

The Effect of Residential School Choice on Public High School Graduation Rates

Jay P. Greene, Ph.D.

Senior Fellow, Manhattan Institute for Policy Research

Marcus A. Winters

Research Associate, Manhattan Institute for Policy Research

EXECUTIVE SUMMARY

This study evaluates the effect that the size of a state's school districts has on public high school graduation rates. The authors calculate the graduation rate over the last decade and examine the relationship between these graduation rates and changes in each state's average school district size.

The study finds that decreasing the size of school districts has a substantial and statistically significant positive effect on graduation rates. Conversely, consolidation of school districts into larger units leads to more students dropping out of high school. The results of the analysis indicate that decreasing the average size of a state's school districts by 200 square miles leads to an increase of about 1.7 percentage points in its graduation rate. This finding is particularly important for states with very large school districts. For example, if Florida decreased the size of its school districts to the national median, it would increase its graduation rate from 59% to 64%.

Decreasing the size of school districts could improve educational outputs, including graduation rates, because it would increase the choice that parents have in the school system that educates their child. By making it easier to relocate from one school system's jurisdiction to the next, smaller school districts make it possible for a larger number of families to exercise choice among different school districts. The more families are able to move from district to district, the less students can be taken for granted by schools, which, for a variety of reasons, don't want to lose enrollment. This study provides empirical evidence that increasing the choice parents have in their child's school district contributes to higher public high school graduation rates.

ABOUT THE AUTHORS

Jay P. Greene is a Senior Fellow at the Manhattan Institute's Education Research Office, where he conducts research and writes about education policy. He has conducted evaluations of school choice and accountability programs in Florida, Charlotte, Milwaukee, Cleveland, and San Antonio. He has also recently published research on high school graduation rates, charter schools, and special education.

His research was cited four times in the Supreme Court's opinions in the landmark *Zelman v. Simmons-Harris* case on school vouchers. His articles have appeared in policy journals, such as *The Public Interest*, *City Journal*, and *Education Next*, in academic journals, such as *The Georgetown Public Policy Review*, *Education and Urban Society*, and *The British Journal of Political Science*, as well as in major newspapers, such as the *Wall Street Journal* and the *Washington Post*.

Greene has been a professor of government at the University of Texas at Austin and the University of Houston. He received his B.A. in history from Tufts University in 1988 and his Ph.D. from the Government Department at Harvard University in 1995. He lives with his wife and three children in Weston, Florida.

Marcus A. Winters is a research associate at the Manhattan Institute's Education Research Office, where he studies and writes on education policy. He has performed several studies on a variety of education policy issues including high-stakes testing, charter schools, and the effects of vouchers on the public school system. His op-ed articles have appeared in numerous newspapers, including the *Washington Post*, the *San Francisco Chronicle*, and the *Chicago Sun-Times*. He received his B.A. in political science with departmental honors from Ohio University in 2002.

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ABOUT EDUCATION WORKING PAPERS

A working paper is a common way for academic researchers to make the results of their studies available to others as early as possible. This allows other academics and the public to benefit from having the research available without unnecessary delay. Working papers are often submitted to peer-reviewed academic journals for later publication.

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THE EFFECT OF RESIDENTIAL SCHOOL CHOICE ON PUBLIC HIGH SCHOOL GRADUATION RATES

INTRODUCTION

Most people would agree that producing as many qualified graduates as possible is a primary goal of our public school system. Unfortunately, many would also agree that schools have failed to live up to this mandate. According to our best estimate, only 71% of the class of 2002 graduated high school with a regular diploma. This problem is particularly troubling in the case of minority students. Only slightly more than half of all Hispanic and African-American students who enter the ninth grade graduate from high school. These disturbing estimates have led policymakers to search for reforms that could increase graduation rates.

One reform that could lead to higher graduation rates is decreasing the size of school districts. Some argue that decreasing the size of school districts could improve educational outputs, including graduation rates, because it would increase the choice that parents have in the school system that educates their child. By making it easier to relocate from one school system's jurisdiction to the next, smaller school districts make it possible for a larger number of families to exercise choice among different school districts. The more families are able to move from district to district, the less students can be taken for granted by schools, which, for a variety of reasons, don't want to lose enrollment.

