Centralization of School Finance and Property Values:
Lessons from Vermont

Thomas Downes

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Abstract

In June 1997 the elected leaders of Vermont enacted Act 60, potentially the most radical reform of a state's system of public school financing since the changes in California in the late 1970s. Little is known about the capitalization effects of changes like those that occurred in Vermont - which combined redistribution of education spending, a statewide property tax, and limits on property tax liabilities based on the taxpayer's income. This research closes that knowledge gap by quantifying the capitalization effects of Act 60. Data on property transactions in Vermont are combined with data on Vermont school districts to create a data set that spans the pre- and post-Act 60 period. This data set enables me to use the repeat-sales methodology to determine the capitalization effects of Act 60. The estimates of a standard hedonic specification estimated using all transactions (not just repeat sales) indicate that, while in Vermont property taxes appear to be capitalized into property values, measures of schooling provision are unrelated to property values. The estimates also indicate that finance reforms resulting from Act 60 may have accentuated the gap in property values between districts with relatively high and relatively low spending prior to reform.

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Introduction

In June of 1997 the elected leaders of Vermont enacted the Equal Educational Opportunity Act (Act 60) in response a state Supreme Court decision in the *Brigham v. Vermont*. Act 60 may well have represented the most radical reform of a state's system of public school financing since the post-*Serrano*, post-Proposition 13 changes in California in the late 1970s. As a result, Act 60 has provided a unique opportunity to evaluate the impact of the type of dramatic school finance reforms like those enacted in Vermont on the equality across school districts in education spending and measured student performance. Downes (2004) provides a start by quantifying the extent to which the reforms equalized spending and student performance. But little is known about the impact of the reforms on the well being of taxpayers. Quantifying the extent to which the changes in spending and in property taxes were capitalized into property values, which is the goal of this paper, is an important first step in evaluating the impact of the reforms on the well being of taxpayers.

At this point, very little is known about the capitalization effects (i.e., the effects on property values) of changes like those that occurred in Vermont - which combined redistribution of education spending, a move to a statewide property tax, significant increases (and decreases) in tax rates in some communities, and limits on property tax liabilities that are based on the income of the taxpayer. Some researchers (e.g., Dee, 2000) have used national data to document the impact of finance reforms on property values. One potential weakness of such analyses is the inability of the researchers to control fully for the unique institutional structure of each state. As a result, researchers have come to realize that national-level analyses and state-by-state case studies are complements, not substitutes. And, as Flanagan and Murray (2004) noted, the most interesting cases are those in which state policy makers have made the most revolutionary changes in the school finance systems. The Act 60 reforms represent just such a revolutionary change.

While the reforms were in some dimensions revolutionary, they also served to create a funding system in Vermont that had two of the important attributes argued for by Kenyon (2007). In particular, Act 60 did, as Kenyon recommends (2007, 56), "[t]arget property tax relief to needy taxpayers through state-funded property tax circuit breakers." And, while the reforms in Vermont did not explicitly target increased aid to those districts and schools in which student achievement was most in need of improvement, the Vermont reforms did improve the relative performance of students residing in low-wealth districts (Downes, 2004). The Vermont reforms could therefore serve as a model for finance reform in other states. Evaluating the social welfare implications of the reforms thus becomes imperative.

Glaeser's (1996) argument that local property taxes can serve to provide appropriate incentives to local governments suggests a second reason for careful analysis of the capitalization effects of the Vermont reforms. The Vermont reforms transformed much of the property tax into a state tax. If that transformation weakened the link between property taxes and property values, local governments may no longer have the appropriate incentives. Fischel's (2001) homevoter hypothesis also suggests that weakening of the link between taxes for schooling and local property values might reduce local involvement in government. Since weakening the links between property taxes and property values could, as both Glaeser and Fischel suggest, change the incentives facing both governments and voters, documenting the capitalization effects of the Vermont reforms must be done before those reforms are used as a model for other states.
The source of data on property values is the returns that must be filed for each property transaction in the state. Because these transactions go back to 1987, many of the properties can be observed two or more times. Therefore, not only are traditional cross-sectional capitalization analyses possible, but also feasible are analyses that utilize a repeat-sales approach. Further, these data on transactions can be merged with a rich set of data on Vermont school districts that spans the pre- and post-Act 60 periods. Because these data include measures of per pupil expenditures and student performance for both the pre- and post-reform period, full advantage can be taken of the sharp changes created by Act 60.

The next section provides a brief overview of the Vermont context. A review of the literature on the impact of finance reforms on property values then follows. The fourth section provides a detailed description of the data and a discussion of the methodologies used. Results are presented in the fifth section. The estimates of a standard hedonic specification estimated using all transactions (not just repeat sales) indicate that, while in Vermont property taxes appear to be capitalized into property values, measures of schooling provision are unrelated to property values. The estimates also indicate that finance reforms resulting from Act 60 may have accentuated the gap in property values between districts with relatively high and relatively low spending prior to reform. The final section of the paper offers concluding remarks.

The Vermont Context

In 1997 the Supreme Court of the State of Vermont invalidated the existing system of education financing in the state, concluding that the system deprived "children of an equal educational opportunity in violation of the Vermont Constitution" (*Brigham v. State* (96-502); 166 Vt. 246). While the court decision focused on inequities in spending, the support in the state for the suit grew out of widespread dissatisfaction with inequalities in educational spending and disparities in property tax burdens resulting from the existing foundation system of education financing and the existing system of property taxation.

The discontent with the system of education finance, which resulted in the suit, also influenced the dynamics of the 1996 legislative elections. The state senate that was elected in 1996 was committed to property tax reform (Mathis, 2001). The result was a state legislature that was

ready to move on legislation that would comply with the *Brigham* decision and reduce the property tax burdens of poor individuals.

Given the political dynamic in Vermont, the speed with which Act 60, the legislation designed to comply with *Brigham* and to provide property tax relief, was passed surprised no one. Signed into law on June 26, 1997, Act 60 created a system of school financing that combined elements of foundation and power equalization plans. A statewide property tax was established, with revenues from the tax being used to finance a portion of foundation aid.[1] If in a locality property tax revenues generated by levying the statewide rate exceed the amount needed to finance the foundation level of spending, the excess property tax revenues are recaptured by the state.

