House Prices and the Quality Of Public Schools: What Are We Buying?

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When a family with school-age children looks for a house to buy, the quality of the local public schools is often a major consideration. Real estate agents respond to this concern by identifying the school district and sometimes the local elementary school in the information sheet they provide on houses for sale. They also report the property taxes on the house, most of which are used to finance local public schools. The press responds to the interest in the quality of local schools by periodically publishing available information on per pupil expenditures, teacher-student ratios, average class sizes, and test scores by school district and often by individual school. For example, in September 1997, the *Philadelphia Inquirer* published a special section of the Sunday paper containing this information for schools in the Philadelphia metropolitan area.

Does the availability of such information and home-buyers' concerns for high quality schools result in higher house prices in neighborhoods with better schools? And to what extent are the policies of the local school districts responsible for differences in school quality and, therefore, for any school premium in house prices? A large

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number of statistical studies support the common assumption that differences in the quality of local schools are reflected in house prices. There is less agreement, however, on the extent to which school district policies determine school quality as measured by student performance.

MEASURING THE SCHOOL PREMIUM IN HOUSE PRICES

In most areas, certain schools or school districts have reputations for being better than others. Presumably, home buyers are willing to pay a premium for public schools that are considered better than average, just as supermarket shoppers are willing to pay more for name brands than for generics. There is a major difference, however, in the way we purchase ordinary goods and local public services like education. We buy soup, soda, and spices directly, but we purchase public education only indirectly by buying or renting a house in a specific neighborhood. So, to identify any school premium in house prices, we have to separate it from the effects of other neighborhood characteristics and the basic quality of the house.

What's a Good School Worth? Only a few studies have used direct measures of the community's evaluation of the local school to determine how it affects house prices. In a 1973 study, A. Thomas King used the responses to a survey of home buyers about their neighborhoods in the New Haven, Connecticut, area. The survey included questions on the quality of the local elementary and high schools, and King even defined neighborhoods by the boundaries of the elementary schools. But in his measure of neighborhood quality, King combined the ratings of school quality with ratings on other neighborhood characteristics, such as the danger of crime and quality of garbage collection.[1]

The overall measure of neighborhood quality was highly significant in explaining the variation across school boundaries in the prices of houses with similar characteristics, such as the size and age of the house, the lot size, and distance from New Haven. King's sample included houses sold between 1967 and 1969. The difference in price between similar houses in the least desirable and the most desirable neighborhoods was more than $5000.[2] While King could not attribute all this difference to the reputation of the local schools, the ratings on the local elementary and high schools were the most important factors in his overall measure of neighborhood quality.

Ronald Ridker and John Henning also used data from the 1960s to estimate the effect of neighborhood characteristics on house prices. Their main focus was the effect of air pollution on house prices, but they also developed a direct measure of the reputation of the local school. They interviewed educators and real estate agents to classify school districts in the St. Louis area as above average, average, or below average. The authors took into account some housing and neighborhood characteristics like the median number of rooms per house and accessibility to shopping. Surprisingly, in most cases they found no association between the school's reputation and the median house price by census tract, and in some cases, they found that schools with better reputations were associated with lower house prices. The authors themselves suggest that a failure to fully account for other neighborhood characteristics may have led to this result. Ridker and Henning also did not use any direct measure of school district taxes to determine how they may have affected house prices.

A 1997 study by William Bogart and Brian

[1]King combined the different dimensions of neighborhood quality by using a statistical technique called principal components analysis.

[2]The mean value of the houses in King's sample by census tract ranged from $10,000 to $41,000.

Cromwell provides more recent evidence that house values are higher in school districts with better reputations. They examined house prices in three neighborhoods in the Cleveland metropolitan area, where children in each neighborhood attended public schools in two different districts. In each neighborhood, all the houses were in the same municipality, and home owners were assumed to enjoy the same level of public services provided by the municipality. But each neighborhood was partly in one school district and partly in another, so that educational services and school taxes differed among home owners in the same neighborhood. Bogart and Cromwell did not have a direct measure of school quality, but in each neighborhood, one school district clearly had a better reputation than the other. After accounting for differences in the size and quality of the houses, the authors estimated the remaining difference in the value of houses in what was considered the better school district in each neighborhood. The estimated differences were $5600 in the first neighborhood, $10,900 in the second, and $12,000 in the third.[3] Since Bogart and Cromwell do not control for differences in school district taxes, these differences in house values represent the *combined effect* of differences in school quality and taxes. Even though Bogart and Cromwell do not have a direct measure of school quality, the difference in house prices between school districts implies that a better reputation for local schools translates into a measurable difference in house prices.

