School Vouchers and Home Prices: Premiums in School Districts Lacking Public Schools

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Abstract:

Vermont has numerous school districts lacking traditional public schools. In these jurisdictions, families are provided school vouchers. Using a sample of 2,933 single-family home purchase transactions, we examine residential property values in areas with vouchers as compared to those with assigned schools. We find robust evidence that these vouchers increase home values. We also find that home values are increasing in the number of alternative schooling options available within reasonable commuting distances. Finally, homes with access to schools that are better than the closest school, as defined by standardized test scores, sell at a higher price where vouchers exist. Thus, we conclude Vermont's housing market places a premium on school voucher access availability, and this premium increases if families have access to more and better schools.

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I. Introduction

On April 11, 2013, the North Bennington, Vermont school board voted unanimously to close the local public grade school (North Bennington Graded School) and lease the facility to a newly formed private school, beginning with the 2013-2014 academic year. In doing so, North Bennington became a "tuition town," granting families tuition vouchers to send their children to almost any non-religiously affiliated school of their choice. North Bennington is not the first Vermont community to convert its public school to a private one. Winhall Elementary School was reconstituted as the private Mountain School at Winhall in 1998. Though these school conversions are uncommon, the final result is not. Many communities across the State of Vermont have no traditional public schools, but they offer tuition voucher programs as "non-operating" school districts.

While other states have recently launched charter-school and/or school voucher programs to complement traditional public school education, Vermont's voucher program is over 140 years old. Vermont's program also has one unique element: no district can have both a traditional public school and the voucher program. Each community has one, or the other. School districts can't have both. This unusual mix of "school districts" with "school-less districts" makes Vermont a compelling laboratory for analyzing the value of educational choice opportunities on residential real estate prices. Because Vermont's system prohibits voucher communities from also offering what could be a valuable traditional public school option, the real estate valuation effect of vouchers in this study should be viewed as a worst-case scenario.

A community that offered both vouchers and traditional options would, presumably, be a more attractive alternative.

Unlike in other parts of the country where some underperforming traditional public schools have been converted to privately operated charter schools, the North Bennington public school was not privatized due to poor academic performance.[1] The reconstituted independent school will retain the same teachers, administrators, and staff, while servicing the same basic student population base as their public school predecessor. While town officials hope to eventually take advantage of economies of scale by increasing the student population through attracting more students, the primary motivation for the conversion seems to be a desire for local autonomy, control, and parental choice with respect to educational decisions.[2]

Primary and secondary education in America has long been a point of both local and national concern. With current expenditures of nearly $11,000 per student accounting for well over 4% of gross domestic product (GDP), the United States ranks near the top of the developed world with respect to its financial investment in providing educational opportunities for its citizenry.[3] Despite this substantive resource commitment at the aggregate level, tremendous variation exists both across and within States in terms of both aggregate and per pupil spending. These differences are (at least partially) driven by the nature of the educational finance system, which continues to vest both decision-making and financial responsibility primarily with state

[1] Greatschools.com ranked the school's quality as a 7 on a 10 point scale, while the school's students performed above the state average on the New England Common Assessment Program (NECAP) in most grades and subjects.
[2] While Winhall's privatization has led to significant growth in their student population -- more specifically a doubling of the number of students served from less than 40 in 1998 to 80 by 2013 -- these privatizations are not without their critics. Legislative efforts to prohibit such conversions were narrowly defeated in the Vermont Senate (vote: 12-14) on May 9, 2013, with Republicans unanimous in their opposition to such restrictions and Democrats split primarily along geographic lines.
[3] See U.S. Department of Education, National Center for Education Statistics, "The Conditions of Education," available at: http://nces.ed.gov/programs/coe/pdf/coe_ifn.pdf, accessed 3/25/2013. More specifically, only 3 (Luxembourg, Switzerland, and Norway) of the 34 OECD member nations spend more per pupil than the current U.S. average of $10,995 per year.

and local authorities. Recent estimates from the U.S. Department of Education suggest nearly 83% of K-12 spending is funded through state (45.6%) and local (37.1%) resources, with private contributions (8.9%) outpacing federal government investment (8.3%).[4] Within states, considerable variation also often exists across school districts with respect to local funding. Even within a given school district, private contributions can lead to disparities across schools with respect to the discretionary resources available to teachers and administrators.

High public educational spending by communities seems to be warranted. School quality is consistently found to be a significant determinant of local housing prices. While individual real estate agents are often restrained in their willingness and ability to comment on their personal perceptions of local schools outside of directly verifiable test scores, a cottage industry has arisen designed to given potential homebuyers access to additional information about individual schools across a plethora of dimensions of school quality.[5] The existence of such firms, and the demand for their services, provides *prima facie* evidence that school characteristics represent a critically important dimension of the housing search process for many buyers. Furthermore, to the extent market participants value various dimensions of school quality, access to such information should enhance the operational efficiency of local housing markets, and value-relevant components of local schooling options should be observable in housing market transactions.

Applying this general framework, the purpose of the current investigation is to assess whether the residential housing market values school choice, and if so, to what extent. More specifically, we use a sample of 2,933 single-family residential transactions to investigate the

[4] See U.S. Department of Education, "10 Facts About K-12 Education Funding," available at: http://www2.ed.gov/about/overview/fed/10facts/index.html, accessed 3/25/2013.
[5] See, for example, GreatSchools.org, neighborhoodscout.com, psk12.com, publicschoolreview.com, and schooldigger.com to name just a few.

valuation implications of Vermont's tuition voucher program. Previewing our main empirical results, we find the residential real estate market does indeed value the options provided by these vouchers. Homes located in jurisdictions providing vouchers exhibit market values over $8,450 (or nearly 5.9%) higher than observationally equivalent housing units in jurisdictions without such educational options. Furthermore, the benefit of living in a school choice district increases as both the number, and quality, of viable alternative schooling outlets increases.