Under Act 60, localities were allowed to choose spending levels in excess of the foundation level. To weaken the link between property wealth and spending in excess of the foundation level, the act established a power equalization scheme that insured that localities with the same nominal tax rates would have the same levels of education spending. As other district power equalization reforms, Act 60 sought to equalize tax bases and per pupil tax yields for education across the state. Act 60 importantly diverged from traditional district power equalization in the financing of the system. In most district power equalization systems, aid drawn from state funds supplements the tax yields of the low property wealth towns. Act 60 deviated from this norm, creating a sharing pool that directly tapped local property tax revenues from property-rich towns to supply the aid to property-poor towns. Because the sharing pool's redistribution mechanism utilized property tax revenues from gold towns to finance the power equalizing aid to property-poor towns, the marginal tax price of education increased in some towns, and the tax rate required for a given level of additional education spending fell in others. Schmidt and Scott (2004) document the dramatic impact of the reforms on the tax prices for education faced by Vermont towns.

While the *Brigham* decision forced state policy makers to implement finance reforms, the reality was that Act 60 was as much about property tax relief as it was about school finance reform. For taxpayers in many communities, the finance reforms by themselves would have dramatically reduced tax burdens by allowing localities to maintain or even increase education spending with substantially lower tax rates. At the same time, taxpayers in high-wealth communities, which have been labeled "gold towns," necessarily faced increases in their property tax payments.[2] To lessen the burden on low-income residents of the "gold towns," the drafters of Act 60 included in the legislation a provision that granted tax adjustments to certain homestead owners. These tax adjustments were explicitly linked to the taxpayer's income; the original legislation specified that all owners with incomes at or below $75,000 were eligible for adjustments.

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[1] In the 2000-2001 school year, the nominal property tax rate was 1.1 percent, and the foundation level was $5200.

[2] In the 1994-95 school year, 69 of the 248 towns in Vermont for which data were available had effective education property tax rates below $1.10 per $100 in assessed value. While the percentage of towns with effective education rates below $1.10 had undoubtedly declined by the 1997-98 school year, the last year before the phasing in of Act 60 began, the reality was still that Act 60 forced a sizeable fraction of the towns in Vermont to increase property tax rates.

Not surprisingly, Act 60 generated significant unhappiness and strong criticism from the property rich towns[3] and was repealed by the Vermont legislature in 2004 by the passage of Act 68. Act 68 eliminated the sharing pool and reduced the marginal tax rates for education to below $1 in the gold towns. Act 68 also established a property tax system that differentiated between residential and nonresidential property. Nonresidential property was removed from the tax base of localities. As a result, all revenue from taxation of nonresidential property flows to the state and is used to finance state aid. In fiscal year 2007, the tax rate on nonresidential property was $1.44 per $100 of fair market value.

After Act 68, the local tax base consisted only of residential (homestead) property. As was true under Act 60, all residential property was subject to a minimum tax rate, set at $0.95 per $100 of fair market value for fiscal year 2007. Localities could levy rates in excess of $0.95 per $100 of fair market value. Access to spending beyond the foundation level was equalized using a power equalization method. In other words, if two localities choose the same tax rates on residential property, those two districts will generate the same revenue even if the localities have different residential tax bases. That equalization is accomplished via state aid.

In addition, communities that choose particularly high levels of spending face an excess spending penalty that has the effect of increasing effective tax rates. In fiscal year 2007, any community with spending in excess of 125 percent of the average spending in fiscal year 2006 was subject to the excess spending penalty.

Act 68 preserved the prebate system that limited the tax liability of low-income owners of residential property. That system has since been modified to speed up the receipt of prebates. Under Act 60, prebates were distributed when individuals filed their income taxes. Because of concern about the potential impact of the delay in receipt of prebates on low-income taxpayers, the system was modified so that, beginning in Fiscal Year 2007, adjustments to tax liabilities are made on the property tax bill. To handle the timing problem, those adjustments are based on prior year's income.

The changes in Vermont provide a relatively unique opportunity to examine the effects of shifting from a system in which property taxes are locally levied to a system that is a hybrid of statewide and locally levied property taxes. Unquestionably, what made the new system in Vermont feasible politically was the combination of this change in the property tax system with an income-based prebate program. While some residents of low wealth communities would have received tax relief even if there were no prebates, for many taxpayers there would have been no tax relief without the prebates. What makes the new system interesting from a policy perspective is the opportunity these stark changes provide for quantifying the effects of school finance reform and of changes in the property tax system.

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[3] A lawsuit filed by the towns of Wilmington and Whitingham challenging the legality of Act 60, and the town of Killington's threat of secession from the state provide the most extreme examples of the disapproval of the property-rich towns.

Housing Prices and Finance Reforms

While the literature on the relationship between schooling provision and property values dates back at least to Oates' (1969) seminal paper on the subject, a combination of recent methodological innovations (such as the boundary discontinuity approach pioneered by Black (1999)) and improvements in the available data have led to a number of recent additions to this literature. Kain, Staiger, and Samms (2003) and Clapp, Nanda, and Ross (2008) provide reviews of the recent developments in the literature. This evolution of the literature relating schooling provision and property values has not, however, been as evident in the work examining the capitalization effects of finance reforms.

The earliest work on the impact of finance reforms on housing costs is that of Dee (2000), who finds that housing prices and rents increased more rapidly in states with court-mandated finance reforms, relative to states not facing such mandates. Further, the changes in property values were largest in those districts with the lowest pre-reform spending, as one would expect if the spending changes associated with court-mandated finance reforms are capitalized into housing prices and rents. That finance reforms could have important capitalization effects was first noted by Wyckoff (1995), who laid out a simple theoretical model in which changes in equalizing intergovernmental aid are capitalized into property values. Wyckoff goes on to argue that these capitalization effects can have dramatic effects on the impact of the changes in the aid program on consumer well being. Empirical evidence in line with Wyckoff's prediction is provided by Barrow and Rouse (2004), who establish a positive relationship between state aid for K-12 education and property values.

Dee's (2000) finding that the effects of court-mandated finance reforms are capitalized into property values was executed using national-level data on property values drawn from the Decennial Census. Numerous authors (e.g., Hoxby, 2001; Downes, 2004) have argued that the diversity of state responses to court mandates means that any national-level analysis necessarily groups together states in which the expected impact of reform is very different. Nevertheless, state-level analyses examining other potential effects of finance reforms have tended to confirm the results of national-level studies while providing a richer picture of the impact of the reforms. This seems to be true in this context, with state-level analyses both confirming elements of Dee's findings, while also providing a more nuanced picture of the impact of reforms on housing costs. For example, though Hoxby and Kuziemko (2004) find that in Texas property values in low-wealth communities did increase after that state's finance reforms, they also argue that the "Robin Hood" school finance formula in that state destroyed $81 billion in property wealth in high-wealth communities. Similarly, Roy (2004) finds that the finance reforms that followed Proposal A in Michigan served to close the gap between high and low spending districts in their trends in property values. This gap closing occurs primarily by slowing growth in districts that had been high spending prior to the reform, with these high spending districts also experiencing immediate declines in their per pupil housing stock after the finance reforms. Thus, both Hoxby and Kuziemko (2004) and Roy (2004) find that, while there are increases in property values in those districts that benefit most from the finance reforms, the capitalization effects are larger in the districts that benefit least from the reforms.