A school's reputation is not easy to measure. It has many dimensions, including physical appearance, library facilities, quality of teachers, students' academic performance, and the range of extracurricular activities. People have different opinions about school quality, and the differences between local schools or school districts may be slight. Moreover, surveys on school quality, such as the ones used by King or Ridker and Henning, are seldom available, so researchers have looked to more objective measures, such as school resources or student performance, to estimate the school premium in house prices. They assume that reputation ultimately depends on these objective measures.

School Resources. Expenditures per pupil are the standard measure of school resources, and since the late 1960s, a series of articles on what determines house prices have used per pupil expenditures as a proxy for the quality of the local school.[4] Most of these studies have found that after accounting for other neighborhood characteristics, the prices of *similar* houses are higher in school districts with higher expenditures per pupil.[5] Other studies have found no positive relationship between school expenditures and house prices, but the weight of the evidence is that home owners do value school districts that spend more per pupil.[6]

Higher school expenditures, however, may

[3]These differences are in 1987 dollars. The total difference in the average value of houses in different school districts was $9600 in the first neighborhood, $33,100 in the second, and $17,600 in the third. But some of the total difference was due to factors other than the schools, such as the size and quality of the house, lot size, and street traffic. The results on the difference in the value of schools are from regression equations that use a dummy variable for the school district and control for differences in the houses. The estimates of the differences in house prices between school districts are all statistically significant.

[4]A. Thomas King (1973) also used student-teacher ratios as a measure of school resources, but he found no statistically significant relationship between student-teacher ratios and house prices.

[5]See the articles by Wallace Oates, 1969 and 1973; Henry Pollakowski; Richard Gustely; A. Thomas King, 1977; Timothy Gronberg; and Raymond Reinhard.

[6]See the articles by Matthew Edel and Elliot Sclar; Richard Dusansky, Melvin Ingber, and Nicholas Karatjas; and Kathy Hayes and Lori Taylor.

necessitate higher taxes, and higher taxes depress house prices, making it difficult to assess the *net* effect of school taxes and expenditures on house prices.[7] A few studies have suggested that raising property taxes and applying the revenues to local schools would increase the average value of the houses in their samples.[8] But Jan Brueckner argues the opposite. For the communities in his sample, he concluded that a reduction in both property taxes and school expenditures would increase house values. Home owners certainly prefer more school resources to less if their tax bills remain unchanged. But we cannot conclude that home owners would be willing to pay for increased school funding in the form of higher taxes or cuts in other services. And once we take into consideration the tax effect, higher school expenditures may not increase house values.

A more serious concern about using expenditures as a measure of quality is that expenditures are an input into the education process, not a measure of the output. Expenditures represent the financial resources available to the school. They can be used to reduce class size, purchase equipment, or fund a broader range of courses. But even smaller class sizes, state-of-the-art facilities, and a broad curriculum are not direct measures of how well a school is fulfilling its mission. Home buyers are more likely to view student achievement as the primary indicator of the quality of public schools. But how do we measure student achievement?

Performance Measures. Some recent studies imply that future earnings are the ultimate measure of student achievement and school quality. But future earnings are not a very practical measure of school quality for prospective home buyers. Home buyers would normally find it impossible to get information on the earnings of former students in order to evaluate the quality of local public schools, and they would have to assume that the quality had not changed since those students attended the schools.[9]

A school's performance is typically measured by how well it fulfills the immediate goals of primary and secondary education. These goals can include furthering artistic and vocational skills, fostering good work habits and civic awareness, and imparting academic knowledge.[10] Performance in some of these areas is difficult to measure, so traditionally school quality has been judged by academic achievement. And this is the principal gauge of quality for many prospective home buyers.

Comparing academic performance across schools or school districts requires a common measure of achievement, such as scores from standardized tests. These scores are often available upon request and are sometimes even reported in the local press. Several studies have used a standard measure of academic achievement, such as test scores, to estimate the effect of school quality on house prices.[11] These stud-

[7]Most studies that estimate the effect of per pupil expenditures on house values attempt to estimate that effect while holding taxes or tax rates constant.

[8]See the articles by Wallace Oates (1969) and Richard Gustely.

