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School and School District Consolidation Major Concepts

Catherine J. Reilly

Catherine Reilly June 9, 2004

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Major Concepts

1. **School Consolidation**
   Combining two or more schools into a single larger school; some of the original schools would be closed

2. **School-District Consolidation**
   Combining the administrations of two or more school districts; none of the schools within the districts would necessarily close

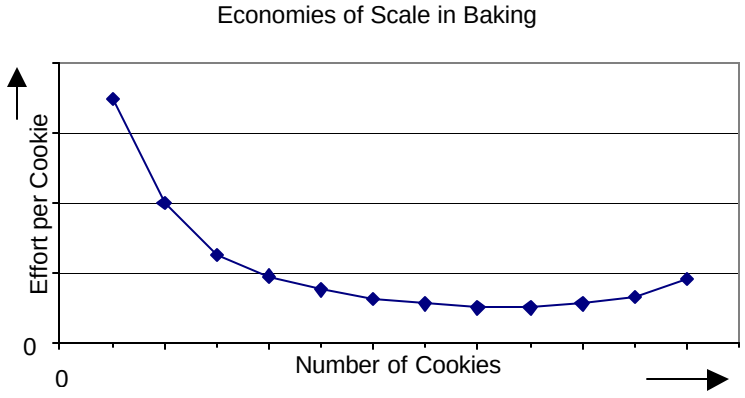
It is possible to consolidate schools but not districts *and* it is possible to consolidate districts but not schools *and* it is possible to do both at once.

3. **Economies of Scale**
   The principle that it can be more efficient to make larger quantities rather than smaller; for example, if you want to make a dozen cookies, it is more efficient to bake one batch with twelve cookies rather than twelve batches of one cookie each

4. **Diseconomies of Scale**
   The concept that after a certain point it becomes less efficient to make larger quantities; for instance, if you tried to make too many cookies at once the ingredients wouldn't fit in the mixing bowl, the cookies would stick together on the baking sheet, etc.

Graphing Economies of Scale

The graph below illustrates the cookie example. The vertical axis represents the amount of effort per cookie and the horizontal axis represents the number of cookies. If economies of scale exist, then one would expect the following relationship:



The effort needed to make a one-cookie batch is high. One has to mix the ingredients, grease the pan, form the cookie, etc. However, if one were to make a two-cookie batch, effort per cookie would be nearly half since virtually all of the steps are the same, except that one would form two cookies. Effort per cookie decreases as the batch becomes larger. At some point, if one encounters problems with the shear volume of cookies being made, effort per cookie begins to rise. The lowest point on the curve would correspond to the number of cookies that required the least effort per cookie.

Relating the Concepts to School and District Size

Just as it would not be efficient to bake one cookie at a time, it would not be efficient to build a school for every Maine child. Likewise, it would not be efficient to build one school for the entire state. In other words, we can utilize *economies of scale* by educating multiple children in each school, but we could run into *diseconomies of scale* if we try to educate too many. The *optimum* is the point at which we stop enjoying *economies of scale* and hit *diseconomies of scale* – the point at which the addition of more students would make the school or district operate less efficiently rather than more efficiently.

Defining "Optimal"

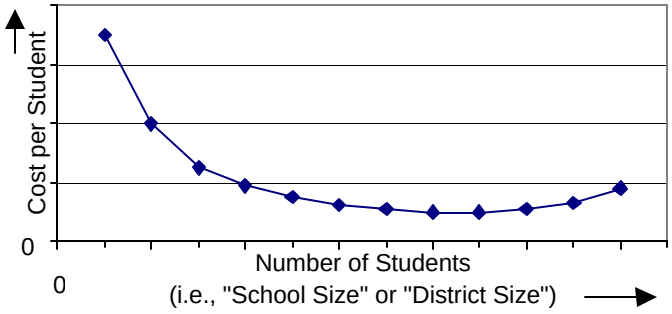
In this context "optimal" can mean different things to different people. Some could say that *optimal efficiency* is the enrollment level at which a school's cost per pupil is lowest. Others say it's the size that allows schools to offer a sufficiently diversified curriculum. Still others say it's the level that maximizes students' standardized test scores, minimizes dropout rates, or maximizes graduation rates. There are dozens of factors for which one could find the *optimal* enrollment. However, those *optima* are unlikely to be the same for each. In others words, the school or district size that minimizes cost per pupil may not be the same size that maximizes test scores.

