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AN EXAMINATION OF SCHOOL QUALITY
INDICATORS & HOUSING PRICES

by

Jerry Ducay

Dissertation

Submitted to the Faculty of

Olivet Nazarene University

School of Graduation and Continuing Studies

in Partial Fulfillment of the Requirements for

the Degree of

Doctor of Education

May 2015

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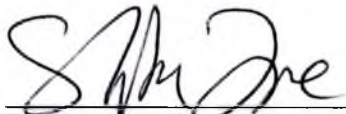
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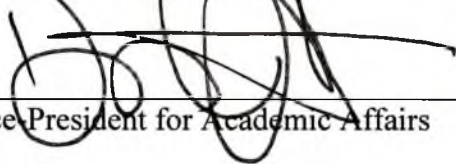
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ABSTRACT

Within major metropolitan cities the public school system receives the majority of its funding by way of local property taxes. In areas of economic decay, property values, and the associated taxes collected, are declining. Recent tax limiting legislation has hampered the ability of school districts to increase property tax rates to make up for lost revenue. Reduced state funding, combined with declining property values, has widened the chasm of funding inequity in urbanized school districts. Seeking to better understand the relationship between publicized school quality indicators and local property values, this researcher reviewed 14,279 properties spread across 26 school districts within a densely populated Midwestern metropolitan area.

Pearson's Correlation Coefficient was employed to measure the relationship between three school quality indicators: (1) per-pupil spending; (2) student performance on standardized tests; and (3) teacher-pupil ratios and property values within the school catchment area.

Student performance on standardized test scores was found to be directly related to local property values ($r_{(14,279)} = .432, p = .01 (r^2_{te} = .19)$). Per-pupil spending ($r_{(14,279)} = -.277, p = .01 (r^2_{se} = .08)$) and teacher-pupil ratios ($r_{(14,279)} = -.094, p = .01 (r^2_{ce} = .01)$) were determined to be indirectly related, albeit to a lesser extent. This lead to the conclusion that schools seeking to enhance property valuation, and associated property taxes, within their catchment area should focus on improving student performance on standardized test scores within the school.

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CHAPTER 1

INTRODUCTION

“Strong schools make strong communities and strong communities make strong schools” (Belcher, 2010, p. 1). Those prophetic words, uttered by Dr. Chris Belcher, superintendent of Columbia Public Schools, located in the center of the state of Missouri, ring true for parents, school administrators and community leaders throughout the nation.

Within the state of Illinois, and the Chicago metropolitan area specifically, a majority of the school districts are in decline. Property values within the community are declining, and with them, the funding that comes from property tax revenue (Illinois Department of Revenue, 2006). On the state level, funding for schools continues to be the subject of much debate (Quinn, 2013). Unfortunately, many of the recent changes from the state have only exaggerated the problem. After years of delayed state aid to the schools of Illinois, the legislature permanently lowered the funding allocation statewide (Long, 2012). Further, the state legislature has begun discussing the transfer of outstanding pension obligations to the local school districts without allowing for tax increases to fund the obligation (Quinn).

Previous research has indicated that in metropolitan areas, home buyers place a great value on the quality of individual schools (Clark & Herrin, 2000). Thus, identifying the school quality indicators that affect property values in the individual catchment areas, as well as regionally, would provide a mechanism by which increases in certain school programs would result in higher property values (Chiodo,

Hernandez-Murillo, & Owyang, 2010). Within the state of Illinois, school funding comes from property taxes calculated using the equalized assessed value (EAV) (Illinois Department of Revenue, 2006) of property within the school district. Increasing the valuation of the property within the school catchment area would produce additional tax dollars for the schools without assistance from the state or a vote of the taxpayers. In depressed areas, where EAV's are in decline, increasing tax rates has been ineffective in raising additional school revenue (Dye, McGuire, & Merriman, 2001). Only added property valuation truly produces new and sustainable revenue.

Research is needed to examine the measure of school quality (Brasington, 1999) and the bearing on property values (Leech & Campos, 2003) within the Chicago metropolitan area. According to Weiss (2004):

At the present time, there is much anecdotal evidence on the role that school facilities play in urban revitalization efforts. One compelling question is how renovated schools have actually raised real estate values and contributed to the economic well-being of longtime residents. (p. 32)

This research is necessary to examine the impact, if any, that school initiatives have had on property values, in order to alter the way schools are funded within the metropolitan regions of the Midwestern United States.

Only through a better understanding of the relationship between school quality indicators, and the effect of such indicators on property values, can the value-added benefit of local school initiatives on property tax funding be fully realized. This research will attempt to define that relationship. Such information would be valuable to schools assessing the financial cost and benefit of individual programs and initiatives. When

deciding between two equally beneficial programs within the school, the influence of each program on the valuation of property within the school catchment area, and the resulting impact to the property tax revenue returned to the school, would be considered. On a grander scale, the manipulation of property values through school programs may also be employed by state officials looking to fund school programs as part of an urban renewal effort.

Statement of the Problem

In the Chicago metropolitan area, the existing property tax system has been blamed for the economic decline of the region (Scott, 2000), as well as a barrier to reforming school funding (Koeneman, 2000). Statewide, reliance upon property taxes for school funding has resulted in an inequity in per pupil spending that is one of the worst in the nation (Moeller, 2011).

The problem, simply put, is inequity in school funding brought on by reliance upon property taxes. Complicating the inequity is a lack of interest in changing the current tax system and the expansion of tax limiting legislation.

Research into the influences of school quality indicators on property values within school catchment areas is necessary and timely within the state of Illinois, and more generally, the Midwest. The debate regarding school funding inequality has been ongoing for nearly 30 years (Wheeler, 1990) with little progress. The debate centers on the inequity of relying upon local property tax revenue to fund schools and the disproportionate impact school funding policy changes have on the disadvantaged (Aleman, 2007). The Illinois Supreme Court heard the case of *Carr v. Koch* (2012) that argued the inequitable school funding in place violated the Equal Protection clause of the

Illinois state Constitution. The court affirmed the decision of a lower court, dismissing the plaintiff's claim, and the debate over inequity raged on. Across the state the average annual school spending per pupil remains diverse, ranging between \$26,225 on the high end and \$6,061 the lowest. On average, 63.27 % of school revenue in 2011 came from local property taxes, 26.64 % from the state, and 10.09 % from the federal government (Illinois State Board of Education, 2013).

Some have argued that the survival of the property tax over the years is an indication that it is preferred over other taxes (Fischel, 1992). Regardless, with no changes to the current system likely, it is important that school districts pursue property tax funding manipulation options. Traditionally, public referenda have been used to increase tax revenue through vote of the public. Such efforts rely upon public support for the need for additional school funding. In depressed areas, declining property values cause voters to perceive a loss in property wealth, making them less likely to support property tax rate increases (McMillen, 2011). Paradoxically, school districts experience a decrease in revenue as a result of the same declining property values that sours public support for additional revenue to supplement the loss. Researching the relationship between school program variables and property values provided an important tool to assist school districts in expanding funding program options within their operation, to offset the effect of declining property values.

With the influence of property values on school funding clear, research is needed to better understand the potential effect of schools on property values within the school catchment areas. Such research could change the way school funding is regulated. Quantifying such relationships will provide local, county and state officials with a better

understanding of the tools necessary to arrest declining property values and bring about enhanced property tax funding within the school districts of the state of Illinois, and the greater Midwestern metropolitan areas.

This researcher looked specifically at school quality indicators related to per-student spending, performance on state proficiency exams and student-teacher ratios and how they relate to changing property values within the school catchment areas. A better understanding of the relationship, if any, was valuable in determining future school funding options.

Previous research examining the relationship between school variables and housing prices within Illinois has been limited. Brasington (2000) studied the influence of private schools on public school quality. Bruno and Dickson (2011) looked at the influence of Tax Increment Finance Districts on Chicago school funding, Dye et al. (2001) studied the property tax structure, Healey and McCormick (1999) focused on urban revitalization, and Sander (1993) looked at student achievement. Scant research was found relating directly to the variables examined within one's research herein.

The state of Illinois is in financial crisis and has become delinquent on payments (Rich, 2011) to local school districts. The reliance upon local property taxes has forced schools to seek voter approval for tax increases during a time of property value decreases across the region. Research is necessary to provide a better understanding of the relationship between school quality variables and property values within the urban community (Weiss, 2004). Defining such an effect, if any, could provide schools with data that can be used to garner community support for

referenda seeking additional taxes. Furthermore, data obtained from this research could assist the local and state officials in determining what programs would be beneficial to areas experiencing the greatest degree of depressed property values.

Background

Illinois is at a crossroads. In March of 2013, the Chicago School Board announced the closure of 54 public schools in response to a one billion dollar deficit, citing a need to provide students with better resources (Byrd-Bennett, 2013). The debate over school funding inequity, and the role of property taxes, that began nearly 30 years ago, continues without a workable solution today (Reed, 1998). In the coming section, this researcher will examine the history of school funding, property tax distribution, school quality research, and housing value determinants to provide a foundation for this research.

Within the state of Illinois, 881 school districts take the form of local tax districts serving a regional jurisdiction (Mullin & Brown, 2008). Each school district elects representatives who serve on a school board for a term of four years. More than one half of all school funding comes from local property taxes collected from residential, commercial, and industrial properties located within the school district (Chicago Metropolitan Planning Council, 2011). Annually, the elected school district officials adopt a tax levy, outlining the property tax funding necessary to fund school operations for the fiscal year. The funds requested are dispersed over the properties within the school district by way of a property tax rate. The rate is calculated by dividing the tax levy amount by the value of the properties within the district (Illinois Department of Revenue, 2006). Each property is given a value based upon the tax assessor's valuation of

the property. Dividing the property by a county-derived equalizer, the tax assessor develops the equalized assessed valuation (EAV). It is the EAV that determines the taxable value of the individual parcels. With the EAV of all parcels within the district compiled, the assessor divides the district-wide EAV by the tax levy amount requested by the school district and produces a tax rate (Dye et al., 2001).

In 1971, the California Supreme Court issued an opinion in the case of *Serrano v. Priest* (Fischel, 1989), finding that the reliance upon property taxes to fund schools was unconstitutional in that it made public school education reliant upon the wealth of the community within which it was located. In response to the decision, the California legislature reworked the state's school aid formula to provide for additional funding to disadvantaged school districts within the state. Subsequent decisions by the California Supreme Court, *Serrano II* and *Serrano III* (Fischel), found the efforts of the state to be insufficient in addressing the inequity in school funding. By 1978 a proposition was placed on the ballot proposing an amendment to the California state constitution reducing property tax rates and limiting future growth of property taxes to two percent annually (Fischel). Proposition 13 paved the way for tax limiting legislation across the nation, with Massachusetts approving Proposition 2 ½ in 1980, Oregon's Measure 5 approved in 1990 (Figlio, 1998), and Illinois Tax Cap legislation enacted in 1991 (Illinois Department of Revenue, 2006).

Since 1991, the Illinois Tax Cap legislation has been amended multiple times with the most recent amendment in 2006 (Illinois Department of Revenue, 2006). With each amendment of the Act, the Illinois State Legislature further limited the ability of school districts, within the state, to raise property tax revenue. However, none of the

amendments addressed the issue of inequity, choosing instead to concentrate on property tax relief.

Further complicating the area of property tax funding for schools was the introduction of economic development initiatives which used property tax dollars slated for schools as incentives for development. One such initiative was Tax Increment Financing (Illinois State Comptroller, 2012). In 1977 the state of Illinois established the Tax Increment Finance (TIF) regulations allowing for the use of property tax revenue, including that which was to go to schools, for the purpose of economic development (Healey & McCormick, 1999). First established in California in 1952, TIF Districts are used throughout the nation as an economic development tool (Peddle, 1997). By 2012 the state of Illinois, recorded 1,176 TIF Districts statewide with 430 located in Cook County alone (Illinois State Comptroller, 2012). In the 2011-2012 school year, schools within the study area experienced a \$700 million budget deficit, while TIF district opponents pointed to the diversion of \$500 million in tax revenue by the municipal government in 2010 alone (Bruno & Dickson, 2011). Across the state of Illinois, while borrowing against the future tax revenue of the TIF, many local communities have diverted tax dollars from the school districts through decade long rebate agreements. Economic development, geared at increasing property valuation, is an important priority for politicians, often shaping the political system and policies of elected officials (Dye, 1966). Schools, taking the lion's share of the property tax bill, are often seen as an impediment to development. On the state level, socioeconomic variables dictate the taxing and spending policies in unique ways, with little concern for the needs of individual communities (Fry & Winters, 1970).

Adding to the challenges of school funding was the introduction of the No Child Left Behind Act of 2001, which increased accountability standards for school performance on standardized tests as a condition of federal funding (Figlio & Lucas, 2004). The advent of such performance standards, and the relationship to federal and state funding, has encouraged school administrators to be more subjective in the program funding allocations within the schools (Betts, 1995) and creating inconsistency in school priorities throughout the state (Linn & Haug, 2002).

Unique rules and regulations of each state have made standardized compliance with new federal standards difficult (Linn, Baker, & Betebenner, 2002). In some cases, compliance with the Act by underperforming schools required annual increases in school performance well beyond those historically possible within the districts (Linn et al.). Often, underperforming schools are found in disadvantaged areas having a higher percentage of minority students (Betts, 1995). Specific initiatives that help the school comply with federal standards and help the disadvantaged are often undertaken and receive additional funding (Summers & Wolfe, 1977). However, such programs may come at the expense of the school curriculum overall. Often the disadvantaged are lower academic performers and have a negative perception of the learning environment (Baker, 1999). High turnover rates for teachers in such environments attract inexperienced teachers, resulting in a poor teaching peer group and lower student performance (Jackson & Bruegmann, 2009). Often complicating the learning environment is the antiquated nature of school facilities. Branham (2004), researching schools in need of updating and repair, found that attendance in such schools is decreased by as many as five days in a school year.

School funding inequity has caused a migration to communities with better quality public and private schools (Bradbury, Mayer, & Case, 2001). This migration of students posed a fiscal challenge for budgeting within local school districts (Bradbury, Case, & Mayer, 1998) and resulted in decreased student performance in the most financially disadvantaged schools (Downes, Dye, & McGuire, 1998) and overall school quality decreased (Downes & Figlio, 1999).

Reliance upon property taxes for school funding, and the disproportionate effect of Tax Caps on schools (Dye & McGuire, 1997), has fueled a debate over funding equity within the state of Illinois, and more specifically, the collar counties of the Chicago metropolitan area (Toenjes, 1982). Lawmakers within the state struggle with the complexity of funding schools in a way that is both equitable and adequate for all (Augenblick, Myers, & Anderson, 1997). Opponents to the use of property taxes have argued that income and property value disparities within the school districts have created inequity in the quality of education provided. Others have argued that income tax or sales tax (Nyhan & Alkadry, 1999) is the answer. Revenue sharing and distribution by various tax classifications, such as commercial versus residential, have been considered without success (Toenjes, 1986) .

The issue of equity remains at the center of the debate surrounding school funding and property tax reform. Poorer and wealthier communities alike support funding for disadvantaged schools (Fischel, 1989); however, they struggle to agree on how to provide additional funding.

