The Impact of School District Consolidation on Housing Prices

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Abstract

This paper estimates the capitalization of school district consolidation into housing prices in New York State between 1990 and 2000. We utilize first differencing and 2SLS to account for district heterogeneity and possible endogeneity of the consolidation decision. We find that consolidation boosted house values and rents by about 25 percent in very small school districts and that this effect declines with district enrollment, as expected based on economies of size. Consolidation has no impact on house values for districts with more than about 1700 pupils. We also find that the impact of consolidation on housing prices declines with tract income and actually is negative in the highest-income tracts.

Key Words: *school district consolidation, capitalization*

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1 Introduction

Ever since Oates (1969), economists have recognized that any change in the property tax or perceived quality of the local public school system is likely to have an important impact on housing demand and therefore on housing prices in the affected communities. This paper applies this insight to school district consolidation.

School district consolidation has been one of the most dramatic changes in education governance and management in the United States in the last century. The number of U.S. school districts declined from 128,000 in 1930 to 14,805 in 1997 (National Center for Education Statistics (NCES) 2006, Table 84). The trend in New York state mirrors the trend in the nation; the number of school district in New York dropped from 9,950 in 1925 to 719 in 1990 (Pugh, 1994).

School district consolidation is no longer as common as it once was, but some states still encourage districts to consolidate. Districts receive extra aid for "reorganization", which usually means consolidation, in New York and at least seven other states (NCES 2001).[1] Some also encourage consolidation through their building or transportation aid formulas (Haller and Monk, 1988), although several states also discourage consolidation by giving additional aid based on sparsity or small scale (Huang 2004).

For two reasons, New York state has experienced a resurgence of school district consolidation since the mid 1980s. First, the consolidation incentives in New York's education aid programs were increased dramatically in 1983. A consolidated school district is eligible for additional formula operating aid over fourteen years and additional building aid for both approved renovation and new construction for projects begun within ten years of consolidation. According to the 1983 legislation, districts that consolidate received a twenty percent increase in formula operating aid incentive (ten percent in 1965 legislation) for five years, decreasing two percent each year afterwards, and ending after fourteen years. In the case of building aid, the matching rate bonus for consolidating districts was increased from twenty-five to thirty percentage points. (Spear and Payton, 1992).[2]

Second, the implementation of the Regents Action Plan in the mid 1980s contributed to the increased interest in reorganization (Spear and Payton, 1992). The Regents Action Plan imposes requirements to expand both the number and type of courses that students must complete to

[1] Consolidation, reorganization, and merger are used interchangably in this paper.

[2] The purpose of the incentive aid is to cover immediate costs incurred with consolidation. These costs include a single salary schedule for all staff in the reorganized school district, added class rooms to house classes, new uniforms and textbooks for the students and, in some cases greater transportation costs. According to NYSED (2006), the operating incentive is now up to forty percent for some districts.

receive a high school diploma in New York. As a result, some districts, especially the very small ones, most likely rural districts, had to broaden their curriculums and find classrooms to house the added courses.

Not surprisingly, consolidation is a particularly appealing option to small rural school districts. In fact, among the 31 school districts consolidated since 1990, only three small suburbs are not classified as rural. Table 1 presents some statistics on the consolidations that have taken place since 1990, such as the year of consolidation and the enrollment before consolidation. The majority of these school districts had an enrollment below 1000 the year before consolidation. Considering the fact that more than 40 percent of all American schools are in rural areas and 30 percent of all students attend rural schools (NCES, 2006.), the focus on rural consolidation in this study may shed light on issues of importance in many states other than New York.

The main source of the consolidation trend in this country appears to be the belief that consolidation leads to lower costs per pupil as a result of economies of size. Several studies, which are reviewed below, have explored the accuracy of this belief. Consolidation has other effects, however, which may be more difficult to estimate. Consolidation may lower competition among school districts, for example, or it may raise the transportation costs of students and their parents. As a result, we attack this issue from a different angle by asking how much parents value district consolidation as reflected by how much they are willing to pay to live in a school district that has recently consolidated with a neighboring district. Thus, we ask whether the people who buy housing perceive net benefits from consolidation due to economies of scale or other sources. Our analysis draws not only on studies of economies of size, but also on studies of the causes of consolidation (Brasington 1999; Gordon and Knight 2006).

We begin with a conceptual discussion that illustrates the channels through which consolidation could affect housing prices. Building on this discussion, we show that any empirical estimate of the impact of consolidation faces three key challenges. First, some characteristics of the consolidated school districts that are not observed by the researcher may be related to both the consolidation decision and housing prices. Some districts that have declining property values, because a large factory has closed, for example, may respond by consolidating with a wealthier neighbor. In this case, the estimated capitalization effects will be biased and inconsistent. In other words, we have to deal with the potential endogeneity problem caused by omitted variables.

Second, the impact of consolidation on property values is unlikely to be the same in all circumstances. Many studies, reviewed in Andrews et al. (2002), find a U-shaped relationship between spending per pupil and district enrollment. A recent study of rural school districts in New York (Duncombe and Yinger, forthcoming) also finds economies of size that decline with district enrollment. These findings imply that consolidation will lower per pupil costs substantially when two small districts combine but will have a much smaller impact on costs when both consolidating districts are relatively large for rural districts. Because property values are expected to reflect these cost savings, consolidation will have a larger impact on property values in the first case than in the second. We develop a specification that allows us to account for this possibility.

Third, for policy purposes, it is helpful to know whether consolidation affects property values because it lowers per pupil costs, because it attracts large increases in state aid, or for some other reason. A comparison of property values in districts that do and do not consolidate, holding other things constant, yields an estimate of the overall impact of consolidation, but it cannot determine which of these factors is at work. In addition to estimating the impact of consolidation alone on property values, therefore, we also estimate a model that separates the property-value impacts of enrollment change, school aid change, and other factors associated with consolidation.

Only one previous study has explored the effects of school district consolidation on property values, namely, Brasington (2004). Using housing transaction data from Ohio in 1991, this study finds that school district consolidation lead to a 3.5 percentage drop in constant-quality housing values. This pioneering study has extensive data on housing characteristics, but it does not address any of the three problems identified above. Brasington (1999) also contributes to an understanding of the potential endogeneity problem discussed above by showing that property values may influence the decision to consolidate, but he does not incorporate this insight into his later study of the impact of consolidation on property values.

The paper is organized as follows: Section 2 provides a conceptual framework. We discuss the potential sources of economies of size associated with school district consolidation and develop a formal model of the link between consolidation and property values. Section 3 describes our data set, and section 4 describes our estimating strategy. Our results are presented in section 5. These results indicate the extent to which school district consolidation affects property values in New York State. Section 6 presents our conclusions.

2 Conceptual Framework

The principal reason consolidation is expected to influence property values and rents is that it allows small school districts to take advantage of economies of size. In this context, the definition of "scale" is school district "enrollment" or "size." [3] As we use the term, economies (diseconomies) of size exist if the estimated elasticity of education costs per pupil with respect to enrollment, holding student performance constant, is less than (greater than) zero.

[3] Alternative measures of scale include the quality or scope of educational services. See Duncombe and Yinger (1993).

2.1 Sources of economies of size

Although consolidation is often expected to engage economies of size, the literature finds sources of both economies and diseconomies of size in educational production. Three main sources of economies of size have been identified.[4] The first one is a price privilege associated with larger size; large districts can negotiate bulk purchases of supplies and equipment. The second one is related to specialization. Tholkes (1991) pointed out that large school districts are able to efficiently utilize specialized labor, such as math and science teachers, and specialized facilities, such as science and computer labs. Finally, administrative costs per pupil may be lower in large schools because central administrative staff and support personnel, such as counselors, can be shared by many students.

Several potential sources of diseconomies of size also appear in the literature. Tholkes (1991) argued that price disadvantages also exist as teacher unions are more apt to organize in larger districts, and wages are typically 'leveled up' to those of the most generous district. These possibilities may be particularly relevant for rural areas because one of the objectives of consolidation is to provide competitive salaries so that the new district can attract and retain quality teachers. A second potential source of diseconomies of size, which also appears to be particularly relevant in rural areas, is higher transportation costs. Consolidated districts usually pool pupil in similar grades in the same building, which generally results in longer average commute times.[5] Another factor that could lead to diseconomies of size is lower student and staff motivation and parental involvement in larger schools. Cotton (1996), Barker and Gump (1964) argue that in smaller schools students have a greater sense of belonging to the school community and school personnel are more apt to know students by name and to identify and assist students at risk of dropping out. In addition, school administration may be less flexible in larger schools, and parents of children in larger schools may find it less rewarding to participate in and monitor school activities.

As indicated earlier, Duncombe and Yinger (forthcoming), find evidence that the factors leading to economies of size dominate in rural school districts and that economies of size weaken as district size goes up. In addition, they find that consolidation involves substantial adjustment costs. Overall, doubling enrollment through consolidation cuts total annual costs per pupil by 31 percent for two 300-pupil districts but by only 14 percent for two 1,500-pupil districts.