Two studies in the relatively small literature on the impact of finance reforms on property values are the most direct antecedents of the work in this paper. Sherlock (2008) looks directly at the effects of the finance reforms in Vermont on changes in aggregate residential property values after Act 60. She finds a positive relationship between the growth in property values and changes in student performance. But she also finds a negative relationship between changes in education spending and property values, a result that she notes is both unexpected and in contrast with findings in the literature.

Sherlock's surprising result on the relationship between spending and property values may highlight a drawback to using Vermont data to execute a traditional capitalization study. Most of the recent work on capitalization has utilized within metropolitan area variation to quantify the extent to which education provision is capitalized into property values. Within a metropolitan area labor market opportunities are the same, so residential choice will be of the determined by variation in local taxes and public goods provision, among other things (Tiebout, 1956). Vermont is not a single labor market, so in that context estimating the extent to which schooling provision is capitalized into property values is particularly challenging. Only sharp changes in spending, like those that resulted from Act 60, would be likely to produce the type of variation that would make it possible to isolate the relationship between schooling provision and property values. By 1999, most of the Act 60-induced changes in the distribution of spending were already in place (Downes and Steinman, 2008). In the Vermont context, estimating the extent of capitalization requires data from before and after Act 60.

Sherlock also used administrative data on aggregate property values to construct her dependent variables. As a result, Sherlock used data on assessed, not market, values of property. Further, as Sherlock notes, her measure includes changes in aggregate value attributable both to increases in the value of existing properties and to new construction. Quantifying the extent to which a finance reform changes the relationship between schooling provision and property values necessitates holding constant the attributes of the housing stock. Otherwise, if, after a finance reform, new construction in a community differs from the stock of housing that existed prior to the reform, then some of the post-reform change in value would incorrectly be labeled as a change in the value of schooling provision. The data and methodology of this paper make possible assessment of the impact of Act 60 on the value of properties holding constant the attributes of those properties.

Methodologically, this paper has the most in common with Brunner, Murdoch, and Thayer's (2002) analysis of the impact on Los Angeles area properties of the changes in the late 1970s in California's system of K-12 finance. Using data on tax-adjusted sales prices for properties in Los Angeles County for the years 1975, 1980, 1985, and 1990, Brunner, Thayer, and Murdoch estimate the extent to which changes in education spending and test scores are capitalized into property values. Because their data span the finance reforms in California in the late 1970s, Brunner, Murdoch, and Thayer can quantify the impact of these reforms on property values. They find that the reforms resulted in convergence between high- and low-spending districts of the premium for schooling provision, an analogous result to those of Roy (2004) and Hoxby and

Kuziemko (2004). Further, Brunner, Murdoch, and Thayer argue that this convergence appears to be the result of leveling-down of the perceived quality of schooling provision.

Of the research quantifying the impact of finance reforms on property values, Brunner, Murdoch, and Thayer's comes closest to accounting for the innovations in methodology and data that have characterized the recent hedonics literature. Their use of data on individual sales and of district fixed effects is particularly noteworthy. Their data do not, however, enable them to account for unobservable neighborhood characteristics in the manner of Black (1999) or of Bradbury, Mayer, and Case (2001) or of Downes and Zabel (2002). Also, as Dee (2000) notes, the unusual nature of the housing market in California and of the nature of finance reform in that state may limit the generalizability of results based on California data. Further, the contemporaneous occurrence in California of finance reforms and Proposition 13, that state's draconian property tax limit, means that any estimates using California data necessarily confound the effects of these two policy changes. For all of these reasons, estimates of the capitalization effects of the finance reforms in Vermont using data and methods that account for the recent innovations in the hedonics literature can add substantially to our understanding of the impact of finance reforms.

Data and Methodology

The data on property values were drawn from the property transfer tax return data maintained by the Department of Revenue of the state of Vermont. In Vermont, property transfer tax returns must be filed along with any deed showing the transfer of title of real property. Transfers of commercial, industrial, and government-owned property were excluded, as were transfers of open land and land used for agriculture. Properties were also excluded if the transfers were between family members, if property value was missing from the record, or if the transaction could not be merged with schooling data because no schooling data were available for the town in which the property was located or if the property was located in multiple towns. The top portion of Table 1 gives basic information on the characteristics of the transfers that remained for the period from 1997 to 2005.[4] The mean value of transactions increased from 1997 to 2000, dropped slightly during the economic downturn in 2001 and 2002, and then grew rapidly through 2005. The composition of transactions shifted slightly away from permanent residences towards vacation homes, with a smaller share of single-family homes among the transactions in 2005 than among the transactions in 1997. This shift in composition may have muted any capitalization effects, since purchasers of vacation homes would be expected to be less sensitive to school quality when making their purchasing decisions.

The property transfer tax return data has the virtue of providing an exhaustive source of information on property values in Vermont. The main drawback of this data source is, however, the absence of detailed data on housing characteristics such as square footage, number of bedrooms, and number of baths. This drawback can be rectified by using data on houses that

[4] The analysis is limited to this period because data on test scores are unavailable prior to the 1995-96 school year and because Act 60 was operative only through the 2003-2004 school year.

have sold one or more time in the 1997 to 2005 period, since housing characteristics tend to be stable across time and thus can be accounted for implicitly in an analysis using repeat sales.

To generate the sample of repeat sales, properties were matched using the names of sellers and of buyers together with self-reports of the timing of the last sale. The characteristics of the properties that could be matched using this methodology are given in the bottom portion of Table 1. On average, relative to all transactions, the repeat sales tend to have prices, to be likely to be permanent residences, and to be likely to be condominiums.

The data on transactions was supplemented with information drawn from a variety of sources on Vermont's towns and their schools. Town level school expenditure and administrative data were obtained from the Vermont School Report and from publications of the Vermont Tax Department and the Vermont Department of Education. Annual estimates of each town's population were acquired from the U.S. Census Bureau. Added to these data were school district data available through the Common Core of Data, which is maintained by the National Center for Education Statistics. The Common Core provided information on school district revenues and expenses, including data on tax revenue and non-tax income sources such as user fees, capital gains, tuition, and miscellaneous alternative revenue, as well as enrollment figures and per pupil expenditures. The Vermont Education Report, Vermont Tax Department publications, and Vermont Department of Education data provided measures of school district characteristics, including property wealth, income, school inputs, standardized test performance, and salaries.