The remainder of this paper is organized as follows. Section two reviews the limited existing empirical evidence on the valuation implications of school choice programs. Specific attention is given to the valuation implications of school quality. Section three outlines and describes the unique school choice voucher system currently available to many Vermont residents. The data used to analyze our focal hypotheses are described in section four, while the results of our multi-variate empirical analysis are presented in section five. Finally, section six summarizes our key findings, discusses their implications, and concludes.

II. Empirical Evidence on the Value of School Quality and School Choice

Given the enormous time and financial commitment afforded K-12 education across the country, it comes as little surprise that empirical studies consistently find school quality to be positively related to increased housing values. For example, as far back as Edel and Sclar (1974) we find empirical evidence of school quality, in their case school expenditures ($) per pupil, being directly capitalized into housing values. Bogart and Cromwell (1997) find a premium of approximately 20% accruing to "better" schools in Cleveland, while more recently Owusu-Edusei, Espey, & Lin (2007) find similar price premiums of 9 to 19% accruing to properties located in areas zoned to include exclusively "above-average" schools in their sample of South

Carolina homes. Brasington and Haurin (2006) find premiums of 7.1% for superior schools in Ohio, while Figlio and Lucas (2000 and 2004) report premiums of over $10,000 (or approximately 8%) for homes in "A" level school districts relative to those in "B" level districts across Florida. Continuing, Black (1999) finds parents are willing to pay a house price premium of approximately 2.5% for access to schools with 5% higher test scores across suburban Boston, while Ries and Somerville (2010) find price premiums of approximate $14,000 (or 4%) for homes located in the best performing school districts around Vancouver. Numerous additional studies also find a direct association between various dimensions of school quality and residential housing prices. These studies include, but are not limited to, Haurin and Brasington (1996), Brasington (1999), Downes and Zabel (2002), and Clapp, Nanda, and Ross (2008).

This extant research clearly suggests school quality is an important determinant of local housing prices, however, relatively little empirical work has been conducted into the related impact of school choice, and particularly tuition vouchers, on residential home values.[6] While basic finance theory posits options have value, and hence one might expect both school choice and voucher programs to unequivocally increase property values in participating locations, operationalizing this construct to residential property markets engenders significant complexities. For example, the presence of unconstrained school choice across a geographic catchment area reduces the value of proximity to "good" schools. Reback (2005) provides evidence of precisely this phenomenon in his analysis of Minnesota's adoption of a statewide open enrollment system. Over the eight years immediately subsequent to the policy's adoption, properties in areas with a greater fraction of students transferring out of district experienced greater appreciation than homes already located in regions with preferred schools. A similar outcome was observed in

[6] See Nechyba (1996 & 2000), Epple and Romano (1998), and Ferreyra (2007) for theoretical insight on the impact of school vouchers on residential housing values.

Oslo, Norway. In the late 1990s, Oslo abandoned catchment-based school assignments and instituted a choice-based enrollment policy. Prior to the change, catchment-area homes assigned to the worst-performing schools were valued 7 to 10 percent below the average Oslo home. The policy change helped equalize home values, as half of the discount disappeared (Machin and Salvanes 2010).

Fack and Grenet (2010) consider the residential value impact of vouchers offered in tandem with traditional catchment-based assignments in Paris, France. They examine the presence, or absence, of voucher-funded private middle and high schools in Paris and conclude that the presence of such voucher-funded institutions eliminates the relationship between designated school assignment zones and housing values.

Danielsen, Harrison, and Zhao (2013) observe that the presence of a charter school appears to make a community more attractive to families. Families who send children to the charter school are significantly more likely to relocate nearer to the school, and the school's attraction is much greater than parent work locations. While Danielsen et al. does not attach a price to the improvement in community quality, the charter school amenity should be priced, to some extent, in surrounding residential real estate. In sum, depending upon the nature of available educational choice arrangements, a variety of residential sorting equilibria and resulting price patterns appear possible. However, a common thread appears to be that school choice raises the attractiveness and residential home values of communities that had been previously served by poorly performing schools.

III. Vermont's School Choice Voucher System

School voucher programs across the United States are typically a relatively new and politically divisive phenomena. Vermont, on the other hand, has operated a relatively broad, generally non-controversial, tuition vouchering program for over 140 years.[7] Beginning in 1869, Vermont residents living in towns which do not operate public elementary or high schools, and furthermore do not belong to a supervisory union, were granted the right to attend any public school across Vermont, on a space available basis, with the state and local municipality picking up the cost by providing a tuition voucher equal to the full cost of attendance. These jurisdictions are frequently referred to as "tuitioning towns." Parents in tuitioning towns also have the option to send their children to an array of independent schools, or out-of-state public schools, on a subsidized basis.[8] In general, this subsidy is set equal to the lower of the full cost of tuition at the alternative school, or the state-wide average per pupil expenditure. Thus, residents of "choice communities" can essentially send their children to any public school across the state for a marginal tuition cost of $0, or send their children to private academies or independent schools on a heavily subsidized basis.[9]

This portability to independent schools, and similarly to public schools across state lines, represents a unique aspect of Vermont's voucher program, as many choice programs in operation throughout the remainder of the country rely exclusively upon networks of public schools. Additionally, the inception and growth of Vermont's voucher program are somewhat unique

[7] See Sternberg (2001) for a comprehensive review of the foundations and development of Vermont's school voucher program.
[8] The option to attend out-of-state schools was extended to program participants in 1902. According to the Vermont Independent Schools Association (VISA), 116 tuition vouchering program participants currently attend school outside of the state. Some of these students attend school in Canada. See http://www.vtindependentschools.org/ .
[9] While reimbursement of transportation expenses is not statutorily mandated, many choice towns offer bus service to schools in nearby communities, contract with third-parties to provide transportation services, and/or reimburse a fraction of parental expenses associated with getting their children to and from these non-local schooling alternatives.

relative to more recent choice-based voucher initiatives. While many recent initiatives along this dimension have been created in direct response to failing inner city schools, the roots of Vermont's program date back to the state's founding principles and commitment to education.[10]

As early as 1777, Vermont's first constitution mandated the establishment of local schools to ensure a well-educated populace. Consistent with this mission, for nearly the next 100 years state officials oversaw the creation of dozens of publicly chartered grammar schools and private academies. Over time, given the rural nature of many Vermont communities, it was deemed impractical to require each town to build its own school. Additionally, due to the wide-spread academic success of many private academies across the state, there was little concern over the quality and rigor of the academic offerings provided by non-public entities. Thus, in 1869, the Vermont legislature adopted the state's first school choice tuitioning (i.e., voucher) program. While many modest changes have been made to the program over the past 140 years, this basic program structure continues to serve as the framework for the educational choice opportunities available to Vermont families today. More than 2,500 students across the state of Vermont participated in this tuition vouchering program during 2012.[11] For comparison The Vermont Agency for Education reports total state-wide public school enrollment of 86,133 for the year.