Identifying Tradeoffs

The tradeoffs of not operating at the *optimal* level depend on which factor one considers. For instance, the tradeoff of operating below the level that enables a diversified curriculum means fewer class choices. The result of not operating at the minimum cost per pupil is less clear. Obviously, the tradeoff is paying more for each child, which might be alright if the extra cost benefits students. However, the principle of *economies of scale* suggests that they might not be.

To return to the cookie analogy, the extra effort of baking a dozen cookies in twelve batches does not add value to the cookies. Likewise, by not operating at an efficient enrollment level, we may be spending more than necessary to educate students and not improving their educations. By taking advantage of economies of scale and moving to an enrollment level that lowers per-pupil costs, we may be able to give students the same quality of education and save money. That extra money could be fed back into the school to increase resources and/or used to reduce property taxes.

Economies of Scale in Education



As with the cookies, cost per student initially decreases as the number of students within a school and/or school district increases. Cost per student then increases when schools and districts become too large.

School and School District Consolidation

National Research Findings

Research History

Scholars have investigated school- and district-size issues since the beginning of the last century, when in many areas new regionalized schools were displacing the one-teacher schools that had been the standard for many years. Larger schools seemed to represent positive educational and social progress. Whereas once the "3 Rs" were all that were expected from schools, they are now expected to offer students a much more diversified education. In the 1960's and 1970's, researchers began to investigate the possible advantages of smaller schools. As more and more dimensions have been examined (such as academic performance, student behavior, and postsecondary achievement), evaluating the relative merits of "small" and "large" schools have become more complex.

Terminology

A common problem that can lead to the misinterpretation of research results and confuse the debate on school size is the lack of consistency in the use of words "small" and "large." Depending on which study one reads, these words have different meanings. For example, when studying students' perceptions of their environment, Bowen et al. (2000) separate schools into five size categories: schools with enrollments of 0-400, 401-600, 601-800, 801-1000, and over 1000. One year later, in a study on the same topic, Moracco (2001) uses two categories: 0-474 ("small") and 475 or higher ("large"). Some schools called "large" in the second study would be in the second "smallest" category in the first. Comparing results across studies for "small" and "large" schools, without referring to their numerical enrollments, leads to confusing and contradictory results.

When applying research findings to schools and districts in Maine, it is important to look at enrollment numbers, not labels like "small" and "large." A school that is "large" for Penobscot County may be in the "small" category of a study of New York City schools.

Costs

Many studies have investigated whether economies of scale exist for schools and school districts, and the overall answer is "yes" (Riew, 1966; Cohn, 1968; Shapiro, 1973; Chakraborty, Biswas, and Chris, 2000; Kumar, 1983; Bee and Dolton, 1985). The observation that per-pupil costs decrease as enrollment increases from very low levels is generally not disputed. As enrollment rises, per-pupil costs decrease quickly at first and gradually flatten out. Some studies have found that per-pupil costs begin to increase again when schools become so large that they experience diseconomies of scale (Cohn, 1968; Duncombe et al., 1995).

Some recent researchers argue that cost comparisons of schools should use cost per graduate, rather than cost per pupil. They theorize that the latter is a better measure of educational outcomes and could capture some of the qualitative dimensions of education. A commonly cited study by Stiefel et al. (2000) compared per-graduate costs of New York City high schools. It found that "large" (over 2000 students) and "small" (up to 600) academic high schools had roughly the same cost per graduate, and both were lower than the average per-graduate cost for "medium" schools. However, the study also found that cost per graduate for vocational schools with 600 to 1,200 students was 57.6% higher than cost per graduate for larger vocational schools with 1,201 to 2,000 students.

Academic Achievement

Standardized test scores are the most commonly used proxies of academic quality. They are quantified measures of achievement that are comparable across schools and school districts (unlike grades which can vary by locality). However, a myriad of variables affect a student's test performance, and findings on the impact of school and district size are mixed.

Large is Better

Gardner et al. (2000) found that high school size had a significant, positive effect on Scholastic Aptitude Test (SAT) scores of California students. In a national study of high school students with advanced mathematics, Schreiber (2002) found that school size positively influenced performance on the Third International Mathematics and Science Study, even when accounting for gender, parental education, and other variables regarding students' academic background, habits, attitudes, and activities. Positive relationships between school size and test achievement are reflected in studies of standardized test scores in the United Kingdom as well (Bradley and Taylor, 1998; Barnett et al., 2002).

