

The Importance of School District Size

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How does school district size affect performance? How will consolidating districts into larger districts affect student performance? If smallest districts in Ohio are consolidated, how much larger would we expect these districts to be?

Executive Summary

Governor Kasich has recently proposed Ohio's 613 school districts into larger, more cost-efficient districts. Consolidation is the process of combining two or more school districts into single district. Proponents of consolidation argue that reducing the number of school districts saves money on administrative overhead. However, a review of prior studies suggests the savings from consolidating small rural districts will likely be an insignificant fraction of state spending on education overall. After reviewing previously conducted studies and our own analysis on district size and student performance, we conclude that increasing district size has a negative effect on student achievement. Increasing district size produces a statistically significant decrease in the percentage of students who pass the math section of Ohio achievement tests. We recommend that policymakers not pursue school district consolidation at this time. Instead, policymakers should focus their attention on alternative savings measures, such as shared-service agreements between districts.

Introduction

Over the last fifty years, school district consolidation has been a major topic in the American education system. Initially, educators and administrators introduced district consolidation as an effective way to cut costs. As a result, the number of school districts decreased from 117,108 in the 1939 – 1940 academic year to 13,862 in the 2006 – 2007 year (Duncombe 2010). While district consolidation has been an important movement in the American education system for nearly a century, the financial and academic benefits are arguable, particularly in terms of size. An individual school's size does not necessarily increase, but the school district experiences an increase in students and area jurisdiction. As the school district size grows, the relationship between school district size and student achievement becomes important. Policy makers and state officials, including Governor John Kasich, have proposed school district consolidation in the state of Ohio to save costs from very small, largely rural districts. While state officials believe consolidating schools into larger districts is a way to save administrative costs, it could be a detriment to a district's student achievement.

We will be analyzing and providing literature and statistical data to test the relationship between district size and academic performance. Our research on a variety of studies, arguing both sides of debate, provides new perspectives and conclusions on the state of academic performance within large school districts. Following the origins of large school district consolidation, our literature review analyzes the costs and benefits of large district consolidation. Afterwards, we will introduce our analysis, which suggests that student performance will decrease as district size increases holding demographic variables constant. Our research clearly concludes that larger enrollment equals smaller student achievement. In addition to this

conclusion, we also find that the correlation between large district size and academic performance influences rural districts at a greater rate than urban districts.

History and Literature Review

The history of school district consolidation began as a duplication of the economy of scales models used in the automotive industry that saved production costs and delivered a quality product at a low cost (Howley 2011). However, as district consolidation grew tremendously and increased education's accessibility, the price of education only increased (Howley 2011). Until 1970, consolidation's marker of success depended on producing quality or "better" inputs, which subsequently, are more expensive (Howley 2011). Administrators presented district consolidation as a savings model, but were actually promoting an expensive endeavor that created quality inputs with the hopes of producing quality outputs (Howley 2011). Education analysts conclude that the markers of success for consolidation now depend on an explicit output: student achievement tests. Strong critics of consolidation argue that student achievement has not been able to keep up with the costly inputs that districts produce on a daily and yearly basis (Howley 2).

District consolidation has been a recognizable characteristic in Ohio's education system since the early 20th century. The state of Ohio had 2,402 school districts in 1902, 1,893 in 1935, and a total number of 614 districts for the 2011 – 2012 academic year (Howley 2011). In the early 20th century, education leaders argued for consolidation as the economic models used in industry could produce equal success in a school setting (Howley 2011). During the early 20th century, the automobile industry emerged and completely changed American economics. Henry T. Ford, creator of Ford Motor Company, introduced new methods of developing low cost, high quality cars that made his company become world-famous. The emphasis of these methods

depended on the economies of scale as, “ a large industrial enterprise can radically lower unit costs of production of cars and offer consumers an excellent product at a very low cost,”(Howley 2011). Interestingly, Ohio leaders chose not to promote consolidation as a cheaper option, but as a model for better quality inputs. Currently, researchers recognize Ohio’s unique position in terms of consolidation as the state tends to reflect the national averages in regards to economic and achievement benefits (Howley 2011).

Historical perspectives overwhelmingly believe that large school districts provide better economic benefits and efficiency than very small districts. However, comprehensive research has shown that economic benefits are not necessarily achieved by consolidating into large districts. In addition, many policy studies question if large districts play a direct role in the decrease of academic quality and performance.