The finding that economies of size declines with size (and may eventually disappear or reverse) has two key implications for our study. First, it implies that all consolidations are not alike, and in particular that some consolidations, those involving very small districts, are likely to have a larger

[4]See Andrew et al. (2002) or Duncombe and Yinger (forthcoming) for a detailed discussion.

[5]In addition, Kenny (1982) suggested significant opportunity costs to both students and parents of longer travel time to school resulted from consolidation. This effect does not show up in school district budgets, but might show up in property values.

impact on per pupil costs and hence on property values than others. It is inappropriate, therefore, to specify a model in which consolidation has the same absolute or percentage impact on property values and rents in every district. As discussed in more detail below, we address this problem with an interaction between consolidation and pre-consolidation enrollment.

The second implication follows from the fact that consolidation cannot take place, at least not in New York, unless it is approved by the voters in all affected districts. Because economies of size, the main benefit from consolidation, decline with district size and may eventually disappear, the probability that voters will approve consolidation is likely to be smaller in large than in small districts. Moreover, the benefits and costs of consolidation not associated with enrollment are likely to vary from one district to the next and to influence the decision to consolidate. Because district size and other factors influencing the desirability of consolidation are likely to be correlated with property values, any explanatory variable indicating districts that consolidate is likely to be endogenous. The second implication, in other words, is that variables influencing consolidation also may influence property values so that their omission biases the coefficient of the consolidation variable in a property value regression.

We take two steps to address the potential endogeneity of our consolidation variable. First, we estimate our models in difference form, which is equivalent, in our case, to including fixed effects, to eliminate the possible bias from omitted time-invariant variables. Second, we address any remaining endogeneity in the consolidation variable by estimating our model using an instrumental variable technique. Our instrumental variables procedure is discussed in detail below.

2.2 Formal Model

A full analysis of the impact of consolidation on property values must recognize that consolidation alters both the education cost function in a school district and voters' demands for education services. These effects can be analyzed using three well-known equations: A property value equation, a school district budget constraint, and an education demand function. The property value equation recognizes that rental services from a house, R, are a function of the quality of education services, S. Moreover, the price of a house equals the present value of the flow of rental services. Under the assumption that property taxes, levied at rate τ, are capitalized at a rate of β percent and with a discount rate of r, the capitalization rate is $(r + \beta\tau)$ (Yinger et al. 1988). In short:

$$V = \frac{R(S)}{r + \beta\tau} \tag{1}$$

An education cost function relates best-practice spending on education per pupil to the quality of education services, S, student enrollment, N, the price of inputs, and student characteristics, such as concentrated poverty. Actual spending, E, equals best-practice spending divided by school district efficiency (Duncombe and Yinger, 1997, 2000; Reschovsky and Imazeki, 1997, 2001). Our focus is on consolidation, C. Enrollment is a function of consolidation; that is $N = N\{C\}$, with $N' > 0$ (For all single-valued functions, derivatives are indicated with a prime). Moreover, consolidation may influence best-practice spending in other ways, by requiring adjustment costs, for example. Suppressing the arguments that are not relevant for our analysis, this leads to the following expression for actual spending per pupil: $E = E\{S, N\{C\}, C\}$.[6] A school district budget constraint sets spending per pupil equal to revenue per pupil. Revenue per pupil consists of property taxes and state aid, A. Property taxes per pupil equal the property tax rate multiplied by property value per pupil, or $\tau\overline{V}$. As discussed earlier, consolidation has a direct impact on state aid in New York, so we can write $A = A\{C\}$, with $A' > 0$. Thus the school district budget constraint is:

$$E\{S, N\{C\}, C\} = \tau\overline{V} + A\{C\} \tag{2}$$

Solving Equation 2 for τ and substituting the result into Equation 1 yields

$$V = \frac{R\{S\}}{r + \frac{\beta}{\overline{V}}(E\{S, N\{C\}, C\} - A\{C\})} \tag{3}$$

The final equation is a demand equation for S, which depends on the median voter's income, tax price, and preferences. As is well known, state aid, A, is a component of a voter's full income, and the marginal cost of S, $\frac{\partial E}{\partial S} = MC$, is a component of tax price. (See Duncombe and Yinger, 2000.) Consolidation also affects MC through its impact on economies of size, so we can write $MC = MC\{C\}$.[7] Suppressing the arguments that are not relevant for our analysis, we can write this demand function as follows:

$$S = S\{A\{C\}, MC\{C\}\} \tag{4}$$

Now we can totally differentiate Equations 3 and Equation 4 with respect to V, S, and C. This leads to the following expression for the impact of consolidation on house values:

$$\frac{dV}{dC}\frac{1}{V} = A'[\frac{R'}{R}\frac{\partial S}{\partial A} - \frac{\beta}{\overline{R}}(\frac{\partial E}{\partial S}\frac{\partial S}{\partial A} - 1)] + \frac{\partial S}{\partial MC}MC'(\frac{R'}{R} - \frac{\beta}{\overline{R}}\frac{\partial E}{\partial S}) - (\frac{\partial E}{\partial N}N' + \frac{\partial E}{\partial C})(\frac{\beta}{\overline{R}}) \tag{5}$$

[6] In principle, consolidation might also affect the student characteristics or district efficiency. These effects are likely to be small, however, and they are not considered here.

[7] In principle, consolidation also might affect the tax-share component of tax price, which is $\frac{V}{\overline{V}}$. This effect appears to be very small in New York State (see Duncombe and Yinger, forthcoming), and we ignore it here.

where $\overline{R} = \overline{V}(r + \beta\tau)$. The first term on the right side of Equation 5 reflects the impact of aid increases associated with consolidation on S and τ, and hence on V. Aid increases make possible property tax cuts, which are represented by the 1 at the end of this part, but also lead to service quality increases, which boost the rental value of housing, as indicated by the first term, and lessen the property tax savings, as indicated by the term before the 1.

The second term in Equation 5 reflects the impact of consolidation on the demand for S through its impact on the marginal cost of S. With a standard multiplicative cost function, the sign of MC' is the same as the sign of $\frac{\partial E}{\partial N}$.[8] If consolidation results in economies of size, therefore, $MC' < 0$, and the first term in brackets is positive. The consolidation-induced decrease in MC raises property values because it boosts S, but this increase is offset to some degree because it is paid for in the form of higher property taxes.

Finally, the third term in Equation 5 shows the direct impact of consolidation on the cost function. The first part of this term, $\frac{\partial E}{\partial N}N'$, measures the property-value impact of the cost savings, and hence the property tax cuts, associated with consolidation-induced economies of size. As noted earlier, N' is positive. With economies of size, however, $\frac{\partial E}{\partial N}$ is negative and this effect boosts property values. Different consolidations also result in different changes in N, and the impact of a given change in N on E (and hence on property values) is much larger when the initial N is small than when it is large.

The second part of this term, $\frac{\partial E}{\partial C}$, could be positive or negative. If consolidation results in adjustment costs, for example, these costs will offset some of the property tax gains associated with economies of size.

This model provides valuable perspective on our study of the property value impacts of consolidation. First, it is clear that consolidation may alter both public service quality and local property tax rates. Voters will not give up \$1 of their consolidation-induced property-tax savings and convert it into service quality improvements unless these improvements are worth at least \$1 to them. In principle, the service quality improvements could be worth more than \$1, so that impact on property values might depend on the mix of tax cuts and service improvements.

Of course, education quality and the property tax rate may change for reasons other than consolidation. We do not want to control for these changes because that approach would undermine our ability to isolate the impact of consolidation. If we do not control for them, however, we face another potential source of endogeneity: factors that influence changes in service quality or the property tax rate may also influence the decision to consolidate. This observation reinforces the need to treat consolidation as endogenous. Our approach to this issue also differentiates our study

[8] The standard multiplicative cost function is $E = KS^{\sigma}\ f\{N\{C\}\}$, where K represents all factors other than S and N. In this case, $MC = \frac{\sigma E}{S}$. Hence $MC' = \frac{\sigma}{S}\frac{\partial E}{\partial N}N'$.

from Brasington (2004), who estimates the impact of consolidation after controlling for service quality and tax rate. As a result, Brasington is not estimating the impact on property values of consolidation-induced economies of size, because this impact will show up in the service-tax package. Instead, he is estimating what people are willing to pay for consolidation-induced factors that fall outside the school budget. This interpretation is consistent with the one given by Brasington. He finds a 3.5 percent (or $2,929) decline in constant-quality house value associated with school district consolidation and interprets this as a sign that consolidation restricts the median voter's control over school outcomes and that the median voter would be willing to pay to avoid this loss of control.

Second, this analysis makes it clear that consolidation can influence property values through at least three different channels: its impact on economies of size, its impact on state aid, and its impact on adjustment or other costs not associated with enrollment. These channels have quite different implications for public policy. The main policy question is whether consolidation can result in costs savings by producing economies of size. An estimate of the impact of consolidation on property values does not isolate this impact but instead captures the impact of all these channels put together.