[9]No study has tried to directly link house prices to the earnings of former students at the local school. But studies have attempted to identify the characteristics of local schools that are associated with higher lifetime earnings. The jury is still out on the question of whether any of the typical primary and secondary school characteristics such as student-teacher ratios or the length of the school term directly affect lifetime earnings. See the articles by Julian Betts, 1995 and 1996; David Card and Alan Krueger; and James Heckman, Anne Layne-Farrer, and Petra Todd.

[10]See the study by Elchanan Cohn and Stephen Millman and the one by Robert Leekley.

[11]See A. Thomas King, 1973; Gerald McDougall; Harvey Rosen and David Fullerton; Donald Jud and James Watts; Raymond Reinhard; and Sandra Black. In the study by

ies have consistently found that higher achievement is associated with higher house prices. Most studies have used the average score for a given grade on some standard reading, math, or general academic test as the measure of achievement, and higher average scores are associated with higher house values in the neighborhood. Raymond Reinhard sought to get a more accurate measure of what the school contributes to academic achievement by looking at the *improvement* in the average reading level between first and third grade. He found that the greater the improvement in average reading levels, the higher were neighborhood house prices.[12]

Although empirical studies consistently find a positive link between school test scores and house prices, do test scores necessarily represent what the school has contributed to the student's academic development? For example, children with higher innate abilities will have higher test scores on average, but why should house prices reflect the higher abilities that children bring to the local school? The school premium in house prices should reflect what the school contributes to the student's achievement, and there is considerable debate about how much difference a school makes.

TO WHAT EXTENT DO SCHOOLS MAKE A DIFFERENCE?

Clearly, there are significant differences in academic achievement across school districts and among schools in the same district. Standardized test scores from schools in the Philadelphia suburbs illustrate the extent of the differences. Each year fifth, eighth, and 11th grade students in Pennsylvania are given a set of tests called the Pennsylvania System of School Assessment tests. In the 1996-97 school year, the percentage of fifth grade students who scored in the top quartile of all Pennsylvania students taking those tests varied widely among the suburban Philadelphia school districts.[13] For the reading test, the percentage of students in the top quartile ranged from 4 percent in the lowest ranked school district to 51 percent in the highest ranked district. For math, the range was from 2 percent to 57 percent. If we consider the test results for individual schools rather than school districts, the percentage of students in the top quartile ranges from 1 to 69 percent across the schools for reading and from 0 to 75 percent for math.[14] But districts with high av-

Mingche M. Li and H. James Brown test scores were positively associated with house prices in three different estimations, but only one of the estimations was statistically significant.

[12]Two studies that use some measure of academic achievement for school quality also include other measures of quality. King (1973) found that higher test scores and his measure of the residents' estimation of quality have separate effects on house prices. This suggests that a school's reputation is based on more than the academic assessment and home buyers use objective as well as subjective criteria in assessing the value of the local school. And Reinhard found that greater improvement in reading and higher expenditures per pupil have independent positive effects on house prices, suggesting that both resources and student performance are used to evaluate a school's quality.

[13]For these comparisons we did not include data from schools in the City of Philadelphia because the size of the district and the extremely wide variation among schools distinguish the Philadelphia district from the suburban districts. These data refer only to the Philadelphia suburbs in Pennsylvania, not in New Jersey, because the test is taken only in Pennsylvania.

