. For Lincoln and Warren County, the data allowed us to subdivide the sample into seven strata.
- **Ratio Outliers:** In the CFES Study, ratio outliers were trimmed by the primary statistical method, property use and value groups. Since the emphasis of this study is the effect of property age, ratio outliers were trimmed by age groups to ensure that they would not influence the overall results.

3. Additional Statistical Analysis: As previously noted, this study required additional analyses to address the specific new question related to property age. These new analyses included:

- **Regression Analysis:** Four regression models were used. Wherever a regression was used and reported as statistically significant we used appropriate regression diagnostics to assure that the regression assumptions were met. This included examinations for linearity, normality, multi-collinearity and heteroskedasticity, etc. Because heteroskedasticity was identified in several instances, we use robust regression analysis.
- When determining whether the results for a particular stratum were different from the overall results we used two statistical tests, the Mann-Whitney Test and the K-Sample Test. Each test determines whether differences are statistically significant or whether they could result from chance, though each test accomplishes the task in a slightly different way. Results for each are reported in the appendix.

4. Statistical Significance: Regardless of the specific statistical test or intent of the analysis, we report results using three measures of statistical significance. A result that shows * for the 0.10 level means that we can draw a conclusion with at least 90% statistical confidence. A result that shows ** for the 0.05 level, provides at least 95% statistical confidence in the result and one shown as *** for the 0.01 confidence at the 99% level.

5. Appendix: The analysis provided in each county summary provides readers with the results of our work regarding the effects of property age on the level of assessment and the resultant tax burden. For those familiar with sales ratio studies and/or statistical analysis, the actual detailed results are provided in the appendix. Each county's appendix contains:

- A histogram to demonstrate the distribution of sale ratios in the county.
- A scatter-plot graph of the sale ratios compared to the age of the property for visual reference.
- A detailed table listing ratio statistics for each age group used in the analysis.
- Results from two multiple regression models analyzing the effects of age and location on the assessment levels for homes built in two age periods, 1993-2001 and before 1993.
- Results from a regression model analyzing the effects of age on assessment levels for homes within the 1993-2001 period.
- Results from the Mann-Whitney and K-Sample tests.

References

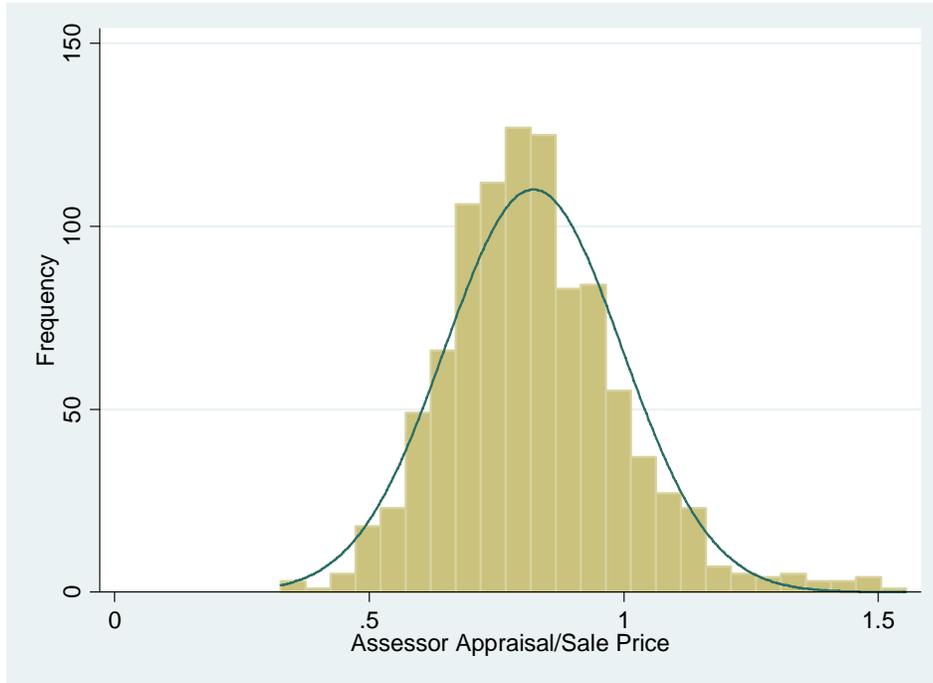
Gardner, Steven M. 2006. *Disparity of Assessment Results: Why Missouri's School Funding Formula Doesn't Add Up*. St. Louis: Public Policy Research Center, University of Missouri - St. Louis.
<http://pprc.umsl.edu/>

IAAO. 1999. *Standard on Ratio Studies*. Kansas City: International Association of Assessing Officers.

