The burden of property taxes on home price values: A relationship study between property taxes and home values

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ABSTRACT

This study adds to the body of research on the relationship between property taxes and home price appreciation. Unlike other research, this study focus is on the property tax burden affecting appreciation. A tax per capita approach is used as a way to describe the burden on U.S. buyers as well as buyers by state. The study uses government tables and other data from independent organizations. The primary explorations were the years following the housing bubble and the great recession of 2008 in the U.S. The research question became: Is there a relationship between the burden of property taxes per capita and property appreciation since the housing bubble in the United States? This study concludes that there exists an inverse relationship between median values of homes and property taxes per capita.

The initial review of the relationship between property taxes and home price appreciations suggested that states with low property taxes tend to have higher appreciations. Therefore, the researchers tested a secondary question: Is there a relationship between per capita property taxes and home price appreciations by state? The researchers did not find a statistically significant relationship between property taxes and home price appreciations of median value homes by state. However when using descriptive statistics, the tendency of this inverse relationship surfaced for some states and not for others.

The researchers acknowledge the complexity of the subject of home pricing as well as those of taxation. Therefore, a brief review of the economic forces affecting home prices including taxation are explored and addressed.

Key Words: Property taxes, home prices, capitalization of home prices, home appreciation, burden of taxes, housing bubble, state and local revenue, housing crisis, housing transactional costs.

INTRODUCTION

This study expands the research on the relationship between property taxes and home price appreciation. In recent years, property owners have been stirring over high property taxes. The article that sparked this study, "Is there a link between property tax rates and the rate at which your home appreciates in value?" appeared in the Washington Post (Ken Harney, 2018) earlier this year. The article was based on data produced by ATTOM Data Solutions (Daren Blomquist, 2018). However, that article focused on the property tax burden as a percentage of the estimated home value and is limited to 2017 values with two fixed periods of appreciation (one and five years). Whereas in this study, the property tax burden is in the form of a per capita approach and uses different sets of government data for the period following the housing bubble and its resulting aftermath.

Several couples from Illinois were the subject of a story entitled "Home is where the hurt is: How property taxes are crushing Illinois' middle class" (Austin Berg, 2015). The story appeared on December 17, 2015 on the website of an Illinois advocacy group (Illinois Policy). Mr. Berg makes a disturbing statement, "Residential property taxes now eat up an average of 6.4 percent of a typical household income in Illinois. In 1990, that share was 3.6 percent" (p.3). For those property owners questioned, property taxes have become a second mortgage that they will never pay off even after paying off their first mortgage. More concerning is the question: Is the property appreciation rate being eaten up by its property taxes? In a period following the housing bubble and its subsequent bursting, compounded property tax rates appear to have exceeded those of property appreciation by twice when measuring the differences in their respective growth means.

A few disclosures are in order: The years studied were after the housing bubble and the great recession of 2008 in the U.S; the housing bubble is considered an aberration and caused financial and economic instability; after 2009 normalcy reappeared; for purposes in this study, a home, house, residential property, single family dwelling, condos, or housing unit are used interchangeably to mean the same thing.

A property tax burden in this study is defined on a per capita basis, or the effective property tax burden per person. Accordingly, the research question for this study matured to: Is there a relationship between the burden of property taxes per capita and property appreciation since the housing bubble in the United States?

The initial review of the relationship between property taxes and home price appreciations suggested that the states with low property taxes tend to have higher appreciations. Therefore, the researchers decided to test a secondary question: Is there a relationship between per capita property taxes and home price appreciations by state?

The Background section of this paper provides a brief history of property taxation and reviews some basic economic forces that affect the price of homes. The Research Approach section provides the thought process and the metrics used. The Results section gives the results as well as provides an explanation of the tables and figures in this paper. The Conclusion provides the results of the research and provides a summary as well as other research needed on the subject matter.

BACKGROUND

History

Taxing property began originally to help fund national defense and subsequently to help pay for the Civil War (Larkin, 1988) and has evolved over time as a permanent source of income to both local and state government. However, “In the early 19th century, states began abandoning their property taxes just as they would in the early 20th century” (Wallis, 2001, p. 2). Wallis used marginal analysis in explaining this phenomena: When the marginal benefits equal or exceed the marginal costs, the logical choice is to redirect the tax to where it is efficient. Basically he concludes that local governments are more efficient in providing benefits of public services to the voters than at the state level.

Over time, property taxes became the source for education funding because it was a reliable and immobile in nature of serving communities (Ronald C. Fisher, 2009) and because it supports what is considered a fundable need of society, education of our children. The tie-in with real estate has made property taxes contemporary and almost inflation proof. This connection and its benefit would be the subject of another research project. However questions of effectiveness and inequities of primary/secondary schools and movements for private/charter schools including promotions of a school voucher system, have weakened its base. As states received more federal assistance, the need for property taxation has reduced. However, the system has made the rate of property taxation increasingly sticky. Consequently reducing them will create a political fight.

One study by the Brookings Institute (Benjamin H. Harris, Brian D. Moore, 2013) declares "the burden of the property tax is substantial, making up about one quarter of homeownership costs at the median homeownership duration” (p. 1). By the turn of the century, property taxes became the domain of local governments, and accounted for 76 percent of U.S. local government revenue (Anonymous, 2014, p. 1). In the third quarter of 2010, property taxes peaked as seen in Figure 1 of Appendix B. Most state governing bodies have accepted property taxes as being the purview of local government.