While evaluating research conducted on the school district sizes, the main conclusion illustrates that large districts do not appear to be a more affordable or an academically beneficial option compared to smaller districts. Very few studies have researched the before and after effects of district consolidation, but sources have revealed that there is no significant difference in costs (Cox & Cox 2010; Groan & Murray 2004; Streinfel, Foldesy, & Holman, 1991). While some educators and government officials advocate for district consolidation for cost effectiveness, research has shown that this is not the actual result. The Ohio Coalition of Rural & Appalachian Schools policy report on school district consolidation indicated that the only districts that would truly benefit would be very small, rural districts. While these districts would receive the benefits of such consolidation, the model cannot be replicated on a large-scale level for urban school districts.

Researchers William Duncombe and John M. Yinger studied 12 pairs of consolidated districts in the state of New York and compared costs between districts that consolidated and those that did not. Both researchers believed that consolidation could not be a cost savings benefit for three distinct reasons: transportation, administrative costs, and community (Duncombe & Yinger 2010). In terms of transportation, consolidation increases the average transportation distance, which also increases the district's transportation spending per pupil (Duncombe & Yinger 2010). Consolidating districts may increase salaries and benefits to the most generous district, an increase in administrative costs (Duncombe & Yinger 2010). Teachers may have a more positive attitude in a smaller school environment, which enables procedures that are more flexible, and lastly, students may feel more comfortable interacting with teachers in smaller districts that are more likely to cultivate a community atmosphere (Duncombe & Yinger 2010). The community atmosphere and close relations can foster higher student achievement regardless of the spending level (Duncombe & Yinger 2010). Both researchers concluded that since consolidation is most likely to involve small districts, the cost savings could not be replicated at the state level to facilitate greater savings.

According to studies from Syracuse's Maxwell School of Citizenship and Public Affairs, only meager savings occur when very small districts consolidate (Howley 4). The study also suggests that while individual district savings may be large, overall, it is small for the state because those districts are typically small (Howley 4). Few studies have researched the before and after effects of school consolidation, but sources have revealed that there tends to be no significant trend in costs (Howley 3).

Another study from Syracuse University concludes that the district consolidation of very small districts from 1990 – 2000 increased home values and rents by 25 percent in low-income

areas in the state of New York (Hu & Yinger 2007). The study issues three challenges for estimating the impact of empirical data largely ignored in consolidation studies. Typically, some characteristics of consolidated districts are not recognized such as declining home values after a factory closure in the town (Hu & Yinger 2007). If studies are not recognizing this kind of information, their data and research can become inconsistent. Second, assumptions about property values will not have the same consequences for every school district. Lastly, a study has to determine if consolidation is directly affecting property values, as this will lower per pupil costs with state aid assistance (Hu & Yinger 2007). Their data concluded that “district consolidation has no impact on house values for districts with more than 1,700 pupils,” and “the impact of consolidation on housing prices decline with tract income and is negative in the highest-income tracts,” (Hu & Yinger 2007).

Currently, there are many studies comparing district and school size to student achievement. Many of the studies indicate that students, especially lower income, perform much better in smaller districts (Howley 2011). A study, analyzing students in Ohio - concluded, “Smaller districts reduced the influence of poverty on achievement in the range of 20 percent to 70 percent across grade and unit levels,” (Howley 2011). Therefore, consolidating these districts would likely negatively affect their students. Economist Illyana Kuziemko discovered, “the dollar cost associated with lower academic achievement in consolidated districts paled in comparison to the somewhat higher per-pupil costs incurred by those districts (Howley 2011). More than anything, the policy report believes that deconsolidating would be the best option for urban school districts.

S.L. Bowen’s 2007 research on school district consolidation in the state of Maine provided interesting and compelling data regarding the issue. Bowen states that contrary to

popular belief, consolidation may produce Bowen's data compared the 15 biggest *and* smallest school districts to compare which group produced a higher graduation rate and post-secondary enrollment. The basic statistics illustrate that the 15 biggest districts have 55,000 students and a median income that is \$8,000 greater compared to the 15 smallest districts that have less than 3,000 students total (Bowen 2007). While Bowen's Table 1 highlights the economic advantages of the 15th largest districts, the report's Table 2 illustrates that the smallest districts outperform the biggest districts in the strongest indicators of academic achievement: graduation rates and post-secondary education (Bowen 2007). The 15 smallest districts had an average graduation rate of 91.4 percent; the 15th largest districts had an 85 percent rate. Bowen conclude that his research results are consistent with the Manhattan Institute's 2005 study that concluded "consolidation of school districts into larger units leads to more students dropping out of school," (Bowen 2007).