We address this issue in two steps. The first step is to estimate our main models with an interaction between consolidation and pre-consolidation enrollment. This approach makes it possible to determine whether the impact of consolidation is larger for smaller districts, as predicted by the economies-of-size effect. In other words, this approach can test the view that economies of size are at work, but it cannot determine the magnitude of this effect or separate it from other effects.

In the second step, we estimate an additional model to determine whether the property value impacts of consolidation are linked to changes in state aid, as well as to initial enrollment. The new variable in this model is the change in state aid. This variable is, of course, endogenous because the decision to consolidate results in a large state aid increase. Our strategy for addressing this endogeneity is discussed below.

A third element of perspective from our model is that the effect of consolidation also might vary within a school district. In equation (5), almost all of the variables describe district characteristics, but R describes the rental value of a house and R'/R describes the percentage change in this rental value when S changes. The impact of this ratio on house values depends, of course, on the extent to which consolidation-related state aid increases and marginal cost decreases lead to increases in S. Although we do not observe R or R', we do observe tract income, Y, which is one of their key determinants. Evidence that the impact of consolidation depends on Y therefore provides indirect support for the hypothesis that residents expect consolidation to lead to improvements in S and that the impact of these improvements on house value depend on R'/R.

More specifically, standard derivations in the Tiebout literature (Ross and Yinger, 1999) indicate that $R' = MB/(1 + \tau/r)$, where MB is the marginal willingness to pay for S. The value of MB obviously depends on Y, as higher income households generally are willing to pay more for another unit of S. Using this expression for R' and differentiating R'/R with respect to Y, we find that R'/R increases with income if the income elasticity of MB is greater than the income elasticity of demand for housing.[9] Under this condition, therefore, the impact of consolidation on house values will be greater in higher-income tracts. In contrast, R'/R decreases with income if this elasticity condition is reversed, and the impact of consolidation will be greater in lower-income tracts.

The income elasticity of MB equals the ratio of the income and price elasticities of demand for S.[10] The above elasticity condition therefore compares this ratio with the income elasticity of demand for housing. This is the same elasticity condition that has been derived to study sorting: If the income elasticity of MB is greater than the income elasticity of demand for housing, then higher-income households will sort into school districts with higher levels of S, which is called normal sorting. Most estimates of these elasticities indicate that the condition for normal sorting is likely to hold (Ross and Yinger 1999). If so, our application of this condition indicates that consolidation should have a larger percentage impact on house values in higher-income tracts. Nevertheless, the range of estimated elasticities is quite wide, and few estimates are available for rural areas. As a result, the condition for normal sorting might not hold in our sample, in which case consolidation could have a larger percentage impact on house values in lower-income tracts. Our strategy is to interact consolidation with a tract's income relative to the average income in its (pre-consolidation) school district and then interpret the result with all these possibilities in mind.

3 Data Description

We estimate the impact of consolidation on housing prices using the Geolytics Company's Neighborhood Change Database (NCD) for New York State in 1990 and 2000, a variation of census data; data from the New York State Education Department; and school district maps from NCES. The dependent variable and a number of housing characteristics, demographics, and economic characteristics come from NCD data. The NCD data are collected at the census tract level, which is the smallest geographic unit that can be matched across multiple census years. Each census tract usually contains approximately 4,000 people. Our data set includes all census tracts in 228 rural

[9]More formally, $R = PH$, where PS is the price per unit of housing services, H, and $R' = P'H$. The literature shows that $P'H = MB/(1 + \tau/r)$. Thus, $R'/R = MB/[PH(1 + \tau/r)]$, where MB and H are functions of Y. Simple differentiation reveals that the sign of $\partial(R'/R)/\partial Y$ depends on the elasticity condition in text.

[10]This statement is exactly true for some utility functions (see Ross and Yinger, 1999) but is approximately true for any utility function (Wheaton 1995).

school districts in New York State.[11] After dropping 154 observations with missing values, the sample contains about 2,850 census tracts.

Our dependent variables are average house values and rents.[12] The average house value in each tract is derived from the data for owner-occupied single-family houses by dividing aggregate house value by the number of housing units. Average housing rents are derived in the same manner based on the sample of renter-occupied housing units. Housing characteristics and demographics include variables such as number of bedrooms, age of the house, percentage population that are black, and percentage household with public assistance income, etc.

Table 2 and Table 3 present descriptive statistics of our data in 1990 and 2000. Census tracts located in consolidated school districts are listed separately from those belonging to non-consolidated school districts to facilitate comparisons. The indicator for consolidation equals 1 if a school district merged with another after 1990 and equals zero otherwise. In our sample, 28 rural school districts containing a total of 140 census tracts consolidated in the 1990s.

In both years, real average housing value is slightly lower in census tracts within a consolidated school district than those in a non-consolidated district.[13] Moreover, census tracts in consolidated school districts have relatively lower household income and fewer total housing units.

It is worth noting that, on average, expenditure per pupil grew at a faster rate in census tracts belonging to school districts that consolidated than those in other districts. Between 1990 and 2000, expenditure per pupil increased by 86 percent in census tracts located in districts that consolidated during that decade but only by 66 percent in census tracts within districts that did not consolidate. This relatively high increase in expenditure appears to be fueled, to some extent, by generous state aid. To be specific, state aid increased by 109 percent in consolidating districts but only by 55 percent in other districts. This disparity in aid increases implies that by 2000 almost 56 percent of

[11]A school district is defined as rural if its urban population is less than thirty percent (NCES, 2006). We exclude census tracts in non-rural school districts because, as noted in the text, the consolidation of non-rural school districts is rare. Following the logic of the no-support condition in program evaluation, therefore, we might obtain misleading estimates of the impact of consolidation if non-rural districts were included.

[12]Ideally, we would also like to conduct analysis based on median house values and rents. It turns out, however, that the median house values data obtained from the Geolytics Company's NCD for New York State in 1990 are unreliable. NCD is a panel data set of census tracts based on 2000 census tract boundaries. In 2000 the mean and median house values are reasonably close to each other in New York States. In New York in 2000, for example, the mean of the median house values is $175,133 and the overall mean is $207,785. In 1990, however, the mean of the census tract median house values in New York State is only $106,824, compared with an overall mean of $215,825. This remarkable gap between overall mean and the mean of median in 1990 is probably caused by the procedure used to form consistent data that are based on 2000 census tract boundaries. In particular, in order to construct a panel data based on 2000 census tract boundaries (the census tract boundaries have changed since 1990), the data in 1990 have to be reconfigured somehow to match the 2000 tract boundaries. The derived median values may have nothing to do with the true median values if the census tract boundaries have changed dramatically across years. These problems do not appear to be as large with rents; in 1990, the median housing rent was 681 and the overall mean rent was 685. For consistency, however, we use the mean rent.

[13]Both average house values and rents are adjusted using Consumer Price Index to 2000 dollars.

expenditure per pupil was covered by state aid in census tracts associated with consolidated school districts; the comparable share for those belonging to non-consolidated districts was 46 percent.

As we mentioned earlier, the 1983 legislature imposes a dramatic increase in operating aid for those districts that consider reorganization. Higher aid implies lower property tax rates holding everything else constant, which may be capitalized into housing values. Thus, it would be interesting to distinguish the capitalization effect that is caused by increased state aid from the effect that is due to economies of scale. We will explore this decomposition in more detail in the empirical estimation section.

A key data challenge is the determination of the school district location of each census tract. This challenge has three parts. First, we need to obtain consistent measures of census tract boundaries because these boundaries change over time. Second, school district boundaries also change due to consolidation. Third, we have to match each census tract with its corresponding school district for each year.

The Geolytics Company's Neighborhood Change Database (NCD) provides a panel data set of census tracts that is based on 2000 census tract boundaries. This data set solves the first part of our data challenge. As far as the school district boundaries are concerned, the NCES provides 1990 and 2000 school district maps. By overlapping the 1990 school district map and the census tract (NCD) boundary map, we are able to match each census tract with its corresponding school district and maintain the school district boundaries as they were in 1990. This approach ensures that we can match each tract in a pair of consolidating districts with the characteristics of its separate non-consolidated district before consolidation. Alternatively, we can also overlay the 2000 school district map on the NCD map to match each census tract with a school district based on 2000 school district boundaries. In this way we can link each tract with the characteristics of the consolidated school district to which it belongs after consolidation. These tasks are accomplished using Mapinfo.

4 Estimation Strategy

A general cross-sectional model of housing prices (or rents) can be written as

$$\log(V_{it}) = \alpha + \beta C_{it} + \gamma X_{it} + \mu_i + \epsilon_{it} \tag{6}$$

where $\log\,(V_{it})$ is the logarithm of average housing values (rents) in school district i at time t.[14] The indicator variable C_{it} equals 1 if district i has experienced consolidation at time t. The vector X_{it} includes determinants of housing prices, such as housing characteristics and neighborhood demographic and socioeconomic characteristics. u_i is time-invariant unobserved school district heterogeneity. ϵ_{it} is the error term. A version of this equation is estimated by Brasington (2004).