Several authors have attempted to influence policy decision makers by publishing paper proposing models to predict the outcome of income tax legislation that affects housing. For example, Poghosyn suggests that “property taxation could be used as an important tool to dampen house price volatility” (Tigran Poghosyan, 2016, p. abstract). Harris (Benjamin H. Harris, 2013) proposes a discrete-period model that includes transactional costs in the price of housing with duration periods. The study provides a good review of the user-cost analysis and previous literature on the matter of tax proposals. However like most authors, Harris makes several assumptions that are not static or independent of each other. For this reason, most proposed models may be limited in their predictive ability.

Basic Economic Forces at Play

When one thinks of the price and appreciation of housing, one has to think of the economic forces affecting supply and demand. We know a price point is the intersection of these two forces, or the equilibrium level. The drivers of demand and supply are generally the number of participants, income, expectations, tastes and preferences, competing substitutes of alternatives, technology, and taxes. While there may be other drivers, suffice to say that for this

study property taxes will be the focus. Additionally as in most answers, economists use the concept of "ceter paribus," which means assuming all else remains the same. In this research, an attempt to address some of these drivers of supply and demand was made only to give a background and to warn the reader that many known and unknown forces are always at play when making declarative statements and using statistics to prove a relationship.

We know that the price of a home is at the equilibrium point of the demand and supply curves created by such forces as stated above. For example, if there should be a sudden growth or change in the buying population, popularity of homeownership, changes in disposable income, changes in mortgage interest rates, legislative changes or taxation that change the expectations of buyers as well as sellers, or changes in substitute prices of alternatives, there will be shifts in the demand and supply curves. The change resulting from these shifts as well as the elasticity of the supply and demand curves will determine the price. In this case, the price of the house will change. A positive shift in demand along with a negative shift in supply will cause an increase in the price. Further if there are opposite shifts at the same time, the shift having the greatest force may change the price up, down, or stay the same. These shifts may occur independent or concurrently making a price prediction uncertain. However using the "ceter paribus" concept, one may make short term predictions. In many of the models used by decision makers assume the supply of housing to be inelastic, thus simplifying the results of the price change by only shifts of the demand curve. Finally, most models attempt to predict short term effects. The long term effects would depend on how radical the changes are and whether the fundamental demand base for the resource has been eliminated.

An example of how shifts in supply may change the price of a home will help explain some short term increases. Anything that increases the cost to the supplier of the product (house builder), may increase the price the supplier is willing to sell it for in the market. Regulations account for approximately 25 percent of the final cost of a new home (Paul Emrath, 2011). However, the interesting fact is that over 8.6 percent of the price of the house "is the result of costs incurred by the builder after purchasing the finished lot" (p. 1) due to changes in the regulations. If we assume that the supply of housing is perfectly elastic, then we may conclude that the total cost will be passed on to the buyer, and the price will go up by the full cost.

Anything that affects the cost, or in this case the deductibility or benefits of owning a home, may cause a shift in the demand curve which in turn may reduce the price of homes if it is a leftward shift and vice versa if it is a rightward shift. In this case, reducing the deductibility would reduce the price of homes, ceter paribus, because the demand would shift leftward. This is especially painful for the wealthy who bought high value homes based on the deductibility of the mortgage interest. The interest deductibility has been reduced under new tax law by capping the mortgage loan amount at $750,000. Further, the new doubling of the standard deduction reduces the benefit of itemizing one's tax deductions (Mark Zandi, 2018). Finally, if property taxes are part of the consideration in the purchase, it may be considered by suppliers. This supplier consideration may in turn shift the supply curve leftward, thus increasing the price of the house, ceter paribus.

Besides the two tax considerations mentioned above, the limitation of deducting property taxes to $10,000 further contributes to the thoughts that the tax benefits of owning a home may not have the same influential power as before, especially for the middle classes. However, an article posted in Forbes by a partner at Montage Ventures (Matthew Murphy, 2018), suggests that home ownership is much more than getting a tax break. He advocates that there are other

benefits from the new tax law of 2018 that will encourage the purchase of homes by increasing disposable income and creating new jobs.

A research paper on tastes and preferences for homeownership (Rachel Drew, Christopher Herbert, 2012) found little evidence that preferences had changed post the great recession. Increasing the number of buyers such as was expected by the entrants of the millennials, would shift the demand curve to the right, thus, increasing the price. The delay in the millennials entering the market place has created a conundrum. The millennials' paradox and preference on homeownership are further explained by several authors (Jung Choi, Jun Zhu, Laurie Goodman, Bhargavi Ganesh, Sarah Strochak, 2018) and (Doweell Myers, Hyojung Lee, Patrick Simmons, 2018).

Concerning the interest rate factor impacting home prices, one has to consider that an element of the qualifying determinants for obtaining a mortgage is the standard of having a certain mortgage payment to income ratio. This ratio is created by adding the mortgage payment, taxes, and taking that sum over a person's income. Since the mortgage payment includes principal and interest, it stands to reason that changing interest rates over a period of time will have an impact on the willingness of a buyer to pay the higher price created by the higher property tax. Accordingly, the price of the house will be determined in part by buyers that are qualified to make the purchase.