Consolidation supporters argue that small districts can be very costly even if they have high academic achievement. Maine's biggest districts spend, on average, \$8,033 per pupil compared to the \$11,027 the smallest districts spend (Bowen 2007). Despite the \$9 million in savings if the smallest districts consolidated, their academic performance would decrease, costing the state of Maine about \$14.5 million. Currently, the largest districts cost the state \$648 million due to the 8,100 students who do not receive a high school diploma (Bowen 2007).

Similar to the research we have found, Bowen claims that what exactly small districts are doing correctly is a matter of debate, as researchers believe that money is not the sole explanation (Bowen 2007). Bowen cites a University of Maine study of student achievement that found, "per pupil operating costs did not significantly predict the achievement levels of Maine high school students," (Bowen 2007). This result is consistent with national studies on school

spending that find there is not a consistent relationship between student performance and school resources (Bowen 2007). Cultural factors such as promising teacher practices, higher parental involvement, and closer relationships are considered notable reasons for the success of small districts.

In addition to the debate between small and large districts, other research studies have illustrated that moderation between district and school size would provide a better outcome for student achievement. Researchers Matthew Andrews, William Duncombe, and John Yinger's study, *Revisiting Economies of Scale in American Education*, defined the factors that affect economies of scale. Their study concludes that, "sizeable potential savings can exist by moving from a very small district (500 or less pupils) to a district of 2000 to 4000 pupils in instructional and administrative costs (Andrews, Duncome & Yinger 2002). The diseconomies of scale will not be relevant until the district has an enrollment of around 6,000 pupils (Andrews, Duncome & Yinger 2002). Since these dis-economies of scale do not include opportunity costs, such as transportation, the study suggests that any district that is considering consolidation must take into account the total travel times for both parents and students due to consolidation (Andrews, Duncome & Yinger 2002).

Our compilation of research analysis in Table 1 indicates that small districts outperform larger districts in academic performance and provide higher student achievement amongst low-income students. Every study that used standardized or state achievement test scores their dependent variable concluded that smaller districts outperformed or provided better academic success than larger districts. Researcher Donna Driscoll's study, *School District Size and Student Performance*, found increasing district size has a negative effect on school performance, particularly middle school academic performance (Driscoll 2003). Similarly, Duncombe &

Yinger analysis proved that small districts and schools outperform larger districts in schools on state achievement tests (Duncombe & Yinger 2010).

In addition, multiple studies found negative correlations between low-income students and large school district size. Martin L. Abbott's research found that large district size strengthens the negative relationship between low socioeconomic status and student achievement (Abbott 2002). Independent variables such as median household incomes and percent of students receiving free or reduced lunch supports the argument that the low-income students receive the most negative effects of large school district size. Craig Howley's *The Matthew Project: State Report for Ohio* analyzed district performance on state achievement tests. Using school size, district size, and percent of free or reduced lunch as the independent variables, Howley discovered reducing school and district size will reduce the negative influence of poverty on performance (Howley 1999). In support of this argument, Jerry Johnson's research on reading and mathematics scores in the state of Nebraska concluded smaller school systems in Nebraska reduce the harmful effects of poverty on student achievement (Johnson 2003).

In terms of consolidation, moderation in district and school size would be the most efficient compromise. Just as consolidating small rural districts can save money and transportation costs, a suburban or city school district of 4,000 to 8,000 pupils with a high school that serves 1,500 to 3,000 pupils may be too large, especially when considering disadvantaged students (Andrews, Duncome & Yinger 2002). While the study does not provide a direct answer to consolidation, the researchers believe a model of moderation between school district size and school size will provide the most effective results for cost savings and student achievement.