The presence of time-invariant heterogeneity in equation 6 could be a source of bias in estimating β, which measures the percentage change of house values (rents) associated with school district consolidation. For example, consolidating and non-consolidating districts could have systematically different unobserved characteristics that influence housing prices. This problem can easily be solved with our data, however, by estimating equation 6 in difference form so that the time-invariant unobservable factors cancel out:

$$\Delta\log(V_{it}) = \beta\Delta C_{it} + \gamma\Delta X_{it} + \Delta\epsilon_{it} \tag{7}$$

As discussed earlier, the impact of consolidation on property values is unlikely to be the same in all jurisdictions. According to the estimates in Duncombe and Yinger (forthcoming), for example, economies of size fade as school district enrollment increases, so the net benefits of consolidation and hence the impact of consolidation on property values should be greater for smaller districts. To account for this possibility, we add another term to our specification, namely, an interaction between the change in the consolidation indicator and a district's 1990 (i.e., pre-consolidation) enrollment. We expect that the sign of this interaction term will be negative; larger districts will have smaller net benefits and smaller property value gains than smaller districts.

Accounting for time-invariant unobservable factors is a step in the right direction but is unlikely to eliminate all bias in the estimate of β. As discussed earlier, consolidation is a choice made by voters and this choice may be influenced by factors that also influence property values. Brasington (1999) finds, for example, that current property values help to predict future consolidation, so unobservable district level trends in property values may influence which districts consolidate during a given decade. In addition, we pointed out that our regressions purposely do not control for changes in service quality and property tax rates, but such changes might be correlated with both property values and the decision to consolidate. As a result, estimates from Equation 7 are still subject to endogeneity bias due to time-varying unobservable factors influencing both property values and the decision to consolidate. Under these circumstances, unbiased estimates require an instrumental

[14]Consolidation takes place at the school district level. For two reasons, however, we estimate our models at the census tract level. First, we want to capture as much variation in housing characteristics as possible. Second, we want to determine whether the impact of consolidation depends on household characteristics, as measured by the tract average. To account for potential heteroscedasticity with this design, our standard errors are clustered at the school district level.

variables procedure.

The challenge in implementing such a procedure is, of course, to find appropriate instruments. These instruments must help to predict whether consolidation occurs in the 1990s and not be correlated with the change in property values during that period. We have identified two instruments that appear to meet these conditions. In a later section, we implement a series of tests to address this claim.

The first instrument is number of consolidations that occurred in a census tract's county in the 1960s. The number of possible consolidations is limited, and this variable indicates the extent to which possible consolidations have already been used up. Thus, we expect that a larger number of consolidations in the 1960s will lead to a smaller chance of a new consolidation in the 1990s. We base this variable on the 1960s instead of the 1970s or 1980s both because more consolidations took place in the earlier decade, which gives us more variation to work with, and because the more distant timing minimizes the chance that the instrument is correlated with unobserved factors that influence the change in property values in the 1990s.

Our second instrument is the number of school districts that are contiguous to the school district in which a census tract is located. This instrument also refers to opportunities for consolidation, but it captures both within- and across-county variation in the number of neighboring districts. We expect that a larger number of neighbors will increase the probability of consolidation.

The distributions of these two instrumental variable are presented in Table 4. On average, there have been twice as many consolidations, 3, in each county in the 60s among consolidated school districts than among non-consolidated school districts, 1. In terms of the number of neighboring districts, consolidated school districts have slightly more neighbors, 6, than non-consolidated school districts, 5.

To account for the fact that consolidation-induced economies of size will be larger for smaller districts, our specification includes not only the change in the consolidation indicator, but also an interaction between this variable and pre-consolidation enrollment. We put in the fitted value of consolidation indicator, along with the interaction of this fitted value and pre-consolidation enrollment in our second stage regression in the 2SLS (Fisher, 1966).

5 Estimation Results

We begin by conducting the conventional cross-sectional approach to estimating the relationship between school district consolidation and house values and rents. For conciseness, these results are not shown here but are available upon request. It is worth noting that the coefficient of the consolidation indicator is generally negative regardless the year or the dependent variable. The change of average house values associated with consolidation is roughly -1 percent using 2000 data, although the result is not significant at conventional levels. As far as housing rents are concerned, we find an increase of 0.1 percent using 2000 data. As in the case of house values, the result is not statistically significant. With one exception, the results for the housing and neighborhood characteristics have the excepted signs.

The results for first-differenced estimation are shown in Table 5 and Table 6. The adjusted standard errors are obtained using bootstrapping based on 2000 replications. In addition to those control variables shown in Table 2 and Table 3, we also add the interaction term between consolidation and pre-consolidation enrollment to capture the heterogenous effects due to the various sizes of the school districts. These results differ significantly from the OLS results. The coefficient of the two consolidation variables now have the expected signs. In Table 5, the coefficient of the consolidation variable without the interaction term is 0.020 with a standard error of 0.018. After accounting for the heterogenous effects, the coefficient of consolidation now is 0.041 and the coefficient of the interaction term is -0.0024. As expected, consolidation increases house values and this impact declines as the initial enrollment of the district rises. The result for the consolidation indicator is significant at conventional levels. The results from Table 6 when rents are used as dependent variable are similar. The first-differenced models show that consolidation is likely to increase average housing rents after correcting for time invariant unobservables. The coefficient of consolidation variable is 0.012 without the interaction term and 0.013 with the interaction term. The coefficient on the interaction term is -0.0001. These results indicate that consolidation increases rents and, as expected, that the impact decreases with pre-consolidation enrollment.

In addition, we apply our instrumental variable strategy to the first-differenced estimation using Two Stage Least Squares (2SLS). We present the first-stage regression results in Table 7. Two instrument variables, namely, the number of consolidations in the 60s and the number of neighbors, along with the explanatory variables in the first differencing model are used to predict the change of consolidation status in the 90s. In the first stage regression, the coefficient on consolidations in the 60s is negative and statistically significant as expected. The coefficient on the number of neighbors is positive and significant at conventional level, consistent with our prediction. The first stage F statistics is about 6.

Our 2SLS results with first differencing are presented in Table 8 for house values and Table 9 for rents. For the sake of parsimony, these tables only display the coefficients for the consolidation variables (the results for other coefficients are similar to those in the first differencing tables, and are available from the authors upon request). These regressions are estimated with a conventional 2SLS procedure applied to Equation 7.[15] The first column in each table is based on a regression

[15]Because consolidation is a discrete variable, probit or logit estimation might be more appropriate for the first

estimated with two instrument, the number of consolidations in a district's county in the 1960s and the number of neighboring districts. The coefficient on consolidation using the instrument variables is 0.165, although the coefficient now is not significant at conventional level. The same trend persists in the rents equation in Table 9, the coefficient on consolidation is not statistically significant at conventional levels in either case.

In the second column, we add the interaction term of the consolidation and pre-consolidation enrollment to the 2SLS estimation using both instrument variables. As indicated earlier, this interaction term is defined using the predicted value of the consolidation variable.

As shown in column (2) of Table 8, the impact of consolidation on house values is positive and significant and declines significantly with pre-consolidation enrollment. The net impact on property values is plotted in Figure 1. This figure shows that consolidation boosts house values by about 24.5 percent in a 500-pupil district but only by about 5.5 percent in a 1,500-pupil district. This figure also shows that the 2SLS regression results are quite different from those of the OLS regressions.

Table 9 shows that the consolidation also appears to affect rents. More specifically, the consolidation variable is positive, although not significant at conventional levels and the interaction with pre-consolidation enrollment is negative, but not significant. These results are plotted in Figure 2. The 2SLS curve has the same general shape as in Figure 1, but the slopes are smaller. In short, the impact of consolidation is smaller and less significant on rents than on house values. This finding suggests that many renters do not believe the property tax savings associated with economies of scale will be passed on to them in the form of lower rents.

Overall, our results demonstrate that in both sales and rental markets, the impact of consolidation on housing prices cannot be estimated accurately without accounting for the endogeneity of consolidation. Some of the endogeneity bias is eliminated by differencing (which is equivalent, in our case, to adding fixed effects because we only have data from two years). This step does not eliminate all of the bias, however, as shown by the large difference between the OLS and 2SLS results for our differenced model.