Low interest rates over a long time will increase the prices of homes. However, when the standards are lowered and irresponsible behavior at different levels as coined by Alan Greenspan 22 years ago as "irrational exuberance" (Greenspan, 1996), prices will skyrocket as they did from 2004-2007. Others argue that the housing bubble was not caused by immoral behavior and they seem to almost excuse it as "human nature" (Miller, 2010, p. 137). Others go to extensive means to explain the behavior of securitization managers as "bad incentives…as well as bad luck" (Ing-Haw Cheng, 2012, pp. abstract, 28).

Besides interest rates, the buyer's income is considered in the qualifying ratio of the lending institutions, logic would view that increasing the income (the denominator of the ratio) would create a lower ratio and help buyers qualify for a larger mortgage, or in this case, a higher priced house. Combined with income, expectations of both lenders, sellers, and buyers' play an important role in shifting both the demand and supply curves.

In 1978, California's Proposition 13 was the result of property owners' political revolt on the matter, and its story line may prove to be the reminder that renewals of dissention may be stirring. History will determine the effects of the new tax law on housing as well as studies on property taxes. The recent articles and papers on the matter are the beginning discussions and focus in the last five years.

RESEARCH APPROACH

Both descriptive and inferential statistics were used to test the research questions using a computer statistical program (SPSS-version 22). Deciding on which tests to use required a quick review of what was being measured. For this, the researchers turned to the research question, Is there a relationship between the burden of property taxes and property appreciation since the housing bubble in the United States? Accordingly, subsequent questions followed: What variables were being compared; what periods would be compared in light of the history of the housing bubble and its aberration along with the great recession; which data bases were available

that matched both the time period and relationship to the variables being measured; and what reliable sources were available to use in the comparison?

Some preliminary review of the literature was done to discover what had been written on the subject being studied, and some statistical analysis was done to understand the relationship among the variables to be studied over time. This study surfaced a relationship between property taxes and property values. The results of the preliminary research gave support to another study by Byron Lutz (Lutz, 2008). Lutz concluded "that property tax revenues are quite responsive to changes in house values" (p. 568). However, they lag in administrative execution of assessment and collection by two years. It is not until the third year after changes in property values that tax collections appear in the local and state coffers. The image in Figure 1 in Appendix B, which came from a report created by OpenGov.org (Anonymous, 2014), displays the lag between assessments and collections. The lag in collection depends on the state and local government officials' reaction or lack thereof. The reaction may be caused by the shortfall in administration or for political reasons.

Why was the lag between assessment and collections of property taxes per capita (research variables) not considered in the data bases selected for this study? First, the data bases for the property taxes per capita for all states were not available to stagger the years between variables without falling into the housing bubble and the great recession. Second, to forecast property taxes in the future would be difficult. Of course, while difficult but possible, this would be the subject of another paper. Third, both variables stabilized after 2009 as seen in Figure 2 of Appendix B.

Another question that needs clarity is: Why not do the research on the relationship during the housing bubble? The answer is that the housing bubble was an aberration and caused great instability in the way markets work including creating a temporary lower than normal collection of property taxes (see Figure 2 in Appendix 2 B). A conference paper presented at a forum by the Urban Institute and sponsored by the Lincoln Institute in 2017 stated that the municipal property tax revenue of the 91 largest cities dropped by 8.5 percent (Howard Chernick, Andrew Reschovsky, Sandra Newman, 2017) between 2007 and 2013. Prior to 2007, the property tax revenue had been climbing at a rate of 10 percent (Burtless, 2017). A more stable environment would make the study more reliable. Therefore, the period after the housing bubble was chosen for this study.

Figure 2 in Appendix B was created from Table 1 in Appendix A, and Table 1 in Appendix A was created from two sources within the Federal Reserve Bank of St. Louis (Table S210400 and USSTHPI). However, the originator of these sources was the U.S. Bureau of Economic Analysis (Personal Current Tax Receipts). Please note that the property taxes are total receipts in the United States and not on a per capita basis. Also, the housing measurement is based on an index and not actual values.

Both Figures 1 and 2 are being used here to provide that the researchers did consider these discoveries and their importance. Additionally, they help clarify why the period of 2009-2015 was used in the statistical analysis.

Because the housing bubble created instability, its consideration is of great importance as well as to keep in mind in future studies that attempt to make projections. There is a plethora of literature on what caused the housing bubble and subsequent financial meltdown. The authors on the subject provide different sides of the argument, all providing convincing thoughts on the matter. However, Jeff Holt (Holt, 2009) published an article that made more sense. He provides four primary causes of the housing bubble resulting in financial fiasco. According to Mr. Holt,

they were: “low mortgage interest rates, low short-term interest rates, relaxed standards for mortgage loans, and irrational exuberance” (abstract).

The researchers’ study on the housing bubble matter suggests that the single most important spark that started it all was the new securitization formulation by the rating bureau’s, mixing subprime debt obligations with prime obligations and creating a new investment instrument to sell investors. What followed was, irrational exuberance, “a heightened state of speculative fervor” (Shiller, 2005) by all parties in the mortgage process. This state of mind fueled the fire of financial destruction because the fundamentals of mitigating risk were abandoned. After 2009, the financial markets began to settle and returned to normalcy. Accordingly it was decided to conduct the study for the period of 2009-2015.

RESULTS

Table 1 in Appendix A provides the compounded growth rates for the Property Taxes and Home Price Index in the U.S. (2000-2018) and serves to produce Figure 2 in Appendix B.