Appendix

1. Franklin County

Graph 1.3 Distribution of Sale Ratio for Single Family Homes



Graph 1.4 Scatter Plot of Sale Ratio and Age of Property

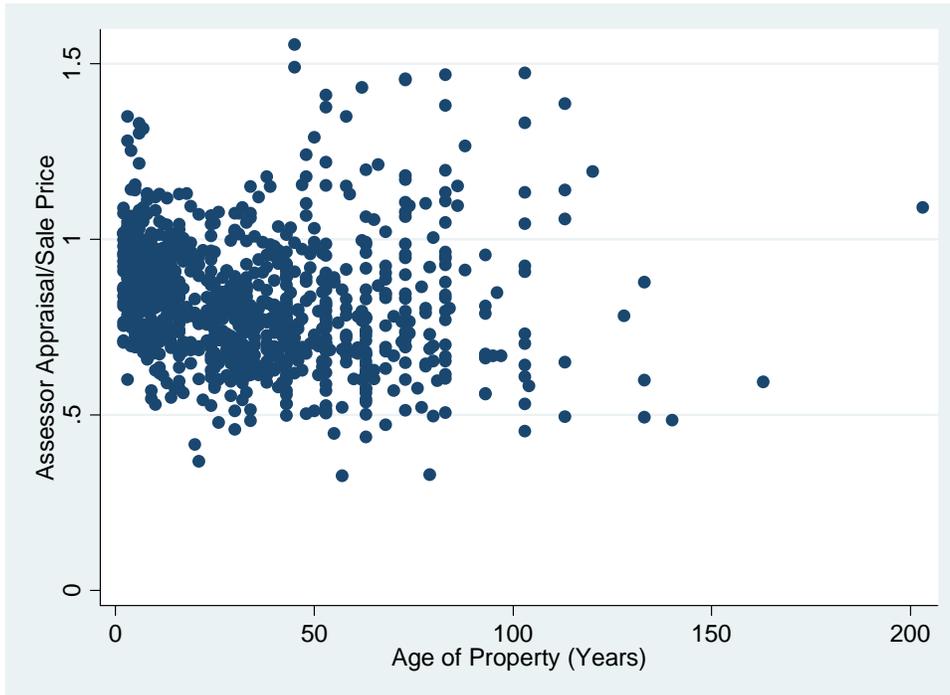


Table 1.3 Franklin County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

		Group (Year Built)									
		2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	1960-1969	1950-1959	Before 1950	Overall 1
Mean		.919	.888	.831	.820	.798	.774	.777	.835	.809	.823
95% Confidence Interval for Mean	Lower Bound	.883	.866	.809	.787	.736	.753	.751	.786	.776	.812
	Upper Bound	.956	.910	.853	.853	.860	.795	.804	.884	.842	.834
Median		.922	.863	.825	.809	.793	.775	.768	.776	.769	.808
95% Confidence Interval for Median	Lower Bound	.861	.840	.812	.778	.707	.737	.726	.719	.720	.797
	Upper Bound	.953	.894	.846	.851	.918	.801	.794	.837	.796	.821
Weighted Mean		.918	.880	.826	.816	.744	.766	.764	.809	.779	.818
95% Confidence Interval for Weighted Mean	Lower Bound	.887	.855	.802	.775	.670	.744	.735	.763	.746	.806
	Upper Bound	.949	.905	.851	.857	.819	.787	.793	.856	.811	.829
Price Related Differential		1.002	1.009	1.006	1.004	1.072	1.011	1.017	1.032	1.039	1.006
Coefficient of Dispersion		.107	.121	.116	.137	.169	.137	.152	.213	.234	.164

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Table 1.4 Franklin County Robust Regression Results for Age and Location on the Sale Ratio

Variables	Coefficient (Standard Error)	1993-2001			Before 1993			
		t	P> t		Coefficient (Standard Error)	t	P> t	
Age of Property	-0.011 (0.003)	-3.49	0.001	***	0.0003 (0.0003)	0.80	0.424	
Locations:								
All Other Road Districts	-0.033 (0.067)	-0.49	0.623		0.13 (0.058)	2.37	0.018	**
Road District "US"	-0.013 (0.07)	-0.19	0.853		0.093 (0.057)	1.65	0.100	*
Road District "SS"	-0.0228 (0.07)	-0.32	0.747		0.115 (0.057)	2.02	0.043	**
Road District "W"	-0.026 (0.07)	-0.37	0.713		0.161 (0.058)	2.75	0.006	***
Road District "NH"	(dropped)				(dropped)			
Constant	0.973 (0.069)	14.17	0.000	***	0.663 (0.055)	11.96	0.000	***
N	267				709			
R-Squared	0.046				0.022			

* Significant at the 0.10 level
 ** Significant at the 0.05 level
 *** Significant at the 0.01 level

Table 1.5 Franklin County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	Coefficient (Standard Error)	1993-2001		
		t	P> t	
Age of Property	-0.011 (0.003)	-3.59	0.000	***
Constant	0.947 (0.021)	45.65	0.000	***
N	267			
R-Squared	0.042			

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 1.6 Franklin County Mann-Whitney Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	52	35342	25402	-5.026	< 0.000***
All Other Years	924	441434	451374		
1995-1999	148	90770	72298	-5.848	< 0.000***
All Other Years	828	386006	404478		
1990-1994	121	63368	59108.5	-1.468	0.142
All Other Years	855	413408	417667.5		
1985-1989	68	33827	33218	-0.272	0.786
All Other Years	908	442949	443558		
1980-1984	32	15207	15632	0.271	0.786
All Other Years	944	461569	461144		
1970-1979	154	63213	75229	3.743	< 0.000***
All Other Years	822	413563	401547		
1960-1969	123	50477	60085.5	3.288	0.001***
All Other Years	853	426299	416690.5		
1950-1959	84	39513	41034	0.616	0.538
All Other Years	892	437263	435742		
Before 1950	194	85059	94769	2.763	0.006***
All Other Years	782	391717	382007		

* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

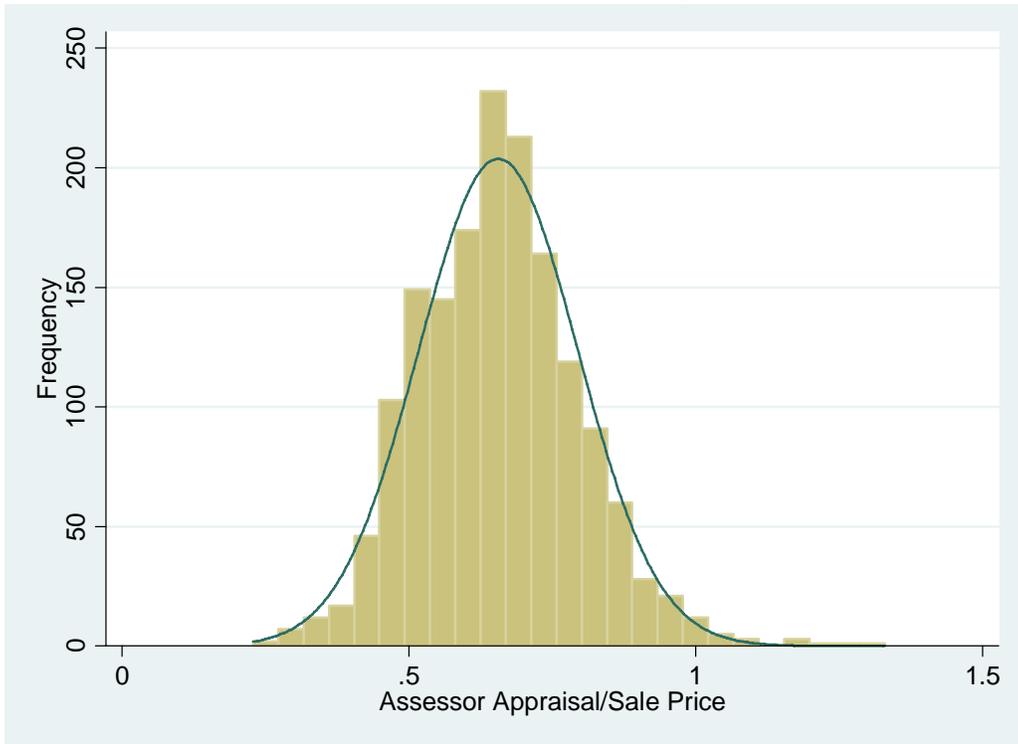
Table 1.7 Franklin County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	8	44	24.883	< 0.000***
All Other Years	480	444		
1995-1999	49	99	19.911	< 0.000***
All Other Years	439	399		
1990-1994	48	73	5.434	0.02**
All Other Years	440	415		
1985-1989	34	34	0.016	0.9
All Other Years	454	454		
1980-1984	17	15	0.032	0.857
All Other Years	471	473		
1970-1979	92	62	6.484	0.011**
All Other Years	396	426		
1960-1969	78	45	9.526	0.002***
All Other Years	410	443		
1950-1959	47	37	1.055	0.304
All Other Years	441	451		
Before 1950	115	79	7.88	0.005***
All Other Years	373	409		

* Significant at the 0.1 level
 ** Significant at the 0.05 level
 *** Significant at the 0.01 Level