Research on the effect of changes in school district size on graduation rates is important because several states are currently considering either consolidating their school districts into fewer larger districts or increasing their number of school districts. For example, the state legislature in Arizona has recently considered consolidating all school districts with fewer than 6,000 students.¹ On the other hand, officials such as the governor of Hawaii² and the mayor of Miami³ have campaigned in favor of breaking up their states' very large school districts.

Research on the effect of reducing district size on graduation rates might also provide important, though limited, information on the effect that we might expect other school choice programs, such as voucher programs and charter schools, to have on graduation rates. While there is an abundance of research on the effect of school choice, particularly vouchers, on standardized test scores, little is known about the effect of such programs on high school graduation. Since these programs operate under the same principle as does reducing district size—that increasing the choice that parents have in the school their child attends will improve educational outcomes—it is reasonable to assume that research on the effect of changes in school district size will also apply to voucher and charter school programs.

In this study, we measure the effect that increasing residential choice by decreasing school district size has on graduation rates. We find a strong positive relationship between decreasing school district size and increasing graduation rates. This effect is significant both in terms of statistical confidence and in terms of its magnitude. For example, our results indicate that if Florida decreased the size of its school districts until they were equivalent to the national median, the state could increase its graduation rate from 59% to 64%.

EDUCATIONAL OUTCOMES AND INCREASING PARENTAL SCHOOL CHOICE

Many people have theorized that increasing parental choice in schooling will lead to greater educational outcomes for public schools. Several researchers have found that voucher programs lead to higher public school test scores by providing public schools with an incentive to improve. Greene and Winters (2004), for example, find that Florida schools forced to compete with vouchers made an improvement of 5.9 percentile points on the Stanford-9 math test, compared with all other Florida public schools.

The research on the systemic effects of charter schools is more limited but is also positive (see, for example, Hoxby 2001 and Greene and Forster 2002).

Others have argued that increasing school choice will harm public school performance because it robs valuable resources from public schools (see, for example, Berliner and Biddle 1995). However, while claims that school choice harms public schools are frequently and passionately espoused, we are aware of no empirical research showing that any type of school choice has harmed the outcomes of a public school system in the United States. Some research has indicated that in other countries, programs characterized as “school choice” programs have harmed the public schools there (see Fiske and Ladd 2000), but different countries have very different education systems and the programs examined in these studies do not correspond to “school choice” as that term is understood in the United States. Studies of public schools outside the United States are always of limited applicability to schools within the United States, and, in this case, are not applicable at all.

Though it would be particularly interesting to evaluate the effect of voucher programs or charter schools on state graduation rates, we are limited in our ability to measure the effect of these reforms on a statewide outcome such as graduation rates because most voucher programs serve a limited and targeted population of students. For example, Florida only offers its Opportunity Scholarships to students attending schools that have received two failing grades from the state in a four-year period—a total of 13,888 students are eligible, and only 1,611 use a voucher.⁴ While Greene and Winters (2004) and Chakrabarti (2004) have found that those schools directly affected by the voucher program have improved their academic outcomes as a result, the very small size of the program would probably prevent us from seeing any effect on the state’s graduation rate.

An even more difficult problem for our model to overcome in evaluating the effect of voucher programs on graduation rates is the incomparability of the populations served by different voucher programs. Florida’s Opportunity Scholarships go to students in chronically failing schools, while other programs only make vouchers available to students

in certain cities (for example, Cleveland and Milwaukee) and still others offer them to students with particular financial or educational needs. These different programs might have very different effects on state graduation rates. Such a wide range of possible effects from the reform would show up as noise in our analysis, so the incomparability of voucher programs is a significant hurdle to evaluating their effect on state-level graduation rates.

Similarly, charter schools vary in the populations that they are designed to serve. In their analysis of charter schools nationwide, Greene, Forster and Winters (2003) found great variation between states in the types of populations that charter schools generally serve. For example, they found that 78.8% of charter schools in Wisconsin are specifically designed to serve disadvantaged populations, such as at-risk students, juvenile delinquents, pregnant teens, and even students who have already dropped out of high school. While it may be a good thing that so many charter schools in Wisconsin are dedicated to improving education for such disadvantaged students, the effect that these schools have on graduation rates might be noticeably different from the effect of charter schools in Michigan, where only 2.8% of the charter schools specifically target low-achieving populations.