Because test score results for each school year became available late in the following fall, schooling provision data for each school year were matched to property transactions for the following calendar year. In other words, for example, transactions for the 1997 calendar year were matched with schooling data for the 1995-96 school year. Matching in this way insured that the schooling data matched to each transaction would have been available to the buyer at the time they made their purchasing decision. This matching process also had the virtue of limiting any potential endogeneity, since schooling provision measures can be treated as predetermined.

Assume, that the log of the value of house i at time t, $\ln(P_{it})$ is a linear function of house characteristics H_{it}, school characteristics S_{it}, and other neighborhood characteristics N_{it}. This model is expressed as

$$(1) \quad \ln(P_{it}) = \beta_{0t} + H_{it}\beta_1 + S_{it}\beta_2 + N_{it}\beta_3 + S_{it}Act60_t Status95_i\gamma + u_i + \varepsilon_{it}, \quad i = 1, \ldots, N, \; t = 1, \ldots, T,$$

where H_{it}, N_{it}, and S_{it} are vectors of observable regressors, β_{0t} , β_1, β_2, β_3 and γ are unknown parameters, and u_i and ε_{it} are unobservable stochastic random variables. The intercept is allowed to vary over time to allow for house price appreciation. This can be accomplished by including a set of time-period dummy variables in the model.

The interaction term $S_{it}Act60_tStatus95_i$ includes both a dummy variable, $Act60_t$, that equals 0 prior to Act 60 and 1 after Act 60 and a measure of the status of the local school district prior to Act 60. This term is included to allow for the possibility that the impact of Act 60 on the extent

of capitalization will vary across communities. Thus, the estimates of the elements of γ will indicate whether the finance reforms altered the extent to which schooling provision was capitalized into property values. In practice, since Act 60 shifted resources towards districts with low spending and low property wealth prior to the reform, measures of each district's spending or property wealth in 1995 will be used for $Status95_i$.

The parameters in (1) can be interpreted as the prices people are willing to pay for the given characteristics of the schools or the neighborhood. If in estimating (1), however, the unobserved individual component u_i is absorbed into the error term, the risk, particularly in a Tiebout-style setting of the type considered in this paper, is that this unobserved individual component may be correlated with the observed regressors. Factors determining neighborhood quality, like local park space, accessibility to local services, and block-by-block differences in maintenance, are unlikely to be among the observed neighborhood characteristics. Many of these factors, and most of the structural characteristics of the house, are relatively constant over time and hence are part of the time-invariant error term u_i . Since these factors are likely to be correlated with observed house, neighborhood, and school characteristics, the coefficients for these latter variables will probably be biased. One method for alleviating this bias is to condition on u_i, thus making u_i a house-specific fixed effect.[5] This methodology, which was used by Downes and Zabel (2002) and is implicit in the repeat-sales approach, is feasible if multiple observations on a single house are available. Since this earlier work established the importance of accounting for these unobserved characteristics, the focus below is on the estimates generated using this fixed-effects specification.

Results

As was evident in Table 1, property values in Vermont, like those in the rest of the nation, grew consistently throughout the period from 1997 to 2005. Figure 1 shows that this growth occurred in those districts that benefited the most from Act 60 and in those that were potentially hurt by Act 60. In this figure, districts are divided into quartiles on the basis of their current spending per pupil on education in 1995. Those in the first quartile would be expected to benefit most from the finance reforms, while those in the fourth quartile would potentially be harmed, in a relative sense, by the reform. Surprisingly, there is no evidence of convergence in values in the aftermath of Act 60. In fact, the growth in property values appears to be most rapid in districts with spending in the top quartile prior to Act 60.

The first two columns of Table 3 include estimates of a variant of equation (1) that replaces the house-specific effect with a term that is the same for all houses in the same district but varies across districts. This specification, which is analogous to that used by Brunner, Murdoch, and Thayer (2002), accounts for unobservable determinants of house prices that are common across

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[5] The boundary discontinuity approach that was first championed by Black (1999) offers an alternative method for controlling for unobserved neighborhood characteristics that might be correlated with observed measures of schooling provision. See Kain, Staiger, and Samms (2003), however, for discussion of the limitations of the boundary discontinuity approach.

all houses in a school district and are stable over time. This specification cannot control, however, for unobservable determinants that vary across houses within a district.

Since the omitted house category is mobile homes that are permanent residences, we get the unsurprising result that all other types of houses have higher values. And, in light of Schmidt and Scott's (2006) argument that effective tax rates in a district are proportional to the per pupil property wealth in that district, it is also not surprising that property values are higher in districts with higher per pupil municipal equalized values (and lower effective tax rates). Property taxes appear to be capitalized into property values. In addition, buyers seem to be willing to pay more to reside in larger districts; the elasticity of property values with respect to a district's average daily membership is about 0.22.

Limiting the analysis to only those properties on which we have at least two sales but still controlling only for district-specific effects, which is done in the final two columns of Table 3, indicates that the repeat sales do not appear to be a select group of sales, relative to all transactions. The estimates change little between the first two and the last two columns of Table 3. While for these repeat sales, the results are closer to those in the literature, we still see no compelling evidence of capitalization.

What each variant of specifications 1 and 2 in Table 3 reveals is that the estimates of this traditional hedonic indicate that schooling quality measures do not appear to be capitalized into property values. Neither the coefficient of the percent of fourth graders above the standard in math concepts nor the coefficient on the log of current expenditures per pupil differs significantly from zero. While these results are very different from the norm in the hedonics literature, they are very similar to the results Sherlock (2008) generated using Vermont data, particularly the negative coefficient on spending.

As noted above, any changes produced by the finance reform would be reflected in coefficients on the interactions between the Act 60 dummy variable and the products of the provision measures and spending in 1995. The finance reforms do not appear to have altered the relationship between property values and test scores. But the reforms do seem to have altered the degree to which per pupil education expenditures and property values were related, a possibility suggested by Figure 3. In particular, the estimates in the first and third columns of Table 3 indicate that the relationship between per pupil spending and property values increased more for districts that had high levels of spending in 1995 than it did for districts with lower levels of spending in 1995. This result, which could be partly attributable to successful use of nontraditional revenues by some districts that might otherwise have been hurt by Act 60 (Downes and Steinman, 2008), differs from the findings of Brunner, Murdoch, and Thayer (2002) for California, Hoxby and Kuziemko (2004) for Texas, and Roy (2004) for Michigan, all of whom found evidence of finance reforms increasing the extent of capitalization in previously low-spending communities relative to previously high-spending communities. To what extent these differences in the effects of reform between Vermont and other states are attributable to the importance of vacation properties and to other idiosyncratic aspects in the Vermont context is a question that must be explored in greater depth, particularly since these results have important implications for the political feasibility and the distributional effects of finance reforms.