The third columns of Table 8 and Table 9 introduce another variable, the change in state education aid as a proportion of the pre-consolidation expenditure in a school district. This variable is included to determine whether the impact of consolidation on housing prices can be linked to the state aid boost received by consolidating districts instead of to economies of size or some other factors. As indicated earlier, the change in aid is endogenous. Because we are interested in

stage. If one of these specifications is used, however, the resulting second-stage model provides inconsistent estimates (unless the first-stage conditional expectation function (CEF) is corrected). However, conventional 2SLS estimates with a linear first-stage are consistent regardless of whether the first-stage conditional expectation function (CEF) is linear (Angrist, 2001).

the impact of aid in consolidating districts, we devise an instrument that is correlated with the expected aid increase in consolidated districts. As explained earlier, operating aid increases to consolidating districts are governed by a formula based on pre-consolidation aid as a proportion of pre-expenditure. Thus, our instrument is pre-consolidation aid expenditure ratio interacted with a consolidation predictor, namely the share of districts in the county that consolidated in the 1960s.

We find that adding the aid variable lowers the estimated impact of consolidation, in both sales and rental markets, which suggests that some share of the property value and rent impact of consolidation is, indeed, due to the aid increases that accompany it. In column (3) of Table 8 adding the aid variable lowers the coefficient of the consolidation variable from 0.340 to 0.199. In other words, the aid variable accounts for 0.141/0.340 = 41.5 percent of the house-value impact of consolidation in a very small district. The coefficient on aid is significant at 16 percent level and the consolidation variable is not significant. Not surprisingly, adding the aid variable does not alter the slope of the lines in Figure 1; that is, it does not alter the role of economies of size. Instead, adding the aid variable shifts this line downward in a parallel fashion, so that aid accounts for all of the positive impact of consolidation on house values once a district reaches about 1,000 pupils.

Overall, therefore, this attempt to decompose the consolidation effect suggests that nearly half of the impact of consolidation on property values in very small districts is due to the aid increases that accompany consolidation.

The comparable results for the rental market are presented in columns (3) of Table 9. Adding the aid variable shifts down the line. The effect due to economies of size remains, but is not significant at conventional levels.

The final columns in Tables 8 and 9 add a variable interacting consolidation with the income in a tract relative to the average income in the district before consolidation.[16] As discussed earlier, this variable should pick up perceived changes in school quality associated with consolidation, which increase the rental value of housing. In both the sales and rental markets, this interaction term has a large, negative coefficient and is highly significant statistically. Moreover, adding this interaction term increases the statistical significant of the other consolidation variables in the regression.

As discussed earlier, this new interaction term not only indicates that residents perceive service quality improvements, but also may indicate the relative magnitude of the underlying demand elasticities. The negative signs for this interaction term in Tables 8 and 9 suggest that in our rural sample, the income elasticity of marginal willingness to pay for school quality, at least the school quality affected by consolidation, is less than the income elasticity of demand for housing. One

[16]We also examined two other interaction terms, namely, consolidation interacted with years since consolidation (to see if the effects of consolidation phase in) and with income in a district relative to the income in the average district (to see if the impact of consolidation varies with district income). In both cases the estimated coefficient was close to zero and not close to statistically significant.

possibility is that the expanded course offerings mandated by the Regents Action Plan are not be highly valued by rural households.

Further information is provided by Figures 3 and 4, which summarize the results from the last columns of Tables 8 and 9. As shown in Figure 3, the net impact of consolidation on house values in small school districts is large and positive in low-income tracts and moderately positive in a tract where income equals the district's average. In addition, however, the sign of this result reverses in high-income tracts, even when those tracts are in small school districts where economies of size are large. In all types of neighborhoods, the impact of consolidation on house values declines as student enrollment increases and economies of size decline. As shown in Figure 4, a similar pattern holds for rents, although the negative effects in high-income tracts are even more dramatic and the role of economies of size is much smaller. In fact, Figure 4 indicates that consolidation lowers rents in a tract with the median tract income in a district, even when the district is very small. This result contrast with Figure 2, which indicates a positive impact of consolidation on the average rent in a very small district. These results are not contradictory; rent in a tract with median income could be, and apparently is, quite different from the district's average rent.

These results imply that within-district variation in the impact of consolidation on house values and rents cannot be fully explained by our elasticity argument. In this argument, after all, consolidation always increases house values and rents, even though it does not increase them at the same rate in every neighborhood. But our results indicate that consolidation leads to declines in house values and rents in high-income neighborhoods. We cannot determine the causes of these declines, but we can think of several possibilities.[17] The first draws on the argument by Brasington, namely, that some people are willing to pay to avoid the loss of control associated with consolidation. Indeed, our finding suggests that among high-income households, the value placed on the loss of control outweighs the benefits from service increases and tax cuts that are made possible by consolidation-induced aid increases and economies of scale. Another possibility is that consolidation leads to increased transportation costs for parents and students and that high-income households value this lost time so highly that it offsets these benefits from consolidation. In addition, high-income households may experience relatively large increases in transportation costs associated with consolidation if their children participate in a relatively large number of extra-curricular activities. A key issue for future research on consolidation is to determine whether these factors or others can explain the large negative impact of consolidation on house values and rents in high-income neighborhoods.

[17]This pattern cannot be explained by tax-price changes. These tax-price changes vary across the districts that consolidate, but they are the same for every household within each original school district. In other words, these tax-price changes do not vary with income or house value.

6 Conclusion

Many states continue to recommend school district consolidation as a way to cut costs, especially in rural areas. This recommendation is supported by research on economies of size in education. Using New York state data, for example, Duncombe and Yinger (forthcoming) found that consolidation leads to large cost savings for small rural school districts.

This study complements previous research by examining the impact of school district consolidation on property values. A focus on property values has the advantage that, at least in principle, it can capture the value voters place on all aspects of consolidation, including but not limited to economies of size. The value voters place on a loss of control, for example, or on the extra time they and their children spend getting to school will not be captured by a study that focuses on school district spending.

We show that any study of the impact of consolidation on property values or rents must address three methodological challenges: it must account for the fact that enrollment changes lead to larger cost savings, and hence larger impacts on property values, in small than in large districts; it must account for the endogeneity of the consolidation decision; and, at least for policy purposes, it must separate the impacts of state aid changes from economies of size. We address the first challenge by interacting consolidation with pre-consolidation enrollment, and we address the second by estimating our model with both first differencing and instrumental variables.

Our estimates show that a failure to account for either of the first two challenges leads to a striking underestimate of the impact of consolidation on property values. OLS regressions without differencing finds no significant impact of consolidation on housing prices, whereas 2SLS regressions with differencing find large, significant effects that decline with pre-consolidation enrollment. In very small districts, the impact of consolidation on house values approaches 25 percent, but this impact declines to 6 percent in a district with 1,500 pupils.

Turning to the third challenge, we find some evidence that a significant share of the impact of consolidation on house values is due to the boost in state aid given to districts that consolidate in New York State. The flip side of this result is that consolidation still influences house values even after controlling for changes in aid, which is a clear sign that factors other than aid are at work. Moreover, the introduction of the aid variable does not alter the coefficient that tests for the presence of economies of size. It appears, therefore, that households in very small districts would still perceive net benefits from consolidation, due both to economies of size and, perhaps, to other factors that we cannot identify, even if consolidation did not lead to an increase in state aid. Paradoxically, this result indicates that state aid to encourage consolidation is still justified in New York State, at least for very small school districts.

Finally, we explore variation in the impact of consolidation on house values and rents within a school district. We find that consolidation has a large positive impact on house values and rents in low-income tracts, but a large negative impact in high-income tracts. To some degree, this result may reflect a relatively low income elasticity of demand for the measures of school performance, such as a broader range of course offerings, that increase due to consolidation. It also appears, however, that other factors are at work; high-income households may place a high value on the personal contact with teachers and school officials that is sometimes lost through consolidation or they may place a high value on the time lost because of the increased driving times often associated with consolidation. Overall, consolidation appears to be popular with the average household in small rural school districts, but judging by its impact on housing prices, it is not popular with high-income households anywhere in rural New York.

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Table 1: Consolidations in New York between 1990 and 2000

District pair	Year of consolidation	Enrollment	District pair	Year of consolidation	Enrollment
Gilbertsville	1990	262	Cuba	1991	1004
Mount Upton		272	Rushford		340
Campbell	1992	753	Cobleskill	1993	1858
Savona		414	Richmondville		441
Wayland	1993	1630	Bolivar	1994	729
Cohocton		272	Richburg		405
Border City	1994	60	Sylvan Beach	1994	87
Waterloo		1856	Oneida^s		2505
Allegany	1995	1368	Brunswick^s	1995	181
Limestone		244	Averill Park		2918
Chautauqua	1996	399	Angelica	1996	356
Mayville		629	Belmont		459
New Berlin	1996	640	Laurel	1997	115
South New Berlin		411	Mattituck-Cutchogue^s		1298
Delaware Valley	1999	564			
Jefferson-Yongsville		867			
Narrowsburg		294			

Data source: New York State Department of Education. The enrollment indicates the district enrollment in the year before consolidation. s denotes that the district is in a suburban area, hence is not included in our sample.