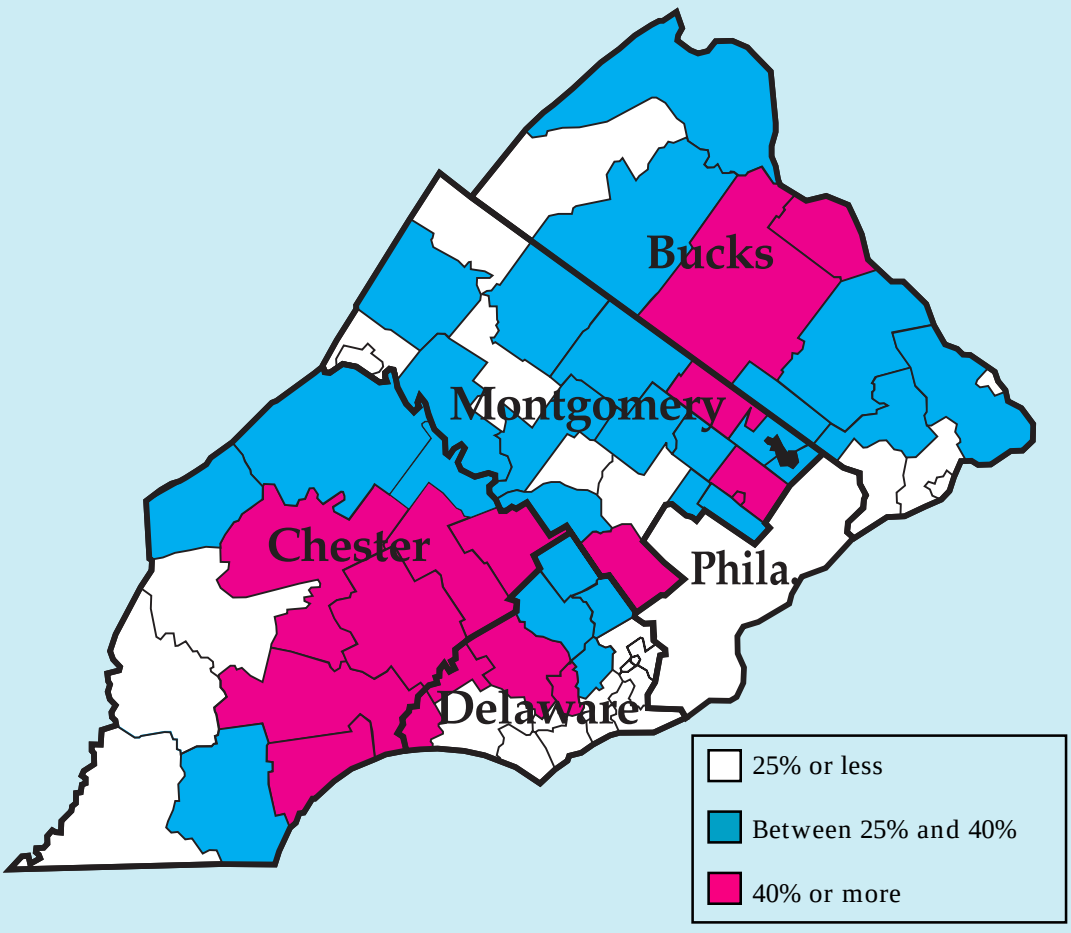
[14]A standard analysis of variance shows that 38 percent of the variation in top reading scores was due to differences *within* districts and 62 percent was due to differences *between* districts. For the top math scores, 33 percent was due to differences *within* districts and 67 percent was due to differences *between* districts. We assume that the differences within districts are not due to any significant differences in school resources. We have no comprehensive information about the distribution of resources *within* school districts in Pennsylvania, but Linda Hertert found that the distribution of spending for elementary schools in California was fairly equal within districts.

erage achievement are clustered together geographically, so is it school district resources and policies or the characteristics of the population in those areas that determine students' achievement levels? (See *Percentage of Students in Top Quartile for Reading and Math Scores.*)

In a 1966 report from the U.S. Office of Education entitled *Equality of Educational Opportunity*, James Coleman and his colleagues suggested that "differences between schools account for only a small fraction of differences in pupil achievement."[15] This suggestion initiated a long-running debate about the extent to which local schools and the resources available to them matter for academic achievement. The Coleman

[15]James S. Coleman et al., p. 21.