In 2009 Senator Meeks, an Illinois State Senator representing the Chicago southland region, called for legislation enacting a statewide income tax to fund public

schools within the state and removing the burden from the local property tax bill (Illinois General Assembly (97th), 2009). In 2011, the Senator presented SB2494 (Illinois General Assembly (98th), 2011), introducing a voucher program for the Chicago Public Schools which allowed students in underperforming schools to transfer to another school within the system. Funding for the transferring student would follow the student to the new school, thus penalizing the low performing school. Senator Meek's call for action on both initiatives was met with inaction by the state legislature with the defeat of SB2494 (Illinois General Assembly (98th), 2011). This defeat sent a message to the schools that help is not coming from the state, reigniting the debate over the inequity of school funding by way of local property taxes.

Without changes to the existing tax structure taking place, research examining the relationship between neighborhood schools and the taxable value of property within catchment areas is crucial. Researching Chicago schools, Downes and Zabel (2002) found that improvements in student performance on standardized tests and increases in per-pupil expenditures influenced housing prices within the school catchment area. Sander's (1993) research examined the relationship between school expenditures and student achievement in 113 high school districts within the state of Illinois, between 1989 and 1990. Specifically, Sander investigated the effect teacher salaries and pupil-teacher ratios had on ACT scores and graduation rates.

Studying residential homes within the school catchment area in the Dallas Independent School District, Hayes and Taylor (1996) determined that home buyers value quality schools. Probing deeper into the definition of school quality, Hayes and Taylor determined that home buyers would pay a premium for even marginal enhancement of

student performance. Looking specifically at one quality indicator, sixth-grade mathematics achievement scores, Hayes and Taylor concluded that “only the size and age of the property and the distance from downtown have more influence than school performance on home prices in northern Dallas” (p. 6).

Bayer and McMillan (2011) researched the variables contributing to neighborhood stratification within local jurisdictions predicated on the Tiebout Model, which assumed that people are fully mobile in their housing decision making. They concluded that better public goods and services bring about increased demand for residency and increased property values (Oates, 1973). Black (1999) concurred, determining that parents value school quality and are willing to pay a premium for houses within a school catchment area. In addition, public perception of variables, such as race and the perceived impact of such variables on property values, shaped public sentiment about school funding equalization measures (Tedin, 1994). Home consumers migrate to property that provides the characteristics deemed desirable (Hamilton, 1976). Housing prices provide a measure of the implicit costs of the public goods and services (Sieg, Smith, Banzhaf, & Walsh, 2002) provided by public schools and other taxing districts.

Factoring for variables in community tax rates, income levels, and racial composition, Brasington (1999) determined that the amount of funds expended per pupil was highly valued in the housing market and influenced the home values within the school catchment area. Brasington concluded that the amount of funds allocated per pupil was “an appropriate substitute for proficiency test scores in hedonic regressions” (p. 410). To a lesser degree, the pupil/teacher ratio was a variable influencing house values within the school catchment area. Parents consistently penalized higher pupil/teacher ratios as a

measure of school quality. While such indicators were valued by the housing market, the value was not consistently applied across varying school catchment areas. Brasington attributed this inconsistency to the “peer group effects” (p. 410) of the specific demographics of the individual areas. Kane, Staiger, and Reigg (2005) determined that desegregation efforts in the community census block and the classroom influenced housing prices. Lavy and Schlosser (2007) determined that changes in the classroom gender were associated changes on standardized test. Furthermore, student experiences prior to school, and outside the school environment, affect student achievement and the perceived quality of the school overall (Heyneman & Loxley, 1983).

Research has determined that the pursuit of quality education reforms is not unique to the United States (Cheng, 1993). In Oslo Norway, Fiva and Kirkeboen (2008) investigated the impact of school quality on housing prices, hypothesizing that school performance would only control housing values to the degree that the school quality is valued by households within the school district.

According to Fiva and Kirkeboen (2008), school performance indicators and accountability systems were primarily designed to create incentives for the school leaders and teachers. However, parents and taxpayers also monitored performance measure as a consequence of public reporting. Often the reporting of school quality indicators in the media have been perceived by the general public as positive indications of school performance.

In Mexico, an increase in spending per pupil was found to have a positive impact on the national economy, with the strongest impact found within the urbanized areas (Fuller, 1985). However, in many Third World nations, the relationship between academic

achievement and student performance is greatly influenced by the family background of the student (Fuller, 1987), albeit to a lesser degree than the true quality of the school (Behrman & Birdsall, 1983). In India, a nation where nearly one third of the children do not attend school, the father's education plays an important role in the children's school participation (Dreze & Kingdon, 2001).

Looking past school quality variables, researchers have found a plethora of other variables that also influence property values. The impact of variables beyond the school has been the subject of much research in the area of perceived school quality and the effect on community property values. Variables such as crime within the community (Linden & Rockoff, 2008), changing racial demographics (Clapp, Nanda, & Ross, 2008), the gender of students (Summers & Wolfe, 1977), and the education level and participation by parents in the learning process (Griffith, 1996), can affect the perception of school quality. Factors such as student mobility and individual student characteristics contributing to the student achievement often skew standard measures of student performance, rendering data less useful (Meyer, 1997).

Examining house price determinants, Tsatsaronis and Zhu (2004) found household income and interest rates as variables associated with fluctuations in housing prices internationally. Even unique community characteristics such as pollution (Ridker & Henning, 1967), open space and parks (Crompton, 2001), undesirable land uses such as power plants (Boyle & Kiel, 2001), cultural art amenities (Haurin & Brasington, 1996), and historic district designations (Schaeffer, 1991), can make a difference in property values. However, the most influential price determinant, and one that is difficult to reverse, is that of poverty (Dale, Murdoch, Thayer, & Waddell, 1999). Gramlich and

Rubinfeld (1982) determined that demands for public spending are directly related to the income of individuals within the community.

Goodman (1988) proposed a model to address the investment and consumption demands for housing by examining variables such as housing price, permanent income, tenure choice, and housing demand. Goodman concluded that rental housing has a complex bearing on housing demand and thus housing prices and much of that effect is attributable to the tenure choice decision of consumers. House price is related to individual income and local population demographics for renters as well as owners (Malpezzi, Chun, & Green, 1998).

Further complicating the debate about school market valuation is the supposition of critics who have argued that simply providing additional funding does not guarantee better student performance. Hanushek (1986) researched the economics of education and schooling on a national level, examining the efficiencies and production of schools between 1960 and 1980. Hanushek found that while national school sizes peaked in 1970, since that time per-pupil expenditures have increased with current elementary and secondary schooling today equaling about four percent of the United States' gross domestic product. During that same period, Hanushek discovered that the median years of schooling completed by students has only risen slightly and that performance on the Scholastic Aptitude Test (SAT) has declined. During the same period, class sizes fell and the median experience of teachers with a master's degree more than doubled.

Hanushek (1986) argued that "increased expenditures by themselves offer no overall promise for improving education" (p. 1167) and that the need to reduce class size and require post-graduate degrees from our teachers may not be a fruitful endeavor.

Hanushek lectured that schools must “stop requiring and paying for things that do not matter” (p. 1167) if they are to be efficient.

Hoxby (1996) found that the gravitation toward state-funded school districts is not the answer for school funding concerns. Hoxby contended that “the current predicament of school finance is a failure of productivity rather than a failure of spending” (p. 53), and moving toward state funding for general school funding is displacing categorical aid for special needs students. Conversely, public perception and peer group bias uniquely contributes to differences in public opinion regarding school funding. Peer group perceptions of school quality can further a school’s reputation and the value of property within the catchment area (Kane, Staiger, & Samms, 2003). Such perceptions can overshadow the impact of student performance within the school district and must be removed to adequately measure any influence on housing values within the catchment area (Rothstein, 2006). Researchers such as Oakes (1989) and Porter (1991) have argued the need for school quality indicators that look at school context free from peer group tendencies of school seeking to enhance public perception.

Past research supports the contention that school quality indicators can influence to property values within the school catchment area within which they are located (Black, 1999). Within the Chicago metropolitan region, school funding relies upon property taxes generated by local property values. The current tax distribution system has created financial, and by default, quality of education, inequity throughout the region. Unable to count on help from the state of Illinois, (Long, 2012), school districts require help from researchers to better understand ways to further funding opportunities within the

programs of the school (Brasington, 1999). Such research, born of necessity, is crucial to long term stability within school districts and the communities they call home.

This research examined three school quality variables that, in one's opinion, are commonly discussed when touting the quality, or lack thereof, of an individual school. The first, per-pupil spending, is at the heart of the issue of inequity within the school funding arena. The second, performance on state proficiency scores, is a litmus test that is determinative of the school's ranking and placement on school watch lists. Many of the funding elements of the No Child Left Behind Act are tied to student performance on proficiency tests. The third, teacher-pupil ratios, commonly referred to as class size, centers on the time afforded individual students in the classroom. To examine the influence of each of the aforementioned variables the following research questions were formulated.

Research Questions

1. What relationship, if any, exists between property values and school per-pupil spending across school catchment areas?
2. What relationship, if any, exists between property values and student performance on state proficiency scores across school catchment areas?
3. What relationship, if any, exists between property values and school teacher-pupil ratios across school catchment areas?

Description of Terms

Census Block. Census blocks are areas bounded on all sides by visible features, such as streets, roads, streams, and railroad tracks, and by invisible boundaries, such as city, town, township, and county limits, property lines, and short, imaginary extensions of

streets and roads. Generally, census blocks are small in area; for example, a block bounded by city streets (United States Census Bureau, 2012).

Equalized Assessed Valuation. The value assigned to real estate by the Township Assessor for the purpose of calculating property taxes (Illinois General Assembly Compiled Statutes, 2012).

School Catchment Area. The area served by a local school (Hayes & Taylor, 1996).

School District. The taxing authority combining multiple school catchment areas and collecting taxes for the purpose of school funding (Illinois General Assembly Compiled Statutes, 2012).

Tax Increment Finance (TIF) District. A geographical area wherein taxes beyond those in place at the time of creation of the TIF, known as the incremental taxes, are directed to the municipality to use for the purpose of economic development within the defined geographical boundaries of the TIF District (Illinois State Comptroller, 2012).

Significance of Study

Researching the influence of school quality indicators and housing values within the Chicago metropolitan region is essential in school funding reform efforts within the state of Illinois. School quality, and subsequent earning of students, is generally improved with increases in school funding, and the associated improvement in quality (Card & Krueger, 1996). Raging within the Midwest is a debate over the inequity of local property tax funding for public schools. The consensus is that additional funding is needed in the poorest school districts to bolster insufficient local property tax levels (Illinois General Assembly (97th), 2009). The distribution of additional funding to

schools, whether a redistribution of property tax dollars from wealthier areas, or additional state funding from new taxes, will not alone be able to address the root cause of property tax inequities. Unless the state is willing to eliminate local reliance upon property taxes entirely, the redistribution of funding will be ineffective so long as poor areas continue to see declining property values and associated tax revenue (Dye et al., 2001). In depressed areas, increasing tax rates, even when supported by the voters, further depresses property values and is thus not a sustainable option for school funding growth (Oates, 1973).

Performance within the public schools impacts home values within the school district. Declines in school performance, or increases in school taxes without an associated increase in school performance, are realized by homeowners as reduced property value (Oates, 1973). Additionally, changes in the ethnic and socioeconomic composition of the students can also be influential to local housing prices when assessed over a longer period of time (Clapp, Nanda, & Ross, 2008).

This research hopes to provide a better understanding of the reasons home buyers gravitate to select school districts and are willing to pay a premium for homes within the school catchment area. Looking specifically at school quality indicators such as per-student spending, performance on state proficiency tests, and student-teacher ratios, provides a better understanding of the impact each indicator has, or has not had, on housing prices across school catchment areas. Understanding that difference provided foundation upon which state funding programs geared toward economic development could be reallocated to school programs.

Local economic, county and statewide economic development initiatives often focus on jobs or sales tax revenue. However, at the core, economic development is intended to raise property values within the area served. What if local, county and state officials could be convinced that economic development can be initiated in the schools? One believes such a conviction could change the way schools are funded in the future. Using existing economic development dollars to fund school programs, that in turn increase property values within the school district, would provide a mechanism for reversing downward trends in property values. The poorest communities are often those most adept at providing incentives to new residential and commercial developers to bring new projects to town. This research could be the mechanism by which the allocation of such incentives focus on select quality indicators in the local school. For example, units of local government in areas with a declining tax base often request property tax rebate incentives from the schools to attract new commercial and industrial businesses to the area. Such incentives are promoted as necessary to improve property values in the area and provide future property tax funding for all of the special taxing districts. If school quality indicators were found to be impactful on local property values, investing in the schools rather than taking money from the schools could be an effective economic development tool.

Process to Accomplish

This research will examine the south and southwest region of a large metropolitan area with a population of 830,000 residents. Data will be collected from 26 school catchment areas in two different counties, serving a population of approximately 150,000

residents. One-half of schools studied were located in an urbanized county and the other one-half in a rural county.

School quality data for each school within the studied districts was collected, looking specifically at per-pupil spending, student proficiency on state tests, and student-teacher ratios for each of the schools. Data for each of the schools within the study area was obtained, at no charge, from the Illinois Department of Education.

To better understand the variables effecting home values within each of the school catchment areas being studied, data was collected on variables deemed impactful by previous research on housing values. Specifically, data was collected for 550 residential properties within each of the studied catchment areas. The equalized assessed valuation (EAV) was amassed for each residential property within the data sample. Data was obtained from the Township Assessor database which is open to the public and free of charge. Population data was obtained using census tract and block group data provided by the United States Census Bureau (2012), via a public database free of charge.

The residential homes in each catchment area were chosen using a simple random sampling of the school catchment area. A listing of all residential property within each study area was obtained and random properties were selected using randomizing selection software. Data was maintained using an indexing process to assure the anonymity of the subject properties examined.

The researcher applied a quantitative approach, compiling existing data from multiple existing database sources and assessed the data using a series of comparison techniques. Using a model similar to that of Brasington (1999), a mean and standard deviation were developed for each of the variables related to school quality across the

study region: (a) per-pupil spending, (b) state proficiency scores, and (c) teacher-pupil ratios, as well as those related to property valuation: (a) property EAV and (b) assessed value. Data was charted so as to compare school and housing variables within school catchment areas.

Using a correlation coefficient calculation, the variables spending per-pupil, student performance on standardized tests, and student-teacher ratios were measured against residential property values within the school catchment districts. This researcher calculated an r and R^2 score to examine the relationship between variables. The data was plotted on a scatter plot to visually represent the relationship between the variables.

Summary

Housing values within a community have been shown to reflect the perceived quality of local schools (Fiva & Kirkeboen, 2008). Specifically, school quality indicators such as those studied within this research have been shown to be valued by the housing market (Brasington, 1999). It is incumbent upon community residents, elected officials and business leaders to ensure that local schools are providing a quality education, in furtherance of economic growth within the region (Chicago Urban League, 1997).

Since 1990 Illinois has seen manufacturing jobs decline, only to be replaced by service jobs that pay lower wages and offer limited benefits (Martire, 2009). At the same time Illinois has risen to be the state with the highest reliance upon property taxes for school funding. That reliance has created a large disparity in the quality of education provided throughout the Chicago region, with the poorest school districts spending as little as 60% of the richest (Martire). The educational benefits of early intervention programs in grade schools are often being lost in high school (Currie & Thomas, 1998) as programs subside.