2. Jefferson County

Graph 2.3 Distribution of Sale Ratio for Single Family Homes



Graph 2.4 Scatter Plot of Sale Ratio and Age of Property

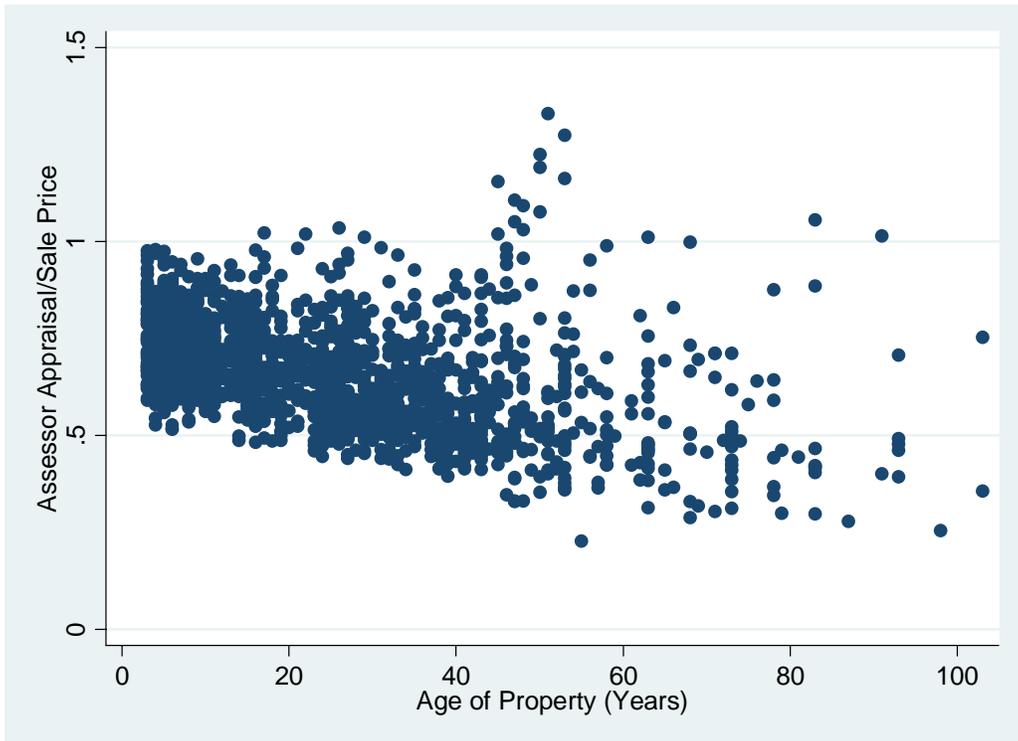


Table 2.3 Jefferson County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

	Group (Year Built)										
	2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	1960-1969	1950-1959	Before 1950	Overall 1	
Mean	.765	.730	.717	.697	.658	.622	.584	.623	.538	.656	
95% Confidence Interval for Mean	Lower Bound	.732	.719	.705	.684	.632	.610	.568	.587	.506	.649
	Upper Bound	.798	.741	.729	.710	.685	.634	.600	.659	.571	.663
Median	.753	.723	.702	.686	.649	.601	.562	.572	.487	.654	
95% Confidence Interval for Median	Lower Bound	.700	.709	.692	.672	.607	.586	.538	.528	.464	.647
	Upper Bound	.813	.739	.715	.703	.674	.610	.580	.608	.518	.660
Weighted Mean	.745	.722	.717	.688	.654	.612	.571	.576	.501	.658	
95% Confidence Interval for Weighted Mean	Lower Bound	.714	.711	.704	.673	.624	.601	.558	.549	.469	.651
	Upper Bound	.776	.733	.730	.703	.685	.623	.585	.603	.533	.664
Price Related Differential	1.027	1.011	.999	1.013	1.006	1.016	1.022	1.082	1.074	.997	
Coefficient of Dispersion	.119	.102	.094	.109	.140	.142	.165	.269	.279	.166	

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Table 2.4 Jefferson County Robust Regression Results for Age and Location on the Sale Ratio

Variables	1993-2001				Before 1993			
	Coefficient (Standard Error)	t	P> t		Coefficient (Standard Error)	t	P> t	
Age of Property	-0.006 (0.002)	-2.86	0.004	**	-0.003 (0.0003)	-11.16	0.000	***
Locations:								
Northwest School Districts	-0.002 (0.019)	-0.12	0.908		-0.07 (0.017)	-4.15	0.000	***
Northeast School Districts	0.031 (0.017)	1.79	0.074	*	-0.08 (0.015)	-5.39	0.000	***
East School Districts	0.059 (0.018)	3.28	0.001	**	-0.04 (0.016)	2.02	0.043	**
Central/West School Districts	(dropped)				-0.02 (0.02)	-1.00	0.319	
Southern School Districts	-0.01 (0.023)	-0.43	0.666		(dropped)			
Constant	0.744 (0.02)	31.97	0.000	**	0.783 (0.017)	47.11	0.000	***
N	411				1198			
R-Squared	0.105				0.145			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 2.5 Jefferson County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	Coefficient (Standard Error)	1993-2001		
		t	P> t	
Age of Property	-0.007 (0.002)	-3.35	0.001	***
Constant	0.778 (0.015)	51.06	0.000	***
N	411			
R-Squared	0.028			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 2.6 Jefferson County Mann-Whitney Test Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	43	50976	34615	-5.443	< 0.000***
All Other Years	1566	1244269	1260630		
1995-1999	278	303808	223790	-11.357	< 0.000***
All Other Years	1331	991437	1071455		
1990-1994	191	200217	153755	-7.708	< 0.000***
All Other Years	1418	1095028	1141490		
1985-1989	210	202781	169050	-5.373	< 0.000***
All Other Years	1399	1092464	1126195		
1980-1984	75	60400	60375	-0.006	0.995
All Other Years	1534	1234845	1234870		
1970-1979	335	222045.5	269675	6.294	< 0.000***
All Other Years	1274	1073199.5	1025570		
1960-1969	218	116657.5	175490	9.224	< 0.000***
All Other Years	1391	1178587.5	1119755		
1950-1959	140	85998	112700	5.083	< 0.000***
All Other Years	1469	1209247	1182545		
Before 1950	119	52362	95795	8.905	< 0.000***
All Other Years	1490	1242883	1199450		

* Significant at the 0.1 level.

** Significant at the 0.05 level.

***Significant at the 0.01 level.

Table 2.7 Jefferson County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	7	36	18.769	< 0.000***
All Other Years	798	768		
1995-1999	57	221	115.779	< 0.000***
All Other Years	748	583		
1990-1994	46	145	57.194	< 0.000***
All Other Years	759	659		
1985-1989	73	137	21.827	< 0.000***
All Other Years	732	667		
1980-1984	39	36	0.0534	0.817
All Other Years	766	768		
1970-1979	228	107	54.1	< 0.000***
All Other Years	577	697		
1960-1969	167	51	70.008	< 0.000***
All Other Years	638	753		
1950-1959	97	43	21.904	< 0.000***
All Other Years	708	761		
Before 1950	91	28	37.799	< 0.000***
All Other Years	714	776		

* Significant at the 0.1 level.