The way that charter schools operate also differs significantly from state to state. The Fordham Foundation graded states on the strength of their charter school laws and found wide variation (Palmer and Gau 2003). As with voucher programs, the variation in the type of charter schools between states makes comparisons of graduation rates across states inappropriate.

Another type of school choice, however, lends itself very well to comparisons between states because its meaning does not vary significantly between states: the ability of parents to more easily choose what school district they live in. Many people fail to recognize that those with the financial means have always had a choice in where their children attend school. Parents have access to school choice to the extent that they can choose where to live. Such “residential school choice” has existed to some extent for as long as there have been public schools. According to the National Center for Education

Statistics, 47% of parents chose their residence based in part on the public school that their child would attend.⁵ This makes residential school choice by far the most frequently used type of school choice.

Because people seriously consider the quality of the local public schools when they decide where to live, providing good schools is an important way for localities to compete for a tax base. When the schools in a district are bad, fewer people want to move there, so local property values go down and the community has an incentive to pressure the school system to improve. School districts themselves also have a financial incentive to improve the education that they provide because they receive a great deal of their funding on a per-pupil basis.

However, the strength of the incentive residential school choice creates for localities and school districts to provide quality public schools varies depending upon the ease with which parents can change school districts. The more difficult it is for parents to change public school districts, the weaker the incentive for districts to differentiate themselves by the quality of their public schools.

Average district size varies quite a lot from state to state. In Florida, for example, each of the state's particularly large counties is a single school district. So the entire state contains only sixty-seven school systems, each of which is geographically huge. The only way for parents in Miami to change school districts if they are unhappy with the dismal performance of Miami-Dade County's public schools is to move to the next county. Moving as far as the next county often means moving away from the support of friends and family and would probably require getting a new job. These are considerable burdens to most Americans, let alone for the low-income minority parents who disproportionately send their children to failing public schools. Conversely, there are seventy independent school districts within a thirty-minute drive of downtown Boston.⁶ Parents who are unhappy with their children's public schools can simply move a short distance if they wish to enter a different school system. Such a move is far less burdensome than in Florida. This means that the cost of exercising residential school choice is much lower, so the positive incentive applied to Boston's school districts is much stronger.

This variation in the availability of residential school choice allows us to study its effects on academic performance by comparing outcomes in locations with high and low levels of available choice. Several researchers, most notably Hoxby (2001) and Greene (2002), have found that increasing residential school choice leads to higher public school test scores. In their review of the literature, Belfield and Levin (2002) found that the evidence overwhelmingly indicates that increasing residential school choice leads to greater educational outcomes.

This study adds to the research on the effects of district size in a significant way by looking at its effect on the final secondary school educational outcome—high school graduation. Our analysis indicates that there is a substantial and statistically significant relationship between the change in the size of a state's school districts and the percentage of students who leave high school with a diploma.

CALCULATING GRADUATION RATES

The first stage, and most significant hurdle, of our analysis that measures the effect of school district size on graduation rates is developing a reliable way to calculate the percentage of students who graduate. The method used in our study demands that we calculate the graduation rates in each state for as many years as enrollment data are available. This will allow us to measure changes in the graduation rate for each state and evaluate whether those changes are in part caused by our variables of interest.

While it may seem an easy task, the most accurate method for calculating graduation rates is the subject of a great deal of heated debate among researchers. In fact, one major flaw of the No Child Left Behind Act is that, while it requires states to formally report their graduation rates to the federal government, states are allowed to calculate the graduation rate in any way they wish. The U.S. Department of Education has made some initial gestures in the direction of developing an official graduation-rate method for use under NCLB, but for now there is no standard measure.