In 2011 a Bill that would have introduced a school voucher program into the Chicago Public Schools passed the state of Illinois Senate only to die in the House (Illinois General Assembly (98th), 2011). This would have allowed students to leave schools performing in the lowest ten percent of the district. In the fall of 2012, the Illinois Supreme Court heard arguments about the inequity of schools within the state (*Carr v. Koch*, 2012) choosing not to intervene.

Research measuring school performance and quality must now transcend the needs of the school and look to the needs of the community. Economic development efforts to rejuvenate stagnant areas of the Midwest region must consider the impression of such efforts on public services such as education. This research examined and compared the discipline of school quality assessment and property value appreciation in an effort to better understand how, if at all, they are interconnected. Such an understanding is vital in the effort to equalize school funding within the state of Illinois.

In the coming section, this researcher will review past research in greater detail to better understand the processes and methodologies utilized by researchers to assess the influence of school quality on property values. Multiple models and techniques will be reviewed to provide a summation of the research in the area of property valuation inputs and school quality variables in the latter part of the twentieth century and into the twenty-first century. The focus will build upon the early work of Tiebout (1956) and Coleman (1966) in an effort to summarize the research examining the issue of inequity in public schools and the catchment area they serve. While a general overview of research was provided, specific deference is given to the variables outlined in the research questions outlined previously.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

In the metropolitan areas of Illinois, inequality is evident in school districts and the communities they serve. It is common to find highly performing schools, located in higher income catchment areas, within a few miles of schools, and school districts, unable to fund even the most basic school program (Fischel, 1989). This disparity has been the subject of much debate and little action (Illinois General Assembly (98th), 2011). It is incumbent upon local school districts to find ways to enhance local property values, and the associated tax revenue, while seeking to enhance school performance. Local school districts seek to find a balance between maximizing the services provided to the residential inhabitants within the school catchment area and the tax dollars that can be collected (Oates, 1969). Simply stated, home purchasers assess a value to the quality of services provided by the school district and assign a financial value to the property they seek.

In the latter part of the 20th century, the focus on mobility of the population across the nation introduced the concept of school competition. This focus was fueled, initially, by the work of Tiebout (1956) which suggested the mobility was tied to quality of local governmental services. Later Coleman (1966) introduced the issue of equity and race into the debate and the focus gravitated to the area of school performance.

Since the introduction of the Tiebout (1956) model suggested that people are “rational consumers” (p. 417) seeking to maximize their preferences for a property while understating that value to the taxing district in the hopes of avoiding being taxed for such valuation, researchers have sought to explain the inequity of school performance. Tiebout’s suggestion that consumers would seek out the communities that best served the consumer’s preferences for public services was quickly expanded to include public education. Oates (1969) put the theory to the test, determining in fact, that community services are valued in addition to the home variables specific to the property location. While the valuation of community services was found to have extended beyond the local neighborhood, it did not expand to the county or state level (Sonstelie & Portney, 1980). This *local effect* is in line with Tiebout’s model that such valuation decisions are local in nature and prompted exclusively by the success and failures of the local governmental jurisdictions. The conclusion reached was that the mobility of consumers, in their home purchasing choices, creates pressure on local governments to perform in a manner that is valued by the consumer.

Expanding the scope of the local variables affecting property values, researchers examined, among other things, pollution (Ridker & Henning, 1967), crime (Clark & Herrin, 2000; Linden & Rockoff, 2008), racial demographics (Malpezzi et al., 1998), taxes (Gustely, 1976) and land uses (Grether & Mieszkowski, 1978). Personal preference for each of the aforementioned variables was found to be associated with a premium or discount in the monetary valuation of the property (Tiebout, 1956). In some cases a hedonic model was developed to value the differentiated variables and the characteristics attributed to them (Rosen, 1974).

During the same period, pressure was mounting in the area of school equality across the nation. The federal government commissioned a study examining the impact of racial segregation and its impact on performance on standardized tests (Coleman et al., 1966). The study, commonly referred to as the *Coleman Report*, delved into new areas of study, such as teacher qualifications, experience and education, and the “peer effects” (p. 302) of student interaction. The introduction of peer effects continues as the focus of much research surrounding school performance measures today (Bayer & McMillan, 2011; Brasington, 1996; Downes & Zabel, 2002; Hayes & Taylor, 1996; Jackson & Bruegmann, 2009; Lavy & Schlosser, 2007; Rothstein, 2006).

Tiebout (1956) and Coleman (1966) expanded research into the study of education and its impact on property values within the catchment area. Looking specifically at the impact of school quality on property values, researchers studied a plethora of school variables. Epstein and McFarland (1976) looked at the school quality from the student perspective. Downes et al., (1998) examined the impact of school funding from the perspective of tax limitation legislation. Kane et al., (2005) determined that desegregation efforts in the community census block and the classroom influenced housing prices. Lavy and Schlosser (2007) determined that changes in the classroom gender were associated with performance changes on standardized tests. Furthermore, student experiences prior to school, and outside the school environment, were found to affect student achievement and the perceived quality of the school overall (Heyneman & Loxley, 1983). One study researched the impact of private school availability on housing valuation in the public school catchment areas (Dee, 1998).

Focusing the debate on the relationship between school quality variables and housing prices is the discovery that home buyers “are not only cognizant of differences in school quality, but also have revealed their preferences for higher quality schools by paying a premium for their home” (Hayes & Taylor, 1996, p. 6). Fiva and Kirkeboen (2008) agreed, finding that households react to information regarding school quality in an accelerated timeline. Even marginal changes in perceived school quality were valued by the market. While it is generally agreed that school quality variables affect property values within a catchment area, the valuation and duration of such changes continue to be less robust (Fiva & Kirkeboen). Regardless, the aforementioned research leads to the presumption that the quality of public schools within a catchment area is a determinant in the home valuation process within that area (Haurin & Brasington, 1996). Focusing the debate is the research examining three school quality variables: 1. expenditure per pupil, 2. student performance on test scores, and 3. teacher-pupil ratio to determine the relationship, if any, each has on the valuation of local residential property within the school catchment area.

Previous research on each of three variables, while built upon the work of Tiebout (1956) and Coleman (1966), has expanded the debate regarding the impact of value-added variables such as school quality. The debate has evolved a great deal since first introduced by Tiebout, Coleman, and Oates (1969). As the 20th Century came to a close, research in each of the three variables was limited to studies examining the overarching social aspects of school quality and inequity. Only after the adoption of the No Child Left Behind Act (2001), at the turn of the century, did research into the areas of expenditure per pupil, student performance on test scores and teacher-pupil ratio enter

the research mainstream. With state and federal school funding tied to performance in these new areas, the local school district and the public at large began to express curiosity about the basis of such requirements. Research into the impact of changes in the variables became the basis for school programs and quality measures across the nation. With the local school, the state, and the federal government defining the variables as a measure of school quality, researchers sought to understand the relationship, if any, such public perception had on home buyers purchasing valuation.

Some research looked at the variables using a more simplistic modeling based upon Tiebout (1956), opting to assess changes over time (Brasington, 1996; Clark & Herrin, 2000; Downes & Zabel, 2002; Figlio & Lucas, 2004; Kane et al., 2003) while others examined a more finite snapshot of conditions (Black, 1999; Fiva & Kirkboen). Past research also varied the sample size and geography of the area studied. On the local level researchers opted to study select metropolitan cities (Black; Downes & Zabel; Sander, 1993) or states (Figlio & Lucas; Kane, et al.), while a select few studied school quality variables on the national level (Fiva & Kirkeboen; Hayes & Taylor, 1996; Gibbons & Machin, 2002).

This research focused on a large Midwestern metropolitan area of the United States assessing data from nearly 300,000 households at a fixed moment in time and examining individual schools and the supporting catchment area of those schools (Haurin & Brasington, 1996). In the pages that follow, one will examine the previous research on each of the three variables. The methodology, process and findings of each

will be assessed and debated, creating the foundation upon which one's research will be conducted.

Expenditure Per Pupil

During most of the 20th century, the study of school spending did not receive much attention from researchers. Tiebout's (1956) theory of consumer mobility did little to focus attention on the issue of school spending. Coleman's (1966) work suggested school inequality was a function of race and socioeconomics, missing the valuation of funding per student. While Tiebout and Coleman framed the argument that school quality is a function of the catchment area population choices and valuation, they stopped short of drawing a direct connection between the two. The work of Oates (1969) brought the two together determining that the public is not only cognizant of the cost of public education, but that they are willing to pay for such quality in the purchase price of a home. Oates incorporated Tiebout's theory that individuals are mobile in their housing choices, seeking the best opportunity to serve their personal interests and needs; and Coleman's findings that inequity results from that mobility. Oates connected the desire to receive better quality school services with the need to minimize taxes. The result was an assessment of the value placed upon the capitalization of increased taxes to improve education. The recognition that the value placed upon changes in taxes could be tied to resident property valuation was a defining moment for school spending research.

As the century came to an end, a wave of tax limiting legislation swept the nation. In 1991, the state of Illinois enacted Tax Cap legislation limiting the annual growth in property taxes collected by school districts to the lesser of the consumer price index or

5% annually (Illinois Department of Revenue, 2006). Prior to the legislation, school district tax increases were regularly in the double digits. This legislation was intended to increase school efficiency and reduce administrative costs (Dye & McGuire, 1997). As schools worked to reallocate funding, the state of Illinois began tracking expenditure per pupil data in a public database as a way to measure school funding (Betts, 1995). This measure provided a stable benchmark from which different schools could be measured and assessed.

The establishment of school spending as a variable tied to school performance was a turning point in the field of school performance research. Expenditures per pupil, traditionally measured to assess school funding inequality, became the focus of research examining other community variables (Brasington, 1999). Research examining expenditures on housing choices (Sonstelie & Portney, 1980), and public spending (Edel & Sclar, 1974) predicated on the Tiebout (1956) Model evolved into the modern study of school quality variables and how they are valued in the housing market (Brasington). That transformation elevated the variable expenditures per pupil into the mainstream and focused the debate on school quality.

Researching the impact of per-pupil spending on local property valuation has been limited within the state of Illinois. Unlike the variable teacher-pupil ratio which may focus on a specific school within a district, expenditure per-pupil data traditionally focuses on the school district overall. Unwilling to change school funding allocations within the state, school funding inequity within Illinois has been the focus of legislative and public debate (Illinois General Assembly (97th), 2009). Current research examining

the relationship, if any, between a school district's expenditure per pupil and property values within the school catchment area is necessary to further the debate (Weiss, 2004).

In the past, modeling expenditure per-pupil data followed the work of Tiebout (1956), using data reported by school districts statewide (Edal & Sclar, 1974). Hedonic analysis was used to capitalize the valuation of changes in the expenditure per pupil across school districts in a localized geographic region (Black, 1999) or nationally (Hilber & Mayer, 2004).

The work of Tiebout (1956) and Coleman (1966) led to the determination that expenditures on local services, such as schools, is connected to an expectation of service that is to be provided. The resulting conclusion has been that residents in communities paying, on average, the highest real estate taxes have enjoyed the highest level of service. Taxes are simply the cost of receiving quality services. In a similar manner, residents value school performance. But do they value paying more for that performance? According to Sonstelie and Portney (1980), home purchasers apply 90% of every dollar increase in school funding to an increase in the valuation of their home. Oates (1969) agreed, finding that while increasing property taxes generally had a negative effect on property values, the use of such tax increases to fund school programs "offsets the depressive effect of the higher tax rates on local property values" (Oates, 1969, p. 968). Edel and Sclar (1974) diminished the findings of Oates and Sonstelie and Portney, suggesting that the offsetting value capitalized by home buyers is lower than suggested, having declined steadily since 1950. The varying findings suggest that other variables are considered as part of the capitalization of tax rates.

To remove many of the variables associated with scattered data, Downes and Zabel (2002) found the need for data that recognized the heterogeneous nature of housing prices variables. To that end, data from the American Housing Survey (1987-1991), the Illinois School Report Cards (1987-1992), and the Census Bureau (1980-1990) was merged to create a model from which Downes and Zabel could conduct their research. Black (1999) controlled for variation in property tax rates, equalized property valuation, and school spending by focusing her data sample on denser scatter patterns along shared school district boundaries. Black's findings supported the contention of Oates (1969) and Sonstelie and Portney (1980), albeit at a percent of capitalization closer to 50%, finding that per-pupil spending was "positively correlated with house prices" (p. 587).

Downes and Zabel (2002) found that increases in per-pupil expenditures were a factor in choosing and valuing housing. Downes and Zabel determined that an increase in the expenditure per pupil of 1% districtwide yielded a .67% increase in housing values across the district. Unlike other variables considered within this research, the influence of per-pupil spending was stable over time. Black (1999) concurred, finding per-pupil spending to be "positively correlated" (p. 587) with housing prices with a 2.2% increase in housing valuation resulting from a \$500 increase in the annual per pupil expenditure district wide.

Burke (2012) suggested that school spending on ancillary costs such as administrative and support staff is at the core of the debate on school funding. Simply spending more money for per student within the school was only valuable when the

student performance, or public perception of performance, was affected by the spending. Regardless, it has been generally accepted that, accounting for neighborhood and housing diversity, home values in school districts with higher spending per pupil are valued at a premium (Crone, 1998). Sander (1993) determined that, within a high school district, a 10% increase in an average teacher's salary increased ACT scores by one percent. Further, Sander concluded that a "substantial increase in average teacher salary of 30% is associated with a four to five point increase in percentile ranking of the school" (p. 410) statewide – a valuation recognized by home purchasers.

Hayes and Taylor (1996) disagreed, finding no evidence that changes in school expenditures or student body characteristics impacted housing prices. While Hayes and Taylor determined that a 1% increase in the effectiveness of the school increased home prices by .26%, the same was not true for changes in school spending per pupil. Thus, while the school effect on student performance was found to be impactful on the prices home buyers are willing to pay, school spending was not (Hayes & Taylor).

Within the state of Illinois, one-half of graduating high school students do not attend college (Sander, 1993). In the city of Chicago, less than one-half of high school students graduate high school. Between 1960 and 1990, expenditures per pupil increased 146 % within the state exceeding the national average; yet one-third of Chicago schools are in the bottom 1% of the nation in ACT scores, and 92% are in the bottom 10% nationwide (Sander).

Entering the debate regarding equality in education, Sander suggested that financial equality "does not imply that schools become equal" (p. 415), and simply

paying teachers more is not the answer (Hoxby, 1996). Complicating the debate is the findings by Oates (1969) that an increase in property taxes between two and three percent would decrease home values by 7.5%, while increasing the expenditure per pupil by 28% increased home values by 6%. With the majority of school funding in Illinois coming from local property taxes, this finding creates a paradoxical research dilemma. If school funding comes from property taxes and property taxes diminish home values, then how can increased school spending increase property values?

Seeking to explain the diversity of opinion is the work of Brasington (1999) and the application of a two-pronged analysis. Applying a traditional least squares hedonic regression technique, Brasington found that expenditure per pupil was a statistically significant positive measure of school performance valued by the housing market. This finding is consistent with those of Black (1999), Oates (1969), and Sonstelie and Portney (1980). However, when mixed regressive spatial autoregressive estimation was employed, Brasington determined the statistical significance to be less conclusive, with 50% of the regressions positively significant, 33% negatively significant, and 17% insignificant.

Expenditures per pupil, examined in a vacuum, present a statistically significant measure of school quality. However, when the variable is modeled factoring other external variables, the statistical significance diminishes greatly. The mixed findings indicate that those individuals valuing homes may have concerns for other variables, such as taxes that, at some point, can overwhelm the value placed on per-pupil spending,

causing them to deem the additional spending in a negative light (Gustely, 1976; Tiebout, 1956).