IV. Data and Univariate Analysis of Voucher and Non-voucher Towns

[10] This commitment continues today, and is perhaps best exemplified by per pupil spending. In 2011-2012, average per pupil spending on primary and secondary education across the state averaged over $16,000. This figure is more than 40% higher than the national average. See, http://www.edchoice.org/Documents/Publication/2013/ABCs/2013-ABCs-of-School-Choice--Vermont--Town-Tuitioning-Program.pdf, accessed 4/1/2013.

[11] See, http://www.edchoice.org/Documents/Publication/2013/ABCs/2013-ABCs-of-School-Choice--Vermont--Town-Tuitioning-Program.pdf, accessed 4/1/2013.

We begin the empirical portion of our analysis by assembling a dataset of single-family residential sales transactions from across the state of Vermont. As alluded to in our previous discussion, using Vermont as an empirical laboratory offers a number of compelling advantages. For example, a number of previous investigations into school quality and housing values note the interdependent nature and important role of community characteristics. Relative to other geographic locations, Vermont offers a relatively homogeneous demographic and socio-economic landscape. Racially, the state is predominantly Caucasian, with only two public high schools in our sample having a student population that is less than 80% white.[12] While low-income areas exist, the state exhibits relatively little abject poverty. Within this context, school choice decisions are significantly more likely to be driven by quality and proximity issues than by Tieboutesque geographic income or racial sorting.[13] Thus, our empirical results offer a cleaner test of the value relevance of school vouchers than has been available to previous analysts.

On the downside, most of the state is sparsely populated, limiting the number of home sale transactions observable within any given town or chronological window.[14] As such, to add power to our statistical analyses, we examine a relatively long time period. Our analysis includes all arms-length, single-family residential home sales that took place within the state of Vermont over a three-year period, between April 1st, 2009 and March 31st, 2012. Information on each of these home sale transactions, and the associated characteristics of the subject properties, are gleaned from Zillow.com. To ensure the generalizability of our results, we further restrict the

[12] These schools are Winooski High School (64.1%) and Missisquoi Valley Union High School (78.1%). Three additional public secondary schools have Caucasian enrollment of less than 90%: Burlington High School (80.7%), South Burlington High School (87.6%), and Montpelier High School (89.8%).
[13] See Tiebout (1956) for further discussion and analysis of issues related to neighborhood sorting.
[14] For simplicity, we use the term town to refer to all cities, towns, unincorporated areas, and gores (small, low population areas with limited self government) throughout the state. 2010 U.S. Census estimates place the total state population of Vermont at only 625,741 residents.

sample to structures containing one to five bedrooms, one to six bathrooms, and a primary living area of 500 to 5,000 square feet. Additionally, only transactions with a market value of more than $25,000 and less than $2,500,000 are included in our analysis. Using these decision rules, we are left with a final sample of 2,933 home sale transactions.

Descriptive statistics for these sample observations are provided in Exhibit #1, and a tabulation of all the cities, towns, unincorporated areas, and gores from which these observations are drawn is provided in the Appendix. Among the noteworthy findings, the typical house in our sample has approximately three bedrooms, two bathrooms, nearly 2,000 square feet of heated, primary living area, and exhibits an average selling price of approximately $240,000. Not surprisingly, given the rural nature of Vermont, lot sizes vary widely and range from slightly over 1,000 square feet to literally hundreds of acres. As outlined above, the state is predominantly white, and reasonably well off economically, and 8.6% of property transactions occurred in jurisdictions participating in the State's voucher program at the high school level. Many of these jurisdictions also participate at the elementary school level.

As illustrated in Exhibit #2, these school voucher jurisdictions are broadly distributed across the entire state, rather than being concentrated within a confined geographic area. The typical Vermont residence which turned over during our sample period was also located within a 20 minute (one-way) commute of two to three schools, and a 30 minute (one-way) commute of over five schools.[15] As would be expected, roughly one-half of these drivable alternatives represent high schools with higher standardized test scores than would be found at the default (i.e., geographically most proximate) public high school location.[16] These latter figures suggest

[15] These potential commuting distances were selected to book-end the typical travel time for Vermont workers. 2010 U.S. Census estimates place the average commuting time for Vermont workers over 16 years of age at 25.4 minutes.

[16] NECAP scores for Vermont public schools are available through the Vermont Agency of Education.

true school choice is available for most Vermont families with access to the State's tuition voucher program.

Exhibit #3 provides further descriptive insight into the nature of our sample by bifurcating the available observations into those with, and without, access to public school choice through the State's voucher system. Properties in choice (voucher) towns sell, on average, for $75,000 less than those in non-choice locations, even though these are larger homes with larger lot sizes than those found in non-choice locales. A naïve assessment of these facts might confuse correlation with causation; suggesting that voucher programs reduce property values and income levels. However, the fundamental driver of this correlation is relatively obvious. Historically, the tuition voucher program was developed so that relatively rural areas were not burdened by the cost of operating a local public school. To participate in the State's tuition voucher program, a town must not operate its own school or belong to a supervisory union. Almost by definition, these towns are smaller and more rural, on average, than those communities operating their own schools. Additionally, median income levels in voucher towns are also lower than in non-voucher towns. As such, it should come as no surprise that homes located in voucher towns across Vermont exhibit relatively low unconditioned transaction prices. Hence, an effective analysis of school choice/voucher valuation implications requires a more sophisticated multivariate analysis.