To calculate graduation rates over time, this study uses a version of the method developed by Greene.⁷

This method estimates the number of students who enter a high school cohort, makes adjustments for population changes over the following four years, and then divides the number of students who actually received a regular diploma four years later by the estimated number of students who should have graduated if no one in the original cohort had dropped out. While this method is unable to produce a perfect calculation of the graduation rate, no method for calculating graduation rates can claim perfection. It does, however, consistently produce reliable estimates of the percentage of students who graduate from high school.

This method has emerged from the crowd as the most widely accepted estimate of graduation rates currently available. Calculations using Greene's method are widely cited by news outlets and researchers alike and have been used to determine the graduation rate in distinguished publications, including a high-profile study by the Education Trust (2003) and in Education Week's annual "Quality Counts" issue (2004). Additional evidence of its reliability is that its graduation-rate calculations are consistently similar to those produced by the methods of other independent researchers (see, for example, Orfield, Losen, and Wald 2004 and Sum et al. 2003).

Instead of using survey responses or other unreliable data, Greene's method relies upon officially reported enrollment and diploma counts made available by the U.S. Department of Education in its Core of Common Data (CCD).⁸ These enrollment data are far more reliable than survey instruments, which are subject to sampling difficulties and problems with self-reporting. Enrollment counts are also more reliable than schools' attempts to follow the progress of individual students over time, which is the basis for some states' official calculations of their graduation rates. Schools lack both the incentive and the resources to accurately track individual students, especially those who have either moved away or dropped out, for whom the schools are no longer responsible.

However, there is good reason to believe that enrollment counts are accurate because schools have an incentive to correctly report them and states have an incentive to monitor their validity. Schools are especially careful to take attendance accurately

because the size of their enrollments determines their eligibility for state and federal funds. And because states pay schools based on enrollment, they have an incentive to audit enrollment counts to ensure that they are not inflated. While there certainly remains some latitude for error in these figures, the incentives of schools and states to get the numbers right make enrollment counts our most reliable source for measuring graduation rates.

The first step in calculating the graduation rate with this method is to estimate the number of students who enter the ninth grade for the first time in a given year. Unfortunately, the ninth-grade enrollment numbers are inflated because substantial numbers of students repeat that grade. Many researchers have noted their concern for the "enrollment bubble" in the ninth grade (see Haney et al. 2004). This makes it difficult to isolate the cohort of students who are entering ninth grade for the first time. We cannot simply use the number of students who were in the eighth grade in the previous year because many students switch from private schools to public schools between middle school and high school, on account of the relatively small number of private high schools. Similarly, we cannot just use the tenth-grade enrollment figures for the following year because by that time, students have already begun to drop out. To estimate the number of students who enter the ninth grade for the first time in a way that minimizes the impact of these problems, we take an average of eighth-, ninth-, and tenth-grade enrollments for that cohort class. For example, with Texas's graduating class of 2002, this would entail averaging the enrollments in the eighth grade in 1997–98 (292,648), ninth grade in 1998–99 (350,743), and tenth grade in 1999–2000 (275,265) to produce a cohort of 306,219.⁹

Next, we make adjustments for population changes between each cohort's ninth-grade year and its graduating year. We use data provided by the U.S. Census to estimate the change in the total number of people in our cohort's age group nationally and in each state.¹⁰ To measure the population change, we simply subtract the number of 14-year-olds in the population in the spring of our cohort's ninth-grade year from the number of seventeen-year-olds in the population in the spring of the cohort's twelfth-grade year. This gives us the amount by which this part of the population has either grown or shrunk during that period. We then determine the percentage

change by dividing this figure by the original fourteen-year-old population. For Texas's 2002 graduating class, we subtracted the number of fourteen-year-olds in the state during the spring of 1998 (299,003) from the number of seventeen-year-olds in the state during the spring of 2001 (323,095) and divided the resulting figure (24,092) by the number of fourteen-year-olds in 1998 (299,003) to get a population change of approximately 8%.

To estimate the number of students who should have graduated from high school if none had dropped out, we multiply our estimated ninth-grade cohort by the percentage change in the population and add this to our cohort estimate. The resulting figure is the number of students who would need to have graduated for the state to have a graduation rate of 100%. For the 2002 graduating class in Texas, we would multiply the number of students we estimated entered the ninth grade (306,219) by the population change (8%) and add the resulting growth estimate (24,673) to the ninth-grade cohort estimate to get a class of 330,892 students who should have graduated.