In the past, researchers have adjusted for variables beyond expenditure per pupil when valuing property within a school district in different ways. Black (1999) used the proximity of differing school districts to isolate the relationship, while Downes and Zabel (1996) modeled an inter- and intra-district study. Others such as Sander (1993) used a simple regression analysis utilizing a large data set. Further research that examines the variable expenditure per pupil, especially research that assesses the variable at a fixed point in time, would benefit from the research processes of Black and Sanders.

Within the state of Illinois, school funding inequity is one of the worst in the nation (Moeller, 2011). Research examining the impact, if any, of school district's annual expenditure per pupil has on property values within a catchment area is essential in clarifying the value-added benefit of school funding redistribution efforts within the state of Illinois (Weiss, 2004). Only through a better understanding of such relationships can the inequity present in school funding be addressed. Research clarifying the relationship, if any, is timely and necessary.

Performance on Test Scores

Nearly five decades have passed since the Coleman (1966) report first studied inequity, and its role in student performance, in schools across the nation. School desegregation, performance funded programs such as the No Child Left Behind Act

(1992), and tax limiting legislation (Illinois Department of Revenue, 2006) have complicated the measure of school performance and school quality across the nation. Schools must meet performance standards as a condition of funding, while at the same time meeting local, state and federal regulations related to desegregation and tax increases. Long valued as a measure of school quality, student performance on standardized tests has been widely studied as a measure of local property value; and in the case of No Child Left Behind, a measure of school improvement.

Since Coleman (1966) first suggested that a lack of socioeconomic diversity within the classroom allowed for homogeneous ability to excel as a group or lag behind as a group, researchers have sought to better understand the impact of student performance on test scores as a function of the school and communal environment. Most researchers have concluded that home buyers would pay a premium for even marginal enhancement of student performance (Hayes & Taylor, 1996). However, in doing so, researchers caution that one must control for neighborhood characteristics (Black, 1999) so as not to overstate the effect such impact may have on home values within the school catchment area (Clapp et al., 2008). Socioeconomic conditions within a school district have been found to be statistically significant in home valuation and student performance within a school catchment area (Black; Clapp et al., 2008).

In a similar manner to the dataset relating to spending per pupil, the school quality variable performance on test scores is obtained on a district wide basis. However, equally similar to the variable teacher-pupil ratio, the dataset can also be broken down within the district to grade levels and individual schools. This flexibility provides

diversity in the research material available. Research has generally focused on the traditional grade levels of fourth-, eighth-, and twelfth-grade students (Black, 1999).

Looking at the research specifics, Downes and Zabel (2002) found student performance on standardized tests to be a factor in choosing and valuing housing by consumers. Unlike the work of Hayes and Taylor (1996), which looked more generally at the school performance grading, Downes and Zabel reviewed specific student test score performance. Looking specifically at pupil performance allowed for greater specificity in the measure of relationships.

Downes and Zabel (2002) determined that an increase of 1% in eight-grade reading scores increased house values within the school catchment area by 1.6%. According to Downes and Zabel even the factoring for neighborhood demographics does not change the positive correlation between the variable and housing values. However, causing some basis for concern was the finding that the effect to housing prices of changes in standardized test scores was temporary in nature. Others, such as Kane et al. (2003) and Fiva and Kirkeboen (2008), determined that while the housing market discounted annual fluctuations in test scores, it did in fact recognize a longer-term measurable valuation.

Clapp et al. (2008) also determined that an increase in math scores of one standard deviation was related to a 7.4% increase in home values. When adjusted for neighborhood characteristics, as suggested by Black (1999), the effect was reduced to an increase of 1.4%. Equally problematic is the effect student characteristics can have on the interpretation of data. Clapp et al. determined that a one percent increase in the

percent of minority students can decrease property values by .36% for Blacks and .31% for Hispanics.

Researching the impact of student performance on standardized tests on housing values in North Carolina, Kane et al. (2003) found that student test scores within an individual school, as well as across the district, can impact housing values. An increase in district student test scores of one standard deviation was associated with an increase in home values of 18%. Similarly, the impact was 4-5% for test score increases on the local school level.

Haurin and Brasington (1996) studied the variance in home prices across 134 jurisdictions and six metropolitan areas and determined that local school quality is valued by the housing market. A two standard deviation above the mean test rate was valued as much as 18% by the local housing market. This finding was nearly identical to that of Kane et al. (2003). On a district-wide basis, a one percentage point increase in the number of students meeting a standardized test benchmark raised home values by one-half percent across the school district (Haurin & Brasington).

The research of Chiodo, Hernandez-Murillo, and Owyang (2010) studied the influence of standardized state math tests for the St. Louis, Missouri, metropolitan area on housing prices within the school catchment areas. A one-half increase in the standard deviation of the average school test score was associated with a 3.2% increase in home prices.

Examining the relationship between school district quality indicators and housing values across the district is different than comparing such quality indicators within the individual school catchment area. Looking specifically at the impact of school test scores on housing price, Brasington (1999) concluded that while the housing market prizes proficiency scores on standardized tests, it did not recognize the value-added benefit on the school district level. It was the “peer” (p. 410) environment that was revered when valuing test scores in the housing market and such measures were most impactful on the localized school level. Home buyers did not value the school district’s ability to improve school performance – they prized the academic quality of the other students attending the school (Brasington). The desire to seek out school districts having a student peer group whose performance was valued is in line with the research of Downes and Zabel (2002) and Bayer and McMillan (2011).

Figlio and Lucas (2004) studied 73,782 properties across 37 counties and 481 school districts within the state of Florida between 1999 and 2001, examining the effect of state-issued school grades on house prices within school catchment areas. The state-issued grading system, which ranged from “A to F” (Figlio & Lucas, p. 593) and was tied to state funding, assessed student performance on fourth- and fifth-grade achievement tests.

The researchers determined that the housing market did, in fact, respond to the grading of schools, finding that one individual grade change was, in extreme cases, valued between 15.6% and 19.5% for those graded at a *C* or above (Figlio & Lucas, 2004). However, after the first year of the study, 64% of those receiving an *A* dropped to

a grade of *B* and 27% decreased to a grade of *C*. With such dramatic fluctuations in the grading applied, the average impact to housing prices was diminished to 8.7% between that of an *A* and *B* and negligible for grade changes between *B* and *C* (Figlio & Lucas).

Evaluation of individual schools on a micro level, based upon a standardized grading system that is applied statewide, was problematic. With annual fluctuations in school performance evident, and socioeconomic diversity abounding, an adjusted mean value comparison is needed to truly measure school performance on an individual level. The introduction of this new measure of school quality provided a benchmark from which to measure the impact of such information on prospective home buyers (Figlio & Lucas, 2004).

Black (1999) sought to provide district-wide evaluation of school districts while recognizing the local demographics of the individual school. Studying adjoining school districts in an urbanized region that shared common neighborhoods (Hayes & Taylor 1996), Black was able to look uniquely at the political and socioeconomic valuation of school quality. Compensating for ethnic and socioeconomic diversity, Black found that student performance on test scores was, in fact, valued by the housing market, determining that parents are willing to “pay about 2.1 percent more for houses associated with test scores that are five percent higher than the mean” (p. 595). She concluded that a one point increase in average reading and math scores, a less than one standard deviation increase, could increase statewide property value wealth by \$69,192,900 overall within the state of Massachusetts. Similarly, in the urbanized regions of London, Gibbons and Machin (2002) determined that nationwide simply increasing primary

school standards by one percent had a national social valuation of 13.6 billion pounds or 90 pounds per school age child.

After reviewing the aforementioned research, it is evident that local, statewide, national, and even international research supports the contention that student performance within a school district and catchment area property values are, in fact, related. However, not all researchers agree that the relationship is stable or sustainable.

Further complicating the simple relationship between student performance and property values is the manner in which information regarding the matter is disseminated. Fiva and Kirkeboen (2008) determined that a one school level standard deviation increase in reported school quality was associated with a 1.5% increase in housing prices. However, the impact on housing values was most prevalent closest to the publication date of the new measure and appeared to fade with time. The reliance upon data published by the school district and the local news media introduced the potential for bias into the notification process. Control of the message by the entity benefitting by the message content raises questions regarding the reliability of the data provided. Equally troubling are the consequences of legislation such as No Child Left Behind (2001) that tie performance on tests scores to federal and state school funding (Ewing, 2011). The advent of such regulations has resulted in schools adjusting their curriculum to improve testing scores – manipulating the process perversely.

Directly objecting to the use of student performance measures such as standardized tests as indicators of school quality valued by the housing market was the

work of Meyer (1997). Meyer pointed to the average test score as a “highly suspect” (p. 298) indicator suffering from

four major deficiencies (1) it fails to localize school performance to the classroom or grade level; (2) it aggregates information on school performance that tends to be grossly out of date; (3) it is contaminated by student mobility; and (4) it fails to distinguish the distinct value-added contribution of schools to growth in student achievement from the contribution of student, family, and community factors. (p. 298)

Sander (1993) opined that that performance measures alone, such as test scores, are not an appropriate measure of success unless weighed against the environment within which they are measured. Further, study of the nonlinear effects of school quality on house prices based on heterogeneous parent valuations of school quality and competition in the housing market, Chiodo et al. (2010) determined that the house price premium associated with increased test scores is overestimated at lower levels of school quality and underestimated at the higher levels of school quality. In contrast to previous studies, the price premium remains substantially large, especially for houses associated with above-average school performance indicators.

Teacher-Pupil Ratio

Since Coleman (1966) first introduced the inequity of racial segregation into the school quality debate, the debate has expanded to include variables beyond race. The study of one variable, teacher-pupil ratio, has taken the debate from the national level to

that of the local school district where it has become a focused determinant of school quality and catchment area property valuation. Analysis of the teacher-pupil ratio is centered on the premise that fewer students in the classroom allow more time between the student and teacher, thus increasing the quality of the education provided. Increasing the quality of education makes the school district marketable to home purchasers within a catchment area (Barro & Lee, 1996).

Supporting the study of teacher-pupil ratios is Tiebout's (1956) postulation that individuals will gravitate, all things equal, to the schools providing the best educational opportunity to the students it served. Bringing together Coleman's (1966) issue of inequity with that of consumer mobility raised by Tiebout is the study of class size and the relationship, if any, that the variable has on property values within the school district. Long recognized as an indicator of school quality valued by the public, the teacher-pupil ratio has been a driving force in school politics and policy initiatives for decades (Barro & Lee, 1996; Hanushek, Rivkin, & Taylor, 1996). However, only in the last 25 years, has the study of class size been elevated into the mainstream.

In the latter part of the 20th century researchers, led by the work of Coleman (1966) and Tiebout (1956), examined the issue of teacher-pupil ratios as simply one of many determinants in the debate over communal equity. Oates (1969) postulated that such determinants "exert a positive influence on local property values" (p. 966). Entwined in the environmental and civil rights movement of the period, teacher-pupil ratio changes were valued in a manner similar to reductions in pollution (Harrison & Rubinfeld, 1978) and minority educational opportunities (Jencks & Phillips, 1998).

As the 20th century came to an end, a cavalcade of legislation intent on curbing local school funding changed the perception of school quality variables such as teacher-pupil ratio. The advent of tax limiting legislation, for the first time in history, severely limited the ability of school districts to raise funds via property tax increases (Illinois Department of Revenue, 2006). In response to the fiscal tightening, many school districts were forced to increase class size to meet financial constraints. This change in school policy placed the variable teacher-pupil ratio at the forefront of research in an effort to better understand the student performance impact of the new regulations. The research that followed focused on the impact of class size on student performance and local property values.

A pivotal point in the research surrounding teacher-pupil ratios occurred at the turn of the century when the federal government incentivized reductions in class size through grant-funded initiatives created as part of the No Child Left Behind Act (2001). Providing annual funding of nearly \$3 billion dollars, the federal government used block grants to entice schools to hire additional teachers and lower teacher-pupil ratios (Adams, 2011). Prior to the advent of No Child Left Behind (1992), research examining teacher-pupil ratios was based exclusively on the work of Coleman (1966) and Tiebout (1956), focusing on racial and valuation inequity. During that period the debate regarding the value of teacher-pupil ratio as an economic indicator in the valuation of housing took a form similar to that of Harrison and Rubinfeld (1978), who examined the effect of pollution on housing values in the Boston metropolitan area. Harrison and Rubinfeld determined that the teacher-pupil ratio is, in fact, valued by the housing market similarly to that of air pollution. Home values were found to be inversely related

to the public perception of class sizes within the classroom in a manner that is similar to the perception of diminished air quality. Much like regulation aimed at curbing pollution evolved in the 1970's and 80's, so too did school funding. Between 1960 and 1990, class sizes decreased and test scores increased, most notably for minority students (Jencks & Phillips, 1998).

With the advent of No Child Left Behind (1992), the work of Coleman (1966) and Tiebout (1956) was incorporated into a new area of research building upon the issue of inequity while providing a value-added measure of the teacher-pupil ratio as a variable valued by the housing market. Methodologies employed in this new area of research were diverse. While most used variations of the hedonic regression modeling (Black, 1999; Brasington, 1999; Clark & Herrin, 2000), some developed new models and indexes. Bloomquist, Berger and Hoehn (1988) constructed a *quality of life index* using hedonic regression modeling that examined the teacher-pupil ratio along with other student quality of life issues. Some researchers reviewed other research to formulate conclusions regarding the impact of changes in class size (Hanushek et al., 1996). The use of historic public databases for comparison and analysis was also an effective methodology for others (Jencks & Phillips, 1998). It is this latter approach that was employed within this research of the school quality variable teacher-pupil ratio.

Defining the scope of the research subjects has three general scales of measure: 1. local metropolitan cities (Harrison & Rubinfeld, 1978), 2. statewide assessments (Clark & Herrin, 2000), 3. national-level databases (Barro & Lee, 1996). Within the scope of each is a further refining of the research subject selection. Some have looked at

specific classroom data for individual schools or grade levels. Others have studied the issue of class size within the schools of a select district. In manner similar to the research herein, others such as Black (1999) looked to cross district lines and compare adjoining school districts.

Historically, researching the teacher-pupil ratio impact on house prices required a large number of data points, regardless of the geography of the study area. The inclusion of a larger data sample size ensured that other localized variables are easily identified for exclusion or specific assessment by the researcher as part of any general research conclusions (Black, 1999).

Supporting the valuation of teacher-pupil ratios as an appropriate measure of school quality is the determination that an addition of “one teacher per 100 students district-wide increases housing prices by 16%” (Clark & Herrin, 2000, p. 397). Further, a reduction of 1.6 students per class size increased property values by 5.2% within the school catchment area specifically (Clark & Herrin). With elasticity that is “five times the magnitude of the next highest measure” (p. 399), it is clear that the public deems teacher-pupil ratios as highly important when valuing the school district choice. Applying a traditional hedonic estimation and spatial autocorrected likelihood estimation, Brasington (1999) concurred, determining that the teacher-pupil ratio was “highly valued in the housing market” (p. 408). Inversely, Black (1999) concluded that a higher ratio of students for each teacher is associated with a “lower house price” (p. 587). Bloomquist et al. (1988) suggested that property owners in school districts with the lowest teacher-pupil ratios would enjoy a housing premium of \$5,525.