Table 2 in Appendix A provides the descriptive statistics for the means of the compounded growth rates of two variables, the medium value of single family dwellings and condos (ATTOM Data Solutions) and the property tax per capita (Data Query System-Urban Institute-Tax Policy Center). Note that “N” is 51 and not 50 states; it includes Washington DC as a state for comparison reasons.

Table 3 in Appendix A provides the statistical t-test for the two variables. Special note is that the “mean” growth rate for the Property Tax per Capita is approximately half that of the “mean” growth rate for the median home values during the period of 2009-2015.

Table 4 in Appendix A provides the statistical correlation between the variables and provides the statistical significance when testing the variables as pairs in answering the main research question: Is there a relationship between property taxes per capita and the growth rate of the medium home value following the housing bubble and the great recession in the United States? It provides a negative correlation (-0.444) and a significant “p” value of 0.001 between the medium home value growth rate and property tax per capita growth rate for the period after 2009. It also reveals both the upper and lower differences between variables.

Table 5 in Appendix A provides a Pearson correlation matrix of the variables being measured. It confirms the negative correlation between variables as well as reaffirms the significant “p” value of 0.001.

Table 6 in Appendix A shows several statistical measures to arrive at the correlation between the variables and their coefficients to produce Figure 6 in Appendix B.

Table 7 in Appendix A provides a matrix table along with a Chi test that addresses the questions in the introduction section of this paper. Particularly, it addresses the growing belief that states having the highest tax per capita growth rate will have the lowest home appreciation growth rates over time. The table defines the relationship among the states in matrix form where the variables are divided into the lowest, middle, and highest groups to determine not only the statistical significance between the groups but their relationship to each other. The table shows that 9 states (Alaska, Arkansas, Louisiana, Massachusetts, Mississippi, New Mexico, New York, Pennsylvania, and Vermont) having the highest growth rates of property tax per capita also have the lowest growth rates of appreciation. An interesting observation: The state of Illinois, the subject in the Introduction section in this paper, was in both the middle groups despite the reports

that suggested it would be among the highest property tax group as suggested in the website of the advocacy group Illinois Policy on December 17, 2015.

Using a Chi-test approach, no statistical significance was found among the groups to affirmatively conclude that if a state is in the highest growth tax rate per capita, that it will have the lowest growth rate of home price appreciation. For example, 6 states (Iowa, Kentucky, Nebraska, New Hampshire, Dakota, and West Virginia) were in the highest tax rate but were in the middle, not the lowest, appreciation growth rate for the medium home value. However, none of the states that were in the highest tax rate group were in the highest appreciation group.

Figure 1 in Appendix B displays the lag between assessments and collections. The lag in collection depends on the state and local government officials' reaction or lack thereof. The reaction may be caused by the shortfall in administration or for political reasons.

Figure 2 in Appendix B shows the compounded growth rates for the HPI to be greater than the property taxes at the beginning of the century but converging in recent years. Please note that the property taxes are total receipts in the United States and not on a per capita basis. Also, the housing measurement is based on an index and not actual values.

Both Figures 1 and 2 are being employed here to support the research. What they display are important discoveries and have significance. Additionally, they help clarify why the period of 2009-2015 was used in the statistical analysis.

Figure 3 and 4 in Appendix B graphically represent the Histograms of the compounded growth rates for the median home values and property tax per capita respectively. They appear to have normal distributions. Figure 5 in Appendix B graphically displays the "means" of the compounded growth rates of the variables used in this study. Notice the almost mirror image of the means between the two variable showing the inverse relationship. Figure 6 in Appendix B further depicts the inverse relationship showing the observations graphically with a linear line to visually visualize the pattern.

CONCLUSION and RECOMMENDATIONS

The American dream of home ownership may well be in jeopardy with what may be called the permanent second mortgage, the property tax. Whether one uses the capitalization method or other methods, the projected cash outflows created by property taxes need to be factored in any models used in formulating projections. Otherwise, the property taxes may eat up the expected projections of property appreciations.

After reading a few articles and periodicals, it was decided to complete this study to understand if the suggested outcomes of property taxes were affecting their appreciation. An initial literature review was done and some data bases were selected. Because the housing bubble created instability in financial markets, its consideration was of great importance and considered at depth. When applying several statistical methods, it was concluded that the research would concentrate on the period following the great recession. Consequently for purposes of this study, the research targeted the period of 2009-2015 across states and Washington DC. Because of the limited period of 6 years, the conclusions should be tempered. However, they may forge the future relationship between the property tax burden and home appreciation. The research question for this study became: Is there a relationship between the burden of property taxes per capita and property appreciation since the housing bubble in the United States? This study concludes that there exists an inverse relationship between median values of homes and property taxes per capita for the period following the housing crisis and the great recession in the U.S.

When more years of data are available to consider the lag between property assessments and collections, future studies will prove to be more conclusive.

After the housing crisis and subsequent crash of real estate prices, administrators were caught up with diminishing revenues resulting from reduced values. Local municipalities' decision makers may be readily responding to changing property values now. However, there are no guarantees that a housing crisis and its aftermath will not happen again. Therefore it should be kept in mind by decision makers and authors of future studies, especially those studies attempting to make mathematical budget projections for decision makers.

The initial review of the relationship between property taxes and home price appreciations suggested that states with low property taxes tend to have higher appreciations. Therefore, the researchers tested a secondary question: Is there a relationship between per capita property taxes and home price appreciations by state? The research did not find a statistically significant relationship between property taxes and home price appreciations of median value homes by state. However when using descriptive statistics, the tendency of this inverse relationship surfaced for some states and not for others. For example, 9 states that had high growth rates of property taxes had low growth rates of property appreciations. While 6 other states having the highest growth rates of property taxes were in the middle, not the lowest, appreciation growth rate for the medium home value. Further, none of the states that were in the highest growth tax rate group were in the highest appreciation group.