Small is Better

In a national study of 11,794 high school students, Lee and Smith (1995) found that school size had a small but significant negative effect on two-year achievement gains on standardized math and reading tests. Similarly, analysis of pass rates on New Jersey's High School Proficiency Exam found that in various subject areas, students from schools with 500 or fewer students scored 9 to15 percentage points higher than those from schools with 1,500 or more students (Harrison, 2003). On average, 96% of New Jersey students in schools with fewer than 500 students passed the math, reading, and writing exams, compared to 85% of students in the larger schools.

Neither is Better

Lamdin (1995) found no significant relationship between student performance on the California Achievement Test and the size of public elementary schools in Baltimore. In a study of California schools, Driscoll et al. (2003) found that school size had a small negative impact on academic performance at elementary schools, but no effect at the high school level.

School District Findings

Duncombe et al. (1995) found that New York students in larger school districts tended to perform better on the state's high school Regents Examination (Duncombe et al. contributed some of that effect to fewer Regents preparatory classes being offered in smaller districts). They found that performance on Regents was highest in districts of between 1,000 and 5,000 pupils. These findings contrast with a later study of California school districts. Driscoll et al. (2003) found that district size negatively affected standardized test performance of elementary and middle schools, but had no significant impact on high schools.

Curricular and Extracurricular Offerings

If economies of scale exist, then schools should be able to offer students better educational experiences at enrollment levels. These improvements could be a wider range and/or higher quality of course offerings, and/or expanded extracurricular activities. One early study found that Wisconsin high schools with 1,100 to 2,400 students offered 40 to 70% more credit classes than high schools with 701 to 900 students (Riew, 1966). David Monk has studied this issue extensively and has found evidence that larger schools are able to offer students a wider range of course offerings, although the distribution across subject areas is not always equal. For instance, one study of New York high schools found that larger schools were able to offer more

classes in foreign languages and the arts (Monk, 1990). However, other studies by Monk found weaker or contradictory results.

Student Behavior

One non-budgetary advantage that smaller schools may have is the ability to foster better student-teacher relationships, promote stronger support networks, and improve the likelihood that students will successfully complete their educations. Many researchers have examined student behavior data as a measure of those intangible elements. Analysis of New Jersey high schools found that larger schools and districts experienced more student violence and school crime (Harrison, 2003). However, the study did not investigate causation. A study of Philadelphia schools found that larger school sizes could positively impact (i.e., increase) the number of student incidents and disciplinary actions reported by a school, even taking into account crime and poverty rates within the school neighborhood and in students' home communities, (Welsh et al., 2000).

Dropout Rates

Several studies have investigated the connection between school structure (of which size is one element) and dropout rates. These studies generally find a positive correlation between school size and dropout rates (McNeal, 1997; Funk and Bailey, 1999; Lee and Burkham, 2001). Gardner et al. (2000) found that California high schools with more than 2,000 students had significantly higher dropout rates than high schools with 200-600 students (13.9% compared to 10.2%), even when controlling for the number of students eligible to receive free or reduced lunch.

However, other studies have found no correlation between school size and dropout rates (Kennedy, 1989), and at least one study found that the negative impact of school size is weakened or reversed when demographic variables are rigorously considered (Rumberger and Thomas, 2000). Rumberger and Thomas (2000) used a large national sample of high school students to investigate the factors influencing dropouts. They incorporated a wide range of student variables, including gender; race; parental occupation, education, and income; family structure; sibling dropouts; and academic background. When these variables were incorporated (along with other school characteristics besides enrollment), school size negatively affected (i.e., decreased) dropout rates.

Summary

In all, the literature on school and district size presents mixed findings. Education researchers have not reached consensus on these issues. Multiple factors interact to form a student's educational experience and no single enrollment number has been found that can maximize all of them. No individual study presents conclusive evidence of the "best" size for a school or the district in which it is located.