Focus on the state of Illinois, and more specifically, the metropolitan areas, the research of Sander (1993) examining school quality variables in the Chicago metropolitan area; that of Black (1999) researching the valuation placed upon such variables by parents in the Boston metropolitan area; and Brasington (1999) focusing on the major metropolitan areas of Ohio, are worthy of a more in-depth review.

Sander (1993) found a 10% reduction in the teacher-pupil ratio increased student ACT scores by approximately one-half percent, while increasing the graduation rate by nearly two percent. Further, Sander determined that the percentage of high school students attending college increased 3.4% when the pupil to teacher ratio declined 10%. Graduation and college attendance rates are valued by the housing market as they relate directly to future earning potential of students (Betts, 1995). Brasington (1999) agreed, determining that the housing market values lower teacher-pupil ratios and the graduation rate enhancements that they produce.

Brasington (1999) used two models to assess the valuation of teacher-pupil ratios in the housing market. The first, a traditional least squares hedonic model, indicated that teacher-pupil ratios were statistically significant for 66.6% of regressions and insignificant in the remaining 33.3% regressions. The statistically significant relationship was negative in that increases in class size negatively impacted property values within the school district. This finding is in line with the theory that home purchasers discount the value of homes in school catchment areas with higher class size. The traditional method was employed to provide a direct comparison with other traditional hedonic models (Brasington). Employing a more sophisticated regression technique, the

maximum likelihood estimation technique was applied, correcting for the spatial autocorrelation. In that measure, the statistical significance indicated a split between the negative significance occurring 66% of the time and a positive statistical significance occurring the remaining 33%. Two assumptions can be gleaned from this differential: 1. that pupil-teacher ratio is a statistically significant indicator of school quality from the perspective of home purchasers; 2. that the statistical significance in some cases can be inverted. While the first assumption is in line with previous research debating the value of teacher-pupil ratio as a school quality indicator valued by the housing market, the second assumption is intriguing. The inverse valuation by the market may be the result of the oversaturation of the pupil-teacher ratio by the school district and the assumption that such excess will result in higher taxes. Assumptions aside, additional research is required to better reconcile the differential. Further research is need to shed light on the relationship, or lack thereof, between pupil-teacher ratios within a school district and the valuation of homes within a school catchment area.

A challenge of using teacher-pupil ratios as a school quality determinant is the ignoring of other variables that can impact the quality of education within the classroom. Hanushek, Kain, O'Brien, and Rivkin (2005) factored teacher experience, tenure, and education into the equation finding a "strong positive correlation" (p. 18) to student performance. Equally interesting was the finding that minority teachers were more effective for minority students than White teachers, a fact often ignored when simply assessing the ratio of students to teachers in a classroom (Clapp et al., 2008). And what of the work of Darling-Hammond (1999), who postulates that class size is only moderately associated with student achievement? Darling-Hammond argued that it is the

inclusion of teacher salaries, education, and experience that are most impactful on student performance. Hanushek et al. (1996) agreed, concluding that teacher-pupil ratios were unrelated to student performance. Hanushek et al. argued that even with additional increases in teacher salaries, reductions in class size will not improve student performance.

Reconciling the opposing positions put forth is the thought that the property valuation realized by reductions in class size is the result of public perception rather than student performance (Fiva & Kirkeboen 2008). With homebuyers valuing the local schools over the district overall, the perception of school attributes such as class size is an important determinant in property valuation (Clark & Herrin, 2000).

The metamorphosis of the study of the school quality variable teacher-pupil ratio over the last half-century has been exceptional. Spawned from the research of Tiebout (1956) and Coleman (1966) the study of class size has evolved into much more. The advent of No Child Left Behind (2001), tax limiting legislation (Illinois Department of Revenue, 2006), and the capitalization theories of Oates (1969) catapulted teacher-pupil ratios into the arena of public debate. Pressure from the federal government to decrease class size, combined with the financial constraints of local school districts, created an environment eager for a value-added assessment of changes in class size. Over time, the value-added measure of such a variable was reflected in prices consumers are willing to pay for homes within the school catchment area (Oates). Research furthering the focus of this relationship within the state of Illinois is essential. As the debate over school

funding continues, research enhancing the understanding of the relationship between class size and the local property tax base is timely.

Conclusions

Reviewing the above-referenced research, one is drawn to the belief that housing prices can be a function of the publication of school quality data (Fiva & Kirkeboen, 2008). The establishment of a measurable relationship between school quality variables and housing prices is an essential part of the school funding debate in the individual school districts and across the nation (Gibbons & Machin, 2002). Proponents of such a relationship have suggested that care should be given by researchers to adjust for community and socioeconomic variables when evaluating any such relationship (Black, 1999). Others suggest a more micro-level assessment, studying select functions within a school district. Regardless, school district administrators require a better understanding of the ability to manipulate property values within the school district. Doing so allows them justification for spending preferences while generating additional district-wide revenue by way of higher property valuation-related property taxes.

In the last one-half a century research has built upon the foundation laid by Tiebout's (1956) and Coleman (1966) and elevated the debate regarding the school quality variables expenditure per pupil, performance on test scores, and teacher-pupil ratio. As the debate over the impact of each variable had, or did not have, on property values rages on, school districts within the state of Illinois, fall further into the abyss. Inequity within the public school districts across the state is among the worst in the nation (Moeller, 2011). The reliance upon local property values, and the taxes that such

values generate, is unlikely to change. Research examining the relationship, if any, between the expenditure per pupil, performance on test scores, teacher-pupil ratio, and local property taxes is essential to improving the ability of schools to improve their financial condition.

In the pages that follow, this researcher will outline the methodology employed examining residential properties within the metropolitan areas of the state of Illinois, in an effort to better understand the relationship, if any, that property valuation has with school quality variables: 1. spending per pupil, 2. student performance on test scores, and 3. teacher-pupil ratios.

CHAPTER III

METHODOLOGY

Introduction

In the foregoing chapter, an overview of previous research into the study of the relationship between school quality indicators and property values within a community was reviewed and evaluated. In the pages that follow this researcher will build upon that previous research to establish a methodology in an effort to answer the following three questions: 1. what relationship, if any, exists in property values and school per-pupil spending across school catchment areas; 2. what relationship, if any, exists between property values and student performance on state proficiency scores across school catchment areas; and 3. what relationship, if any, exists between property values and school teacher-pupil ratios across school catchment areas.

Within the Midwestern United States, reliance upon property taxes for local school funding has resulted in inequity within the public education system (Moeller, 2011). Calls for corrective action have been met with inaction within the state legislature (Illinois General Assembly (97th), 2009) and the courts (*Carr v. Koch*, 2012). Further complicating the debate is the economically depressed property values of the many school districts located within the suburban regions of large Midwestern cities specifically.

Since Tiebout (1956) introduced the concept of fluidity in the preferences in the population for local goods and services and Coleman (1966) connected such consumer

choices to school inequity, researchers have looked specifically at the relationship between specific school and socioeconomic variables. One of the more common dependent variables examined was property valuation (Black, 1999; Brasington, 1999; Chiodo et al., 2010). In line with Tiebout's Model that consumers will gravitate to the best public services for a given cost, the use of property valuation provides a true measure of consumer preference (Sonstelie & Portney, 1980). The inclusion of Coleman's identification of quality education as a measure of public service, led this researcher to connect these two theories and examine the relationship between school quality and property values within school catchment areas.

Building upon the work of Tiebout (1956) and Coleman (1966), this researcher provided a mathematical model through which future researchers can interpret the relationship between school quality and property valuation. The methodology employed provided a clear process which can be duplicated and enhanced by others seeking to understand similar relationships in other areas of public service.

Research Design

Defining the relationship, if any, between school quality variables and the equalized assessed valuation of property within a school catchment area, this researcher employed a correlation analysis to better understand the "degree of linear relationship" (Yockey, 2011, p. 158) between each of the variables and the valuation of local residential property values. Understanding the degree and direction of the relationship between variables provided a "better understanding [of] what two different outcomes share with one another" (Salkind, 2011, p. 263), and how they are associated. The Pearson correlation coefficient formula was used for this research, an example of which

is provided below and is represented by a small letter r . The variables studied were represented by the letters x and y . The x depicts the independent school quality variable and y depicts the dependent property valuation variable.

$$r_{xy} = \frac{n \sum XY - \sum X \sum Y}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$$

The correlation coefficient is valued between -1 and 1 with the higher absolute value indicating a stronger relationship between variables (Salkind, 2011). The positive, or direct, valuation indicates that changes in variables move in the same direction. Negative, or indirect, values indicated that changes in variables move in opposite directions. The absolute value of the correlation coefficient is a measure of the strength of that relationship. Values close to 1 or -1 indicate a strong relationship while those closer to zero indicate a weak or non-existent relationship (Salkind).

Once calculated, the correlation coefficient (r_{xy}) was squared and a *correlation of determination* (r^2) calculated. The *correlation of determination* assessed the percentage of variance in the property valuation that was accounted for in the variance in each of the independent variables being studied and was represented as a percentage (Salkind, 2011). Such a valuation of the relationship was essential in defining the relationship between school action/inaction and tax receipts by way of property valuation changes.

The use of correlation coefficients as a measure of the relationship between school quality indicators and property values within the catchment area was not new. Fiva and Kirkeboen (2008) used correlations to study the relationship between school test score performance and local housing values. Black (1999) studied the “relationship between school inputs and outputs” (p. 87), looking specifically at the variables per-pupil expenditures and pupil-teacher ratios. Researching the Chicago area specifically, Downes

and Zabel (2002) used correlations to understand the relationship between neighborhood characteristics and student performance.

The analysis of relationship between school quality indicators and community variables is an appropriate “proxy for the actual conditions or traits that may matter to student learning” (Darling-Hammond, 1999, p. 32). Previous research examining the relationship between school performance and community valuation found positive correlations since the 1940s (Hellfritzsch, 1945). Over time researchers honed the study of communal valuation by examining specific aspects of school quality such as student performance, pupil-teacher relationships, and school funding allocations (Druva & Anderson, 1983; Hawk, Coble, & Swanson, 1985).

The rationale for this research is to refine the work that begun more than a half-century ago to better understand the capitalization of school quality variables into property values within the school catchment area (Oates, 1973; Sonstelie & Portney, 1980). Examining the relationship, if any, that exists between school quality variables such as school spending per-pupil, student performance on standardized test scores, and teacher-pupil ratios and local property values connects the theory first postulated by Tiebout (1956) to the decisions put forth by community leaders today.

Population

The subject is a public school located in a suburban region of a large Midwestern city of the United States. The region of study is one of the most densely populated areas within the Midwest, with a population nearing 3,000,000 inhabitants (United States Census Bureau, 2012). Within the region, this researcher selected an area serving three counties and a population of 830,000 residents. The subject area included a mix of rural

and urbanized communities of varying populations between 7,500 and 35,000 residents each.

Within the study area, data was collected for 150,000 properties. That data was sorted to exclude all but occupied residential property. A randomizing process further refined the parcels to roughly 500 properties for each of the school districts studied. For each parcel, the property valuation assessed by the Township and County Tax Assessor was identified and entered into an Excel spreadsheet and SPSS software. The housing data obtained was public information provided on-line and free of charge. No confidential information was reviewed as part of this effort.

Within the study area, 26 school districts were identified. Thirteen of the studied school districts were located within rural communities and 13 located within urban communities. Using the Northern Illinois University (2013) Report Card database, this researcher was able to obtain data related to each of the school quality variables being researched for the 2013 school year. Specifically, annual spending per pupil, average school performance on the Prairie State Achievement Examination (PSAE) test, and teacher-pupil ratio were obtained and entered into an Excel spreadsheet and SPSS software. The school data obtained was public information provided on-line and free of charge. No confidential information was reviewed as part of this effort.

Data Collection

This researcher utilized multiple sources for the collection of the research data. Information regarding property values, including the EAV, was obtained by way of direct contact with the offices of multiple township assessors. In each case a formal request was made, under the Freedom of Information Act (Illinois General Assembly (96th), 2006),

for a master listing of all properties within the studied communities. Specifically, this researcher obtained information regarding the EAV, property use classification (residential/commercial), occupancy status, and property tax code. The EAV provided a valuation placed on the property for the purpose of assessing taxes. Only properties with a residential use classification that were actively occupied were considered for this study. Individual properties were sorted by property tax code to ensure the assignment of specific properties to the appropriate school district within the study. Where data could not be secured at the township level of government, a request was made to the county assessor for the data. All of the data represented the published assessment data for the calendar year 2013.

Data was collected during the months of January and February, 2014. Waiting until the calendar 2013 year was completed allowed for the collection of the most current data. As the assessment data was not completed until the end of calendar year 2013, this researcher was required to wait until 2014 to begin data collection.

The data was conveyed via electronic media from multiple county and township sources and took the form of an Excel spreadsheet. The data was entered onto a master listing with each community and tax code grouped. The master listing included data from more than 300,000 properties within the research area. As the number of records varied by community, this researcher undertook a process to randomly select between 500 and 550 properties for each of the school districts being studied. Randomization was undertaken by dividing the number of data sources for each school district by 550. The resulting number then became the randomizer, which determined which records were chosen. In one example the dataset contained 7,450 residential properties for a select

school district. The 7,450 number of properties was then divided by 550 to obtain a randomizing value of 14. Applying the randomization value, this researcher then selected every 14th record within the database resulting in 532 records for the select school district. This process was then repeated for each of the 26 school districts studied. The resulting data sample used for this research included 14,279 properties.

Data collection relating to the school quality variables also involved the use of public data that is provided free of charge. Annually, reports outlining the performance of schools (Illinois State Board of Education, 2013) is made available through the Northern Illinois University (2013) Report Card database. The state of Illinois also maintains an on-line database of the school performance report card that is public in nature and free of charge.

Accessing the database in early January, 2014, this researcher was able to secure spending per pupil, student test score performance, and teacher-pupil ratio data for each of the 26 schools within the research population. The data collected measured 2013 school performance, as compiled and reported by a Midwestern state.

Analytical Methods

Seeking to provide a better understanding of the relationship, if any, between the school quality variables of spending per pupil, student performance on test scores, and teacher-pupil ratios, this researcher engaged in a correlation study. The Pearson's r Correlation Coefficient was used to measure the relationship between each of the independent variables and the dependent variable (Yockey, 2011). As no prediction about

the direction of the relationship between the independent and dependent variables was postulated, a two-tailed test was conducted.

The alpha α or p -value was set at less than .05, or $p < .05$ for the purpose of measuring the significance level for the correlation analysis. At a value of $p < .05$, the probability that any relationship identified is the result of chance will be less than 5%.

Examining research question 1. What relationship, if any, exists between property values and school spending across catchment areas? this researcher sought to measure the relationship between local property values and school spending. The independent variable, school spending, was used to measure the relationship, if any, between school average spending and the dependent variable, residential property valuation, within the school catchment area. The school spending data reported by the school to the state was assigned the letter s denoting spending. The property valuation data assigned by the tax assessor was assigned the letter e denoting the EAV. The research population was designated the letter P and the hypothesis the letter H .