V. Multivariate Analysis

Exhibit #4 presents the results from our core multivariate analysis of the valuation effects of school vouchers in Vermont. The table presents results from four OLS regressions of the following general form:

Log (Transaction Price) = *f*(Housing Amenities,
Community Characteristics, Voucher Availability, ε)

Each model is designed to capture the determinants of housing prices. In Model 1, the natural log of sample home transaction prices are regressed exclusively against each respective unit's observable physical attributes. Following the approach of Gatzlaff and Ling (1994), we employ a relatively parsimonious hedonic specification.[17] As expected, each significant amenity is positively related to transaction prices, with more bedrooms, more bathrooms, and larger homes all increasing transaction values.

Model 2 expands the empirical specification to include demographic and socio-economic characteristics of the community in which each property is located. While our housing amenity results are robust to the inclusion of these community attributes, relative to previous housing value investigations our Percent White coefficient estimate exhibits an unexpected negative sign. We view this result as a by-product of the unusual demographic nature of Vermont. Burlington, the county seat of Chittenden County, is only 88.9% white, while the rural areas of Vermont are more than 95% percent white.[18] Given the relatively high housing prices observed across Chittenden County, the fact that home prices are lower in the relatively all-white rural areas of the state should not be viewed as particularly surprising.

[17] Gatzlaff and Ling (1994) contend that while repeat sales methodologies provide the most accurate, constant quality measures of housing price appreciation, simple, parsimonious hedonic models also perform relatively well. Similarly, we also note that due to data availability limitations our hedonic specifications do not include controls for time-on-market. As outlined in Benefield, Cain, and Johnson (2014), a wide variety of complex relations have been observed along this dimension. While we know of no reason to suspect that lack of data along this dimension should materially impact our reported results with respect to our focal school choice/voucher attributes, in the interest of full disclosure we do note its omission throughout the current investigation.

[18] Consistent with the descriptive statistics presented in Exhibit #1, 2010 U.S. Census estimates report 95.5% of Vermont residents to be White. No other racial or ethnic classification comprises even 2% of the Vermont populace.

Model 3 introduces our school voucher metric and allows us to directly examine the valuation impact of the voucher amenity. In Model 3, we add a simple binary, 0/1 indicator variable to the empirical specification indicating whether a given property is eligible to participate in the State's school choice, tuition vouchering program. Consistent with the expectation that an option is valuable, the positive coefficient on this indicator variable suggests the housing market is willing to pay a significant price premium for units characterized by government subsidized educational choice. These results are both statistically and economically significant, with estimated price premiums of over $8, 450, or nearly 5.9%, accruing to properties in such locations.[19]

Finally, Model 4 reframes the choice analysis to examine viable school choice alternatives. More specifically, to be considered a viable alternative to the geographically most proximate (i.e., default) schooling option, we assume a maximum allowable one-way commuting distance of 20 minutes. Commuting times between each property and all 63 Vermont public high schools with verifiable New England Common Assessment Program (NECAP) scores are computed using Google Maps. For all properties located in school voucher jurisdictions, we then count the number of viable alternative school options, and include this variable within our existing valuation framework. This revised framework leads us back to our same empirical conclusion that the housing market materially values educational choice opportunities. In Model 4, our viable choice metric is again positive and significantly related to observable transactions

[19] These marginal effect premiums are calculated by comparing the predicted value of our regression equation across choice and non-choice jurisdictions with all other variables set to their mean values. For example, the expected home value in model three absent school vouchers may be estimated as:
e^(9.721+0.076*3.12+0.241*1.85+-0.029*3.266+0.113*4.870-0.009*90.6+0.010*57.154 +0.005*229.637) = e^(11.878) = $144,082.20.
School vouchers raise this value to:
e^(11.878 + 0.057) = e^(11.935) = $152,534.80, a premium of over $8,450, or nearly 5.9%.

prices, with each additional viable school choice/voucher alternative increasing property values by nearly $4,380 (or slightly over 3.0%).

To further illustrate the magnitude and nature of educational choice across Vermont's voucher towns, Exhibit #5 outlines the number of viable options available to residents of each voucher community. Consistent with the preceding analysis, each home sale transaction is initially assigned to the geographically most proximate public high school as the default schooling option. Using Google Maps, we next calculate the expected one-way commuting time between each transacted property and the remaining 62 public high schools across the State with readily verifiable NECAP standardized test score information. We then count the number of alternative public school options within a viable commuting distance, and further outline the number of those drivable options which exhibit superior performance on the NECAP exam.

Column 1 shows the maximum number of public schools within a 20 minute (one-way) commute for tuitioning or choice town residents. As each property is individually geocoded with unique distances and driving times calculated to each school, the reported numbers represent the maximum number of viable public school options available to any transacted property within the community. Some individual homes within a given community may be located on the far side of town from potential schooling options, and thus may possess fewer effective options.