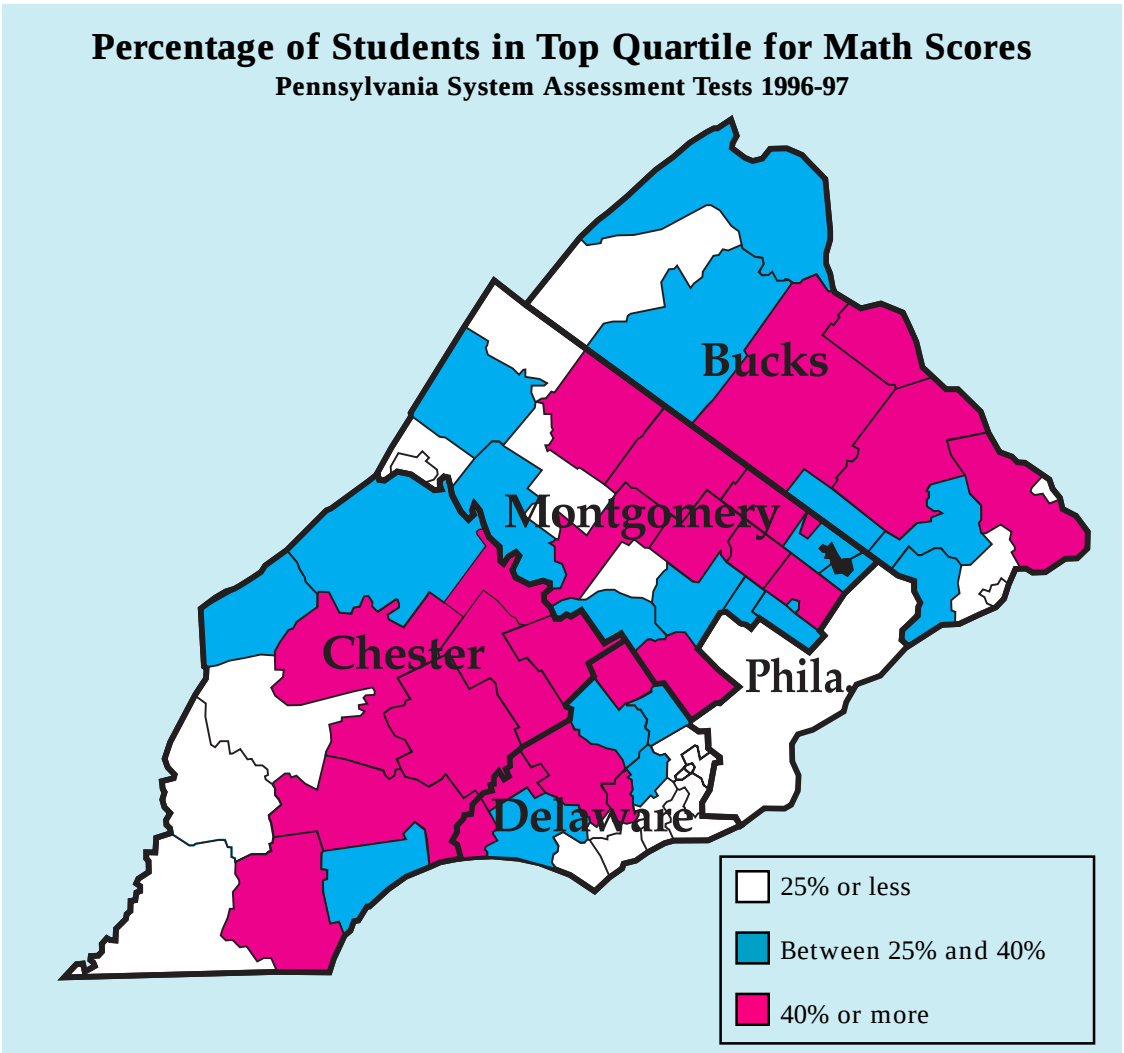
Percentage of Students in Top Quartile for Reading Scores
Pennsylvania System Assessment Tests 1996-97



Black area is Bryn Athyn. Public school students there attend schools in other districts.

report also found that family background and the achievement level of the other students in class were important for an individual student's performance. Somehow the prospective home buyer has to weigh all these factors in assessing how much the local school or school district adds to the value of a house.

School Resources. Few researchers would argue that school resources never affect students' academic achievement, but the empirical estimates of the effects of school resources on student performance present a mixed picture. Eric Hanushek (1996a) catalogued estimates from 90 published studies on the effect of various measures of school resources on student performance. He looked at expenditures per pupil and more specific measures like student-teacher ratios; the education, experience,



Black area is Bryn Athyn. Public school students there attend schools in other districts.

and salaries of teachers; and the condition of the school's physical facilities. In most cases, the estimated effects of these resources on student performance were not statistically significant. Among those estimates that were significant, most were positive but some were negative. Thus, Hanushek concluded that "there is no consistent relationship between the key resources to schools and student performance."