Methodology

The structure of this study shares similarities with much of the previous research on district size and student achievement. The unit of analysis is school districts. Student performance is the dependent variable, whereas school district size is the independent variable of interest. Using data provided by the Ohio Department of Education website and the National Center for Education Statistics, we compared a total of 606 school districts in Ohio. The percent of students passing achievement tests at three different grade levels were used to measure student performance in each district. In Ohio, achievement tests are administered statewide, and are consequently the best available measure for comparing student achievement across districts. These percentages were regressed against the total student enrollment in each district, controlling for other factors. Consistent with previous studies, we also added a variable to control for the size of individual schools within districts. School size is not the primary interest of this study, but previous work has found evidence of a relationship between school size and performance. Similarly, we have added a dummy variable to separate districts into two distinct categories based on previously conducted research: rural and urban. To create this dummy variable, we collapsed the typology of school districts provided by the Ohio Department of Education website into two categories. Earlier research suggests school consolidation is more harmful to rural school districts than urban ones. To take this effect into account, we constructed a multiplicative interaction variable between district enrollment and a district's rural or urban status.

The last several variables used were created to account for socioeconomic differences between districts. Previous studies have typically used free or reduced price lunch to capture socioeconomic differences between school districts; we used several alternative variables to better explain socioeconomic disparities. Using free or reduced price lunch enrollment alone is

not sufficient to explain socioeconomic variance occurring above the poverty line. Therefore, we have included several variables in our analysis to take into account these socioeconomic differences. These variables include: percent below the poverty line, percent of single parent households, and percent of parents who have obtained a bachelor's degree or higher. In order to determine statistical significance, T-statistics were used with an alpha value of 0.05.

Results

The results of our analysis are consistent with previous findings. A summary of our findings can be found in Tables 2-5. Table 2 shows the relationship between the percent of students who pass the OGT math section and the selected independent variables. Tables 3 and 4 show the relationship between the percent of students who pass the math section of 8th and 4th grade achievement tests, respectively, with the selected independent variables. Table 5, however, contains a multiplicative interaction variable between total district enrollment and ruralness. Table 5 is identical to Table 2 except for the addition of this new variable.

The three socioeconomic variables included in the regression analysis were consistent with previous findings. The percentage of families below the poverty line and percentage of single parent households within a school district are negatively correlated with student performance on achievement tests, whereas the percentage of parents with a bachelor's degree or higher is positively correlated with student performance.

Total district enrollment is negatively correlated with student achievement across all tested grade levels. Increasing district size produces a statistically significant decrease in achievement test scores. This means that, other things being equal, students will perform worse on achievement tests in larger school districts than in smaller ones. For each additional hundred

students in a district, all other things equal, the percentage of students who pass the OGT math section declines by 2.6 percent.

In contrast to district size, the size of a school seems to have no statistically significant effect on student performance, regardless of grade level. In contrast, previous studies have indicated a relationship between school size and student performance, albeit a nuanced one. The socioeconomic status of students, for example, might change the relationship between school size and student performance (Howley 1999). Regardless, determining the complex relationship between school size and student performance falls outside the scope and interest of this study.

The location of a school district seems to play no role in determining student performance, regardless of grade level. By itself, it does not seem to matter whether a school district is in a rural or urban area. However, we used a binary variable to determine whether a school falls into the rural or urban category. It is possible that this dichotomous representation of school districts is not sufficient for creating a statistically significant effect. Perhaps a continuous variable, such as population density, would generate different results.

Additionally, the multiplicative interaction variable between total district enrollment and ruralness is not significant. As seen in Table 5, increasing district enrollment does not seem to be any more harmful for rural districts than urban ones. However, policymakers should note that increasing district enrollment is still harmful to both rural and urban school districts.

Policy Recommendation

Based on previous studies and our findings, we recommend that small school districts not be consolidated at this time. Adjusting school district size is one of the few levers available to policymakers that has a direct effect on student performance. Nevertheless, consolidating school districts is likely to push this lever the wrong way. Student performance is negatively affected by

increasing district size. Rural schools districts—the districts most likely to undergo consolidation—are unlikely to see the benefits of consolidation outweigh the costs. Per pupil spending in small rural districts is already the lowest among all school districts in the state (Asbury 2011). Any savings from consolidating these small rural districts is likely to be an insignificant fraction of state spending on education overall (Duncombe 2010). The potential marginal savings from consolidating these small school districts is unlikely to offset the harm to student performance.

However, policymakers pursuing economic savings still have several alternative options available. Sharing certain services across school districts, such as healthcare benefit plans, may result in savings, but are unlikely to harm the performance of students within districts. This type of consolidation captures the benefits of economy of scale, but does not interfere with the underlying structure of individual school districts. Our findings on the subject of school size are unclear, but consolidating schools within individual districts may result in savings without harming student performance. However, the findings of this study on the effects school size are severely limited; this study lacks the robustness to make any policy recommendation regarding school size. Any policy pursuing the consolidation of schools within individual districts should be contingent on the findings of future or alternative studies.