Column 2 extends the acceptable commute time for viable alternatives to 30 minute (one-way) commuting trips. Examining the degree of choice evidenced across these two columns, in general, we find that for most residents of Vermont towns without public schools, school vouchers do indeed provide a real opportunity to select from a competing menu of educational offerings. More explicitly, three-quarters of these towns have viable alternative schools within a

20 minute commute, while virtually all choice towns (93.8%) have public school options within a 30 minute commute.[20]

Columns 3 and 4 provide a parallel analysis using a more restrictive definition of viable alternatives. As much of the above cited literature documents a preference for school quality as operationalized through higher standardized test scores, columns 3 and 4 restrict our definition of viable alternatives exclusively to those schools which are both proximate (i.e., within the designated allowable commuting time) and exhibit higher average combined reading and math proficiency scores on the NECAP exams than would be available at the geographically closest (i.e., default) high school. Once again, we note that even under this more restrictive definition, a large portion of Vermonters living in voucher towns have ready access to a viable set of educational choice options, with over half (56.3%) of these towns having higher (test score) achieving schools within a 20 minute commute, and three-quarters having such options available within a 30 minute commute. Thus, the majority of Vermont residents living in voucher towns appear to have clear and viable educational choice opportunities.[21]

Exhibit #6 continues our empirical analysis by presenting the results of re-estimating our housing valuation models using these more restrictive definitions of viable choice alternatives. Of the 253 home sale observations originally coded as possessing school choice, 175 (69.2%) have an alternative public school option available within a 20 minute drive. Furthermore, only 139 (54.9%) property transactions have both school choice and higher scoring public schools

[20] This table understates the true amount of choice available to residents of these towns, as only public school options within a given catchment area (commuting time) are considered. As outlined above, the state of Vermont also allows tuition vouchers to be used at a network of roughly 100 private and independent schools. As test scores generally are not available for these non-public options, they have been excluded from our analysis.

[21] We should note that higher test scores may not make a school a better choice for any particular family. Anecdotal evidence suggests that some families choose a school on the basis of proximity to a parent's work location; simplifying transportation logistics and maximizing parent-child interactions. Describing the attributes of a family's preferred choice relative to standardized school quality benchmarks is an important question, but it is beyond the scope of this analysis.

within this 20-minute commuting area. If the viable commuting distance is extended to a 30-minute one-way commute, the number of transactions with truly viable school choice options increases to 246 (or 97.2%), with 178 (or 70.4%) of those have better-scoring public schools than the nearest public school within the 30-minute commute. The sample components for each of the four regressions in Exhibit #6 are summarized as follows:

- Model 1: Two or more voucher-eligible public high schools within 20 minutes.
- Model 2: Two or more voucher-eligible public high schools within 30 minutes.
- Model 3: One or more ranked school that is "better than closest" and within 20 minutes.
- Model 4: One or more ranked school that is "better than closest" and within 30 minutes.

Turning to the results, across all four samples, voucher opportunities are positively related to housing values. Comparing the results in Models 1 and 3, we find the presence of school choice alternatives within a 20 minute commute increases property values by approximately $10,879 (or 6.9%), while the more restrictive presence of higher achieving schools within this same drive time catchment area is associated with a substantively higher $24,181 (16.1%) increase in housing prices. Similar results are found with respect to our 30 minute commuting distances in Models 2 and 4. Alternative schooling options within 30 minutes enhance property values by $7,618 (or 6.3%), while the presence of higher achieving schools within this same region increase values by $12,805 (or 8.5%). Taken together, these results strongly suggest the market is willing to pay a substantial premium for access to school voucher programs, particularly when those options include access to schools with higher standardized achievement levels.

VI. Summary and Conclusions

Housing market participants across the United States continue to place great value on access to quality educational opportunities. Taking advantage of unique aspects of Vermont's public school voucher program, the current investigation outlines the impact of tuition vouchers on home prices. Using a sample of 2,933 single-family home purchase transactions occurring across the State between April 1st, 2009 and March 31st, 2012, we find robust evidence of statistically and economically important price premiums accruing to properties located in jurisdictions offering school vouchers. These premiums range from 3-16% depending upon model specification, and are robust to alternative definitions of viable commuting distances and minimum school performance (standardized test score) thresholds.

We conclude that educational choice opportunities (in this case school vouchers) increase residential housing values. We also conclude that the voucher programs are more valuable (as measured by property values) when there are a larger number of alternative school choices available. This statement could be rearticulated accordingly: the absence of vouchers (and of viable alternative schools where those vouchers can be used) depresses property values.

We find that Vermont's voucher program is particularly value-enhancing in locations where nearby schools are relatively weak. The availability of vouchers, where the nearest school has low standardized test scores, relative to nearby alternatives, increases typical home values by over $24,000. Alternatively, the practice of assigning students to relatively weak schools, when no alternatives are offered via voucher, depresses real estate in those assigned jurisdictions by more than $24,000.

We would emphasize that this study does not suggest that traditional schools should be closed and replaced by school vouchers. Vermont law prohibits both systems from operating in the same jurisdiction simultaneously. While this law makes Vermont attractive for an academic

study of the effect of school vouchers on property values, we do not suggest that this is an optimal real estate development policy. There seems to be no reason that vouchers cannot coexist with a traditional assigned-school as the default option. For example, in France 79% of secondary student enrollment is in assigned public schools, but most other students are enrolled in voucher-funded private schools that can be accessed without regard to home residence location (Fack and Grenet, 2010). This is also the prevailing model in every other U.S. state where vouchers are used, except for Maine which has a small system similar to Vermont's.

Of course, Vermont differs from most other states in that the Vermont voucher program is available to middle-income, and even wealthy, residents. In this regard, we should be careful not to assume that this paper's results are generalizable to other states with means-tested voucher programs. Excluding the middle class means that vouchers are unlikely to have real estate valuation impacts that are as large as those observed in Vermont. Vouchers that are targeted to the poor may improve their education outcomes, but they are unlikely to drive community revitalization since those who escape poverty will lose access to the voucher and must then leave for a better school district.

Additional study is needed to better understand how parents actually choose schools when vouchers make several options available. Our tests presume that families prefer public schools with higher standardized test scores. However, it is also probable that families value schools that are near parents' workplaces. Many families may also value schools with specialized programs in math, science, foreign languages, or the arts. Without regard to how voucher-funded school choice decisions are actually being made by parents, the clear implication of this study is that families perceive school vouchers as enhancing their quality of life, and they are willing to pay more for homes in jurisdictions that provide school vouchers.