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APPENDIX A

TABLE 1. Compounded Growth Rates for Property Taxes and Home Price Index in the U. S. (2000-2018).

Compounded Growth Rates U.S. (2000-2018) Property Taxes and Home Price Index									
Date	Yr	S210400[1]	Δ Yr/Yr	Tx Base	CAGR PropTx	USSTHPI[2]	HPI Base	Δ Yr/Yr	CAGR HPI
1/1/2000	0	4911		4911	0.00%	228.84	228.84		
1/1/2001	1	4984	2.61%	4911	0.07%	246.37	228.84	2.46%	0.37%
1/1/2002	2	5056	-0.92%	4911	0.14%	261.24	228.84	1.44%	0.63%
1/1/2003	3	5599	4.58%	4911	0.60%	278.13	228.84	1.22%	0.89%
1/1/2004	4	5710	-1.77%	4911	0.66%	298.50	228.84	1.56%	1.16%
1/1/2005	5	5982	2.94%	4911	0.83%	331.67	228.84	2.30%	1.56%
1/1/2006	6	6492	1.60%	4911	1.12%	366.32	228.84	1.59%	1.90%
1/1/2007	7	6868	1.31%	4911	1.30%	378.28	228.84	0.36%	1.95%
1/1/2008	8	6954	-0.27%	4911	1.30%	369.96	228.84	-0.72%	1.80%
1/1/2009	9	7331	2.26%	4911	1.44%	348.70	228.84	0.74%	1.52%
1/1/2010	10	7691	0.61%	4911	1.56%	324.11	228.84	-1.20%	1.21%
1/1/2011	11	7537	-1.17%	4911	1.44%	313.08	228.84	-2.74%	1.05%
1/1/2012	12	7374	-0.16%	4911	1.32%	308.04	228.84	-1.05%	0.96%
1/1/2013	13	7792	4.03%	4911	1.45%	314.91	228.84	0.53%	1.00%
1/1/2014	14	8345	0.49%	4911	1.62%	330.65	228.84	0.90%	1.12%
1/1/2015	15	8376	-0.14%	4911	1.58%	348.17	228.84	0.99%	1.24%
1/1/2016	16	8703	1.60%	4911	1.65%	366.65	228.84	0.94%	1.36%
1/1/2017	17	9102	0.85%	4911	1.73%	388.19	228.84	1.04%	1.48%
1/1/2018	18	9405	0.71%	4911	1.77%	413.88	228.84	1.21%	1.61%
Source: Valadez, R. (2018) Adapted from FRED Table S210400 and USST HPI Retrieved September 5, 2018									
[1] https://fred.stlouisfed.org/series/S210400 [2] https://fred.stlouisfed.org/series/USSTHPI									

TABLE 2. Means Comparison of the Compounded Growth Rates of the Median Home Values and Property Taxes per Capita (2009-2015)

Frequency Statistics			
		PropertyTax per Cap CAGR0915	MedianValHse CAGR 0915
N	Valid	51	51
	Missing	0	0
Mean		.015353	.029251
Std. Error of Mean		.0026225	.0035964
Median		.019900	.025700
Mode		.0204[a]	.0227[a]
Std. Deviation		.0187285	.0256836
Variance		.000	.001
Skewness		-1.559	.682
Std. Error of Skewness		.333	.333
Kurtosis		3.183	1.857
Std. Error of Kurtosis		.656	.656
Range		.0935	.1476
Minimum		-.0499	-.0359
Maximum		.0436	.1117
Sum		.7830	1.4918
a. Multiple modes exist. The smallest value is shown			

TABLE 3. T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PropertyTax per Cap CAGR0915	.015353	51	.0187285	.0026225
	MedianValHse CAGR 0915	.029251	51	.0256836	.0035964

TABLE 4. Paired Samples Test

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PropertyTax per Cap CAGR0915 & MedianValHse CAGR 0915	51	-.444	.001

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PropertyTax per Cap CAGR0915 - MedianValHse CAGR 0915	-.0138980	.0379095	.0053084	-.0245603	-.0032358	-2.618	50	.012

TABLE 5. Correlations of Property Taxes per Capita and Median Home Values (2009-2015)

Correlations

		PropertyTax per Cap CAGR0915	MedianValHse CAGR 0915
PropertyTax per Cap CAGR0915	Pearson Correlation	1	-.444**
	Sig. (2-tailed)		.001
	Sum of Squares and Cross-products	.018	-.011
	Covariance	.000	.000
	N	51	51
MedianValHse CAGR 0915	Pearson Correlation	-.444**	1
	Sig. (2-tailed)	.001	
	Sum of Squares and Cross-products	-.011	.033
	Covariance	.000	.001
	N	51	51

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 6. Curve Analysis

Variable Processing Summary

		Variables	
		Dependent	Independent
		PropertyTax per Cap CAGR0915	MedianValHse CAGR 0915
Number of Positive Values		43	45
Number of Zeros		1[a]	0
Number of Negative Values		7[b]	6[c]
Number of Missing Values	User-Missing	0	0
	System-Missing	0	0

a. The Compound, Power, S, Growth, Exponential, or Logistic model cannot be calculated.

b. The Compound, Power, S, Growth, Exponential, or Logistic model cannot be calculated. The minimum value is -.050.

c. The Logarithmic or Power model cannot be calculated. The minimum value is -.036.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.444	.197	.180	.017

The independent variable is MedianValHse CAGR 0915.