** Significant at the 0.05 level.

***Significant at the 0.01 level.

3. Lincoln County

Graph 3.3 Distribution of Sale Ratio for Single Family Homes



Graph 3.4 Scatter Plot of Sale Ratio and Age of Property

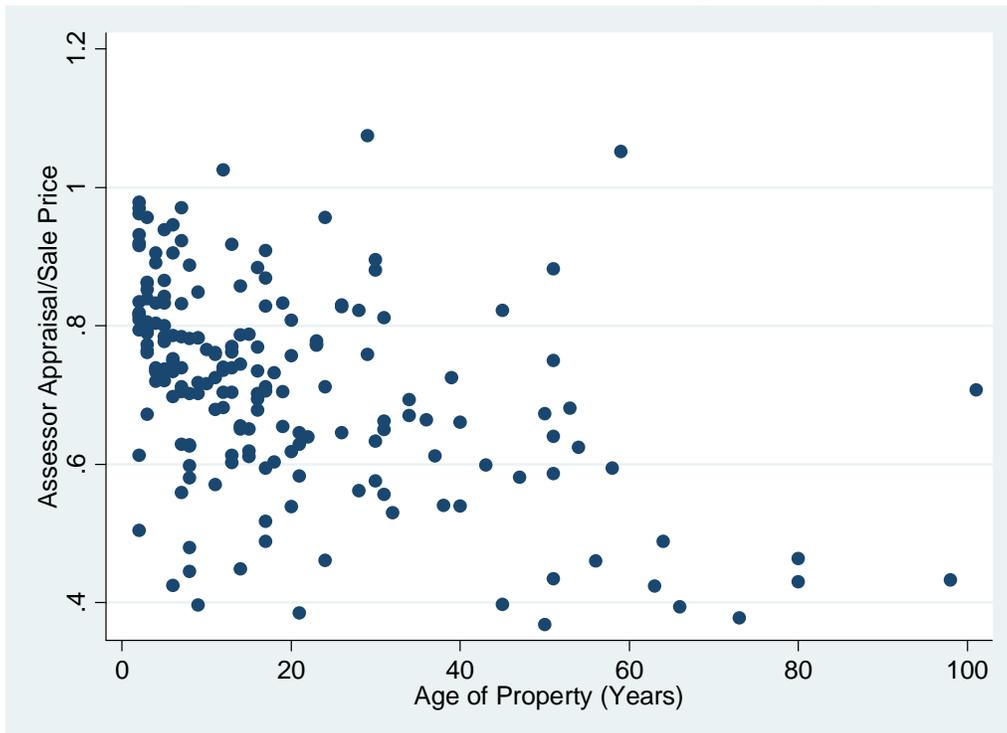


Table 3.3 Lincoln County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

	Group (Year Built)							
	2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	Before 1970	Overall
Mean	.830	.783	.792	.659	.662	.706	.497	.734
95% Confidence Interval for Mean								
Lower Bound	.781	.699	.701	-2.012	.415	.390	.312	.683
Upper Bound	.880	.866	.884	3.330	.909	1.022	.683	.785
Median	.816	.809	.771	.659	.629	.712	.433	.780
95% Confidence Interval for Median								
Lower Bound	.773	.712	.725	.449	.583	.576	.369	.712
Upper Bound	.962	.865	.918	.870	.774	.830	.707	.817
Weighted Mean	.830	.783	.789	.655	.660	.708	.491	.734
95% Confidence Interval for Weighted Mean								
Lower Bound	.779	.703	.704	-2.015	.414	.388	.309	.683
Upper Bound	.880	.863	.874	3.324	.906	1.027	.674	.785
Price Related Differential	1.001	.999	1.004	1.007	1.003	.998	1.012	1.000
Coefficient of Dispersion	.046	.104	.054	.319	.101	.119	.258	.141

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Table 3.4 Lincoln County Robust Regression Results for Age and Location on the Sale Ratio

Variables	1993-2001				Before 1993			
	Coefficient (Standard Error)	t	P> t		Coefficient (Standard Error)	t	P> t	
Age of Property	-0.023 (0.005)	-4.22	0.000	***	-0.003 (0.001)	-3.77	0.000	***
Locations:								
Troy School District	0.059 (0.06)	0.99	0.328		-0.007 (0.036)	-0.19	0.846	
Winfield School District	(dropped)				(dropped)			
All Other School Districts	-0.104 (0.096)	-1.08	0.284		0.002 (0.04)	0.04	0.965	
Constant	0.841 (0.065)	13.03	0.000	***	0.766 (0.034)	22.49	0.000	***
N	78				109			
R-Squared	0.257				0.1475			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 3.5 Lincoln County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	Coefficient (Standard Error)	1993-2001		
		t	P> t	
Age of Property	-0.014 (0.004)	-3.25	0.001	***
Constant	0.870 (0.024)	36.63	0.000	***
N	70			
R-Squared	0.1309			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 3.6 Lincoln County Mann-Whitney Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	26	3609	2444	-4.549	< 0.000***
All Other Years	161	13969	15134		
1995-1999	44	4718	4136	-1.854	0.064*
All Other Years	143	12860	13442		
1990-1994	25	2400	2350	-0.198	0.843
All Other Years	162	15178	15228		
1985-1989	26	2258	2444	0.726	0.468
All Other Years	161	15320	15134		
1980-1984	15	1165	1410	1.219	0.223
All Other Years	172	16413	16168		
1970-1979	19	1821	1786	-0.157	0.876
All Other Years	168	15757	15792		
Before 1970	32	1607	3008	5.026	< 0.000***
All Other Years	155	15971	14570		

* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 3.7 Lincoln County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	3	23	16.364	< 0.000***
All Other Years	91	70		
1995-1999	16	28	3.752	0.053*
All Other Years	78	65		
1990-1994	12	13	0.001	0.977
All Other Years	82	80		
1985-1989	16	10	1.056	0.304
All Other Years	78	83		
1980-1984	9	6	0.267	0.605
All Other Years	85	87		
1970-1979	10	9	0.001	0.98
All Other Years	84	84		
Before 1970	28	4	19.649	< 0.000***
All Other Years	66	89		