The estimates of the specification in the second and fourth columns of Table 3, which adds variables like the share of property owned by town residents that Downes and Steinman (2008) have argued are likely to be related to the post-Act 60 effective property tax rate, differ little from the estimates in the first column. And what differences do exist tend to support the argument that property values are related to the determinants of the effective tax rate in a district. Thus, this richer specification appears to confirm that property taxes are capitalized into property values.

Table 4 gives estimates of the variant of equation (1) that account for house-specific effects. As a result, these estimates account for unobserved neighborhood characteristics. And what these estimates show is that failing to account for unobserved neighborhood characteristics may result in overstatement of the relationship between property values and school quality. In other words, the school finance reforms may not have resulted in as much divergence in capitalization as results in Table 3 indicate. That failing to account for unobserved neighborhood characteristics can result in overstatement of the impact of school quality is a common finding in the literature; see, for example, Black (1999).

But accounting for house-specific effects does not change any of the substantive results. All of the interaction results have the same sign and magnitude. Notably, the estimates continue to indicate that the relationship between per pupil spending and property values increased more for districts that had high levels of spending in 1995 than it did for districts with lower levels of spending in 1995.

The lingering question left from the results in Tables 3 and 4 is why estimates that use Vermont data fail to generate capitalization of school quality that has been seen in other settings. Table 1 implicitly suggest one possibility, the prominence of vacation homes in the Vermont market. Johnson and Walsh's (2009) analysis of vacation home market in Michigan indicates that the factors that influence vacation home prices may be very different from those that influence the prices of permanent residences. Therefore, if the market for vacation homes is distinct from the market for permanent residences, pooling sales from these two different markets is inappropriate, resulting in biased estimates of the impact of school quality on house prices.

The estimates in Table 5 make it possible to explore the possibility that the markets are segmented. In particular, equation (1) is estimated separately for vacation and permanent homes. And, on the whole, the estimates indicate that the markets are not segmented. In particular, the core findings from Table 4 are duplicated for both permanent and vacation homes. But several of the results in Table 5 suggest the two markets may not be fully integrated. For example, the differential strength of the coefficients on several interactions, particularly those on the interaction of the Act 60 dummy with equalized value and the interaction of the Act 60 dummy with the share of property owned by town residents, are consistent with vacation home purchasers responding differently to the changes resulting from Act 60. The stronger interaction of the Act 60 with equalized values implies that vacation home prices were relatively lower in communities in which the tax price associated with participating in the sharing pool were higher. And the stronger coefficient on the interaction of the Act 60 dummy with the share of property

owned by town residents indicates that the price of vacation homes was lower in communities in which there was an increased likelihood that voters would opt out of the sharing pool, depending on private donations to provide funding beyond the foundation level (Downes and Steinman, 2008). In other words, the structure of Act 60 may have been such that the markets for permanent and vacation homes may have segmented in ways that had not been apparent pre-Act 60. As a result, the post-Act 60 changes in the influence of the nature of funding of the public schools on house prices appears to have occurred mainly in the market for vacation homes.

Concluding remarks

The reforms to the system of education finance that resulted from Act 60 in Vermont are the type of canonical reforms that can be used to provide policy makers with necessary information about the magnitude of the expected and unexpected effects of such finance reforms. One such effect is the impact the reforms have on the relationship between school quality and property values. Previous research has provided some indication of the magnitude of that impact, but that research has not been able to incorporate fully the data and methodological innovations in some of the recent research in hedonics. The available data in Vermont will ultimately make it possible to develop measures of the impact of finance that are based on estimates that account for these recent innovations.

Standard hedonics estimates using Vermont data indicate that, while property taxes appear to be capitalized into property values, measures of schooling provision are unrelated to property values. In this way, the estimates using Vermont data differ from those in the literature. The Vermont estimates also differ from those in the literature because they indicate that finance reforms may have accentuated the gap in property values between districts with relatively high and relatively low spending prior to reform.

Why is Vermont different? While some of the differences can be explained by the prominence of vacation homes in Vermont market, most cannot. As a result, other possibilities must be explored. One such possibility is that most of the literature has used within-labor market variation, the type of setting in which the Tiebout model applies particularly well. But this analysis of Vermont may be best characterized as an across-labor market setting. So, school quality may naturally be a less critical determinant of house prices. Other uniquely Vermont explanations, such as the expectation that core elements of reform would be overturned or the ability of some communities to side-step the most onerous aspects of Act 60 may also explain the differences in the nature of capitalization between Vermont and other settings. Determining which of these explanations are the most plausible is a task for future research.

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Tables and Figures

Table 1 – Evolution of Property Values in Vermont

All Transactions										
	Statistic	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Property value	Mean	129184.1	140489.9	152304.7	187006.6	171266.8	183185.7	226359.8	274846.3	280187
	Std. Dev.	395605.2	536907	462432.1	901203.3	534697.7	392395.9	695366.6	947873.7	1074697
Resid. - Single family	Mean	0.6109	0.5906	0.5726	0.5770	0.5549	0.5561	0.5530	0.5455	0.5542
Resid. - Multi-family	Mean	0.0393	0.0420	0.0465	0.0464	0.0552	0.0570	0.0528	..0568	0.0547
Resid. - Condo.	Mean	0.0833	0.0922	0.0968	0.1084	0.0972	0.1068	0.0977	0.1093	0.1037
Resid. - Mobile home	Mean	0.0630	0.0673	0.0705	0.0634	0.0683	0.0633	0.0681	0.0679	0.0725
Vacation – Single family	Mean	0.1168	0.1394	0.1400	0.1301	0.1384	0.1362	0.1449	0.1378	0.1531
Vacation - Multi-family	Mean	0.0009	0.0015	0.0004	0.0008	0.0012	0.0012	0.0016	0.0013	0.0014
Vacation – Condo.	Mean	0.0809	0.0611	0.0682	0.0688	0.0738	0.0729	0.0772	0.0752	0.0538
Vacation – Mobile home	Mean	0.0047	0.0059	0.0049	0.0048	0.0075	0.0065	0.0047	0.0059	0.0065
Observations		9737	11130	11256	11069	11727	12518	13521	12805	9430

Table 1 (cont.)