Table 2: Descriptive Statistics for Rural School Districts in New York, 1990

	Consolidated districts		Non-consolidated districts	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Average housing values	92695.550	(47212.300)	98157.070	(38128.490)
Mean rents	459.745	(126.539)	458.225	(115.661)
% housing units with 1-2 bedrooms	0.328	(0.074)	0.343	(0.081)
% housing units with 3-4 bedrooms	0.610	(0.068)	0.594	(0.072)
% housing units with 5+ bedrooms	0.062	(0.024)	0.063	(0.027)
% housing units built last 10 years	0.060	(0.025)	0.062	(0.029)
% housing units built last 5 years	0.084	(0.034)	0.095	(0.061)
% housing units built before 1950	0.462	(0.122)	0.457	(0.125)
% housing units attached	0.009	(0.010)	0.013	(0.027)
% housing units detached	0.701	(0.102)	0.689	(0.118)
% housing units mobil homes	0.159	(0.084)	0.149	(0.082)
% housing units with full kitchen	0.982	(0.018)	0.979	(0.028)
% housing units using gas as heating fuel	0.248	(0.282)	0.181	(0.253)
% housing units using electricity as heating fuel	0.113	(0.054)	0.126	(0.092)
% housing units with all plumbing facilities	0.988	(0.009)	0.988	(0.019)
% housing units owner occupied	0.607	(0.127)	0.576	(0.161)
Total housing units	360.158	(483.736)	422.414	(588.665)
Average household income	32126.970	(6085.603)	32372.590	(5937.176)
% population black	0.016	(0.038)	0.019	(0.044)
% population Hispanic	0.011	(0.017)	0.016	(0.029)
% population live in the same house 5 years ago	0.627	(0.069)	0.606	(0.086)
% population under 18 years old	0.194	(0.030)	0.193	(0.032)
% households female-headed	0.153	(0.057)	0.152	(0.063)
% population over 25 with a BA or better	0.141	(0.063)	0.150	(0.081)
% population below the poverty level	0.122	(0.048)	0.118	(0.056)
% population unemployed	0.069	(0.022)	0.074	(0.032)
% households with public assistance income	0.070	(0.030)	0.067	(0.031)
Population density	194.805	(626.387)	195.429	(697.597)
Total Enrollment	868.957	(776.280)	1257.601	(773.337)
State aid per pupil	3990.937	(1244.326)	3843.398	(1203.478)
Expenditure per pupil	8012.815	(2473.193)	7827.740	(2207.215)
N	140		1297	

Note: Authors' calculations using census data of 1990 and data from the Education Department of New York State.

Table 3: Descriptive Statistics for Rural School Districts in New York, 2000

	Consolidated districts		Non-consolidated districts	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Average housing values	90285.300	(45112.450)	91373.100	(28046.570)
Mean rents	455.533	(101.030)	451.059	(93.696)
% housing units with 1-2 bedrooms	0.345	(0.060)	0.344	(0.071)
% housing units with 3-4 bedrooms	0.602	(0.057)	0.603	(0.067)
% housing units with 5+ bedrooms	0.054	(0.019)	0.053	(0.021)
% housing units built last 10 years	0.069	(0.028)	0.070	(0.029)
% housing units built last 5 years	0.059	(0.026)	0.059	(0.028)
% housing units built before 1950	0.501	(0.108)	0.497	(0.117)
% housing units attached	0.010	(0.013)	0.014	(0.024)
% housing units detached	0.700	(0.102)	0.709	(0.112)
% housing units mobil homes	0.169	(0.091)	0.149	(0.087)
% housing units with full kitchen	0.961	(0.044)	0.962	(0.045)
% housing units using gas as heating fuel	0.278	(0.283)	0.200	(0.257)
% housing units using electricity as heating fuel	0.089	(0.056)	0.097	(0.100)
% housing units with all plumbing facilities	0.993	(0.006)	0.992	(0.012)
% housing units owner occupied	0.601	(0.122)	0.586	(0.147)
Total housing units	389.777	(513.513)	458.447	(634.336)
Average household income	46028.290	(9614.563)	46127.860	(8043.076)
% population black	0.020	(0.041)	0.023	(0.044)
% population Hispanic	0.020	(0.032)	0.021	(0.033)
% population live in the same house 5 years ago	0.647	(0.065)	0.648	(0.075)
% population under 18 years old	0.196	(0.025)	0.194	(0.029)
% households female-headed	0.192	(0.069)	0.186	(0.066)
% population over 25 with a BA or better	0.168	(0.072)	0.180	(0.089)
% population below the poverty level	0.122	(0.052)	0.118	(0.047)
% population unemployed	0.069	(0.030)	0.069	(0.040)
% households with public assistance income	0.076	(0.035)	0.072	(0.029)
Population density	194.242	(595.619)	181.165	(578.385)
Total Enrollment	1632.850	(752.856)	1290.510	(821.544)
State aid per pupil	8347.852	(2712.487)	5941.631	(1842.058)
Expenditure per pupil	14892.490	(7085.404)	13001.910	(4879.126)
N	140		1289	

Note: Authors' calculations using census data of 2000 and data from the Education Department of New York State.

Table 4: Descriptive Statistics for the Instrumental Variables

	Consolidated school districts	Non-consolidated school districts
Number of consolidations in each county in the 60s	1.214	3.037
	(1.307)	(4.062)
Number of neighboring school districts	5.550	5.066
	(1.395)	(1.281)
N	140	1297

Note: Standard deviations are shown in parentheses.

Table 5: Estimation Results for Sales Market after First Differencing

	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
Consolidation during the 1990s	0.020	(0.018)	0.041	(0.022)
Consolidation * Enrollment in 1990			-0.0024	(0.0016)
% Housing units with 3-4 bedrooms	0.203	(0.110)	0.204	(0.110)
% Housing units with 5+ bedrooms	-0.289	(0.167)	-0.305	(0.166)
% housing units built last 10 years	0.159	(0.131)	0.155	(0.132)
% housing units built last 5 years	0.872	(0.116)	0.867	(0.117)
% housing units built before 1950	-0.139	(0.079)	-0.142	(0.079)
% housing units attached	-0.097	(0.288)	-0.107	(0.288)
% housing units detached	-0.115	(0.122)	-0.119	(0.123)
% housing units mobil homes	0.052	(0.236)	0.037	(0.238)
% housing units with full kitchen	-0.222	(0.096)	-0.217	(0.095)
% housing units using gas as heating fuel	0.057	(0.075)	0.052	(0.075)
% housing units using electricity as heating fuel	0.359	(0.128)	0.339	(0.126)
% housing units with all plumbing facilities	1.902	(0.464)	1.912	(0.465)
% housing units owner occupied	-0.081	(0.135)	-0.096	(0.136)
Logarithm of total housing units	-0.037	(0.057)	-0.044	(0.057)
Logarithm of average household income	0.051	(0.027)	0.048	(0.027)
% population black	-0.169	(0.300)	-0.179	(0.298)
% population Hispanic	-0.630	(0.316)	-0.660	(0.308)
% population live in the same house 5 years ago	-0.120	(0.073)	-0.121	(0.073)
% population under 18 years old	-0.347	(0.218)	-0.337	(0.218)
% households female-headed	-0.196	(0.063)	-0.193	(0.063)
% population over 25 with a BA or better	-0.224	(0.139)	-0.206	(0.139)
% population below the poverty level	-0.946	(0.154)	-0.946	(0.154)
% population unemployed	-0.130	(0.093)	-0.135	(0.093)
% households with public assistance income	-0.330	(0.171)	-0.316	(0.171)
Logarithm of population Density	-0.015	(0.059)	-0.020	(0.060)
N	1425		1418	
R^2	0.323		0.325	

Note: The dependent variable is logarithm of average house value in 2000 minus logarithm of average house value in 1990. Huber-White standard errors clustered at school district level are reported in parentheses.

Table 6: Estimation Results for Rental Market after First Differencing

	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
Consolidation during the 1990s	0.012	(0.009)	0.013	(0.013)
Consolidation * Enrollment in 1990			-0.0001	(0.0008)
% Housing units with 3-4 Bedrooms	0.167	(0.158)	0.169	(0.159)
% Housing units with 5+ Bedrooms	-0.468	(0.243)	-0.479	(0.245)
% housing units built last 10 years	-0.026	(0.164)	-0.015	(0.164)
% housing units built last 5 years	0.202	(0.117)	0.205	(0.117)
% housing units built before 1950	0.024	(0.105)	0.024	(0.105)
% housing units attached	0.008	(0.387)	0.027	(0.387)
% housing units detached	0.745	(0.256)	0.760	(0.258)
% housing units mobil homes	0.455	(0.267)	0.465	(0.271)
% housing units with full kitchen	0.177	(0.085)	0.181	(0.086)
% housing units using gas as heating fuel	0.277	(0.124)	0.278	(0.125)
% housing units using electricity as heating fuel	0.421	(0.190)	0.426	(0.191)
% housing units with all plumbing facilities	1.309	(1.007)	1.312	(1.011)
% housing units owner occupied	-0.354	(0.227)	-0.352	(0.228)
Logarithm of total housing units	-0.309	(0.104)	-0.309	(0.103)
Logarithm of average household income	0.050	(0.040)	0.049	(0.040)
% population black	-0.568	(0.370)	-0.542	(0.372)
% population Hispanic	-0.526	(0.336)	-0.519	(0.338)
% population live in the same house 5 years ago	-0.061	(0.095)	-0.061	(0.096)
% population under 18 years old	-0.724	(0.174)	-0.724	(0.176)
% households female-headed	-0.107	(0.114)	-0.103	(0.114)
% population over 25 with a BA or better	0.125	(0.170)	0.121	(0.172)
% population below the poverty level	-0.964	(0.414)	-0.966	(0.414)
% population unemployed	-0.137	(0.138)	-0.137	(0.139)
% households with public assistance income	0.278	(0.190)	0.273	(0.190)
Logarithm of population Density	0.131	(0.077)	0.132	(0.077)
N	1425		1418	
R^2	0.168		0.169	

Note: The dependent variable is logarithm of average house rent in 2000 minus logarithm average house rent in 1990. Huber-White standard errors clustered at school district level are reported in parentheses.