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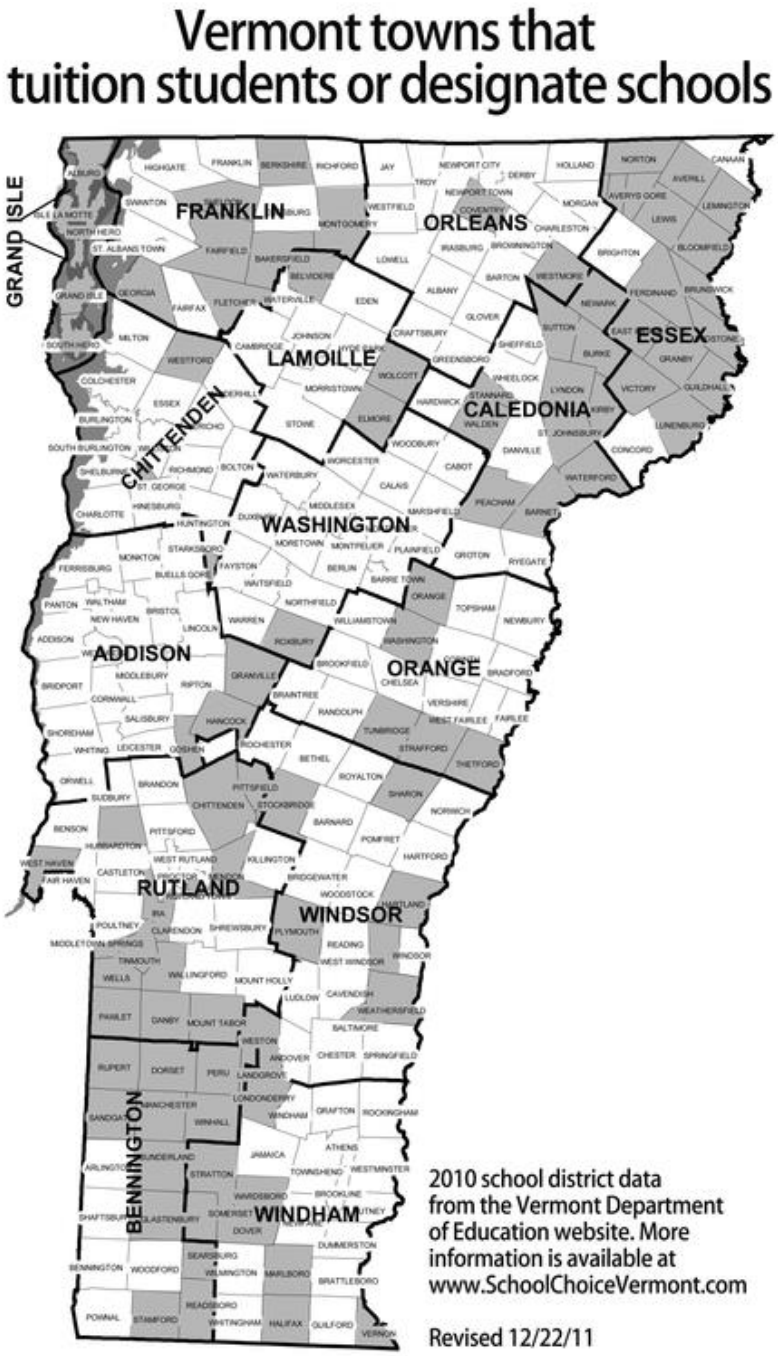
Exhibit #1
Descriptive Statistics

This table outlines descriptive statistics for all sample property transactions. More specifically, the 2,933 transactions all took place within the State of Vermont between April 1st, 2009 and March 31, 2012. Sample observations were limited to units containing less than 6 bedrooms, less than 7 bathrooms, and exhibiting a transaction price of more than $25,000 and less than $2,500,000. Community characteristics represent school level racial/ethnic diversity and county level income and value metrics. Commuting times are calculated directly from Google Maps, while "Better Schools" are defined as those with higher standardized test scores based upon the NECAP Combined Reading & Math assessment.

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
Dependent Variable					
Selling Price ($)	2,933	238,937	147,632	27,000	2.35mil
Housing Amenities					
Bedrooms (#)	2,933	3.12	0.74	1.0	5.0
Bathrooms (#)	2,933	1.85	0.78	1.0	5.5
House Size (ft^2)	2,933	1,846	739.5	500	4,962
Lot Size (ft^2)	2,933	74,085	331,136	1,040	241 acres
Community Characteristics					
White Students (%)	2,933	90.6	7.3	61.4	98.7
Median Income ($)	2,933	57,154	5,827	37,679	62,260
Median Value ($)	2,933	229,637	34,750	126,000	263,200
School Choice Attributes					
School Vouchers? (yes=1)	2,933	0.086	0.281	0	1
Number of Schools					
20 Minute Commute	2,933	2.48	1.41	0	6
30 Minute Commute	2,933	5.24	2.05	0	10
# of Better Schools					
20 Minute Commute	2,933	1.30	1.05	0	5
30 Minute Commute	2,933	2.73	1.70	0	8

Exhibit #2
Distribution of Vermont School Choice/Voucher Towns



Source: Vermont Independent Schools Association
http://www.vtindependentschools.org/map-of-tuition-towns.html

Exhibit #3
Descriptive Statistics and Univariate Tests

This table provides univariate comparisons of sample characteristics disaggregated by school voucher status. All sample transactions took place within the State of Vermont between April 1st, 2009 and March 31, 2012. Observations were limited to units containing less than 6 bedrooms, less than 7 bathrooms, and exhibiting a transaction price of more than $25,000 and less than $2,500,000. Community characteristics represent school level racial/ethnic diversity and county level income and value metrics. Commuting times are calculated directly from Google Maps, while "Better Schools" are defined as those with higher standardized test scores based upon the NECAP Combined Reading & Math assessment.