Finally, we simply divide the number of diplomas that were actually distributed during our cohort's graduating year (in Texas, 225,167) by the number of students we estimated should have graduated (in Texas, 330,892). This final calculation produces the estimated graduation rate (68% for Texas's 2002 graduating class).

Though our calculation does follow a cohort of students from when they enter high school to when they graduate four years later, it is not a four-year graduation rate. Students who take longer than four years to graduate would exit our cohort; however, they are likely replaced by students in previous cohorts who have also taken longer than four years to graduate. Thus, as long as there is not a substantial difference in the number of students in a cohort who graduate after the fourth year, those students will be included in our graduation-rate calculation.

As illustrated by the example above, our method requires five years of data for each graduating cohort of students. To ensure comparability of the enrollment counts, we limit our study to the data provided by the CCD. Unfortunately, CCD data are only available going back to the 1986–87 school year,

so we are only able to calculate graduation rates as far back as the class of 1991. Also, complete CCD data are only available up through the graduating class of 2002. While we would prefer to have more years of graduation rates available for our analysis, these years should prove more than sufficient; even fewer years would be acceptable.¹¹

METHOD

The next step in our analysis is to calculate the average size of the school districts in each state in every year for which we have the necessary data. To measure changes in the availability of residential school choice, we can't simply measure changes in the number of school districts in a state. This would be inappropriate because the addition of a school district is more meaningful in smaller states than in larger ones. A single new district in Rhode Island, for example, could significantly increase the amount of residential school choice in school districts for all residents of the state. Adding a single new district in Texas, however, would have only an infinitesimal effect on the overall availability of residential school choice in that state. Therefore, to evaluate the effects of residential school choice on graduation rates, we created a variable indicating the size of the average school district in square miles for each state-year in our data set. We did this by dividing the total number of square miles of land in each state by its number of school districts in each year.¹² Because we could only obtain information on the number of districts as far back as 1993–94 and up through 2000–01, our analysis can only evaluate the effect on graduation rates between those years.

Surprisingly, there is significant variation in the size of school districts within states over the last decade. Table 1 lists the average square miles per school district in each state for each year in our analysis. Some states have consolidated their school districts into fewer larger districts: Oregon went from an average of 342.8 square miles per district in 1994 to 487.3 square miles per district in 2001. Other states have significantly decreased the size of their school districts: Louisiana added twelve school districts between 1994 and 2001, decreasing the average size of its school districts by 101.5 square miles.

We use a fixed-effects regression model to evaluate the effect of changes in school district size on

graduation rates. Our model controls for dummy variables for each state and year, which means that our analysis treats each state-year as an independent observation. The effect of this approach is to follow changes in each state's graduation rate and its school district sizes over time.

In our analysis, we controlled for educational current expenditures per pupil in each state-year. Since many education reforms cost considerable extra money, controlling for spending is a proxy for reforms other than changes in school district size, such as class-size reduction, that might affect graduation rates. We also control for a dummy variable indicating whether the students in a state during a particular year were required to pass a high school exit exam in order to graduate. Though research suggests that high school exit exams have no significant effect on graduation rates (see, for example, Greene and Winters 2004, Warren and Jenkins 2003, Muller 1998, Warren and Edwards 2003, and Jacob 2001), there remains a widespread perception that such requirements force students to drop out of high school.

RESULTS

Table 2 reports our results. We find a substantial statistically significant relationship between changes in the size of a state's school districts and high school graduation rates. The results indicate that decreasing the average size of a state's school districts by 200 square miles would increase the graduation rate by 1.7 percentage points. This finding is statistically significant at any conventional standard (p -value = 0.002).