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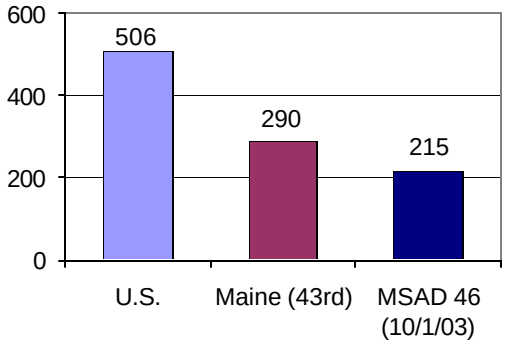
School and School District Consolidation

Maine Research Findings

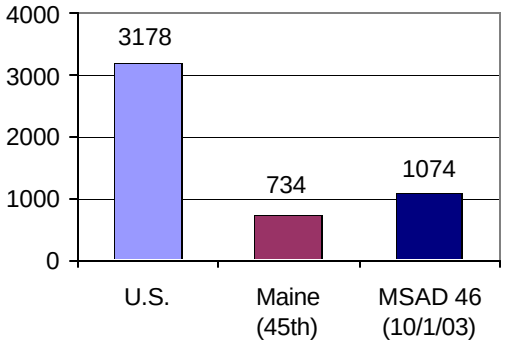
In 2002, fifteen communities in the Greater Bangor Area asked the Margaret Chase Smith Center for Public Policy at the University of Maine to investigate "regional cooperative strategies for…public service provision." One element of that was exploration of the possible benefits of school consolidation done by Philip Trostel, Associate Professor of Economics. Dr. Trostel's work is the most in-depth analysis of the allocation of Maine's education resources to date, but due to limited resources it is only an initial investigation. Dr. Trostel has received a grant for further analysis and his findings are forthcoming. However, his initial results reveal important insights into Maine's education system.

Maine's schools and school districts are much smaller than the national average.

Average Number of Students per School in 2000-01



Average Number of Students per School District in 2000-01

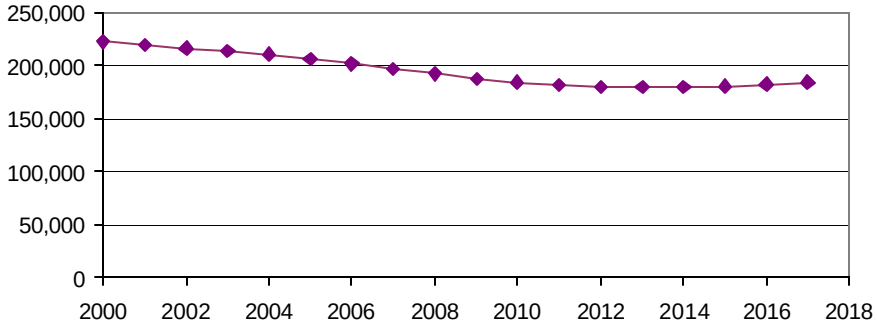


Source: National Center for Education Statistics and Maine Department of Education

Maine's schools are roughly 60% as large as the national average and its districts are only about 25% of the national average. This suggests that there may be potential to consolidate schools and districts, and that the potential for district consolidation may be particularly strong.

More Maine communities are likely to face difficult consolidation decisions in the coming years because Maine's schools and districts are becoming even smaller. The number of school-aged children (5-17 years old) in Maine is projected to shrink by almost 15% in the next decade, from roughly 211,000 in 2004 to 180,000 in 2014.

Projected School-Aged Population in Maine

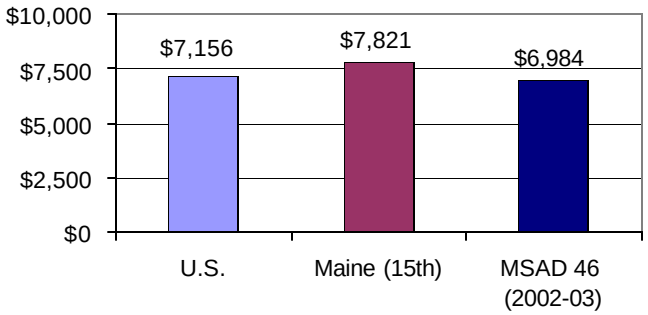


Source: Maine State Planning Office

Maine's cost per student is almost 10% higher than the national average.

(Current costs include operational expenses such as salaries, transportation, books and materials, and energy costs. Current costs exclude expenditures for capital outlay and interest on school debt.)