Repeat Sales										
	Statistic	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Property value	Mean	139165	136054.9	156066.3	213284.6	173962.5	190265.2	202410	251545.6	273359.9
	Std. Dev.	392634.1	196110.8	477066.7	959494.1	363682.3	279049.6	189905.8	610069.3	740860.5
Resid. - Single family	Mean	0.6269	0.5910	0.5891	0.5749	0.5608	0.5465	0.5389	0.5593	0.5187
Resid. - Multi-family	Mean	0.0334	0.0364	0.0364	0.0381	0.0455	0.0421	0.0482	0.0475	0.0560
Resid. - Condo.	Mean	0.1498	0.1623	0.1700	0.1988	0.1517	0.1705	0.1673	0.1565	0.1306
Resid. - Mobile home	Mean	0.0324	0.0332	0.0368	0.0300	0.0377	0.0399	0.0409	0.0404	0.0373
Vacation – Single family	Mean	0.0859	0.1016	0.0971	0.0850	0.1062	0.1119	0.1072	0.1004	0.1567
Vacation - Multi-family	Mean	0.0010	0.0004	0.0004	0.0000	0.0007	0.0000	0.0015	0.0014	0.0037
Vacation – Condo.	Mean	0.0672	0.0712	0.0666	0.0714	0.0863	0.0846	0.0934	0.0918	0.0858
Vacation – Mobile home	Mean	0.0029	0.0040	0.0037	0.0018	0.0067	0.0045	0.0024	0.0025	0.0112
Observations		2096	2501	2689	2731	2967	3109	3275	2798	268

Table 2: School District Summary Statistics

	1996		1997		1998		1999		2000	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Average Daily Membership	655.86	779.71	656.13	778.07	658.49	779.27	655.45	780.71	655.47	782.16
Percent of 4th graders proficient in math	17.97	16.54	----	----	32.66	19.24	37.94	17.88	38.14	18.85
Pupil-teacher ratio	21.49	61.27	12.98	2.13	12.75	2.32	12.30	2.29	12.15	2.25
School District Demographics										
Poverty rate	12.41	7.56	12.59	7.74	11.55	7.41	10.71	7.52	11.81	7.70
Average agi for all tax returns	16387.64	3176.22	16599.11	3293.60	17316.98	3513.02	18337.46	3695.69	18993.97	3747.93
Percent of jointly filed returns with income below $75,000	----	----	89.14	7.46	86.88	8.33	85.16	9.13	83.58	9.58
Per pupil equalized municipal value	489490.3	458605.4	445385.6	430353.4	435064.0	378709.3	427801.8	319542.2	436830.7	340829.8
Percent owned by town residents	60.25	15.85	60.95	16.19	61.24	15.84	62.00	15.30	62.17	15.18
Percent commercial/industrial	11.85	11.49	11.82	11.77	11.69	11.49	11.08	9.28	11.13	9.17
School District Revenues										
Total revenue per pupil	7501.78	2188.55	7522.15	2128.94	7749.57	2248.55	8202.62	2407.84	8405.90	2235.08

Total alternative revenue per pupil	959.40	1630.08	946.27	1567.73	977.91	1629.80	1004.56	1653.35	1106.48	1698.78
Total miscellaneous revenue per pupil	75.98	106.78	101.46	129.56	96.91	124.69	59.07	137.12	157.20	444.80
Total other local revenue per pupil	155.03	149.43	173.78	153.16	165.59	155.19	128.80	150.84	228.86	460.98
Total interest earnings per pupil	73.49	75.60	67.04	63.27	64.85	60.92	68.22	68.23	69.71	75.61
Total revenue from other districts per pupil	696.64	1505.51	686.77	1496.28	729.13	1551.03	782.99	1589.01	792.03	1623.53
Total revenue from other sales per pupil	0.39	4.32	1.37	9.51	0.43	5.35	0.94	7.83	0.02	0.30
Tuition and fees per pupil	35.85	251.56	13.78	96.67	13.41	96.92	16.12	99.30	7.88	29.13
Transportation fees per pupil	3.59	30.89	3.73	32.85	1.81	16.86	1.56	19.37	0.64	5.56
Revenue from the sale of books per pupil	0.81	12.68	0.00	0.00	0.00	0.00	0.00	0.00	0.08	1.30
Activity fees per pupil	4.36	17.32	3.92	16.36	3.39	16.60	3.29	13.77	1.85	7.58
School District Expenditures										
Current expenditures per pupil	6626.30	1614.59	6622.75	1130.02	6753.76	1207.02	7217.65	1403.97	8142.53	1425.03
	2001		**2002**		**2003**		**2004**		**2005**	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**
Average Daily Membership	654.58	774.15	644.82	765.39	639.15	767.28	629.78	762.34		
Percent of 4^{th} graders proficient in math	42.06	19.04	45.65	20.42	44.37	16.70	50.56	19.32		

Pupil-teacher ratio	11.14	1.99	10.90	2.28	10.68	1.90	10.56	2.06		
School District Demographics										
Poverty rate	10.63	7.05	10.63	7.05	9.73	6.55	13.55	9.32		
Average agi for all tax returns	19413.49	3955.14	19115.06	3835.07	18533.49	3661.34	19107.59	3418.11		
Percent of jointly filed returns with income below $75,000	81.63	10.64	81.84	10.60	81.47	10.62	78.84	10.25		
Per pupil equalized municipal value	446659.3	363918.2	470614.5	385173.3	501570.0	437970.2	561755.5	474249.3		
Percent owned by town residents	62.65	15.11	63.03	14.89	63.51	14.88	63.93	14.72		
Percent commercial/industrial	11.34	9.14	11.27	8.85	11.22	9.10	10.77	8.60		
School District Revenues										
Total revenue per pupil	8773.93	2377.46	9265.65	2481.07	9614.96	2665.37	10355.61	3304.21		
Total alternative revenue per pupil	1242.27	1855.48	1280.99	2042.66	1380.01	2415.34	1461.68	2539.33		
Total miscellaneous revenue per pupil	199.46	506.24	206.56	569.09	246.91	725.92	227.94	640.94		
Total other local revenue per pupil	286.10	529.30	258.30	580.73	287.51	729.99	262.95	650.06		
Total interest earnings per pupil	81.71	79.76	48.17	48.43	35.59	47.76	24.67	35.38		
Total revenue from other		1771.29	926.39	1977.81	997.93	2186.74	1103.97	2448.88		

districts per pupil	861.17									
Total revenue from other sales per pupil	2.06	19.00	1.27	13.18	2.06	19.11	1.92	20.38		
Tuition and fees per pupil	8.58	25.88	7.92	26.68	7.36	21.54	9.57	52.45		
Transportation fees per pupil	4.95	40.39	1.10	10.63	0.60	7.34	0.17	1.38		
Revenue from the sale of books per pupil	0.11	1.40	0.00	0.00	0.00	0.00	0.00	0.00		
Activity fees per pupil	2.77	13.94	2.30	9.12	2.94	14.87	2.15	8.88		
School District Expenditures										
Current expenditures per pupil	8212.29	1448.23	8331.61	1535.89	8834.57	1680.58	10192.69	2083.38		