Tables 3 and 4 put the size of this effect in greater context by measuring the effect that consolidating or breaking up school districts would have on particular states. In Florida, for example, the state's sixty-seven countywide school districts, averaging 805 square miles each, make it the state with the seventh largest average district size in the nation. Florida also had the nation's fifth lowest graduation rate for the class of 2002, at 59%. Table 3 shows that according to our findings, if Florida were to shrink its school districts to the national median size (about 260 square miles), it would increase its graduation rate to 64%. This is equivalent to 9,379 more students in Florida earning a diploma who before would have

dropped out.¹³ If Florida went further and decreased the size of its districts until they were the size of Ohio's, a state of similar geographic area but that had the nation's seventh smallest average school district size in 2002, it would increase its graduation rate to 65%, or an increase of 11,394 graduates.¹⁴

Table 4 looks at the effect that consolidating school districts into larger units would have on particular states. For example, if Illinois, which has recently considered consolidating its school districts,¹⁵ increased the size of its school districts to that of the national median, its graduation rate would decrease from 74% to 73%, the equivalent of 2,005 students dropping out who would otherwise have been expected to graduate.¹⁶ If the state went further and increased the size of its districts equivalent to those of Florida, the state's graduation rate would drop to 68%, or another 9,859 students dropping out.¹⁷

Another important example not listed in the tables is Hawaii. All of Hawaii's public schools are governed by a single school district. Recently, the state's governor has campaigned vigorously, in the face of opposition from many entrenched interests, to break up the state's lone school district into multiple districts.¹⁸ So far, however, her proposal has failed to gain adequate support. Our analysis indicates that the governor's proposal would bear substantial fruit. Hawaii's consolidation of all schools into one district is so inefficient that if the state merely increased its number of school districts from one to four, it would raise its graduation rate by a full 13 percentage points.

The example of Hawaii may lead some to ask if a few states with particularly large school districts are driving our statistical results. It is true, as can be seen in Table 1, that there are a few states with abnormally large school districts. For example, the average Alaskan school district encompasses over 10,000 square miles, making Alaska the state with the largest school districts by far. The average school district in Nevada or Hawaii, which have the second and third largest school districts, respectively, is more than three times the average size in the state with the next largest districts, Utah. However, these outliers have no effect on our analysis. Our fixed-effects model focuses only on changes in the variables in our data set. The absolute size of the districts—or of any of our other variables, for that matter—does not drive the analysis.

Our analysis also indicates that requiring students to pass an exit exam in order to graduate had no relationship with graduation rates. Our null finding on the effect of exit exams on graduation rates adds further confirmation to the previous research finding that implementing an exit exam does not decrease graduation rates. We also find no relationship between increasing per-pupil current expenditures and graduation rates. This indicates that states that have invested in expensive reforms over the last decade have not seen a return of higher graduation rates relative to other states.

Some might worry that our finding is being driven by decreases in the size of schools rather than in the size of districts. Shrinking school districts might also entail decreasing average school enrollments as attendance boundaries change, resulting in smaller schools. A large-scale reform movement in favor of smaller schools argues that they provide stronger school communities, leading to better educational outcomes. The Bill and Melinda Gates Foundation is leading this effort, donating \$51 million to create smaller public high schools in New York City.¹⁹ Unfortunately, to this date there is relatively little scientific research on the educational effects of decreasing the size of public schools.

We added to our model a variable for the number of students per school in each state to test whether our results are actually indicating a positive effect from smaller schools rather than smaller districts (see Berry 2004). We created this variable by simply dividing the number of students enrolled in public schools in each state by its number of public schools.²⁰ We found that controlling for the student to school ratio had no significant effect on either the magnitude or the statistical certainty of the benefits of shrinking school districts. Reducing school size itself had no distinguishable effect on graduation rates (p-value = 0.895). This analysis suggests that the positive effect of reducing district size on graduation rates is independent of any effect it has on making schools smaller.

While we are unable to measure the effects of other specific school choice reforms, our finding that increasing residential choice leads to higher graduation rates is encouraging for the use of vouchers and charter schools as well. There is little reason to believe that allowing parents more choice

in the schools that their children attend only helps when it is provided by making school districts smaller as opposed to increasing access to private or charter schools. All these reforms operate under the same principle: the more choices that parents have in which schools they send their children to, the greater the incentive for schools to compete by providing a high-quality education.