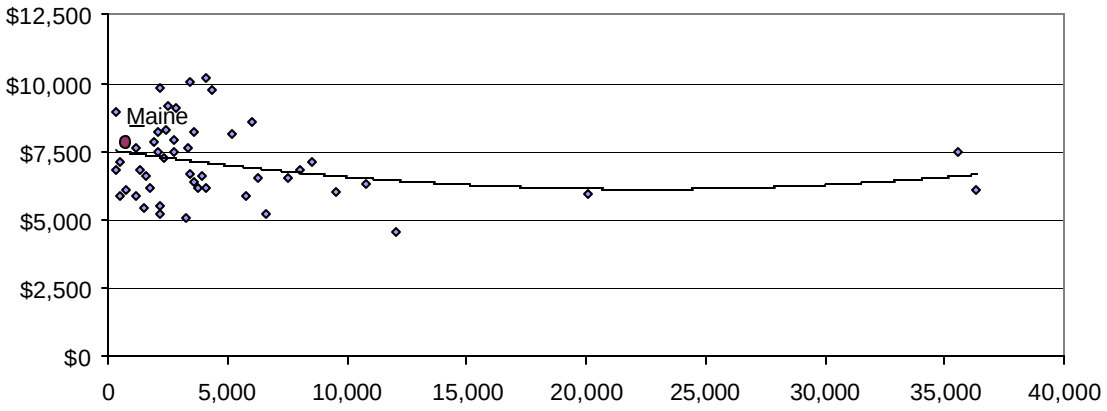
Current Cost per Student 2000-01



Source: National Center for Education Statistics and Maine Department of Education

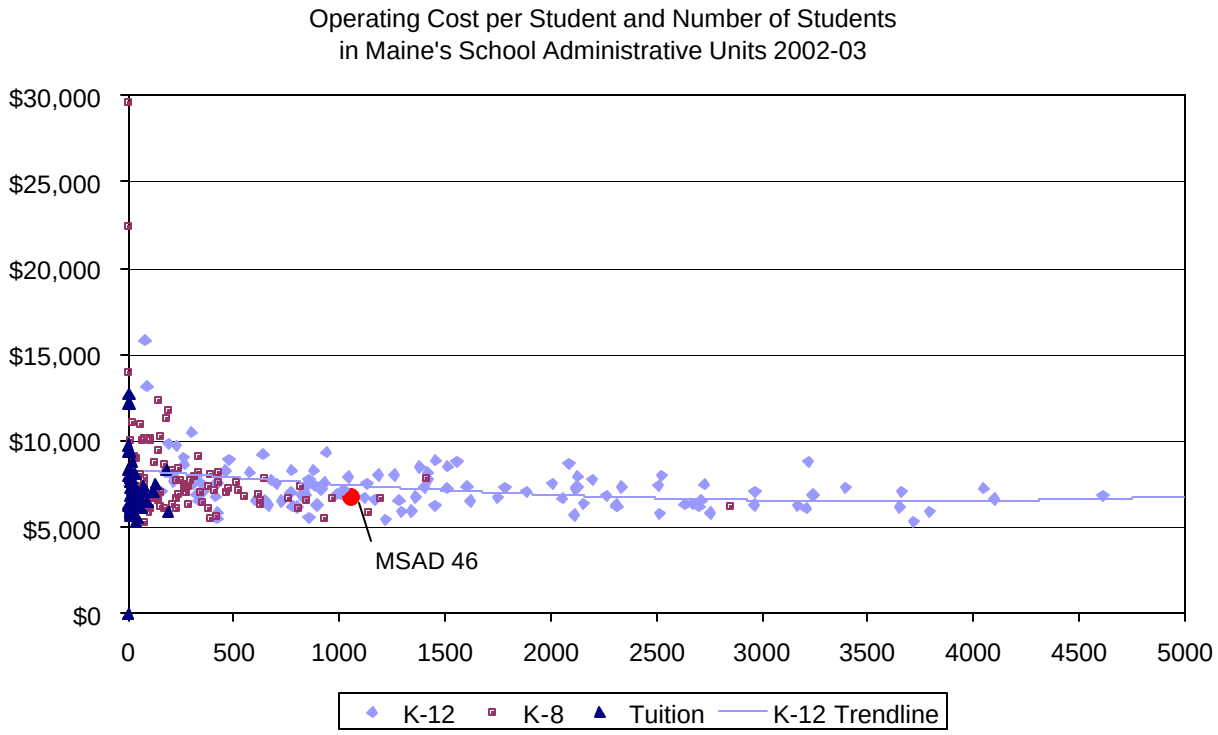
The principle of economies of scale suggests that Maine's lower-than-average enrollment levels and higher-than-average costs could be related. An examination of enrollment and costs in other states supports this hypothesis. The following graph shows each state's cost per student and average school district size. The distribution of the points suggests a slight downward trend, at least until 15,000 students. In other words, if one drew a trend line through the points, it would be downward sloping. That means that states' per-student costs tend to decrease as districts becomes larger. This is an example of economies of scale. On the other side of the graph, cost per pupil seems to rise slightly after 15,000 students. This could suggest diseconomies of scale.