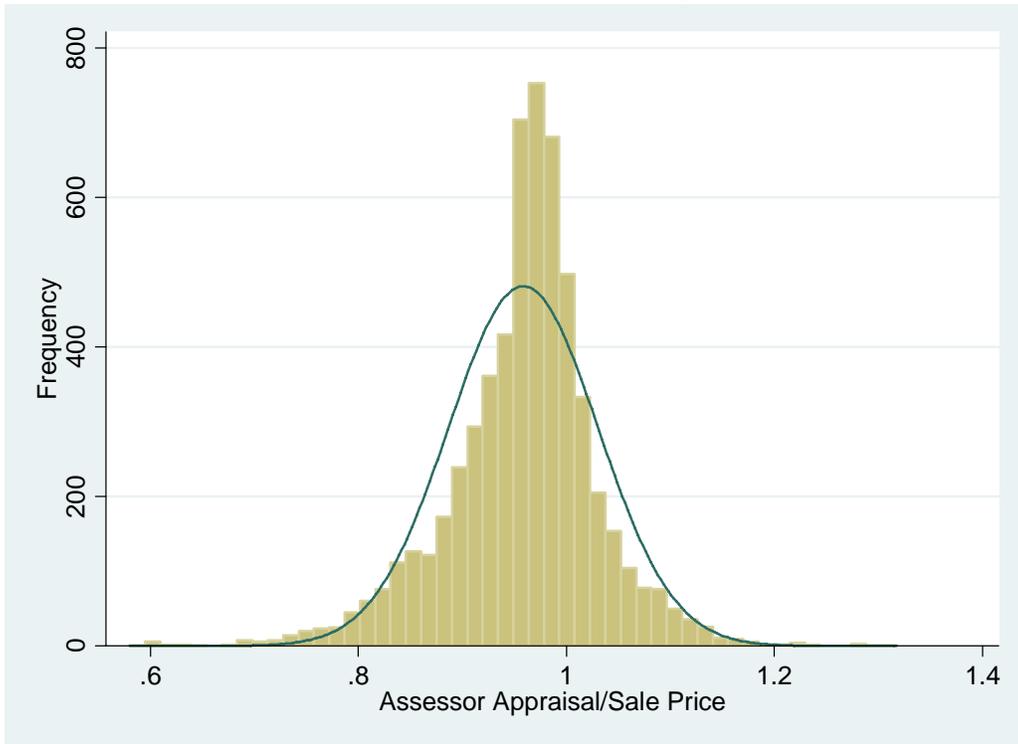
* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

4. St. Charles County

Graph 4.3 Distribution of Sale Ratio for Single Family Homes



Graph 4.4 Scatter Plot of Sale Ratio and Age of Property

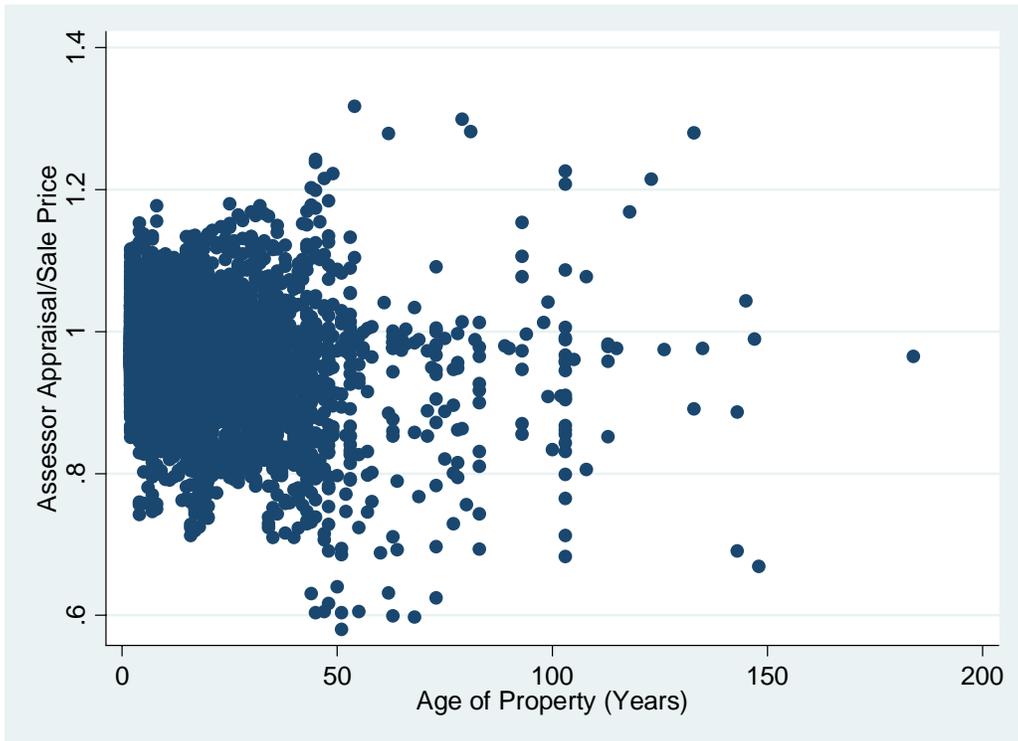


Table 4.3 St. Charles County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

		Group (Year Built)									
		2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	1960-1969	1950-1959	Before 1950	Overall 1
Mean		.975	.966	.964	.952	.945	.961	.935	.923	.925	.959
95% Confidence Interval for Mean	Lower Bound	.973	.963	.960	.947	.938	.956	.926	.903	.903	.957
	Upper Bound	.978	.969	.968	.957	.952	.966	.944	.942	.947	.960
Median		.974	.970	.965	.959	.952	.963	.945	.928	.952	.966
95% Confidence Interval for Median	Lower Bound	.972	.967	.961	.954	.944	.958	.929	.905	.916	.964
	Upper Bound	.975	.974	.970	.963	.957	.968	.955	.957	.973	.967
Weighted Mean		.973	.963	.960	.952	.947	.959	.928	.906	.908	.958
95% Confidence Interval for Weighted Mean	Lower Bound	.971	.958	.954	.945	.940	.954	.919	.886	.885	.956
	Upper Bound	.976	.967	.965	.958	.954	.964	.938	.927	.930	.960
Price Related Differential		1.002	1.004	1.005	1.000	.998	1.003	1.007	1.018	1.019	1.000
Coefficient of Dispersion		.027	.045	.047	.058	.064	.058	.075	.114	.107	.053

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Table 4.4 St. Charles County Robust Regression Results for Age and Location on the Sale Ratio

Variables	1993-2001				Before 1993			
	Coefficient (Standard Error)	t	P> t		Coefficient (Standard Error)	t	P> t	
Age of Property	-0.0018 (0.0004)	-4.61	0.000	***	-0.0004 (0.0001)	-2.81	0.005	***
Locations:								
All Other Fire Districts	-.016 (0.007)	-2.26	0.024	**	(dropped)			
Fire District 306	(dropped)				0.002 (0.007)	0.23	0.816	
Fire District 311	0.004 (0.005)	0.75	0.451		0.001 (0.007)	0.21	0.835	
Fire District 313	0.014 (0.005)	2.72	0.007	***	-0.016 (0.011)	-1.42	0.155	
Fire District 314	0.017 (0.005)	3.43	0.001	***	0.01 (0.007)	1.53	0.126	
Fire District 320	0.003 (0.005)	0.57	0.567		0.006 (0.006)	1.02	0.308	
Constant	0.971 (0.005)	193.71	0.000	***	0.956 (0.007)	146.83	0.000	***
N	2586				3297			
R-Squared	0.039				0.012			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 4.5 St. Charles County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	1993-2001			
	Coefficient (Standard Error)	t	P> t	
Age of Property	-0.002 (0.0004)	-5.77	0.000	***
Constant	0.979 (0.002)	597.43	0.000	***
N	2586			
R-Squared	0.012			