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.003	1	.003	12.002	.001
Residual	.014	49	.000		
Total	.018	50			

The independent variable is MedianValHse CAGR 0915.

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
MedianValHse CAGR 0915	-.323	.093	-.444	-3.464	.001
(Constant)	.025	.004		6.857	.000

TABLE 7. Crosstabs Tables

Percentile Group of MedVal1117			Percentile Group of PropTxCap0915: LOWEST PropTxCap0915	MIDDLE PropTxCap0915	HIGHEST PropTxCap0915	Total
LOWEST apprec. MedVal CAGR (2011-17)	state	Alabama	**1**	**0**	**0**	**1**
		Alaska	**0**	**0**	**1**	**1**
		Arkansas	**0**	**0**	**1**	**1**
		Connecticut	**0**	**1**	**0**	**1**
		Delaware	**0**	**1**	**0**	**1**
		Indiana	**1**	**0**	**0**	**1**
		Kansas	**1**	**0**	**0**	**1**
		Louisiana	**0**	**0**	**1**	**1**
		Maryland	**0**	**1**	**0**	**1**
		Massachusett	**0**	**0**	**1**	**1**
		Mississippi	**0**	**0**	**1**	**1**
		New Jersey	**0**	**1**	**0**	**1**
		New Mexico	**0**	**0**	**1**	**1**
		New York	**0**	**0**	**1**	**1**
		Pennsylvania	**0**	**0**	**1**	**1**
		Vermont	**0**	**0**	**1**	**1**
		Virginia	**1**	**0**	**0**	**1**
		Wyoming	**1**	**0**	**0**	**1**
	Total		**5**	**4**	**9**	**18**
MIDDLE appec. MedVal CAGR (2011-17)	state	DC	**0**	**1**	**0**	**1**
		Illinois	**0**	**1**	**0**	**1**
		Iowa	**0**	**0**	**1**	**1**
		Kentucky	**0**	**0**	**1**	**1**
		Missouri	**1**	**0**	**0**	**1**
		Montana	**0**	**1**	**0**	**1**
		Nebraska	**0**	**0**	**1**	**1**
		New Hampshir	**0**	**0**	**1**	**1**
		North Caroli	**1**	**0**	**0**	**1**
		Ohio	**0**	**1**	**0**	**1**
		Oklahoma	**0**	**1**	**0**	**1**
		Rhode Island	**0**	**1**	**0**	**1**

		South Caroli	**1**	**0**	**0**	**1**
		South Dakota	**0**	**0**	**1**	**1**
		Tennessee	**0**	**1**	**0**	**1**
		West Virgini	**0**	**0**	**1**	**1**
		Wisconsin	**1**	**0**	**0**	**1**
	Total		**4**	**7**	**6**	**17**
HIGHEST apprec. MedVal CAGR1117	state	Arizona	**1**	**0**		**1**
		California	**1**	**0**		**1**
		Colorado	**1**	**0**		**1**
		Florida	**1**	**0**		**1**
		Georgia	**1**	**0**		**1**
		Hawaii	**0**	**1**		**1**
		Idaho	**0**	**1**		**1**
		Maine	**0**	**1**		**1**
		Michigan	**1**	**0**		**1**
		Minnesota	**0**	**1**		**1**
		Nevada	**1**	**0**		**1**
		North Dakota	**1**	**0**		**1**
		Oregon	**0**	**1**		**1**
		Texas	**0**	**1**		**1**
		Utah	**0**	**1**		**1**
		Washington	**0**	**1**		**1**
	Total		**8**	**8**		**16**

Chi-Square Tests

Percentile Group of MedVal1117		Value	df	Asymp. Sig. (2-sided)
Lowest MedValCAGR1117	Pearson Chi-Square	36.000[b]	34	.375
	Likelihood Ratio	37.319	34	.319
	N of Valid Cases	18		
Middle MedVal CAGR1117	Pearson Chi-Square	34.000[c]	32	.371
	Likelihood Ratio	36.495	32	.268
	N of Valid Cases	17		
Highest MedVal CAGR1117	Pearson Chi-Square	16.000[d]	15	.382
	Likelihood Ratio	22.181	15	.103
	N of Valid Cases	16		
Total	Pearson Chi-Square	102.000[a]	100	.426
	Likelihood Ratio	111.587	100	.201
	N of Valid Cases	51		

a. 153 cells (100.0%) have expected count less than 5. The minimum expected count is .29.

b. 54 cells (100.0%) have expected count less than 5. The minimum expected count is .22.

c. 51 cells (100.0%) have expected count less than 5. The minimum expected count is .24.

d. 32 cells (100.0%) have expected count less than 5. The minimum expected count is .50.

APPENDIX B

FIGURE 1. Property Tax Collections Lag Housing Market Fluctuations.

FIGURE 2. Compounded Growth Rates of Property Taxes and the Housing Price Index in U.S. from 2000-2018.