As discussed above, several researchers have found that voucher and charter school programs lead to significant improvement in public school test scores. We have less direct information, however, on how these programs affect graduation rates. For now, we are left with the reasonable inference that increasing student achievement in the form of test scores will lead to higher graduation rates in the future. Our analysis showing that increasing residential school choice has a large significant effect on graduation rates makes it more likely that other school choice programs will have the same result.

CONCLUSION

Most reasonable people would agree that too few public school students graduate from high school. Our previous research (see Greene and Winters 2005) indicates that dropping out of high school has reached near-epidemic proportions and that the problem has not been getting any better over the last decade. Given that the life outcomes of high school graduates are far better than those of high school dropouts, improving the high school graduation rate could dramatically improve the lives of a large number of American children, and their children after them.

Our analysis shows that simply spending more money is not an acceptable solution to the dropout problem. Our finding that spending more money per pupil has no distinguishable relationship with changes in graduation rates, which is consistent with a wide body of previous research (see Hanushek 1996), implies that getting more students into caps and gowns requires real reforms to the educational system.

The results of this study indicate that states could significantly benefit from decreasing the size of their school districts. States—especially those with exceptionally large school districts, such as Florida,

Hawaii, and Nevada—could significantly improve their graduation rates by decreasing the size of their school districts and giving parents greater choice in the school systems that educate their children.

Some states have actually been pursuing the opposite of the reform that our analysis suggests, attempting to consolidate their school districts into larger ones. For example, Arkansas recently consolidated its 308

school districts into 254 larger ones.²¹ Other states, such as Illinois²² and Arizona,²³ have recently considered consolidating school districts that they consider particularly small. Our results indicate that the consequences of states making their school districts dramatically larger could be dire. Increasing the size of school districts limits parental choice in their children's education and significantly decreases graduation rates.

ENDNOTES

1. Ann Rayman and Ofelia Madrid, "Merger Law Could Target Small Districts," *Arizona Republic*, December 3, 2003.
2. Derek DePledge, "Democrats Ready for Final Votes on 'Reinvent Education' Bill," *Honolulu Advertiser*, April 13, 2004.
3. Matthew Pinzur, "School Idea Hits Nerve," *Miami Herald*, December 11, 2003.
4. See http://www.miedresearchoffice.org/opportunity.htm#_Number_of_students.
5. See "Use of School Choice," *Education Policy Issues: Statistical Perspectives, n. 1*, National Center for Education Statistics, June 1995, <http://nces.ed.gov/pubs95/95742r.pdf>.
6. Hoxby 2001.
7. The graduation rates used in this study were reported in Greene and Winters 2005.
8. See <http://nces.ed.gov/ccd>.
9. Calculations do not always sum due to rounding.
10. See <http://eire.census.gov/popest/estimates.php>.
11. We were unable to calculate graduation rates between 1991 and 2000 in Arizona because, as we discovered after discussing it with the state's Department of Education, the enrollment numbers that the state officially reported to the federal government during this period were incorrect.
12. For state areas, see <http://www.infoplease.com/ipa/A0108355.html>; for number of districts, see varying years of the *Digest of Education Statistics*, National Center of Education Statistics.
13. Authors' calculations using data from Greene and Winters 2005.
14. Ibid.
15. Alexa Aguilar and Kavita Kumor, "Tiny School Districts Feel Pressure to Merge," *St. Louis Post Dispatch*, Illinois 5 Star Edition, February 20, 2005.
16. Authors' calculations using data from Greene and Winters, 2005.
17. Ibid.
18. DePledge, "Democrats Ready."
19. David M. Herszenhorn, "Charity Gives \$51 Million to City to Start 67 Schools," *New York Times*, September 18, 2003.
20. For both of these data, see varying years of the Core of Common Data, <http://nces.ed.gov/ccd>.
21. Aguilar and Kumor, "Tiny School Districts Feel Pressure to Merge."
22. Ibid.
23. Rayman and Madrid, "Merger Law Could Target Small Districts."