Richard Laine, Rob Greenwald, and Larry Hedges examined some of the same studies as Hanushek and came to a somewhat different conclusion. They considered the statistical significance of the estimates in each of the studies and concluded that the studies do provide some evidence that certain measures of school resources, such as per pupil expenditures, student-teacher ratios, and teachers' experience and salaries, have a positive effect on student achievement.[16] Even Hanushek agrees with the limited conclusion that in some situations school resources can make a difference in academic achievement, but he still maintains "that there is no strong or systematic relationship between school expenditures and student performance."[17]

Family Characteristics. Those studies that find little or no relationship between traditional school resources and student achievement often find that neighborhood or family characteristics are related to achievement.[18] For example, a higher education level of the parents and other adults in the neighborhood is associated with higher test scores. To the extent that we can get data on the use of libraries by the family and the number of books or magazines in the home, these indicators are associated with higher academic achievement by the children in the family. The presence of both parents in the home also has a positive effect. The larger the family, however, the lower the average academic achievement of the children. Family income, which is highly correlated with many of these other family characteristics, is also positively related to achievement.[19] Some studies combine several family characteristics, such as income, family size, and parents' education and occupation, into an index of socioeconomic status. The studies consistently find that these indexes predict higher academic achievement by the children.[20] If family characteristics were the sole explanation for higher student achievement, paying a premium for a house in a school district with high test scores would make no sense. Moving into the district will not change the family background of the student.

Peer Group Effect. A final factor may go a long way to explain why families are willing to pay a premium for houses near schools with high test scores. Researchers call it the peer group effect: the effect that a student's classmates or schoolmates have on his or her academic achievement. According to the Coleman report, "It appears that a pupil's achievement is strongly related to the educational backgrounds and aspirations of the other students in the school."[21]

[16]Laine, Greenwald, and Hedges applied stricter criteria than Hanushek to the studies they chose, and their analysis is based on 60 studies of school resources and student performance. The authors used a method of combined significance tests to estimate the joint significance of the results from different studies. For an explanation, see the 1994 article by Hedges, Laine, and Greenwald.

[17]See Hanushek, 1994, 1996a, and 1996b.

[18]For evidence on specific family characteristics, see Anthony Boardman, Otto Davis, and Peggy Sandy; Donald Baum; Mark Dynarski, Robert Schwab, and Ernest Zampelli; Eric Hanushek, 1992; and Susanna Loeb and John Bound.

[19]See the articles by Wallace Oates, 1977; Mark Dynarski et al.; and Eric Hanushek, 1992.

[20]See the articles by Byron Brown and Daniel Saks; Anthony Boardman et al.; and Herbert Walberg and William Fowler.

[21]James S. Coleman et al., p. 22.

A true test of the peer group effect requires data not only on the academic progress of individual students but also some measure of the intellectual abilities or academic performance of their classmates. Two studies from the 1970s had such data on individual students, and both found a significant peer group effect.

In 1977, Anita Summers and Barbara Wolfe examined school, family, and peer group factors that influenced the change in test scores between third and sixth grade for 627 students in the Philadelphia school system. After taking into account family characteristics such as income and characteristics of the school such as the teachers' education and experience, Summers and Wolfe found that higher academic performance by classmates helped lower achievers improve their test scores. They found no significant peer group effect for high achievers, however.

In the second study of the peer group effect, Vernon Henderson, Peter Mieszkowski, and Yvon Sauvageau identified the factors that improved language and math scores for 7000 French-speaking students in Montreal. They found that the higher the average IQ of the other students in the class, the greater the improvement in test scores for all students, no matter what their own level of achievement. Thus, both high achievers and low achievers benefited from the peer group effect.[22]

The existence of a peer group effect allows children to benefit from the innate abilities and the family characteristics of the other students in their school. Hence, the makeup of the student body is a factor in the educational process at the primary and secondary levels.

SO WHAT ARE WE BUYING WITH THE SCHOOL PREMIUM?

This survey of housing prices and school quality has identified at least two possible sources for the school premium: the resources available to the school and the composition of the student body. Even though the overall relationship between school resources and student achievement is a matter of controversy, most researchers agree that when extra resources are used wisely, they can enhance the quality of education and thereby contribute to higher house prices. These extra resources might be used to improve academic achievement, but they might also be used to improve other dimensions of school quality, such as the physical attractiveness of the school or the range of extracurricular activities.

The empirical evidence also shows that academic achievement can be improved by the peer group effect. This effect represents a classic spillover, whereby students reap benefits from the personal and family characteristics of their classmates. Therefore, prospective home buyers are applying an appropriate yardstick when they focus on average test scores to help decide what the school premium should be. The peer group effect justifies higher house prices in areas where schools have higher test scores. It is not easy to disentangle the school premium from the value of many other neighborhood characteristics. But the premium clearly exists, and it is an important factor in the difference in house prices across neighborhoods.

[22]Henderson et al. did find that lower achievers benefited more from the peer group effect.

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