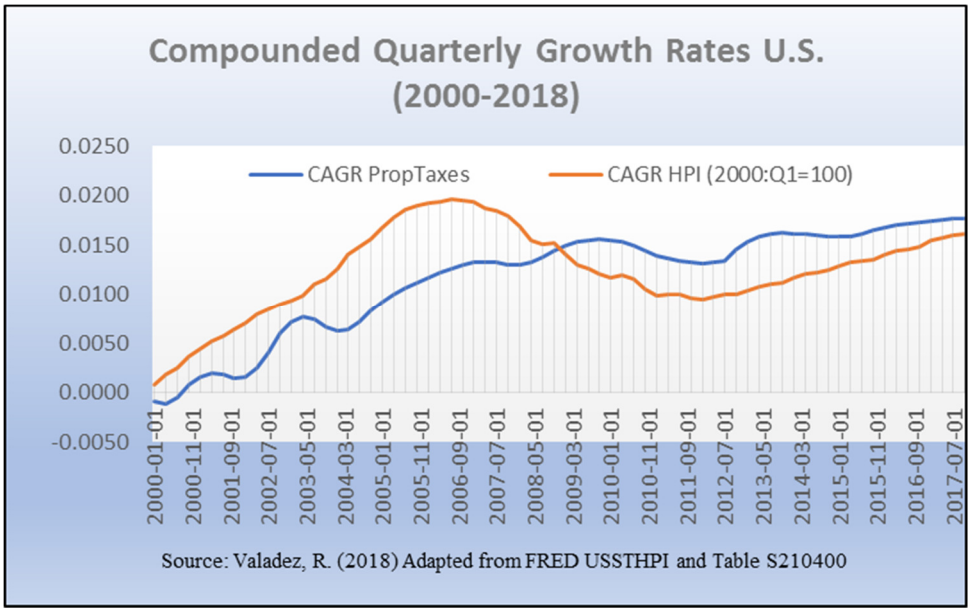


FIGURE 3. Data Histogram of the Compounded Growth Rate of U.S. Median Home Values (2009-2015)

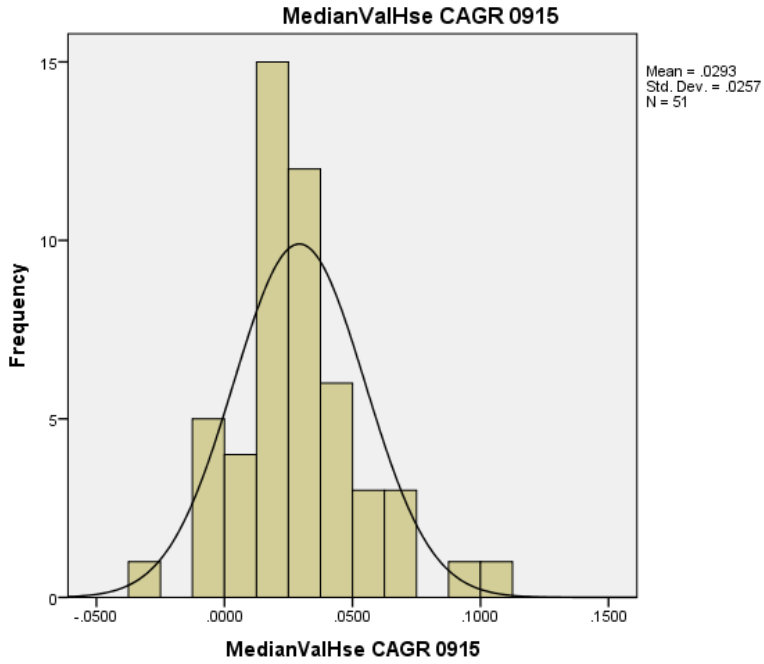


FIGURE 4. Data Histogram of the Compounded Growth Rate of U.S. Property Taxes per Capita (2009-2015)