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APPENDIX

Table 1: Average Square Miles/District by State

State	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
Alabama	400	400	400	400	400	396	396	396
Alaska	10213	10213	10399	10792	10792	10792	10792	10792
Arizona	498	501	501	376	345	309	275	277
Arkansas	165	166	167	167	167	168	168	168
California	156	156	156	156	157	158	158	158
Colorado	589	589	589	589	589	589	589	589
Connecticut	29	29	29	29	29	29	29	29
Delaware	103	103	103	103	103	103	103	103
Florida	805	805	805	805	805	805	805	805
Georgia	320	320	322	322	322	322	322	322
Hawaii	6423	6423	6423	6423	6423	6423	6423	6423
Idaho	732	739	739	739	739	726	732	720
Illinois	60	61	61	60	60	59	62	62
Indiana	122	122	122	122	122	122	122	122
Iowa	141	143	145	147	148	149	149	149
Kansas	269	269	269	269	269	269	269	269
Kentucky	226	226	226	226	226	226	226	226
Louisiana	660	660	660	660	660	622	581	558
Maine	109	108	109	109	109	109	109	109
Maryland	407	407	407	407	407	407	407	407
Massachusetts	22	22	22	22	22	22	22	22
Michigan	102	102	90	85	84	78	77	77
Minnesota	197	201	205	208	210	203	196	192
Mississippi	315	307	307	307	307	309	309	309
Missouri	127	129	130	131	131	131	131	131
Montana	294	303	308	308	316	317	320	321
Nebraska	111	113	115	117	120	127	130	133
Nevada	6460	6460	6460	6460	6460	6460	6460	6460
New Hampshire	50	50	50	50	50	50	50	50
New Jersey	12	12	12	12	12	12	12	12
New Mexico	1379	1364	1364	1364	1364	1364	1364	1364
New York	66	66	66	67	67	67	67	67
North Carolina	403	409	409	409	416	406	406	406
North Dakota	265	284	290	292	296	299	299	300
Ohio	62	62	62	62	62	61	58	62
Oklahoma	124	125	125	125	126	126	126	126
Oregon	343	387	410	438	485	487	487	487
Pennsylvania	89	89	89	89	89	89	89	89
Rhode Island	29	29	29	29	29	29	29	29
South Dakota	426	429	429	429	431	431	431	431
South Carolina	317	317	317	317	335	335	335	335
Tennessee	294	294	294	294	297	297	297	299
Texas	250	251	251	251	251	251	251	252
Utah	2054	2054	2054	2054	2054	2054	2054	2054
Vermont	32	33	33	32	32	32	32	32
Virginia	281	281	281	281	281	293	293	293
Washington	225	225	225	225	225	225	225	225
West Virginia	438	438	438	438	438	438	438	438
Wisconsin	127	127	127	127	127	127	127	126
Wyoming	1982	1982	1982	1982	2023	2023	2023	2023

Table 2: Relationship Between Increasing Average Square Miles of School Districts and Graduation Rates

	Effect on Graduation Rates	Standard Error	P-Value
Average Square Miles in School District	-8.226E-05	2.65E-05	0.002
Exit Exams	-1.962E-03	1.14E-02	0.864
Current Expenditures/Pupil	-4.734E-06	5.73E-06	0.409
Adjusted R Squared	0.943		
N	392		

Note: P-Value less than or equal to 0.05 is conventionally considered statistically significant.

Table 3: Effect of Decreasing District Size to Benchmark Levels for Certain States

	2001 District Size in Sq. Miles	2002 Graduation Rate	Graduation Rate If Districts are Size of National Median (260 Sq. Miles)	Graduation Rate If Districts are Size of Ohio's (62 Sq. Miles)
Florida	805	59%	64%	65%
Colorado	589	72%	75%	76%
Louisiana	558	63%	65%	67%

Table 4: Effect of Increasing District Size to Benchmark Levels for Certain States

	2001 District Size in Sq. Miles	2002 Graduation Rate	Graduation Rate If Districts are Size of National Median (260 Sq. Miles)	Graduation Rate If Districts are Size of Florida's (810 Sq. Miles)
Illinois	62	74%	73%	68%
Massachusetts	22	75%	73%	69%
Arizona	277	70%	N/A*	66%
Arkansas	168	72%	71%	67%

* Arizona's districts are already slightly larger than national median.

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