A null hypothesis, suggesting that a relationship between the variables does not exist, was formulated as

$$H_0: P_{se} = 0$$

and a research hypothesis, suggesting that a relationship between the variables does exist, was formulated as

$$H_1: P_{se} \neq 0$$

The variables were inserted into the Pearson's r Correlation Coefficient as

$$r_{se} = \frac{n \sum SE - \sum S \sum E}{\sqrt{[n \sum S^2 - (\sum S)^2][n \sum E^2 - (\sum E)^2]}}$$

resulting in a value ranging between -1 and 1, the absolute value of which was used to determine the strength of the relationship between variables (Salkind, 2011). A value closer to zero represented a weak relationship. The negative or positive nature of the value indicated whether the relationship was direct (positive) or indirect (negative) (Yockey, 2011). A scatter plot was used to graphically display the data.

The r_{se} value is then squared to calculate the Correlation of Determination as

$$R^2 = r_{se}^2$$

defining the percentage of the variance in the variable, EAV, that is accounted for by the variance in the variable, spending per pupil (Salkind, 2011). With the data compiled, the findings will be displayed in a correlation matrix created by the SPSS software and recorded within the text as $r_{(n)} = r_{se}$, p value, (r_{se}^2).

Previous research examining the relationship between the two aforementioned variables has focused primarily on the use of regressions (Black, 1999; Edel & Sclar, 1974). The decision by this researcher to conduct a correlational study, rather than regression, was based on the desire to test the interdependence of the variables rather than seek out a one-way effect (Salkind, 2011). In the past, researchers have suggested that no relationship between school quality and property valuation exists (Hanushek, 1986). Others have suggested that the relationship is that of diminishing returns (Edel & Sclar). This researcher employed a simpler and objective approach to examining what relationship, if any, exists – correlation coefficient. Once calculated, the correlation

coefficient was used to determine the effect of said relationship through the calculation of a correlation of determination - measuring the degree of relationship between the variables (Sander, 1992; Sonstelie & Portney, 1980).

Examining research question 2. What relationship, if any, exists between property values and school student performance on state proficiency tests across catchment areas? this researcher sought to measure the relationship between local property values and student performance on standardized tests. The independent variable, state proficiency test score performance, was used to measure the relationship, if any, between schools test scores and the dependent variable, residential property valuation, within the school catchment area. The average test score data reported by the school to the state was assigned the letter t denoting test scores. The property valuation data assigned by the tax assessor was assigned the letter e denoting the EAV. The research population was designated the letter P and the hypothesis the letter H .

A null hypothesis, suggesting that a relationship between the variables did not exist, was formulated as

$$H_0: P_{te} = 0$$

and a research hypothesis, suggesting that a relationship between the variables does exist, was formulated as

$$H_1: P_{te} \neq 0$$

The variables were inserted into the Pearson's r Correlation Coefficient as

$$r_{te} = \frac{n \sum TE - \sum T \sum E}{\sqrt{[n \sum T^2 - (\sum T)^2][n \sum E^2 - (\sum E)^2]}}$$

resulting in a value ranging between -1 and 1 the absolute value of which will be used to determine the strength of the relationship between variables (Salkind, 2011). A value closer to zero represents a weak relationship. The negative or positive nature of the value indicated whether the relationship was direct (positive) or indirect (negative) (Yockey, 2011). A scatter plot was used to graphically display the data.

The r_{ce} value is then squared to calculate the Correlation of Determination as

$$R^2 = r_{te}^2$$

defining the percentage of the variance in the dependent variable, EAV, that is accounted for by the variance in the independent variable test scores (Salkind). With the data compiled, the findings will be displayed in a correlation matrix created by the SPSS software and recorded within the text as $r_{(n)} = r_{te}$, p value, (r_{te}^2) .

The use of relationship measures to study the correlation between residential property valuation and student test performance is found in research across the United States and Europe (Edel & Sclar, 1974; Fiva & Kirkeboen, 2008; Haurin & Brasington, 1996). Following a process similar to that of this research, r and R^2 have been used specifically to study the relationship between student test scores and property values within a school catchment area (Sonstelie & Portney, 1980). Studying similar populations within suburban regions of large Midwestern cities, the use of correlations has become an accepted measure (Brasington, 1999; Downes & Zabel, 2002).

Examining research question 3. What relationship, if any, exists between property values and teacher-pupil ratios across school catchment areas? this researcher sought to measure the relationship between local property values and class size. The independent variable, teacher-pupil ratio, was used to measure the relationship, if any, between schools average class size and the dependent variable, residential property valuation, within the school catchment area. The average class size data reported by the school to the state was assigned the letter c denoting class size. The property valuation data assigned by the tax assessor was assigned the letter e denoting the EAV. The research population was designated the letter P and the hypothesis the letter H .

A null hypothesis, suggesting that a relationship between the variables does not exist, was formulated as

$$H_0: P_{ce} = 0$$

and a research hypothesis, suggesting that a relationship between the variables does exist was formulated as

$$H_1: P_{ce} \neq 0$$

The variables were inserted into the Pearson's r Correlation Coefficient as

$$r_{ce} = \frac{n \sum CE - \sum C \sum E}{\sqrt{[n \sum C^2 - (\sum C)^2][n \sum E^2 - (\sum E)^2]}}$$

resulting in a value ranging between -1 and 1 the absolute value of which was be used to determine the strength of the relationship between variables (Salkind, 2011). A value closer to zero represented a weak relationship. The negative or positive nature of the

value indicated whether the relationship was direct (positive) or indirect (negative) (Yockey, 2011). A scatter plot was used to graphically display the data.

The r_{ce} value is then squared to calculate the *Correlation Determination* as

$$R^2 = r_{ce}^2$$

defining the percentage of the variance in the dependent variable, EAV, that is accounted for by the variance in the independent variable, class size (Salkind, 2011). With the data compiled, the findings will be displayed in a correlation matrix created by the SPSS software and recorded within the text as $r_{(n)} = r_{ce}, p \text{ value}, (r_{ce}^2)$.

The use of housing valuation as a variable in understanding the impact changes in teacher-pupil ratios is not new. Harrison and Rubinfeld (1978) used correlations to examine, among other things, the relationship between communal quality of life variables, such as school district class size and air pollution levels, against property valuation within the Boston metropolitan area. Correlations were also used by Bloomquist et al. (1988) examining class size as it related to property values within major metropolitan urbanized areas. Similar to work of this researcher, Harrison and Rubinfeld used correlation coefficients to better understand the relationship between class size and housing values within the community. Clark and Herrin (2000) and Brasington (1999) used spatial autocorrelation model to study the relationship between class size and property values. The uses of hedonic models and regressions have also been used effectively by researchers examining school quality indicators and property values. However, such research is often examining data collected over a series of years and from a much larger population (Clark & Herrin, 2000) and was not deemed appropriate for use by this researcher. Instead, this researcher determined that the study of relationships using

the correlation coefficient is the most appropriate measure for the relationship between teacher-pupil ratios and property values. Understanding the relationship, if any, between class size and property values is an appropriate first step in directing future research into the impact of communal variables on property values.

Limitations

Researching relationships between quality of life variables is challenging.

Tiebout (1956) postulated that valuation of preference is a “matter of degree approximating the ‘ideal’ market solution” (p. 241). True mobility and fluidity within the housing market does not exist in real world. Further, multiple variables, beyond those being studied, confound the measure of relationship (Black, 1999). The diverse ethnic, racial, and socioeconomic demographics of the population examined within one’s study are examples of confounding variables beyond the scope of this research.

The collection of property data, while public in nature, was not without difficulty. Data collection and reporting formats were different across townships and counties. Most jurisdictions had multiple tax codes as taxing districts, including schools, which crossed municipal borders. Within the rural counties, data was made available at the township and county level. Townships within the urban county did not provide a mechanism to share data; data requests were handled by a single individual for the entire county requiring multiple submittals and phone calls. The procurement of public information on a single parcel level was easily obtained via the County Assessor’s website. However, wholesale data on a district- or community-wide level was bureaucratic and cumbersome. Obtaining specific tax code listings and district maps required multiple phone calls and

assistance from elected officials. This limitation may dissuade future researchers from obtaining such essential data.

School data, while much easier to obtain, was less plentiful. Within the study area only 26 public school districts existed. This limited the data that could be collected for each of the independent variables. While limited in data sources, school data was easily obtained from public databases (Northern Illinois University, 2013, Illinois State Board of Education, 2013). The school data was matched with the appropriate residential property data tax code and entered into Excel and SPSS software.

While easily accessible, school data is comprehensive in nature. A single, average, score is provided for the entire student body. Such limitation restricts the grade level performance information of students. Further, socioeconomic data for students within the school district was not broken down by individual schools (Downes & Zabel, 2002). Such information would have been valuable in further refining the study samples.

Researchers seeking to study a large metropolitan area will likely struggle with the limited number of school districts and the manner in which they report data. While many districts include multiple schools, reporting of quality indicators includes only a single listing for each indicator districtwide. Such reporting techniques limit the data and individual schools that can be studied.

The data collection within the study was limited to a single year to avoid the influence of extraordinary housing market trends associated with the economic decline of the last five years. The destabilization of the housing market that began in 2007 remains a limitation to any research using real estate valuation as a variable. Seeking to understand the relationship between school quality variables and property values within the school

catchment area is complicated by an unstable housing market. The economic boon of the early 2000s and the decline later in the decade caused erratic changes in property valuation within the Midwest housing market. In an effort to blend the impact of such fluctuations in value, the tax assessor calculates the EAV of individual properties over a three-year average. Any effort by this research to examine data over multiple years would have rendered housing data subject to the instability of valuation fluctuations and thus unreliable when compared from one year to the next year.

Summary

Determining the variability shared between two variables (Salkind, 2011) is at the very essence of this research. Seeking to value relationships between variables, this researcher employed a correlation study. Pearson's Correlation Coefficient formula was identified as the appropriate formula and the correlation coefficient value the descriptive measure of the relationship. Diverse and extensive data was collected from reliable sources to ensure accurate results.

In the pages that follow, the relationship, if any, that exists between school quality variables and local property values is quantified. The null and research hypothesis are accepted or rejected, the correlation coefficient tabulated, and the strength and nature of each relationship assessed. Displayed within a correlation matrix and scatter plot diagram, visual representations of the correlation assist in the interpretation of the calculated results.

CHAPTER IV

FINDINGS AND CONCLUSIONS

Introduction

If, as Tiebout suggested, our environment is “one in which the consumer shops among different communities” (as cited in Oates, 1969, p. 957), seeking the public education services that best serve their personal preferences, then research providing insight into the relationship between such variables and home values is valuable for entities seeking to maximize the benefit of such programs (Edel & Sclar, 1974). School districts, faced with ever decreasing tax revenue, are well served by research seeking to explain the relationship, if any, between initiatives funded by the school and the property values that ultimately provide school funding via property taxes. Focusing research on the relationship between property valuation within a school catchment area and three school quality indicators: 1. school per-pupil spending; 2. student performance on standardized test scores; and 3. teacher-pupil ratios, this researcher introduces findings further building upon the work of previous researchers.

In the previous chapter, the Pearson correlation coefficient (r) was introduced as the research design tool employed to assess the relationship, if any, between the school quality variables and local property values. The correlation coefficient is used to measure the strength of the relationship between the studied variables. This relationship can be direct (positive) or indirect (negative) measured on a scale of -1 to 1. Measurements closer to the outer extremes of the range are deemed to represent the indication of strong

relationships. Further, the correlation of determination (r^2) was presented as a tool to value the percentage of variance change in each studied variable attributable to the change in local property values.

The unique population attributes of the studied area resulted in large amounts of property valuation data attributed to a small number of school catchment areas. The use of randomization reduced the data set for each school catchment area to 550 residential properties. Simplifying the process further, a mean EAV was calculated for each catchment area to allow for a single observation data point comparison between the property valuation and the school quality variable examined.

In the pages that follow, this researcher will examine the relationship between school quality and property values first introduced by Tiebout (1956) and Coleman (1966) building upon similar research of the last twenty years (Brasington, 1996; Downes & Zabel, 2002; Hayes & Taylor, 1996; Jackson & Bruegmann, 2009; Lavy & Schlosser, 2007) to further the assistance to local school districts seeking to enhance property tax revenue via enhanced property values.

For each of the previously introduced research questions: 1. what relationship, if any, exists between property values and school per-pupil spending across school catchment areas; 2. what relationship, if any, exists between property values and student performance on state proficiency scores across school catchment areas; and 3. what relationship, if any, exists between property values and school teacher-pupil ratios across school catchment areas; a correlation coefficient (r) and correlation of determination (r^2) will be calculated and presented in table and chart format. Once

the analytical methods are completed, the results will be interpreted and incorporated into a summary conclusion.

Findings

Research Question 1. What relationship, if any, exists between property values and school per-pupil spending across school catchment areas?

Seeking to answer the first research question “What relationship, if any, exists between property values and school per-pupil spending across school catchment areas,” this research strived to reject the null hypothesis

$$H_0: P_{se} = 0$$

instead, finding the research hypothesis, suggesting that a relationship between the variables, does exist

$$H_1: P_{se} \neq 0$$

Utilizing SPSS software, the Pearson’s r Correlation Coefficient was employed and the null hypothesis rejected ($r_{(14,279)} = -.277$). As outlined in Table 1, the relationship between property values and school per-pupil spending (Research Question 1.), yielded the following results: $r_{(14,279)} = -.277$, $p = .01$ ($r^2_{se} = .08$). The resulting r value of $-.277$ indicates that an indirect (negative) relationship exists between property values and school spending per pupil. This relationship is represented graphically in Figure 1. With a p value of $.01$, the results are significant, with a 1% probability that they are attributable to chance. With the absolute value of the r near $.2$, the relationship is weak. The r^2 value

of .08 is interpreted as 8% of the variance in EAV and is accounted for by the variance in school spending.

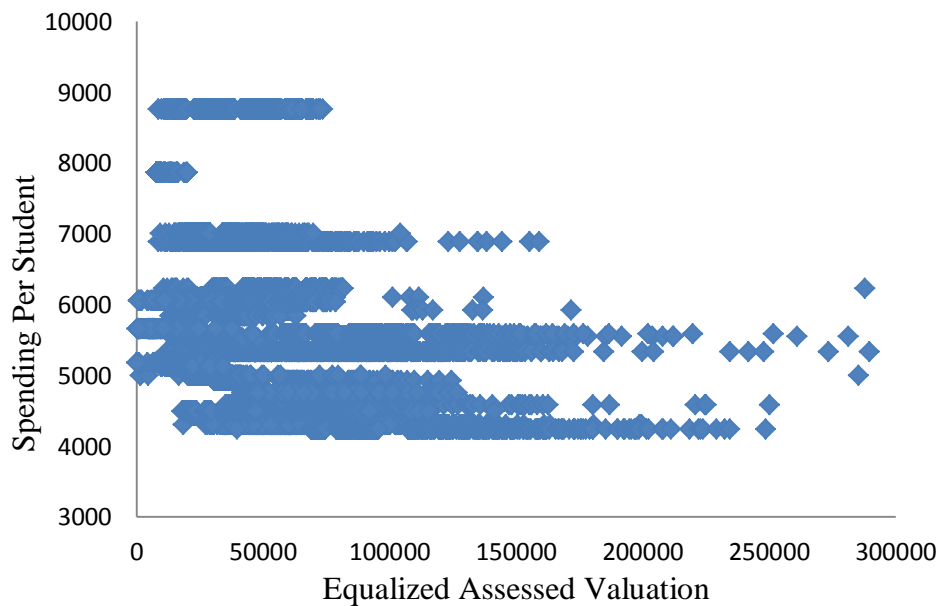
Table 1

Pearson's Correlation Coefficient Examination of Relationship Between Variables Spending per Student and Property Valuation (EAV)

	<i>n</i>	<i>r</i> value	<i>Sig.</i>	<i>R</i> ²
Spending	14279	-.277	.01	.08

Figure 1

Pearson's Correlation Coefficient Examination of Relationship Between Variables Spending per Student and Property Valuation (EAV)



Removing the redundant observations resulting from multiple data points for each school observation, this researcher calculated the mean EAV for each of the 26 school districts. The mean value was then treated as a single observation and assessed against the single school quality variable for each school catchment area. The resulting

correlation coefficient increased to $-.340$ as outlined in Table 2. This relationship is represented graphically in Figure 2. The relationship between spending per student is indirect in nature and statistically significant. While the relationship is moderate and indirect, a relationship exists nonetheless.