Table 7: First Stage Regression Results

Number of consolidations in each county in the 60s	-0.009
	(0.003)
Number of neighboring districts	0.020
	(0.012)
Housing structures	Yes
Neighborhood characteristics	Yes
N	1425
First stage F statistics	5.75
First stage R^2	0.169

Note: The dependent variable is consolidation during the 1990s. Huber-White standard errors clustered at school district level are reported in parentheses.

Table 8: 2SLS Results for the Sales Market after First Differencing

	(1)	(2)	(3)	(4)
Consolidation during the 1990s	0.165	0.340	0.199	1.475
	(0.123)	(0.221)	(0.272)	(0.430)
Consolidation*Enrollment90		-0.019	-0.019	-0.018
		(0.008)	(0.008)	(0.007)
Change in Aid			0.151	0.166
			(0.108)	(0.102)
Consolidation*Ratio of tract to district income				-1.322
				(0.340)
Housing structures	Yes	Yes	Yes	Yes
Neighborhood characteristics	Yes	Yes	Yes	Yes
Instrument variables:				
Number of consolidations in each county in the 60s	Yes	Yes	Yes	Yes
Number of neighboring districts	Yes	Yes	Yes	Yes
Number of consolidations in each county in the 60s*Aid90			Yes	Yes
N	1425	1418	1415	1415

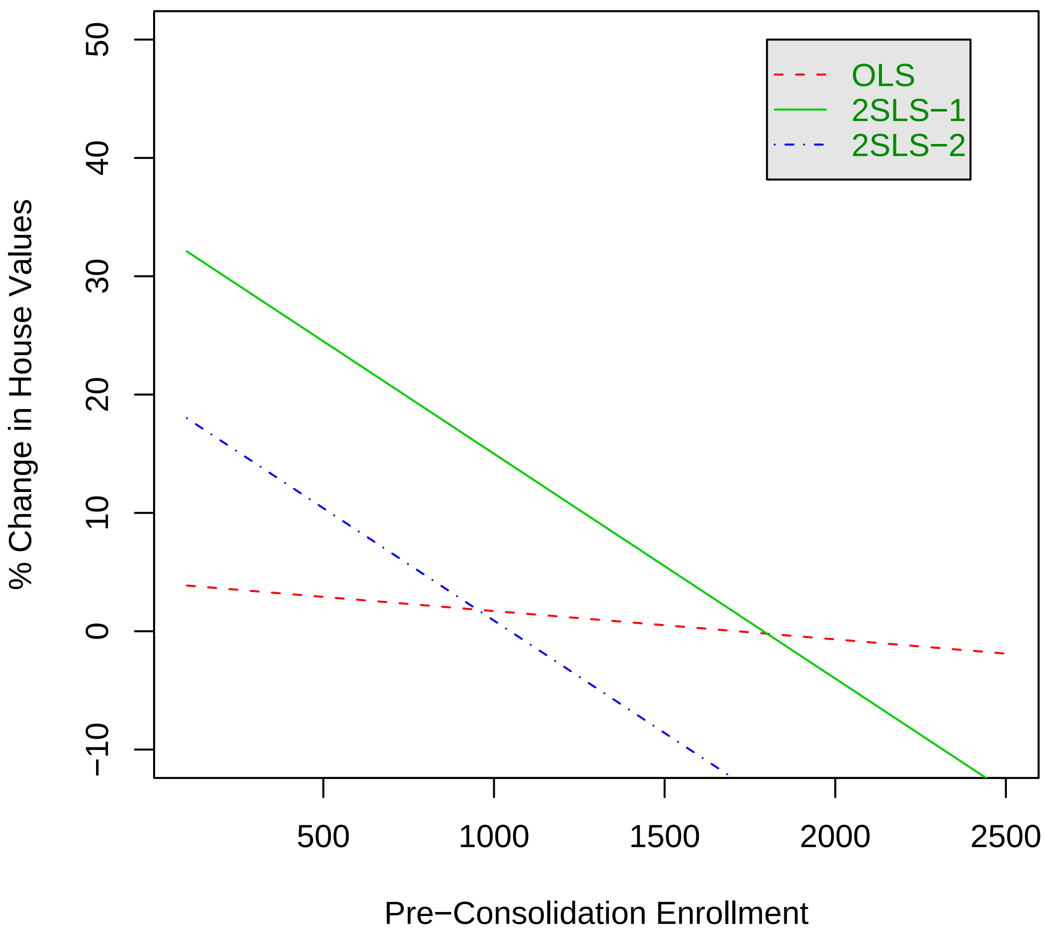
Notes: The dependent variable is logarithm of average house value in 2000 minus logarithm of average house value in 1990. Huber-White standard errors clustered at school district level are reported in parentheses in columns (1). Bootstrap standard errors for columns (2) through (4) are based on 2000 replications. Change in aid is defined as the change in aid as a proportion of pre-consolidation expenditure.

Table 9: 2SLS Results for the Rental Market after First Differencing

	(1)	(2)	(3)	(4)
Consolidation during the 1990s	0.156	0.195	0.095	4.046
	(0.113)	(0.142)	(0.16)	(0.888)
Consolidation*Enrollment90		-0.003	-0.004	0.002
		(0.004)	(0.004)	(0.004)
Change in Aid			0.112	0.143
			(0.078)	(0.075)
Consolidation*Ratio of tract to district income				-4.187
				(0.899)
Housing structures	Yes	Yes	Yes	Yes
Neighborhood characteristics	Yes	Yes	Yes	Yes
Instrument variables:				
Number of consolidations in each county in the 60s	Yes	Yes	Yes	Yes
Number of neighboring districts	Yes	Yes	Yes	Yes
Number of consolidations in each county in the 60s*Aid90			Yes	Yes
N	1425	1418	1415	1415

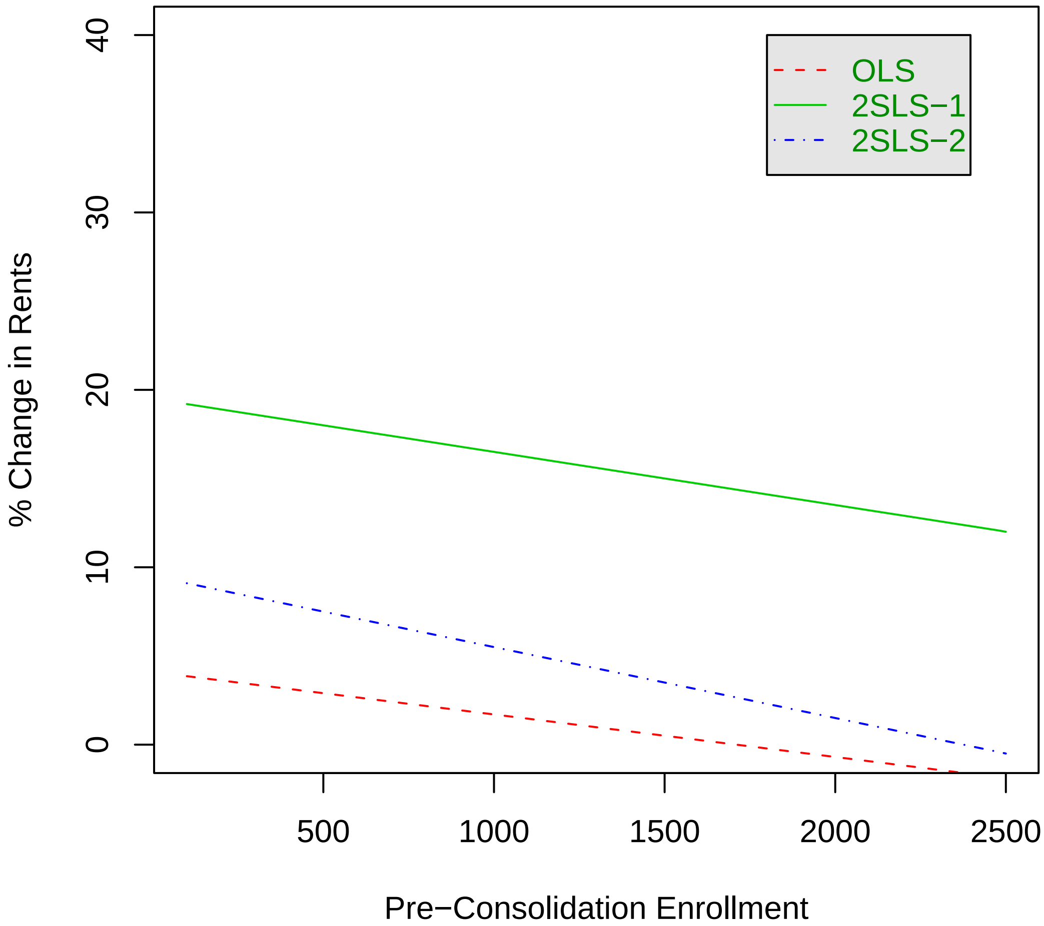
Notes: The dependent variable is logarithm of average house rent in 2000 minus logarithm of average house rent in 1990. Huber-White standard errors clustered at school district level are reported in parentheses in columns (1). Bootstrap standard errors for columns (2) through (4) are based on 2000 replications. Change in aid is defined as the change in aid as a proportion of pre-consolidation expenditure.