	With Vouchers		No Vouchers		T-test of
Variable	**Obs.**	**Mean**	**Obs.**	**Mean**	**Differences**
Dependent Variable					
Selling Price	253	170,255	2,680	245,421	-7.82***
Log(Selling Price)	253	11.94	2,680	12.27	-9.41***
Housing Amenities					
Bedrooms	253	3.15	2,680	3.12	0.59
Bathrooms	253	1.87	2,680	1.85	0.37
House Size (ft^2)	253	1,901	2,680	1,840	1.25
Log (House Size)	253	10.46	2,680	9.96	5.56***
Lot Size (ft^2)	253	88,427	2,680	72,731	0.72
Log(Lot Size)	253	10.48	2,680	9.99	5.84***
Community Characteristics					
Percent White	253	95.1	2,680	90.2	10.49***
Median Income	253	48,087	2,680	58,010	-29.48***
Median Value	253	179,861	2,680	234,336	-26.54***
School Choice Attributes					
School Vouchers? (yes=1)	253	1.000	2,680	0.000	-----
Number of Schools					
20 Minute Commute	253	2.72	2,680	2.46	2.84***
30 Minute Commute	253	4.22	2,680	5.34	-8.40***
# of Better Schools					
20 Minute Commute	253	1.96	2,680	1.24	10.64***
30 Minute Commute	253	2.99	2,680	2.71	2.51**

Exhibit #4
Determinants of Selling Prices for Vermont Homes
Do School Vouchers Matter?

This table presents the results of four OLS regressions investigating the determinants of transactions prices for single-family homes across Vermont between April 1st, 2009 and March 31st, 2012. In Model 1, the natural log of each home price transaction is regressed exclusively against each unit's observable housing amenities. Model 2 expands the empirical specification to include socio-economic and demographic characteristics of the community in which each home is located. Model 3 adds our focal school voucher metric to the analysis, while finally, Model 4 includes information on the degree of educational choice available to housing market participants with respect to a given property location. All models employ 2,933 observations, include fixed effects for time, and are estimated with robust standard errors clustered on the number of bedrooms and bathrooms contained within each housing unit.

	Base Case (1)	**Base Case (2)**	**Voucher Value (3)**	**Value per Alternative (4)**
Variables				
Intercept	11.505	9.825	9.721	9.676
	(71.5***)	(40.4***)	(41.4***)	(39.6***)
Housing Amenities				
Bedrooms (#)	0.056	0.076	0.076	0.076
	(1.78*)	(3.26***)	(3.30***)	(3.34***)
Bathrooms (#)	0.291	0.242	0.241	0.239
	(10.8***)	(10.6***)	(10.6***)	(10.6***)
Log House Size (ft^2)	0.044	-0.028	-0.029	-0.031
	(1.67*)	(-0.98)	(-1.02)	(-1.07)
Log Lot Size (ft^2)	-0.039	0.111	0.113	0.117
	(-1.21)	(3.53***)	(3.54***)	(3.65***)
Community Characteristics				
Percent White (%)		-0.009	-0.009	-0.009
		(-6.16***)	(-6.12***)	(-6.07***)
Median Income ($,000s)		0.008	0.010	0.010
		(1.82*)	(2.17**)	(2.11**)
Median Value ($,000s)		0.005	0.005	0.006
		(7.46***)	(7.38***)	(7.54***)
School Choice Attributes				
School Vouchers? (yes = 1)			0.057	
			(2.03**)	
School Vouchers? * # of Schools w/i 20 Minutes				0.030
				(5.76***)
F(k; n-k-1)	29.36***	248.90***	286.63***	309.10***
Adjusted-R^2	0.2029	0.4244	0.4250	0.4264

$ Value of School Vouchers	-----	-----	**$8,452.62**	-----
Marginal Value per Viable School	-----	-----	-----	**$4,379.54**
% Price Premium Due to Vouchers	-----	-----	**5.87%**	**3.08%**[22]

*** Significant at one percent level; ** Significant at five percent level; * Significant at ten percent level.

[22] Given the average number of viable options for a given Vermont community is 2.48 schools, these price premiums translate into a $10,861, or 7.63%, increase in housing values for the typical property.

Exhibit #5

Vermont School Choice Opportunities by Voucher Community

This table outlines the maximum number of educational choice opportunities available within both 20 and 30 minute (one-way) commuting distances from sample property locations for communities participating in Vermont's school choice tuition voucher program. Additionally, in columns three and four, only those schools with higher (NECAP) standardized test scores are included in the counts as viable school choice options.

CITY	***Schools Within 20 Minutes***	***Schools Within 30 Minutes***	***Better Schools Within 20 Minutes***	***Better Schools Within 30 Minutes***
Bakersfield	1	2	1	2
Brownington	2	3	1	2
Chittenden	3	5	3	4
Corinth	0	2	0	1
East Fairfield	0	0	0	0
Elmore	1	3	1	2
Fairfield	2	5	1	3
Grafton	2	4	0	0
Hartland	2	3	2	3
Mendon	4	5	3	4
Middletown Springs	1	3	1	3
Montgomery Center	0	2	0	2
Newport	2	2	1	1
Newport Center	2	2	1	1
North Chittenden	1	3	1	3
Orange	0	2	0	2
Readsboro	0	1	0	0
Rutland	5	6	4	5
Sharon	1	4	0	1
Sheldon	3	5	2	3
St. George	2	4	1	3
Strafford	0	2	0	0
Tinmouth	0	4	0	3
Tunbridge	1	2	0	1
Vernon	1	1	0	0
Wardsboro	1	1	1	1
Washington	3	5	3	3
West Rutland	5	7	0	0
Westfield	0	0	0	0
Westford	2	7	1	3
Westminster	1	4	0	0
Wolcott	3	6	3	6
Average # of Viable Options	1.59	3.28	0.97	1.94
% of Towns with Viable Options	75.0%	93.8%	56.3%	75.0%

Exhibit #6

Valuation Effects of the Quantity and Quality of Choices

This table presents the results of four OLS regressions investigating the determinants of transactions prices for single-family homes across Vermont between April 1st, 2009 and March 31st, 2012. In Model 1, the natural log of each home price transaction is regressed against each unit's observable housing amenities, community characteristics, and a school choice/voucher indicator variable set equal to one if at least 2 tuition eligible high schools are located within a 20 minute (one-way) commute of the subject property. Model 2 expands the acceptable (one-way) commuting distance to 30 minutes for viable school choice/vouchers. Model 3 alters the analysis to define properties with viable school choice/vouchers exclusively as those with multiple high schools located within a 20 minute (one-way) commute that also exhibit higher (NECAP combined reading and math) standardized test scores than the default (geographically nearest) school. Finally, Model 4 expands our viable school choice/vouchers identifier to include properties with multiple high schools within a 30 minute (one-way) commute that also exhibit higher standardized test scores. All models employ 2,993 observations and include fixed effects for time, with robust standard errors clustered on the number of bedrooms within each housing unit.