*Significant at the 0.10 level
 **Significant at the 0.05 level
 ***Significant at the 0.01 level

Table 4.6 St. Charles County Mann-Whitney Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	1151	3852382	3386242	-9.02	< 0.000***
All Other Years	4732	13455404	13921544		
1995-1999	1105	3431177.5	3250910	-3.543	< 0.000***
All Other Years	4778	13876609	14056876		
1990-1994	709	2139908.5	2085878	-1.274	0.203
All Other Years	5174	15167878	15221908		
1985-1989	887	2457657.5	2609554	3.259	0.001***
All Other Years	4996	14850129	14698232		
1980-1984	493	1281626	1450406	4.676	< 0.000***
All Other Years	5390	16026160	15857380		
1970-1979	815	2400730.5	2397730	-0.067	0.947
All Other Years	5068	14907056	14910056		
1960-1969	384	930899	1129728	6.179	< 0.000***
All Other Years	5499	16376887	16178058		
1950-1959	181	428981	532502	4.602	< 0.000***
All Other Years	5702	16878805	16775284		
Before 1950	158	384424	464836	3.818	< 0.000***
All Other Years	5725	16923362	16842950		

* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

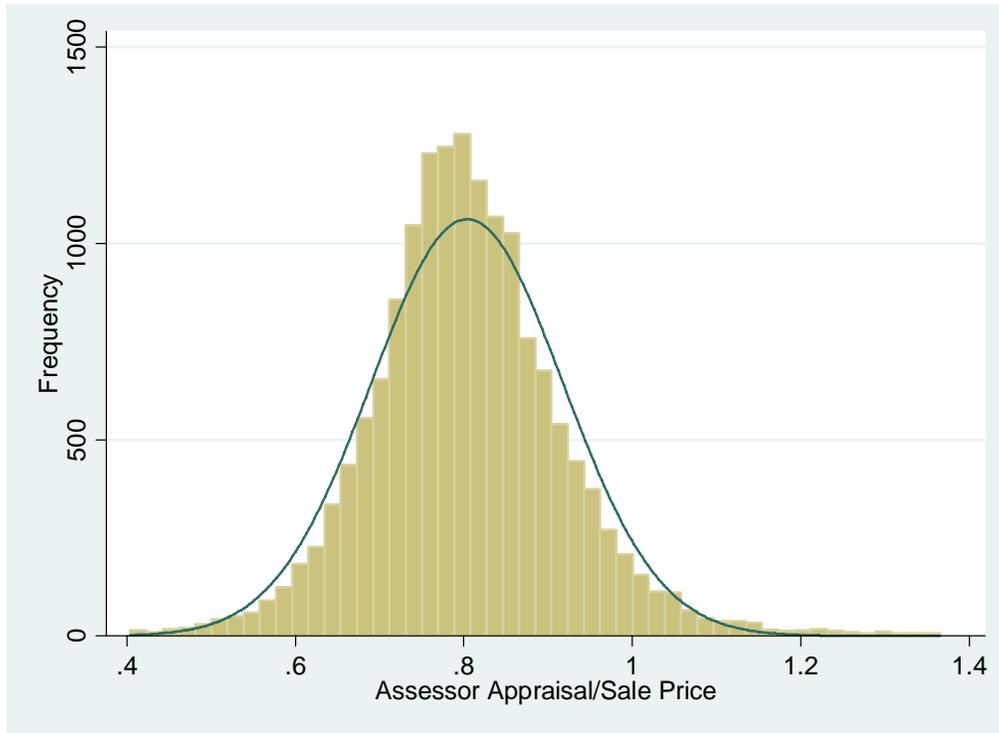
Table 4.7 St. Charles County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	443	708	75.393	< 0.000***
All Other Years	2499	2233		
1995-1999	506	599	9.47	0.002***
All Other Years	2436	2342		
1990-1994	356	353	0.006	0.94
All Other Years	2586	2588		
1985-1989	483	404	8.046	0.005***
All Other Years	2459	2537		
1980-1984	300	193	24.836	< 0.000***
All Other Years	2642	2748		
1970-1979	419	396	0.681	0.409
All Other Years	2523	2545		
1960-1969	237	147	22.036	< 0.000***
All Other Years	2705	2794		
1950-1959	110	71	8.218	0.004***
All Other Years	2832	2870		
Before 1950	88	70	1.874	0.171
All Other Years	2854	2871		

* Significant at the 0.1 level
 ** Significant at the 0.05 level
 *** Significant at the 0.01 level