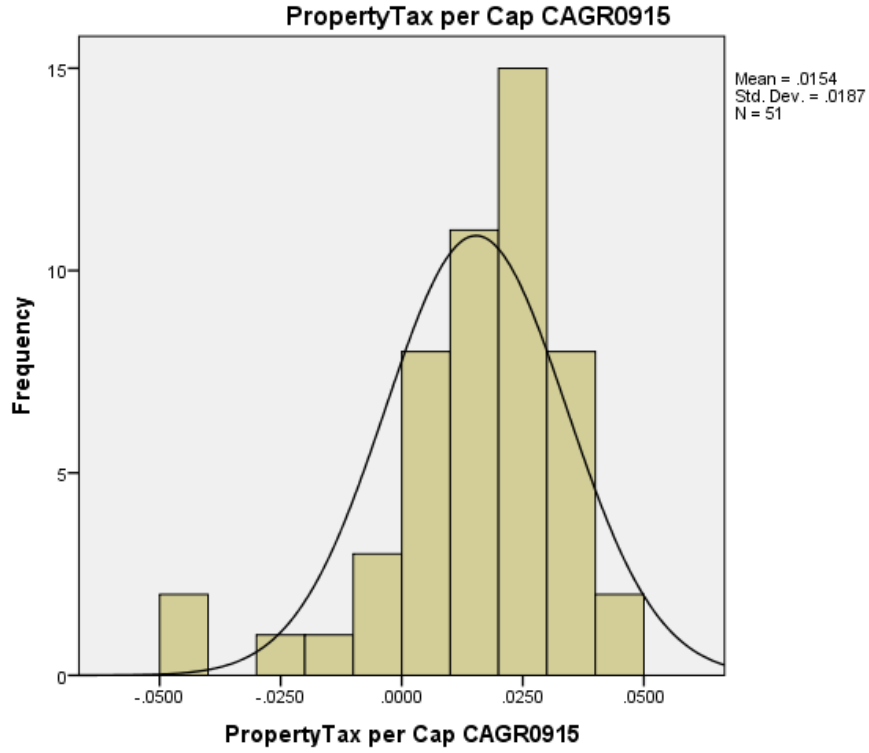
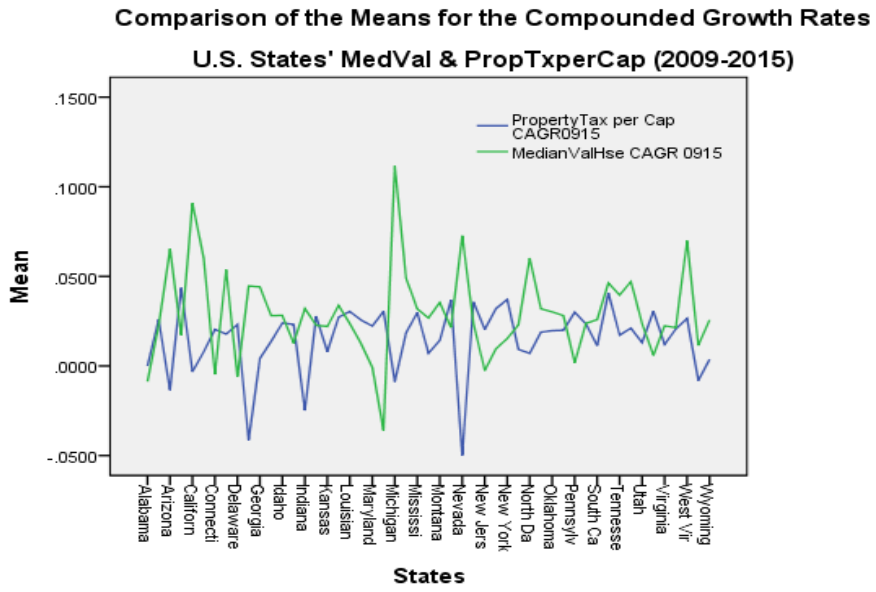
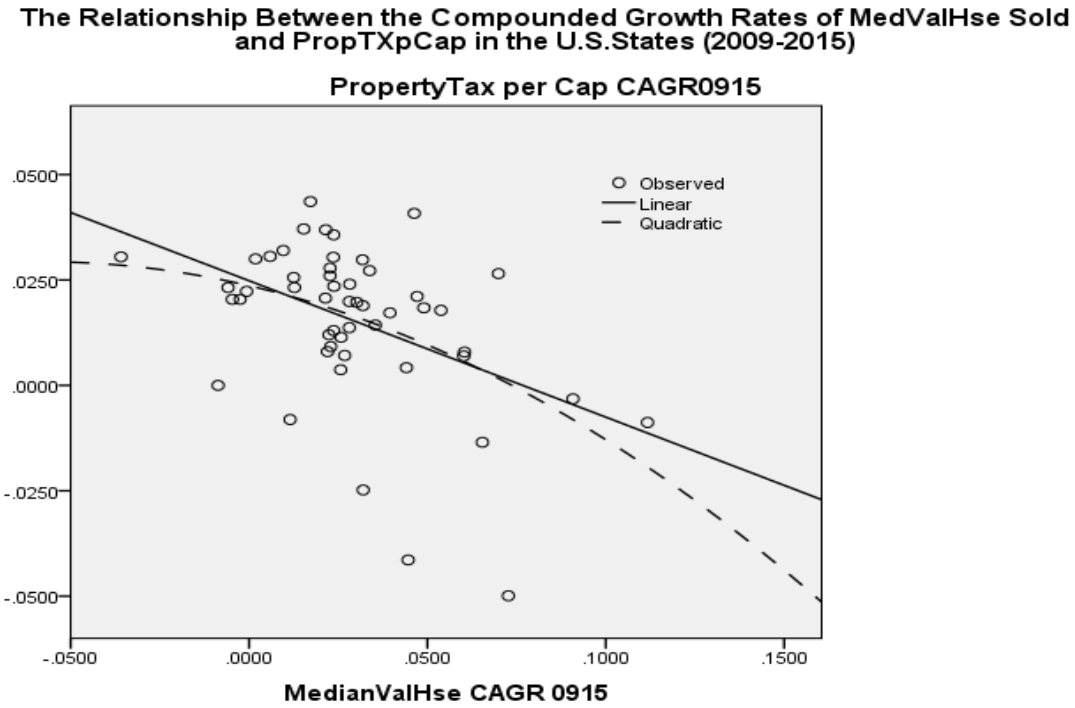


FIGURE 5. Means Comparison of Compounded Growth Rates of U.S. Median Home Values and Property Taxes per Capita (2009-2015)



Source: Valadez, R. (2018) Adapted from ATTOM Data Solutions report August 21, 2018 and Data Query System (DQS) Urban Institute http://slfdqs.taxpolicycenter.org/pages.cfm

FIGURE 6. Curve Fit Compounded Growth Rate of U.S. Property Taxes per Capita & Median Home Values (2009-2015)



Source: Valadez, R. (2018) Adapted from ATTOM Data Solutions report August 21, 2018 and Data Query System (DQS) Urban Institute: https//slfdqs.taxpolicycenter.org/pages.cfm