Figure 1: The Impact of Consolidation on House Values



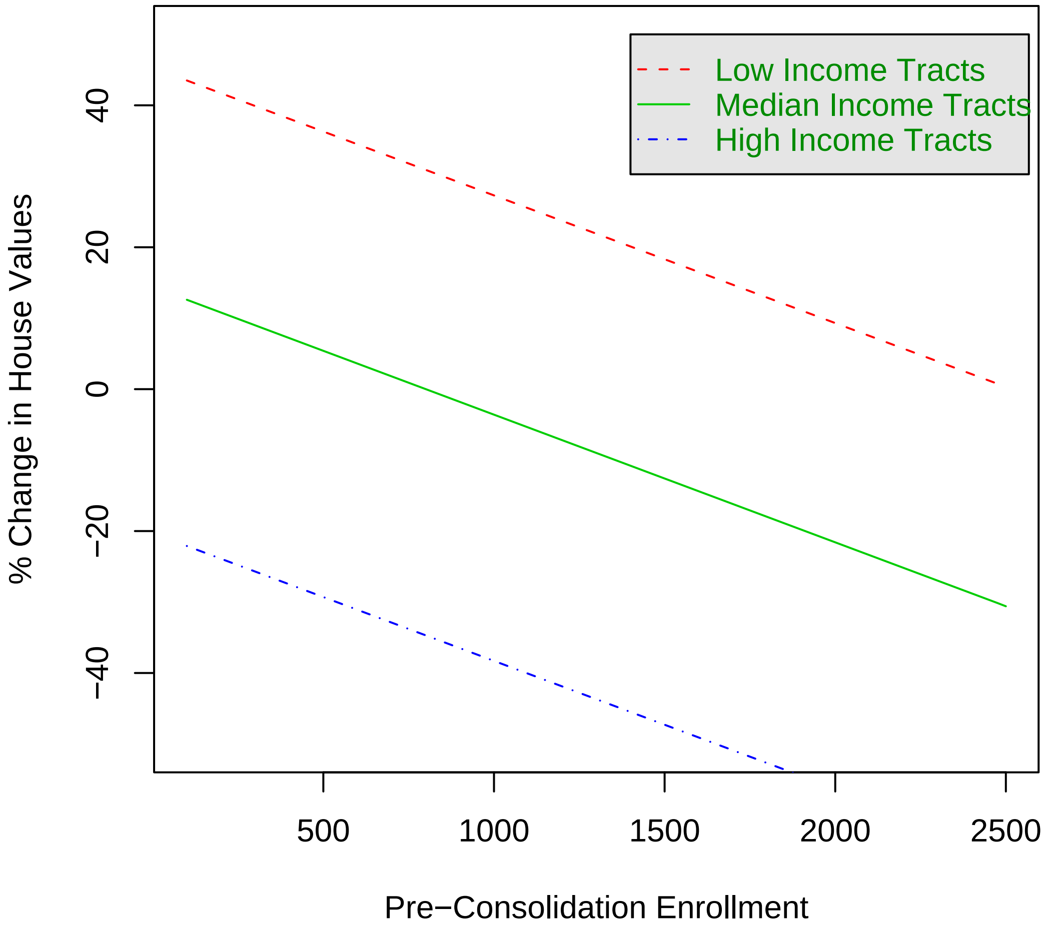
Notes: OLS line refers to the first differencing estimate with the interaction of consolidation and pre-consolidation enrollment. 2SLS-1 and 2SLS-2 represent the estimates in columns (2) and (3) of Table 8.

Figure 2: The Impact of Consolidation on Rents



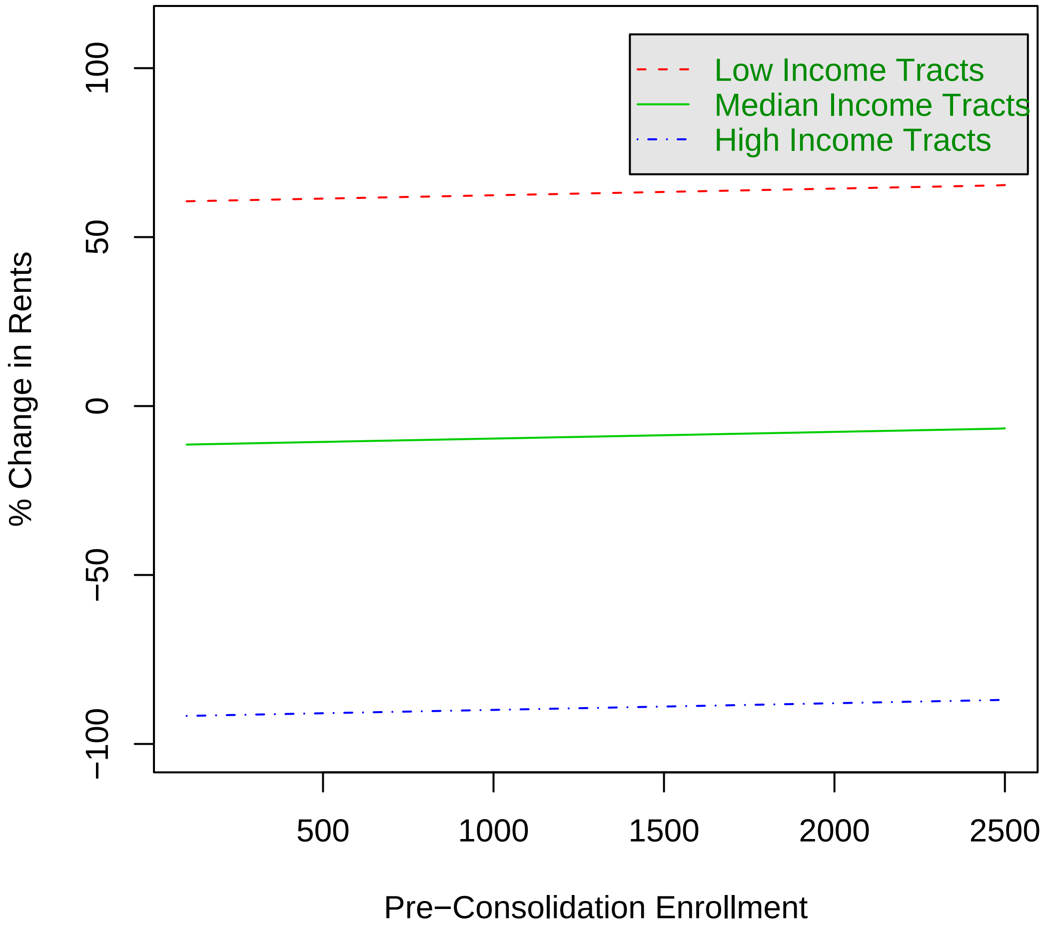
Notes: OLS line refers to the first differencing estimate with the interaction of consolidation and pre-consolidation enrollment. 2SLS-1 and 2SLS-2 represent the estimates in columns (2) and (3) of Table 9.

Figure 3: The Impact of Consolidation on House Values-Heterogenous Effects



Notes: These lines represent the estimates in column (4) of Table 8. A low-income tract is defined as one in the bottom quarter of a district's distribution; whereas a high-income tract is defined as one in the top quarter.

Figure 4: The Impact of Consolidation on Rents-Heterogenous Effects



Notes: These lines represent the estimates in column (4) of Table 8. A low-income tract is defined as one in the bottom quarter of a district's distribution; whereas a high-income tract is defined as one in the top quarter.