5. St. Louis County

Graph 5.3 Distribution of Sale Ratio for Single Family Homes



Graph 5.4 Scatter Plot of Sale Ratio and Age of Property

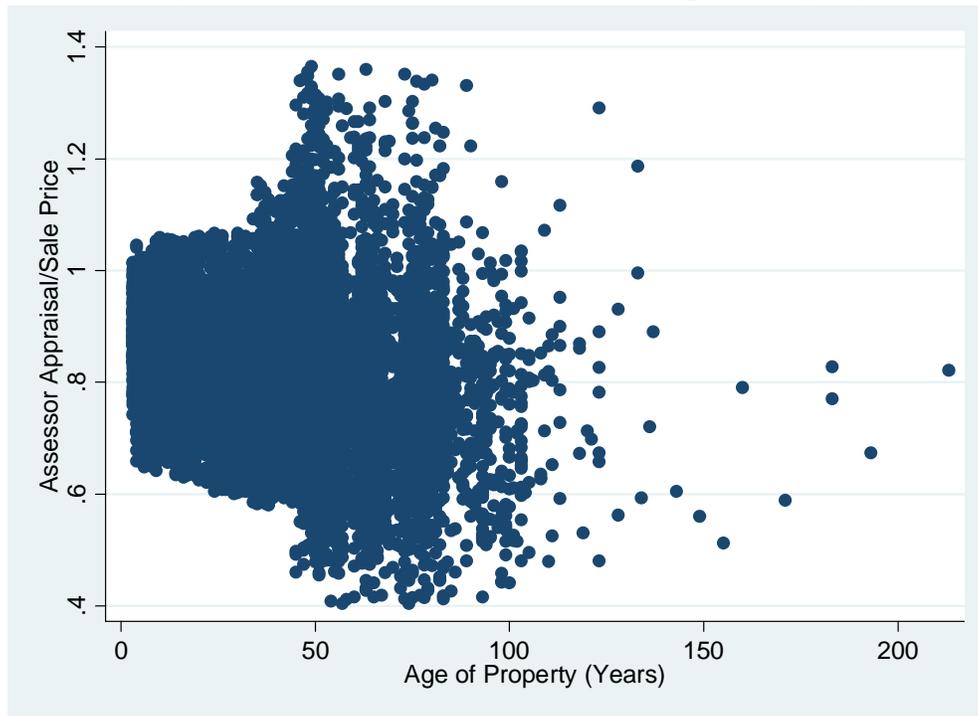


Table 5.3 St. Louis County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

	Group (Year Built)									Overall	
	2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	1960-1969	1950-1959	Before 1950		
Mean	.887	.850	.831	.816	.824	.809	.803	.800	.774	.804	
95% Confidence Interval for Mean	Lower Bound	.875	.845	.826	.812	.818	.806	.799	.796	.769	.802
	Upper Bound	.899	.855	.836	.820	.831	.813	.806	.804	.779	.806
Median	.885	.850	.827	.810	.824	.799	.797	.787	.763	.798	
95% Confidence Interval for Median	Lower Bound	.872	.844	.819	.804	.812	.795	.794	.783	.757	.796
	Upper Bound	.897	.855	.834	.815	.833	.803	.800	.790	.769	.800
Weighted Mean	.889	.850	.834	.822	.828	.811	.806	.795	.773	.809	
95% Confidence Interval for Weighted Mean	Lower Bound	.872	.844	.826	.816	.820	.806	.801	.789	.767	.806
	Upper Bound	.905	.856	.841	.828	.836	.815	.811	.800	.780	.811
Price Related Differential	.998	1.001	.997	.993	.996	.998	.996	1.007	1.001	.994	
Coefficient of Dispersion	.057	.069	.076	.080	.084	.087	.094	.116	.150	.107	

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratios.

Table 5.4 St. Louis County Robust Regression Results for Age and Location on the Sale Ratio

Variables	1993-2001				Before 1993			
	Coefficient (Standard Error)	t	P> t		Coefficient (Standard Error)	t	P> t	
Age of Property	-0.007 (0.0009)	-7.94	0.000	***	-0.0005 (0.00006)	-8.12	0.000	***
Locations:								
Low Ratio School Districts	0.001 (0.025)	0.06	0.954		(dropped)			
Middle Ratio School Districts	(dropped)				0.047 (0.005)	10.18	0.000	***
High Ratio School Districts	-0.002 (0.004)	-0.38	0.703		0.065 (0.005)	12.66	0.000	***
Constant	0.899 (0.007)	131.79	0.000	***	0.775 (0.006)	135.73	0.000	***
N	1404				14349			
R-Squared	0.043				0.036			

*Significant at the 0.10 level

**Significant at the 0.05 level

*** Significant at the 0.01 level

Table 5.5 St. Louis County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	1993-2001			
	Coefficient (Standard Error)	t	P> t	
Age of Property	-0.007 (0.0009)	-7.92	0.000	***
Constant	0.898 (0.006)	140.75	0.000	***
N	1404			
R-Squared	0.0426			

*Significant at the 0.10 level
 **Significant at the 0.05 level
 ***Significant at the 0.01 level

Table 5.6 St. Louis County Mann-Whitney Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	108	1293208	850716	-9.395	< 0.000***
All Other Years	15645	1.228e+08	1.232e+08		
1995-1999	844	8683258	6648188	-15.834	< 0.000***
All Other Years	14909	1.154 e+08	1.174 e+08		
1990-1994	898	8309003	7073546	-9.336	< 0.000***
All Other Years	14855	1.158 e+08	1.170 e+08		
1985-1989	1389	11804571	10941153	-5.335	< 0.000***
All Other Years	14364	1.123 e+08	1.131 e+08		
1980-1984	645	5728168	5080665	-5.725	< 0.000***
All Other Years	15108	1.184 e+08	1.190 e+08		
1970-1979	2128	17310404	16762256	-2.810	0.005***
All Other Years	13625	1.068 e+08	1.073 e+08		
1960-1969	2918	22713015	22985086	1.227	0.22
All Other Years	12835	1.014 e+08	1.011 e+08		
1950-1959	3604	26975174	28388708	5.896	< 0.000***
All Other Years	12149	97111207	95697673		
Before 1950	3219	21269581	25356063	17.756	< 0.000***
All Other Years	12534	1.028 e+08	98730318		

* Significant at the 0.1 level
 ** Significant at the 0.05 level
 *** Significant at the 0.01 level

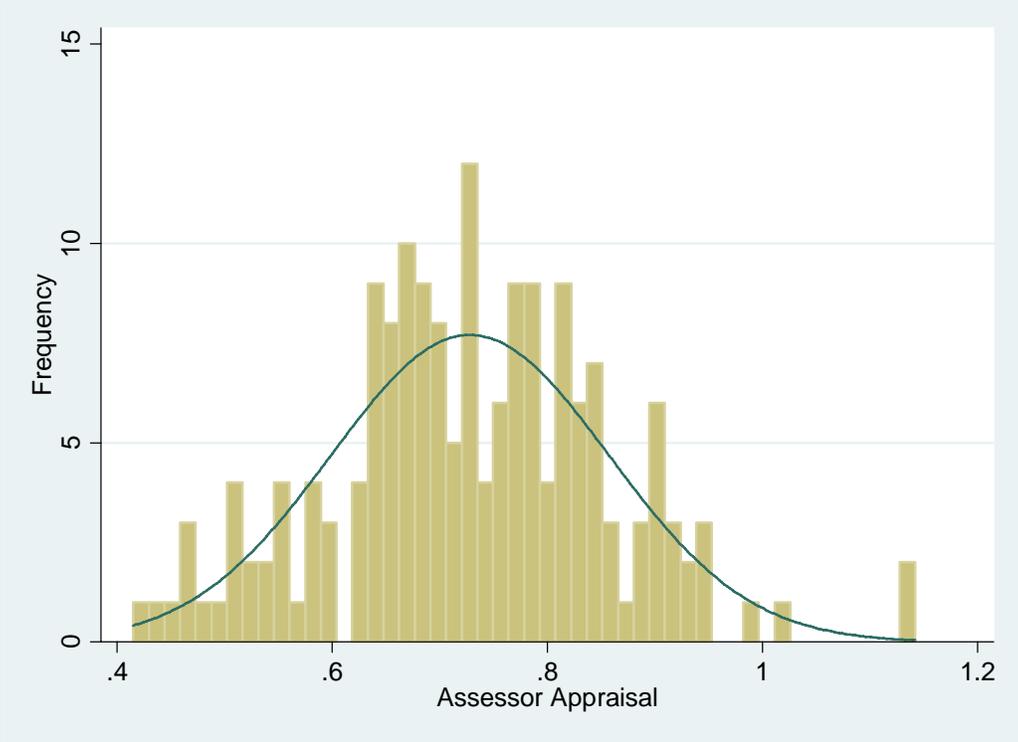
Table 5.7 St. Louis County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	11	97	67.371	< 0.000***
All Other Years	7866	7779		
1995-1999	201	643	243.531	< 0.000***
All Other Years	7676	7233		
1990-1994	334	564	61.959	< 0.000***
All Other Years	7543	7312		
1985-1989	610	779	22.308	< 0.000***
All Other Years	7267	7097		
1980-1984	266	379	20.293	< 0.000***
All Other Years	7611	7497		
1970-1979	1050	1078	0.4001	0.527
All Other Years	6827	6798		
1960-1969	1482	1436	0.8447	0.358
All Other Years	6395	6440		
1950-1959	1983	1621	46.828	< 0.000***
All Other Years	5894	6255		
Before 1950	1940	1279	169.97	< 0.000***
All Other Years	5937	6597		