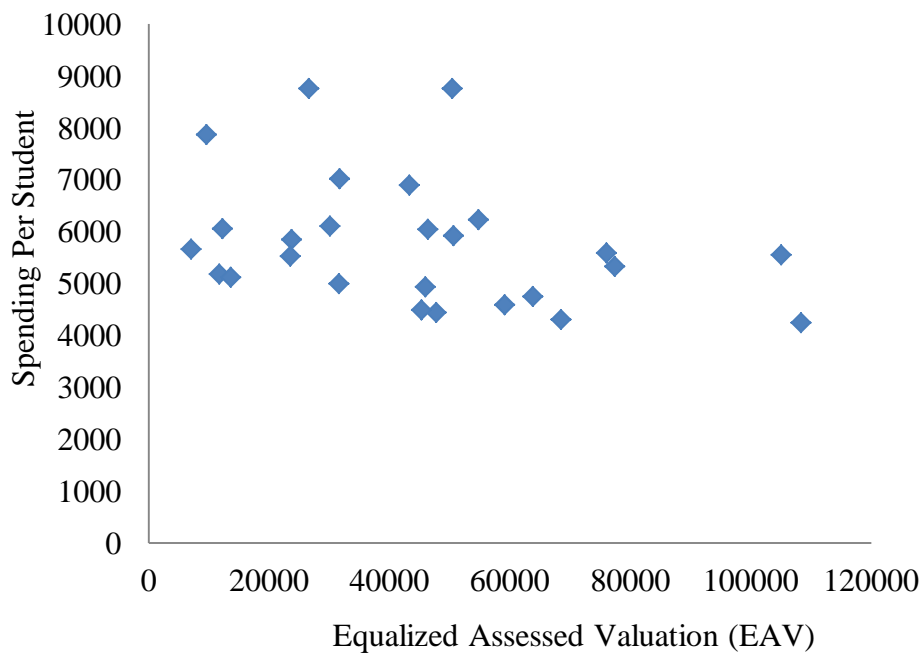
Table 2

Pearson's Correlation Coefficient Examination of Relationship Between Variables Spending per Student and the Mean Property Valuation (EAV) per Catchment Area

	<i>n</i>	<i>r</i> value	<i>Sig.</i>	R^2
Spending	26	$-.340$.01	.12

Figure 2

Scatter Plot Display of Relationship Between Variables Spending per Student and the Mean Property Valuation (EAV) per Catchment Area



Research Question 2. What relationship, if any, exists between property values and student performance on state proficiency scores across school catchment areas?

Moving to the second research question What relationship, if any, exists between property values and student performance on state proficiency scores across school catchment areas, this research endeavored to rejection the null hypothesis

$$H_0: P_{te} = 0$$

instead, finding the research hypothesis, suggesting that a relationship between the variables, does exists

$$H_1: P_{te} \neq 0$$

Utilizing SPSS software, the Pearson's r Correlation Coefficient was employed and the null hypothesis rejected ($r_{(14,279)} = .432$). As outlined in Table 3, the relationship between property values and school student performance on test scores (Research Question 2.), yielded the following results: $r_{(14,279)} = .432$, $p = .01$ ($r^2_{te} = .19$). The resulting r value of .432 indicates that a direct (positive) relationship exists between property values and student performance on test scores. This relationship is represented graphically in Figure 3. As the p value is equal to .01, the results are significant, with a less than 1% probability that they are attributable to chance. With the absolute value of the r well above .2, the relationship is moderately strong. The r^2 value of .19 is interpreted as 19% of the change in EAV and is accounted for by the variance in test scores.

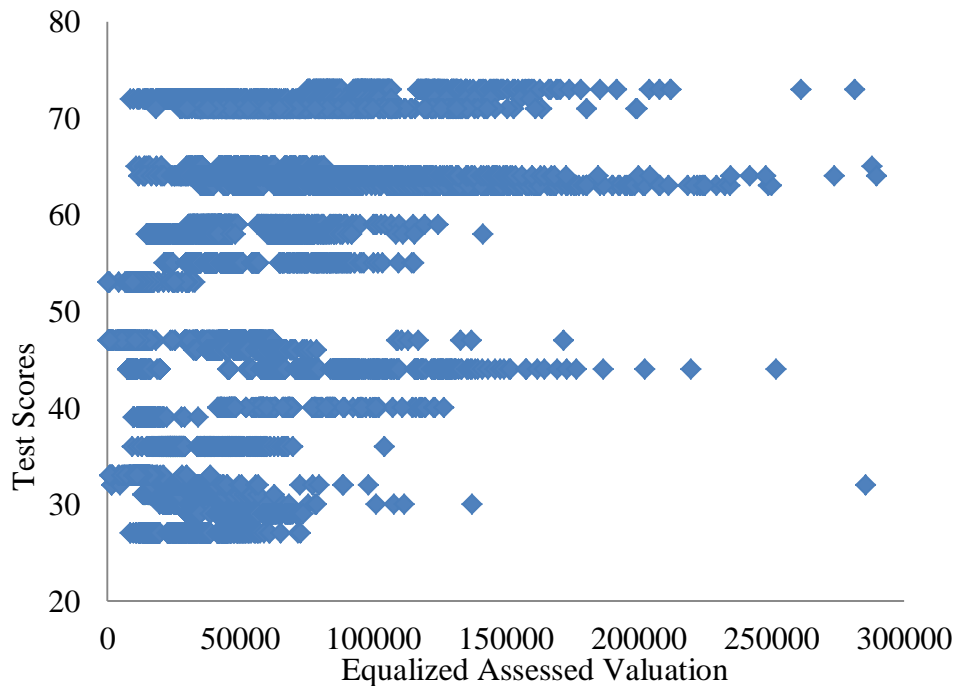
Table 3

Pearson's Correlation Coefficient Examination of Relationship Between Variables Test Scores and Property Valuation (EAV)

	<i>n</i>	<i>r</i> value	<i>Sig.</i>	<i>R</i> ²
Test Scores	14279	.432	.01	.19

Figure 3

Pearson's Correlation Coefficient Examination of Relationship Between Variables Test Scores and Property Valuation (EAV)



Removing the redundant observations resulting from multiple data points for each school observation, this researcher calculated the mean EAV for each of the 26 school districts. The mean value was then treated as a single observation and assessed against the single school quality variable for each school catchment area. The resulting direct correlation coefficient increased to .550 (Table 4), further affirming a strong correlation

between the variables (Figure 4). The new r^2 value of .30 was interpreted as 30% of the variance in EAV and is accounted for by the variance in test scores. This finding is indicative of a strong correlation between student performance on test scores and property values within the school catchment area.

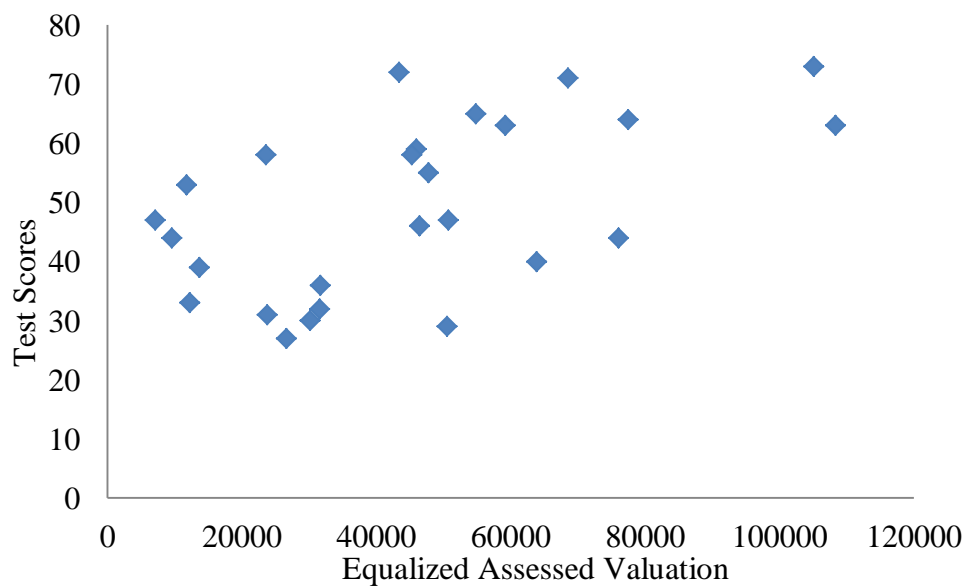
Table 4

Pearson's Correlation Coefficient Examination of Relationship Between Variables Student Test Scores and the Mean Property Valuation (EAV) per Catchment Area

	n	r value	Sig.	R²
Test Scores	26	.550	.01	.30

Figure 4

Pearson's correlation coefficient examination of relationship between variables test scores and property valuation (EAV)



Research Question 3. What relationship, if any, exists between property values and school teacher-pupil ratios across school catchment areas?

Finally, the third research question What relationship, if any, exists between property values and school teacher-pupil ratios across school catchment areas, was examined in an effort to reject the null hypothesis

$$H_0: P_{ce} = 0$$

instead, finding the research hypothesis, suggesting that a relationship between the variables, does exists

$$H_1: P_{ce} \neq 0$$

Utilizing SPSS software, the Pearson's r Correlation Coefficient was employed and the null hypothesis barely rejected ($r_{(14,279)} = -.094$). As outlined in Table 5, the relationship between property values and school teacher-pupil ratios (Research Question 3.), yielded the following results: $r_{(14,279)} = -.094, p = .01$ ($r^2_{ce} = .01$). The resulting r value of $-.094$ indicates that an indirect (negative) relationship exists between property values and school spending per pupil. This relationship is represented graphically in Figure 5. As the p value is equal to $.01$, the results are significant, with a less than 1% probability that they are attributable to chance. With the absolute value of r less than $.2$ and close to zero, the relationship is very weak – nearly nonexistent. The r^2 value of $.01$ is interpreted as 1% of the variance in EAV is accounted for by the variance in teacher-pupil ratios.

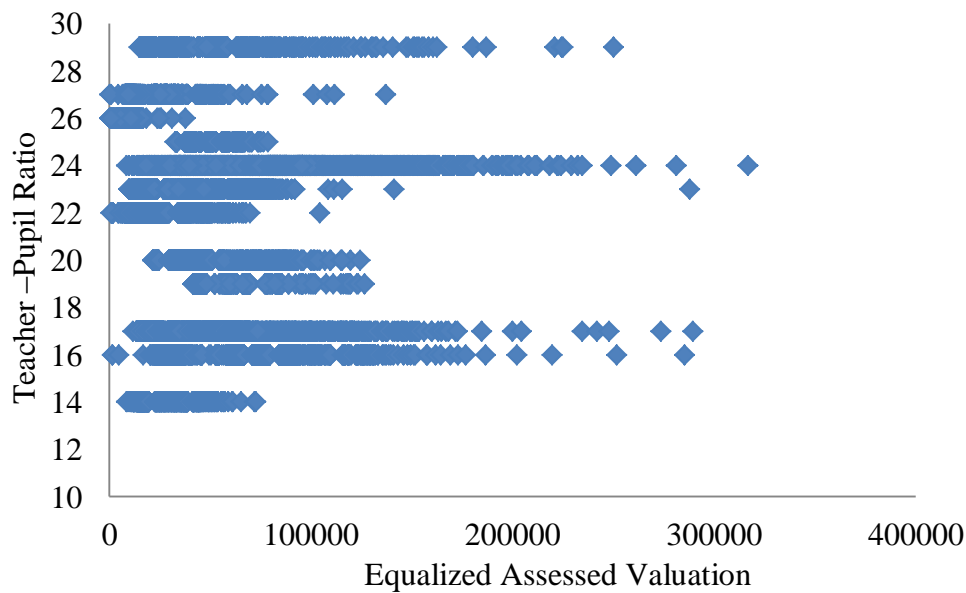
Table 5

Pearson's Correlation Coefficient Examination of Relationship Between Variables Teacher-Pupil Ratio and Property Valuation (EAV)

	<i>n</i>	<i>r</i> value	<i>Sig.</i>	<i>R</i> ²
Teacher-Pupil Ratio	14279	-.094	.01	.01

Figure 5

Pearson's Correlation Coefficient Examination of Relationship Between Variables Teacher-Pupil Ratio and Property Valuation (EAV)



Removing the redundant observations resulting from multiple data points for each school observation, this researcher calculated the mean EAV for each of the 26 school districts. The mean value was then treated as a single observation and assessed against the single school quality variable for each school catchment area. The new correlation coefficient, increasing to $-.106$ (Table 6), increased only moderately. This relationship is represented graphically in Figure 6.

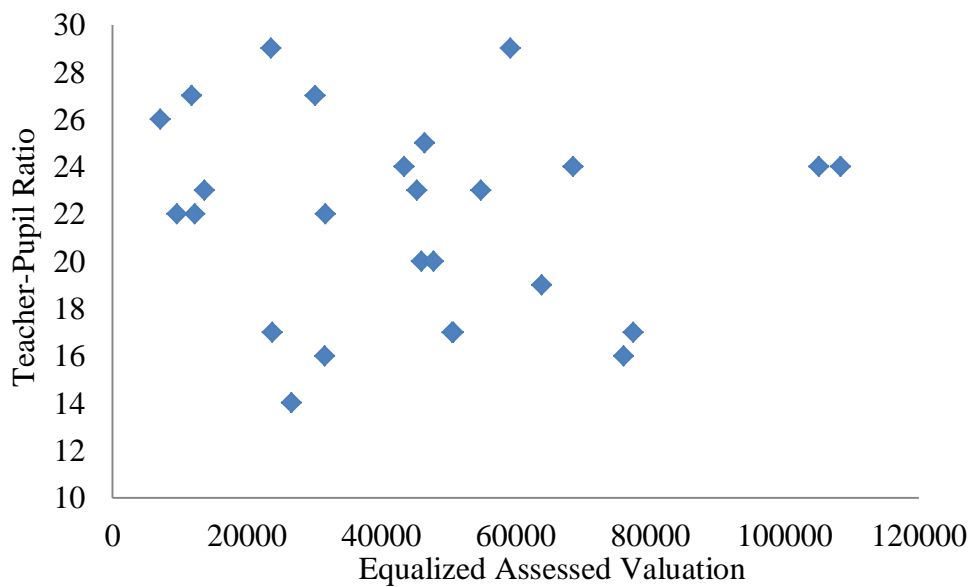
Table 6

Pearson's Correlation Coefficient Examination of Relationship Between Variables Teacher-Pupil Ratio and the Mean Property Valuation (EAV) per Catchment Area

	<i>n</i>	<i>r</i> value	<i>Sig.</i>	<i>R</i> ²
Teacher-Pupil Ratio	26	-.106	.01	.01

Figure 6

Pearson's Correlation Coefficient Examination of Relationship Between Variables Teacher-Pupil Ratio and Property Valuation (EAV)



Each of the aforementioned school quality variables were determined to be related to property values within the school catchment areas they serve. This relationship was found to be statistically significant ($p = .01$) for each of the variables. The measure of the relationship was more pronounced with the single property EAV valuation $r_{(26)}$ for each of the 26 school districts than that of the larger population sample $r_{(14,279)}$. In the pages that follow, this researcher will abstract the salient details from the previous findings and

construct specific conclusions regarding one's interpretation of the data assessment outcomes.