Table 3 - Hedonic Regressions (District effects only)[1]
Dependent variable: Natural log of property value
(Standard errors adjusted for hesteroskedasticity and clustered by district in parentheses)

	All transactions		Repeat-sales only	
	Specification 1	**Specification 2**	**Specification 1**	**Specification 2**
Percent of 4th graders at or above the standard – Math Concepts	0.0002 (0.0007)	0.0004 (0.0007)	0.0006 (0.0008)	0.0003 (0.0008)
Log of per pupil expenditure	-0.1264 (0.1150)	-0.1121 (0.0912)	-0.0805 (0.0861)	-0.1033 (0.0811)
Log of average daily membership	0.2185* (0.1251)	0.2243* (0.1159)	0.0839 (0.1394)	0.1060 (0.1499)
Log of average adjusted gross income per exemption	0.1006 (0.2096)	-0.0310 (0.1934)	0.0471 (0.2847)	0.0267 (0.2835)
Poverty rate	0.0017 (0.0025)	0.0018 (0.0025)	-0.0050 (0.0043)	-0.0046 (0.0045)
Log of equalized municipal property value	0.1762** (0.0722)	0.0933* (0.0563)	0.1195 (0.0834)	0.1711* (0.0930)
Share of property owned by town residents		0.0015 (0.0012)		0.0040*** (0.0015)
Share of property commercial/industrial		0.0022* (0.0012)		0.0013 (0.0013)
Resid. - Single family	1.8937*** (0.0564)	1.8943*** (0.0564)	1.8652*** (0.0870)	1.8656*** (0.0868)
Resid. - Multi-family	1.7593*** (0.0610)	1.7614*** (0.0608)	1.6819*** (0.0934)	1.6814*** (0.0932)
Resid. - Condo.	1.5480*** (0.0632)	1.5500*** (0.0630)	1.4904*** (0.0925)	1.4915*** (0.0924)
Vacation – Single family	1.8526*** (0.0726)	1.8532*** (0.0726)	1.8925*** (0.0996)	1.8962*** (0.0994)
Vacation - Multi-family	1.9838*** (0.1256)	1.9735*** (0.1248)	2.1010*** (0.1457)	2.1000*** (0.1467)

Vacation – Condo.	1.6138*** (0.1257)	1.6149*** (0.1252)	1.6458*** (0.1529)	1.6469*** (0.1528)
Vacation - Mobile home	0.3513*** (0.1136)	0.3509*** (0.1136)	0.4046** (0.1735)	0.4023** (0.1734)
Interactions with Act 60 dummy variable				
Product of math score and log of per pupil expenditure in 1995	-0.00002 (0.00010)	-0.00004 (0.00009)	-0.00001 (0.00010)	0.00005 (0.00011)
Product of log of current spending and log of per pupil expenditure in 1995	0.0093** (0.0047)	0.0050 (0.0033)	0.0076** (0.0035)	0.0094** (0.0045)
Log of equalized municipal property value		0.0436 (0.0278)		-0.0743** (0.0368)
Share of property owned by town residents		-0.0024** (0.0010)		-0.0035*** (0.0013)
Share of property commercial/industrial		-0.0029*** (0.0010)		-0.0017 (0.0014)
Observations	86404	86383	19043	19040
Within R^2	0.2894	0.2902	0.2854	0.2862

Note: 1) All regressions include district-specific fixed effects and year dummies.
* significant at 10 percent level, ** at 5 percent level, *** at 1 percent level .

Table 4 - Hedonic Regressions (Repeat sales with property-specific effects)[1]
Dependent variable: Natural log of property value
(Standard errors adjusted for heteroskedasticity in parentheses)

	Specification 1	Specification 2
Percent of 4th graders at or above the standard – Math Concepts	-0.0002 (0.0006)	-0.0002 (0.0006)
Log of per pupil expenditure	-0.0181 (0.0649)	-0.0595 (0.0648)
Log of average daily membership	-0.0617 (0.1132)	0.0009 (0.1303)
Log of average adjusted gross income per exemption	0.2023 (0.1800)	0.1550 (0.1851)
Poverty rate	-0.0029 (0.0044)	-0.0029 (0.0046)
Log of equalized municipal property value	0.0714 (0.0790)	0.1070 (0.0863)
Share of property owned by town residents		0.0024** (0.0012)
Share of property commercial/industrial		0.0025** (0.0010)
Resid. - Single family	0.4454*** (0.1173)	0.4468*** (0.1172)
Resid. - Multi-family	0.4889*** (0.1218)	0.4876*** (0.1218)
Resid. - Condo.	0.3787*** (0.1153)	0.3833*** (0.1151)
Vacation – Single family	0.4410*** (0.1182)	0.4431*** (0.1180)
Vacation - Multi-family	0.5656*** (0.1269)	0.5583*** (0.1279)
Vacation – Condo.	0.4010*** (0.1167)	0.4019*** (0.1165)
Vacation - Mobile home	-0.1649 (0.1226)	-0.1691 (0.1235)

Interactions with Act 60 dummy variable		
Product of math score and log of per pupil expenditure in 1995	0.00001 (0.00007)	0.00003 (0.00008)
Product of log of current spending and log of per pupil expenditure in 1995	0.0047** (0.0023)	0.0094** (0.0028)
Log of equalized municipal property value		-0.0562** (0.0274)
Share of property owned by town residents		-0.0032*** (0.0009)
Share of property commercial/industrial		-0.0051*** (0.0009)
Observations	19043	19040
Within R^2	0.2198	0.2225

Note: 1) All regressions include district-specific fixed effects and year dummies.
* significant at 10 percent level, ** at 5 percent level, *** at 1 percent level .