Cost per Student and Average District Size in each State 2000-01



Source: National Center for Education Statistics

This graph suggests that larger school districts may eliminate some duplication of services, and perhaps reduce bureaucratic expenses. It is noteworthy that Maine is on the downward sloping side of the graph. This suggests that if Maine's average school-district size were larger (a rightward movement on the graph), then its cost per student could be lower (a downward movement on the graph). This does not mean that every district should be larger, but that Maine's numerous small districts should be larger. For example, Maine has dozens of districts that don't operate any schools, and during 2002-03 had an average of 29 students.



Source: Maine Department of Education

The graph above shows the operating cost per student for Maine's School Administrative Units (SAUs). Operating costs include all expenditures reported by the SAU except "major" capital outlays, transportation costs, and interest on school debt. The clustering of the points is suggestive of a U-shaped relationship. All of the 25 highest-cost SAUs have fewer than 300 students. The size of the 25 lowest-cost SAUs varies considerably, from 9 students to 3718 students. Of those, twelve have fewer than 300 students, six have 300-1000, and seven have over 1000 students.

The fact that so many small SAUs have very low costs seems to contradict the theory of economies of scale. However, when we take a closer look, we see that most of those SAUs do not operate their own schools and instead tuition their students elsewhere. Twelve of the lowest-cost SAUs pay other districts to education all of their students, and another six operate K-8 schools and send students elsewhere for high school. Of course, there are state laws that limit tuition rates, but it seems likely that the receiving SAUs are able to accept those low prices because the cost of adding an additional student is relatively small. In this way, the tuitioning SAUs are able to benefit from the economies of scale generated by the larger SAUs.

We see that the costs for SAUs that tuition all of their students generally lie below and to the left of the K-8 SAUs, which lie below and to the left of the K-12 SAUs. It appears that some SAUs are already utilizing economies of scale to some degree by tuitioning their students to larger SAUs that have lower per-student costs. Furthermore, we see that the largest cost differences occur at the very low end of the size scale (in other words, the trend lines would be steepest to the left of 500 students).

The cost curve for K-12 SAUs appears to be steep at first and then gradually flattens out. The greatest potential cost savings appear to be before 500 students and MSAD 46 is past that level. It lies at the beginning of the flat portion of the curve. An estimation of the cost curve through all points shows that the district size corresponding to the lowest cost per student is 3,378. In 2002-03, nine SAUs in Maine were at least that large. Over 250 were smaller.

School Quality

It seems fairly clear that economies of scale exist within Maine's school districts. However, it is possible that the smaller SAUs, despite being more expensive in general, are providing their students with better educational experiences. Dr. Trostel took a preliminary look at this issue. Education quality is difficult to measure because many elements that form a student's experience are not easily quantified. The following are a few proxies of school quality. Dr. Trostel is currently working to assess the effect of school and district size on more school-quality variables in order to provide a more comprehensive picture of this issue.

Teacher Qualifications

There is a positive correlation between the percent of staff with advanced degrees and school size. This means that larger schools tend to have more staff with graduate degrees. This suggests that larger schools may use some of their cost savings to hire staff with relatively higher qualifications.

Test Scores

Student performance on the Maine Education Assessment standardized test is positively correlated with school size. Students in larger schools tend to score higher on the tests than students in smaller schools.

Postsecondary Plans

There is no correlation between school size and the percent of students who intend to enroll in higher education. Students in small schools are just as likely to plan for college attendance as students in larger schools.

There are many other elements of school quality besides these three measures. These include student behavior, range of course offerings, extracurricular activities, postsecondary achievement, etc. Also, a more thorough analysis of any quality measure would have to control for socioeconomic factors such as household income, parental education and race,. Dr. Trostel is currently working toward a more comprehensive analysis that will incorporate these elements.

Summary

In all, there is evidence that economies of scale exist for Maine's schools and school districts. Evidence of potential savings from school-district consolidation (as opposed to school consolidation) is particularly strong. Most of the potential cost savings are at the very low end of the size spectrum. In other words some very small school districts could save considerably by moving to at least the 300- or 500-student level, but additional cost savings past that point would be much smaller. Some communities are already utilizing the savings generated by economies of scale and others, for various reasons, are not. The extent to which more districts could consolidate likely depends on the unique geography of the region in which it operates.