Conclusion

Reviewing the findings of one's research and assessing it against the research of others examined herein, this researcher settles on three conclusions: 1. within the Midwestern United States, school quality variables are related to property values within the school catchment areas; 2. the relationship is different for each variable and is likely to be impacted by confounding variables related to socioeconomic and demographic differences (Black, 1999; Kane et al., 2005); 3. school funding should focus on programs that result in improved test score performance (No Child Left Behind, 2001).

Home buyers within school catchment areas of the Midwest value school per-pupil spending ($r_{(14,279)} = -.277, p = .01 (r^2_{se} = .08)$); the reported test scores of students within school catchment areas ($r_{(14,279)} = .432, p = .01 (r^2_{te} = .19)$); and the teacher-pupil ratios within the school ($r_{(14,279)} = -.094, p = .01 (r^2_{ce} = .01)$). That value is reflected in the equalized assessed valuation of residential properties within the school district.

The relationship between student performance on test scores and changes in property valuation is direct. An improvement in scores is perceived by the housing market positively through enhanced property values. Declining performance is viewed negatively by the housing market. This researcher found a fairly robust correlation coefficient ($r_{(14,279)} = .432, p = .01 (r^2_{te} = .19)$; $r_{(26)} = .550, p = .01 (r^2_{te} = .30)$), suggesting a moderately strong correlation between test score performance and property valuation within the catchment area. The $r_{(26)} = .550$ valuation resulted in a correlation

determination of .30, suggesting that 30% of the change in property valuation is related to the change in test scores. This finding of a strong correlation between student performance on test scores and property values within the school catchment area is in line with previous research on the subject (Black, 1999; Downes & Zabel, 2002; Fiva & Kirkeboen, 2008; Haurin & Brasington, 1996; Kane et al. 2003).

To a lesser degree, home buyers value school spending per student within the school district ($r_{(14,279)} = -.277, p = .01$ ($r^2_{te} = .08$) and $r_{(26)} = -.340, p = .01$ ($r^2_{te} = .12$). An increase in spending per student is deemed to be indirectly related to the valuation placed on residential property by home buyers. Increased school spending is correlated with decreased home valuation within the school district. The moderately weak correlation coefficient, while significant, is not sufficient to conclude that the spending per student values reported by the school districts is highly valued, even negatively, by the home buying consumer. This finding is in line with previous research suggesting that additional funding does not bring about better education (Hanushek, 1986; Hoxby, 1996), and contradicting those who suggested that funding is positively related (Black, 1999; Brasington, 1999; Sonstelie & Portney, 1980).

Teacher-pupil ratios within the school district are scantily related to changes in home values within a school catchment area ($r_{(14,279)} = -.094, p = .01$ ($r^2_{te} = .01$) and $r_{(26)} = -.106, p = .01$ ($r^2_{te} = .01$)). The weak coefficient is indicative of a variable only slightly related to changes in home valuation within the catchment area. The weak correlation coefficient, while significant, is not sufficient to conclude that the teacher-student ratio reported by the school districts is highly valued by the consumer. Instead, it is likely that no relationship exists. Finding only a miniscule relationship between teacher-pupil ratios

and property values within the school catchment area is consistent with previous research, suggesting that other variables are deemed more important by the housing market (Clapp et al., 2008; Darling-Hammond, 1999; Hanushek et al., 1996; Hanushek et al., 2005). While class size has been found to be related to performance on standardized tests such as the ACT (Sander, 1993), the correlation to property value changes is less defined when pooled with a considerable amount of communal quality variables (Oates, 1969).

Complicating one's research is the variety of confounding socioeconomic variables related to the study area. School spending in the Midwest, some of the worst and segregated in the nation (Moeller, 2011), is complicated by socioeconomic variables unique to the individual school districts studied (Black, 1999; Fry & Winters, 1970; Gramlich & Rubinfeld, 1982; Malpezzi et al., 1998) and the unique past performance of the individual school (Oates, 1973). Perplexing is the negative correlation between increased school funding and local property values. While previous research has effectively argued the merits of the positive impact of additional per-student spending (Brasington, 1999; Hoxby, 1996; Sander, 1993), few, if any, have indicated a negative correlation. This researcher concludes that this unique determination is the result of confounding variables related to the unique variety of the study area.

Student performance on test scores, while strongly related, were likely confounded by the individual school curriculum variations intended to bolster test scores in response to legislative mandates such as No Child Left Behind (2001). Test scores have long been argued to be a function of the school and communal environment

(Coleman, 1966). Without adjusting for the impact of socioeconomic neighborhood characteristics, one risks overstating the relationship between test scores and property valuation (Black, 1999; Clapp et al., 2008). Further, the reported single test score for an entire school district ignores the diversity occurring within the individual school catchment areas within the district. Brasington (1999) pointed to the peer effect within school environments as a valuation on the students rather than the school district. Fiva and Kirkeboen (2008) contend that the manner in which the school disseminates information about test scores may also play a role in property valuation.

The use of class size as a measure of school quality valued by the housing market has long been mired by confounding variables. The relationship between class size and student performance valuation varies depending on student ethnicity (Jencks & Phillips, 1998), teacher-student cultural similarity (Clapp et al., 2008), teacher experience (Darling-Hammond, 1999), and teacher pay (Hanushek et al., 2005). Researchers have suggested that the relationship between class size and school valuation is grounded in public perception rather than student performance (Clark & Herrin, 2000; Fiva & Kirkeboen, 2008).

School funding programs such as No Child Left Behind (2001) requiring schools to improve test scores or lose funding are in line with one's findings that test score publication relates positively to property valuation (Figlio & Lucas, 2004; Fiva & Kirkeboen, 2008). Programs that incentivize student performance on standardized tests are essential in enhancing property valuation and future tax revenue. Conversely, state and local funding programs geared at furthering economic development within a

community should look to funding programs geared at test score performance in local schools. The acknowledgement of student performance on test scores as an effective tool in enhancing property values allows for the reclassification of funding for such programs as economic development within blighted communities.

Since the creation of the first TIF District in the 1950's, a debate has raged regarding the use of development generated school tax dollars as an incentive to further such development. The basis of the argument supporting the reallocation of TIF funding away from the schools and to the local municipality is the belief that such efforts, in the end, raise property values and taxes to the long term benefit of all, including the schools. School districts have failed to argue that such funding should be returned to the schools rather than used by the municipal government because they have failed to provide a nexus to connect funding school programs with economic development. One's research suggests that such a relationship exists in the form of student performance on test scores. Such findings may provide a basis upon which schools could argue that they are, in fact, able to bring about economic development and positive property valuation growth with programs under school district control.

Finding that school quality variables are related, in varying degrees, to local property values, this researcher will now endeavor to define the implications of one's research on future research in the area and funding programs across the Midwestern United States. The implications and recommendations to follow are to serve as a foundation upon which future researchers, elected officials and school administrators will

act to enhance the understanding of the relationship between school quality and local property values.

Implications and Recommendations

In the pages that follow, this researcher will expound upon the following four real world implications taken from this research: 1. School districts can play a role in the enhancement of property tax revenue; 2. legislation seeking to enhance school funding should focus on school quality indicators with emphasis on test score performance; 3. economic development initiatives (local and regional) should consider school quality indicators as economic development tools; 4. energy directed at increasing school tax revenue should gravitate away from tax rate increasing referenda and shift to school student performance measure – and the following three research implications: 1. researchers examining school quality indicators and the impact on local property valuation should, to the extent possible, account for confounding variables related to socioeconomic and regional diversity; 2. future research studying the relationship between school quality variables such as per-pupil spending, student performance on test scores, and teacher-pupil ratios should include parochial and charter school data within the study; 3. further research is warranted examining the relationship between school quality variables and property values over time.

Within one's research, understanding the relationship, albeit diverse, which existed between school quality variables and local property values was paramount. However, underlying the research was the hope that such research would provide fodder for the debate surrounding school funding inequality that has raged for nearly 50 years

(Coleman, 1966; Fischel, 1989; Illinois General Assembly (97th), 2009; Illinois General Assembly (98th), 2011; Reed, 1998; Wheeler, 1990). The translation of research methodologies into real life implications and recommendations set the tone for a new way of looking at school funding programs. This process entails the use of real world and research implications.

The real world implications introduced herein are designed to be straightforward and logical so as to provide a concise and easily shared message. They speak to researchers, legislators, school officials, and everyday citizens in a manner all can understand. This unpretentious approach to implications is not designed to seek a simplified consensus, although that would be well received; it is intended to draw all parties into the fray on a level wherein all opinions matter and can be heard. Conversely, the research recommendations offered herein are presented primarily for future researchers. The recommendations touch upon areas wherein this researcher fell short and future research may be strengthened.

The first, and most poignant real world recommendation put forth by this researcher, involves the role of school districts in enhancing their own tax revenue. As outlined previously, a moderately strong correlation coefficient supports the contention that student test scores, as reported by the school districts, are highly valued by the home buying consumer within the school catchment area. To a lesser extent, school per-student spending and teacher-pupil ratios are also valued by home buyers. Thus, this researcher suggests that school districts can play a role in enhancing local property values and the associated property tax revenue attributed to those values. Districts seeking to increase property tax revenue through enhanced property values within the district would be well

served by efforts within the district to improve student test scores, lower class size, and avoid publication of increased student spending. School districts seeking to enhance the valuation of local property within the school district should, to the extent possible, focus their teaching curriculum and funding on improving student performance on standardized test scores reported to the state. Further, the marginal relationship between teacher-pupil ratios and property values within a school catchment area supports the contention that class size is less valued within the study area and thus, not as good of a mechanism for schools seeking to increase property values within the catchment area.

The second real world implication is directed at legislators plagued by the debate regarding school funding inequity across the nation (Moeller, 2011). This debate centers on the need for additional funding in the inner city school districts where economic decline has resulted in diminished tax revenue (Scott, 2000). Legislators introducing legislation creating new revenue sources or redistributing existing funds are meeting strong opposition from those unable to see value in simply throwing money at the problem (Illinois General Assembly (97th), 2009). This researcher contends that the efforts of legislators like Senator Meeks of Illinois to increase tax revenue or reapportion existing receipts are misplaced. Tax increases or reallocation of existing funding is a politically unpopular position for any legislator and will always bring about strong opposition. On the contrary, economic development has long been an area of agreement between politicians. Thus, it stands to reason that legislative efforts to increase school funding that focus on economic development and community rejuvenation are more likely to be approved.

The introduction of politics and community revitalization through economic development serve as an introduction of the third real world implication suggesting that school quality, and the enhancement of property values school programs manipulate, be tied to economic development funding initiatives. Legislators have long struggled with the issue of accountability. Tying economic development funding to school performance indicators provides elected officials a solid base from which such initiatives can be launched. Economic development funds earmarked to increase test scores would be touted as tools to increase property values and enhance community wealth. Unlike No Child Left Behind, schools unable to bring about test score increases would be considered for further funding to bring about that effort rather than experience funding cuts.

Finally, real world implication four advises schools to redirect energy used in local referenda toward school performance measures enhancing property values. As school districts are increasingly dependent on local property tax revenue to fund curriculum, it is essential that schools seek out opportunities to increase the local tax base. In the past, school districts have sought additional tax funding from the local taxpayers by way of local referenda seeking increase property tax rates. Often the referenda process takes years and occupies a great deal of volunteer time to mobilize. Local taxpayers are often asked to serve on advisory boards and solicit support from voters within the community. The resulting community effort brings a diverse group of educators, business owners, and residents together to further the tax increase agenda. This researcher suggests that such energy be directed at the enrichment of school quality indicators and the public dissemination of such efforts. The broadcasting of such efforts

and successes would allow for an accelerated valuation by the public (Fiva & Kirkeboen, 2008).

Transitioning away from the real world implications and toward research implications is predicated on the desire to encourage and inspire further investigation into the relationship between school quality variables and valuation by home purchasers. As such, the research implications focus on specific elements of one's research that should be considered by future researchers hoping to build upon this work.

The first research implication concentrates on the need to account, to the degree possible, for confounding variables within one's research (Black, 1999; Brasington, 1999; Downes & Zabel, 2002). Examining the relationship between school spending and home values within the school catchment area, this researcher found an indirect relationship between the variables. This finding, on its surface, seems to indicate that schools should avoid spending additional funding per student if they want property values to improve within the catchment area. However, this finding seems contrary to common sense and is likely the result of confounding socioeconomic variables that distort the statistical findings. Downes and Zabel attempted to account for such variables by modeling inter- and intra-district data, Sander (1993) used a larger data set, and Black used adjoining school districts to avoid diversity in sample data. Regardless of the methodology used to account for confounding variables, future researchers must attempt to quantify the impact such variables have on the study of the relationship between school quality variables and property values. Doing so will enhance the purity of the research findings while providing fodder for further research into the area of other such variables (Heyneman & Loxley, 1983).

The second research implication involves the inclusion of local schools beyond those within this researcher's study data set. The school data set utilized herein was limited to public school districts and did not include any parochial institutions. Previous research examining the influence of private schools on local property values (Bradbury et al., 2001; Brasington, 2000) should be incorporated into future research studying the relationship between school performance and property valuation. The inclusion of such schools is especially pertinent in areas with poor performing public schools (Downes et al., 1998). The availability of private institutions within the study area may warrant subgrouping classifications of data sets to assess the impact of such options within the catchment area. In addition, the expansion of charter schools within the urbanized public school system ought to be embedded in future research.

The third, and final, research implication encourages future researchers to maximize the time span of the sample data collection. The use of notable historic data in publically available databases provide an opportunity to examine relationships over greater periods of time (Jencks & Phillips, 1998). Such elongated examinations flush out changing conditions within the study area and short-term anomalies (Brasington, 1999; Clark & Herrin, 2000; Downes & Zabel, 2002; Figlio & Lucas, 2004; Kane, Staiger, & Samms, 2003). They also assist in measuring the stability of relationship changes as school quality program information is dispersed into the local culture (Fiva & Kirkboen, 2008).

School districts across the nation are struggling under the weight of declining tax bases and increased performance measures. The current system is broke, literally and figuratively. Without the introduction of new methodologies for enhancing school

funding, schools in disadvantaged regions will continue to struggle to provide a quality education on par with wealthier districts. The state and federal government have shown limited interest in funneling more money into, what many perceive to be, a failed system. It is now incumbent upon the schools to take control of their destiny and seek a role in improving tax revenue. This research provides a tool that school districts may utilize to support funding programs improving test scores, lobby legislators, or simply improve the lives of the students and the community overall. Most importantly, this research unites those interested in improving education to maximize their own utility (Tiebout, 1956) with those looking to address inequity within public education system (Coleman, 1966) by connecting school performance measures with local property valuation providing a platform from which changes in school funding can begin.

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