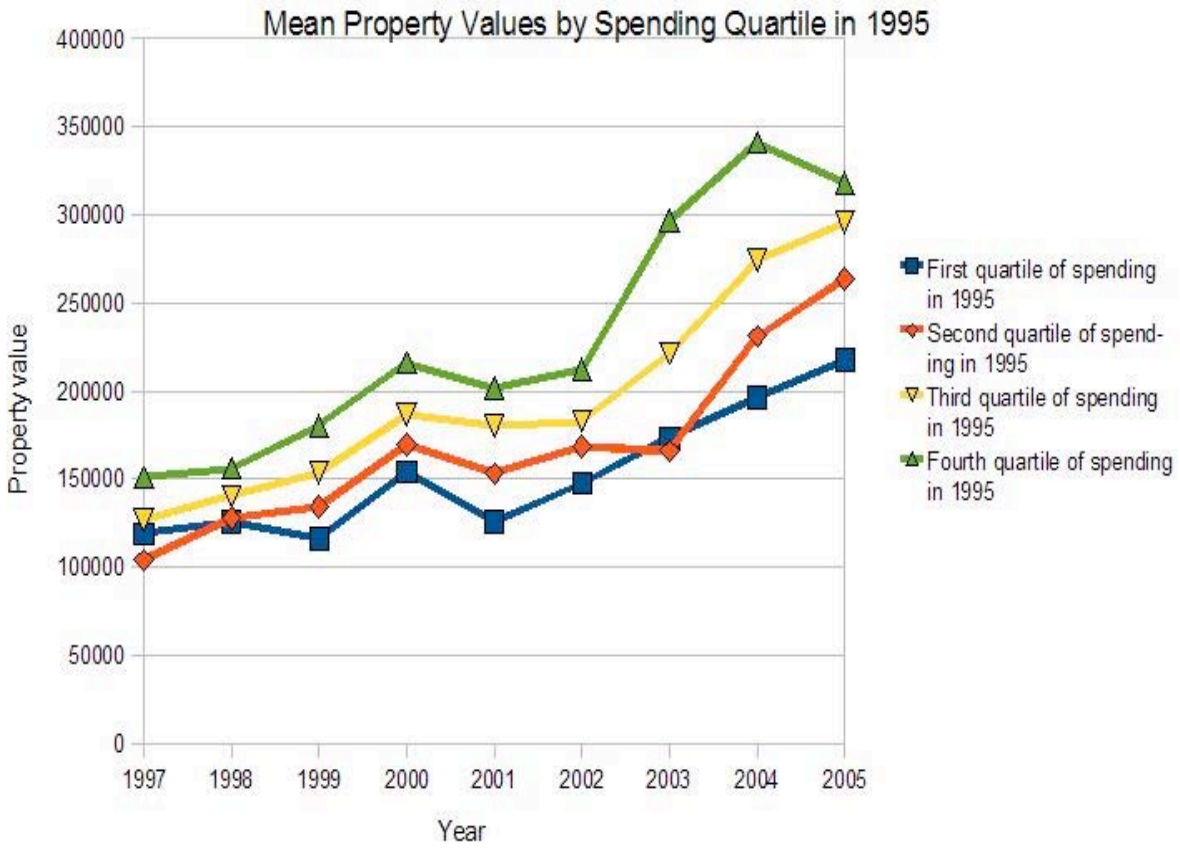
Table 5 - Hedonic Regressions - Vacation v. Permanent Homes
(Repeat sales with property-specific effects)[1]
Dependent variable: Natural log of property value
(Standard errors adjusted for heteroskedasticity in parentheses)

	Permanent Homes		Vacation Homes	
	Specification 1	**Specification 2**	**Specification 1**	**Specification 2**
Percent of 4th graders at or above the standard – Math Concepts	-0.0002 (0.0006)	-0.0003 (0.0007)	-0.0012 (0.0013)	0.0010 (0.0014)
Log of per pupil expenditure	-0.0655 (0.0768)	-0.0964 (0.0756)	-0.0273 (0.1178)	-0.1632 (0.1228)
Log of average daily membership	0.2003 (0.1232)	0.2771** (0.1315)	-0.2023 (0.2227)	-0.1653 (0.2505)
Log of average adjusted gross income per exemption	0.2646 (0.1872)	0.2153 (0.1903)	-0.2441 (0.3591)	-0.3013 (0.3600)
Poverty rate	0.0002 (0.0053)	0.0009 (0.0055)	0.0027 (0.0075)	0.0029 (0.0073)
Log of equalized municipal property value	0.0984 (0.0977)	0.1363 (0.1075)	-0.2185 (0.1128)	-0.1215 (0.1418)
Share of property owned by town residents		0.0022 (0.0016)		-0.0066 (0.0083)
Share of property commercial/industrial		0.0037*** (0.0013)		0.0130** (0.0055)
Resid. - Single family	0.5060*** (0.1297)	0.5073*** (0.1295)		
Resid. - Multi-family	0.5579*** (0.1334)	0.5592*** (0.1333)		
Resid. - Condo.	0.4440*** (0.1278)	0.4483*** (0.1277)		
Vacation – Single family			-0.0298 (0.1104)	-0.0545 (0.1137)
Vacation – Condo.			-0.0323 (0.1172)	-0.0486 (0.1203)
Vacation - Mobile home			-0.0491 (0.1182)	0.0181 (0.1215)

Interactions with Act 60 dummy variable				
Product of math score and log of per pupil expenditure in 1995	-0.00006 (0.00009)	-0.00003 (0.00010)	0.00008 (0.00017)	-0.0001 (0.0002)
Product of log of current spending and log of per pupil expenditure in 1995	0.0048* (0.0025)	0.0100*** (0.0028)	-0.0002 (0.0075)	0.0192* (0.0115)
Log of equalized municipal property value		-0.0475 (0.0389)		-0.1673** (0.0718)
Share of property owned by town residents		-0.0027** (0.0013)		-0.0055** (0.0026)
Share of property commercial/industrial		-0.0043*** (0.0011)		-0.0012 (0.0033)
Observations	15575	15574	3468	3466
Within R^2	0.1905	0.1918	0.3643	0.3739

Note: 1) All regressions include district-specific fixed effects and year dummies.
* significant at 10 percent level, ** at 5 percent level, *** at 1 percent level .

Figure 1


Mean Property Values by Spending Quartile in 1995
400000
350000
300000
250000
200000
150000
100000
50000
0
Property value
1997
1998
1999
2000
2001
2002
2003
2004
2005
Year
First quartile of spending in 1995
Second quartile of spending in 1995
Third quartile of spending in 1995
Fourth quartile of spending in 1995