* Significant at the 0.1 level
 ** Significant at the 0.05 level
 *** Significant at the 0.01 level

6. Warren County

Graph 6.3 Distribution of Sale Ratio for Single Family Homes



Graph 6.4 Scatter Plot of Sale Ratio and Age of Property

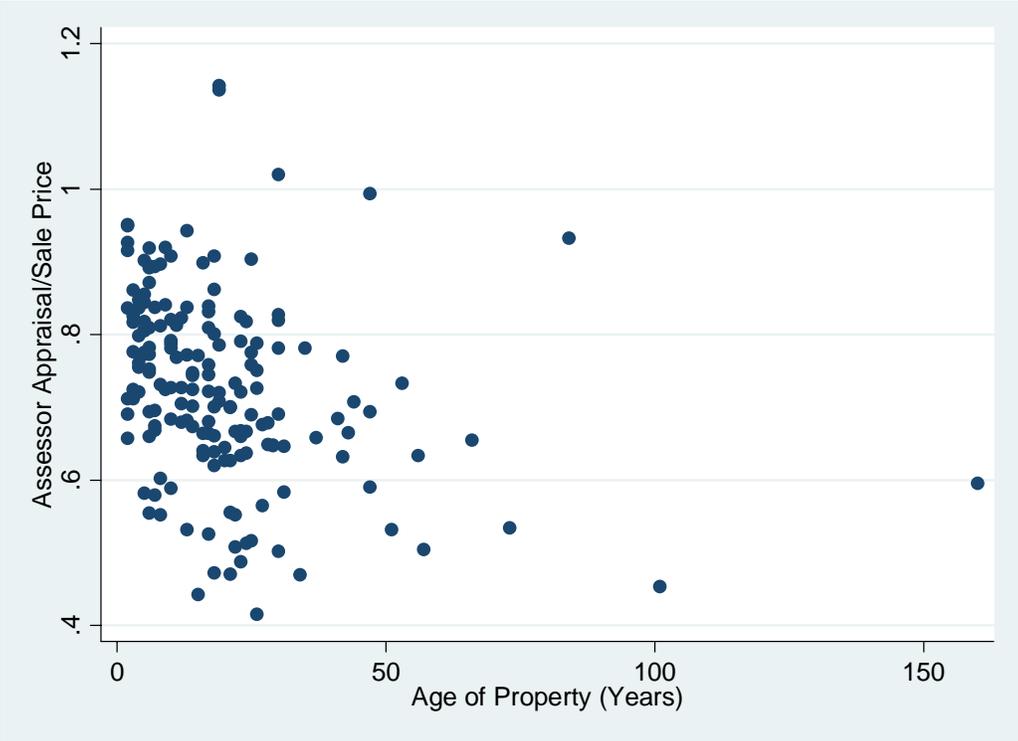


Table 6.3 Warren County Ratio Statistics for Assessor Appraisal/Sale Price (adjusted for time trends)

	Group							
	2000-2001	1995-1999	1990-1994	1985-1989	1980-1984	1970-1979	Before 1970	Overall
Mean	.811	.768	.766	.710	.698	.692	.661	.728
95% Confidence Interval for Mean								
Lower Bound	.753	.734	.722	.666	.626	.640	.596	.709
Upper Bound	.870	.802	.811	.754	.771	.745	.726	.748
Median	.821	.779	.776	.712	.668	.678	.657	.725
95% Confidence Interval for Median								
Lower Bound	.711	.748	.705	.664	.627	.647	.590	.701
Upper Bound	.927	.818	.823	.758	.721	.775	.707	.755
Weighted Mean	.793	.747	.765	.711	.666	.695	.662	.724
95% Confidence Interval for Weighted Mean								
Lower Bound	.734	.709	.723	.671	.601	.639	.595	.705
Upper Bound	.852	.785	.808	.750	.730	.750	.728	.743
Price Related Differential	1.023	1.027	1.001	.999	1.049	.997	.999	1.006
Coefficient of Dispersion	.102	.104	.098	.123	.165	.147	.154	.140

The confidence interval for the median is constructed without any distribution assumptions. The actual coverage level may be greater than the specified level. Other confidence intervals are constructed by assuming a Normal distribution for the ratio

Table 6.4 Warren County Robust Regression Results for Age and Location on the Sale Ratio

Variables	1993-2001			Before 1993			
	Coefficient (Standard Error)	t	P> t	Coefficient (Standard Error)	t	P> t	
Age of Property	-0.005 (0.005)	-1.02	0.312	-0.001 (0.0007)	-1.89	0.061	*
Locations:							
Warrenton School District	0.049 (0.032)	1.50	0.14	0.022 (0.032)	0.71	0.482	
Wright City School District	-0.019 (0.034)	-0.56	0.575	(dropped)			
All Other School Districts	(dropped)			0.024 (0.032)	0.74	0.458	
Constant	0.791 (0.034)	22.93	0.000	0.718 (0.029)	24.66	0.000	***
N	63			109			
R-Squared	0.124			0.037			

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 6.5 Warren County Robust Regression Analysis for Age on the Sale Ratio During Exam Period, 1993-2001

Variables	Coefficient (Standard Error)	1993-2001	
		t	P> t
Age of Property	-0.008 (0.005)	-1.51	0.137
Constant	0.824 (0.031)	26.60	0.000 ***
N	63		
R-Squared	0.037		

*Significant at the 0.10 level

**Significant at the 0.05 level

***Significant at the 0.01 level

Table 6.6 Warren County Mann-Whitney Results

Age Strata	Observations	Rank Sum	Expected	Z-Score	P-Value
2000-2001	14	1686	1211	-2.66	0.008***
All Other Years	158	13192	13667		
1995-1999	38	3992	3287	-2.602	0.009***
All Other Years	134	10886	11591		
1990-1994	22	2305	1903	-1.843	0.068*
All Other Years	150	12573	12975		
1985-1989	28	2239	2422	0.759	0.448
All Other Years	144	12639	12456		
1980-1984	23	1544	1989.5	2.004	0.045**
All Other Years	149	13334	12888.5		
1970-1979	27	1947	2335.5	1.635	0.102
All Other Years	145	12931	12542.5		
Before 1970	20	1165	1730	2.699	0.007***
All Other Years	152	13713	13148		

* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 6.7 Warren County K-Sample Results

Age Strata	Below Median	Above Median	Pearson Chi2	P-Value
2000-2001	5	9	0.699	0.403
All Other Years	81	77		
1995-1999	11	27	7.6	0.006***
All Other Years	59	27		
1990-1994	7	15	2.554	0.11
All Other Years	79	71		
1985-1989	15	13	0.043	0.836
All Other Years	71	73		
1980-1984	17	6	5.019	0.025**
All Other Years	69	80		
1970-1979	16	11	0.7029	0.402
All Other Years	70	75		
Before 1970	15	5	4.583	0.032**
All Other Years	71	81		

* Significant at the 0.1 level

** Significant at the 0.05 level

*** Significant at the 0.01 level