Variables	**Two Schools within 20 minutes (1)**	**Two Schools within 30 minutes (2)**	**Better School within 20 minutes (3)**	**Better School within 30 minutes (4)**
Intercept	9.744	9.719	9.694	9.753
	(40.4***)	(41.2***)	(40.3***)	(40.9***)
Housing Amenities				
Bedrooms (#)	0.076	0.076	0.077	0.077
	(3.30***)	(3.30***)	(3.34***)	(3.32***)
Bathrooms (#)	0.240	0.240	0.239	0.240
	(10.6***)	(10.5***)	(10.6***)	(10.5***)
Log House Size (ft^2)	-0.030	-0.030	-0.031	-0.029
	(-1.03)	(-1.03)	(-1.07)	(-1.02)
Log Lot Size (ft^2)	0.115	0.114	0.117	0.114
	(3.57***)	(3.57***)	(3.64***)	(3.56***)
Community Characteristics				
Percent White (%)	-0.009	-0.009	-0.009	-0.009
	(-6.10***)	(-6.06***)	(-6.06***)	(-6.12***)
Median Income ($,000s)	0.009	0.009	0.009	0.008
	(1.96*)	(2.14**)	(1.96*)	(1.88*)
Median Value ($,000s)	0.006	0.005	0.006	0.006
	(7.47***)	(7.40***)	(7.59***)	(7.59***)

Voucher Availability				
Vouchers Viable? (yes = 1)	0.067 (3.16***)	0.061 (2.36**)	0.149 (4.39***)	0.082 (2.45**)
F(k; n-k-1)	312.36***	291.38***	314.40***	304.73
Adjusted-R^2	0.4229	0.4229	0.4250	0.4233
$ Premium in Voucher Towns	**$10,878.94**	**$7,617.68**	**$24,180.92**	**$12,804.69**
% Premium in Voucher Towns	**6.93%**	**6.29%**	**16.07%**	**8.55%**

*** Significant at one percent level; ** Significant at five percent level; * Significant at ten percent level.

Appendix
Vermont School Choice/Voucher Options By County

The following table contains a list of all sample towns, cities, unincorporated areas, and gores by county location. Jurisdictions participating in Vermont's school choice/voucher program are identified with an asterisk (*).

ADDISON
Addison
Bridport
Bristol
Cornwall
Ferrisburgh
Leicester
Lincoln
Middlebury
New Haven
North Ferrisburgh
Orwell
Panton
Shoreham
Starksboro
Vergennes
Weybridge

BENNINGTON
Arlington
Bennington
Dorset*
East Arlington
East Dorset*
Manchester*
Manchester Center*
North Bennington
Pownal
Readsboro*
Shaftsbury
Stamford*
Sunderlan*d

CALEDONIA
Barnet*
Danville
Lyndonville
Saint Johnsbury*
South Ryegate
Sutton*
Waterford*
West Burke
West Danville

CHITTENDEN
Burlington
Charlotte
Colchester
Essex
Essex Junction
Hinesburg
Huntington
Jericho
Milton
Richmond
Shelburne
South Burlington
St. George*
Underhill
Westford*
Williston
Winooski

ESSEX
Beecher Falls
Canaan
Concord
Guildhall*
Island Pond
Maidstone*

FRANKLIN
Bakersfield*
East Fairfield*
Enosburg Falls
Fairfax
Fairfield*
Franklin
Highgate Center
Montgomery Center*
Richford
Saint Albans
Sheldon*
Swanton

GRAND ISLE
Alburgh*
Grand Isle*
North Hero*
South Hero*

LAMOILLE
Cambridge
Eden
Elmore*
Hyde Park
Jeffersonville
Johnson
Morrisville
Stowe
Waterville
Wolcott*

ORANGE
Bradford
Braintree
Brookfield
Chelsea
Corinth*
East Randolph
East Thetford*
Fairlee
Newbury
Orange*
Post Mills
Randolph
Randolph Center
Strafford*
Tunbridge*
Washington*
Williamstown

ORLEANS
Albany
Barton
Brownington*
Craftsbury
Derby
Derby Line
Irasburg
Jay
Morgan
Newport*
Newport Center*
North Troy
Orleans
Westfield*

RUTLAND
Brandon
Castleton
Chittenden*
Danby*
East Wallingford
Fair Haven
Florence
Killington
Mendon*
Middletown Springs*
Mount Holly
North Chittenden*
North Clarendon
Pawlet
Pittsford
Poultney
Proctor
Rutland*
Shrewsbury
Tinmouth*
Wallingford
Wells*
West Rutland*

WASHINGTON
Barre
Berlin
Cabot
Calais
East Calais
East Montpelier
Graniteville
Marshfield
Middlesex
Montpelier
Moretown
Northfield
Plainfield
South Duxbury
Waitsfield
Warren
Waterbury
Waterbury Center
Worcester

WINDHAM
Bellows Falls
Brattleboro
Brookline
Dummerston
Grafton*
Guildford
Londonderry*
Newfane
Putney
South Newfane
Townshend
Vernon*
Wardsboro*
West Townshend
Westminster*
Wilmington
Windham

WINDSOR
Andover
Bethel
Cavendish
Chester
Hartford
Hartland*
Ludlow
North Springfield
Norwich
Perkinsville
Reading
Rochester
Royalton
Sharon*
South Royalton
Springfield
Stockbridge*
Weston*
White River Junction
Windsor
Woodstock