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Table 1
Summary of Reviewed Studies

Study	Dependent Variables	Independent Variables	Findings
Bowen 2007	High school completion rate, post-secondary enrollees	Median household Income, district enrollment	Small districts outperform larger districts in terms of graduation rates and post-secondary enrollment
Duncombe & Yinger 2010	State achievement test scores	Percent of students receiving free or reduced price lunch, school system size, school size	Small districts and schools outperform larger districts in schools on state achievement tests
Driscoll 2003	Standardized test scores	Percent of students receiving free or reduced price lunch, median household income, parental education, population density, percent of children enrolled in private schools, district size, school size, average class size	Increasing district size has a negative effect on student performance. Middle school performance in particular is negatively affected.
Howley 1996	State achievement test scores	Enrollment per grade level, free or reduced price lunch rates, percentage of adults with less than grade 12 education	In West Virginia, low income student perform better in small school districts, whereas affluent students perform well in large school districts.
Friedkin 1988	State achievement test scores	School system size, occupational status of parents,	As the socioeconomic status of a school district increases, the relationship between size and performance goes from negative to positive.

Abbott 2002	4 th and 7 th grade state achievement test scores	Percent free or reduced price lunch, school size, school district size	Large district size strengthens the negative relationship between low socioeconomic status and student achievement.
Eigenbrood 2004	3 rd and 6 th grade math and reading scores, 4 th and 7 th grade reading and mathematics scores	Percent free or reduced price lunch, school size, district size	Small schools in small districts are most beneficial for less affluent students, while large schools in large districts are most detrimental to achievement.
Howley 1999	District performance on state achievement tests,	School size, district size, percent free or reduced price lunch	Reducing school and district size reduces the negative influence of poverty on performance.
Leithwood 2009	Literature review of 57 post-1990 studies on school size effects. Variables vary between studies.		The majority of evidence favors small school and district size. Low socioeconomic students primary benefactors from small schools and districts.
Jerry 2003	Reading and mathematics scores	School system size, percent free or reduced price lunch,	Smaller school systems in Nebraska reduce the harmful effects of poverty on student achievement.

Table 2,
10th Grade Math OGT Scores

	Coefficient (t-statistic)
Rural or urban school (rural = 0)	-.08109 (-.13)
Percent below the poverty line	-.22611 (-5.81)
Percent single parent	-.24904 (-7.18)
Percent bachelor's degree or higher	.11897 (4.70)
Total district enrollment, per hundred students	-.026 (-3.86)
Students per school	-.00001 (-.01)
N	606
Adjusted R-Square	.48

Table 3
8th Grade Math Achievement Test Scores

	Coefficient (t-statistic)
Rural or urban school (rural = 0)	.05353 (.06)
Percent below the poverty line	-.15500 (-2.57)
Percent single parent	-.41111 (-7.72)
Percent bachelors or higher	.21499 (5.51)
Total district enrollment, per hundred students	-.038 (-3.65)
Students per school	-.00162 (-1.19)
N	606
Adjusted R-Square	.41

Table 4

4th Grade Math Achievement Test Scores

	Coefficient (t-statistic)
Rural or urban school (rural = 0)	.71505 (.78)
Percent below the poverty line	-.19723 (-3.48)
Percent single parent	-.34805 (-6.93)
Percent bachelor's degree or higher	.13939 (3.79)
Total district enrollment, per hundred students	-.031 (-3.14)
Students per school	.00132 (1.03)
N	606
Adjusted R-Square	.38

Table 5

Interaction between District Enrollment and Rural-Urban, 10th Grade Math OGT Scores

	Coefficient (t-statistic)
Rural or urban school (rural = 0)	.81090 (-.90)
Percent below the poverty line	-.22448 (-5.72)
Percent single parent	-.24680 (-7.10)
Percent bachelor's degree or higher	.12221 (4.78)
Total district enrollment, per hundred students	-.031 (-3.14)
Students per school	.00003 (0.04)
Total district enrollment X rural or urban school (rural = 0)	.00046 (1.12)
N	606
Adjusted R-Square	.48