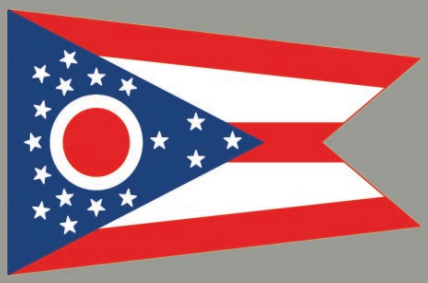
SCHOOL CHOICE

ISSUES

IN THE STATE

Promising Start:
An Empirical Analysis of How EdChoice Vouchers Affect Ohio Public Schools



School Choice for Ohio:
Many agree with the concept. Some disagree. And some simply want more information. As the public debate continues to grow about how best to provide a quality education to all Ohio children, it is important to know the facts about parent choice, and how parent choice programs have had an impact on communities, parents and students around the country. All of this analysis is done with one goal in mind: The best possible education for all of Ohio's children.

Prepared By:

Dr. Greg Forster

Senior Fellow

Friedman Foundation for Educational Choice

August 2008

Study released jointly by the Friedman Foundation for Educational Choice, Agudath Israel of America, Alliance for School Choice, Black Alliance for Educational Options, Buckeye Institute for Public Policy Solutions, Children's Scholarship Fund Cincinnati, Hispanic Council for Reform and Educational Options, Northwest Ohio Scholarship Fund, Inc., School Choice Ohio, and Thomas B. Fordham Institute

A MESSAGE FROM THE FRIEDMAN FOUNDATION:

OUR CHALLENGE TO YOU

Our research adheres to the highest standards of scientific rigor. We know that one reason the school choice movement has achieved such great success is because the empirical evidence really does show that school choice works. More and more people are dropping their opposition to school choice as they become familiar with the large body of high-quality scientific studies that supports it. Having racked up a steady record of success through good science, why would we sabotage our credibility with junk science?

This is our answer to those who say we can't produce credible research because we aren't neutral about school choice. Some people think that good science can only be produced by researchers who have no opinions about the things they study. Like robots, these neutral researchers are supposed to carry out their analyses without actually thinking or caring about the subjects they study.

But what's the point of doing science in the first place if we're never allowed to come to any conclusions? Why would we want to stay neutral when some policies are solidly proven to work, and others are proven to fail?

That's why it's foolish to dismiss all the studies showing that school choice works on grounds that they were conducted by researchers who think that school choice works. If we take that approach, we would have to dismiss all the studies showing that smoking causes cancer, because all of them were conducted by researchers who think that smoking causes cancer. We would end up rejecting all science across the board.

The sensible approach is to accept studies that follow sound scientific methods, and reject those that don't. Science produces reliable empirical information, not because scientists are devoid of opinions and motives, but because the rigorous procedural rules of science prevent the researchers' opinions and motives from determining their results. If research adheres to scientific standards, its results can be relied upon no matter who conducted it. If not, then the biases of the researcher do become relevant, because lack of scientific rigor opens the door for those biases to affect the results.

So if you're skeptical about our research on school choice, this is our challenge to you: prove us wrong. Judge our work by scientific standards and see how it measures up. If you can find anything in our work that doesn't follow sound empirical methods, by all means say so. We welcome any and all scientific critique of our work. But if you can't find anything scientifically wrong with it, don't complain that our findings can't be true just because we're not neutral. That may make a good sound bite, but what lurks behind it is a flat rejection of science.

Promising Start:
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THE FRIEDMAN FOUNDATION

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Executive Summary

This is the first empirical study to examine the effects of Ohio's EdChoice voucher program. Using publicly available data, it measures the program's effect on academic outcomes in public schools where students are eligible for vouchers.

The EdChoice program offers vouchers to students who are assigned to chronically underperforming public schools. Students can use these vouchers to attend private schools of their choice. One of the purposes of voucher programs such as EdChoice is to improve academic outcomes at public schools by allowing students to find the schools that are best suited to them and by introducing competitive incentives. However, opponents often claim that voucher programs harm public schools.

This study finds that the EdChoice program produced academic improvements in voucher-eligible public schools. It tracks the year-to-year change in test scores within each school from one grade level to the next grade level (e.g. the difference between third-grade scores in 2005-06 and fourth-grade scores in 2006-07). It uses regression analysis to compare the academic growth of voucher-eligible schools with that of other Ohio schools, controlling for demographic variables and for the presence of charter schools. The analyses were then repeated using only schools in districts designated by the state as "major urban—very high poverty"; this second round of analysis compares voucher-eligible schools in very poor urban districts to other schools in very poor urban districts, helping reduce the possibility that results may be tainted by a statistical phenomenon known as "regression to the mean." Due to the restrictions of available data, the study is unable to include high schools.

Key findings include:

- In 2006-07, its first year of operation, the EdChoice program produced substantial academic improvements in Ohio's most stubbornly underperforming public schools. Positive effects were detected in some grades, and no negative effects were detected in any grades.

- The positive effects were substantial in size, though not revolutionary. If the effects accumulate over time, in three to four years the voucher-eligible schools will have improved by one standard deviation (equal to one-sixth of the distance between the top-scoring and bottom-scoring schools in Ohio).

- When the analysis was repeated using only schools located in districts designated by the state as "major urban—very high poverty," the results were virtually unchanged. This suggests that the results of the analysis are not affected by regression to the mean.

- The EdChoice program was more restricted in its first year of operation than it is today. Since previous research suggests that the positive impact of vouchers on public schools increases when the programs grow, it is reasonable to expect that the program's current benefits probably exceed those detected in this study.

- This study adds to a large body of empirical research that consistently finds vouchers improve academic outcomes at public schools. Vouchers allow families to choose the right schools to meet their children's needs and introduce competitive incentives for improvement that are lacking in the traditional government-run education system.

About the Author

Greg Forster, Ph.D., is a senior fellow at the Friedman Foundation for Educational Choice. He has conducted empirical studies on the impact of school choice programs in Milwaukee, Cleveland, Florida and Texas, as well as national empirical studies on private schooling, participation in school choice programs and the impact of charter schools. He also has conducted empirical studies of other education topics, including accountability testing, graduation rates, student demographics and special education.

His research has appeared in the peer-reviewed publications Teachers College Record and Education Working Paper Archive, and his articles on education policy have appeared in the *Washington Post*, the *Los Angeles Times*, the *Philadelphia Inquirer, Education Next*, the *Chronicle of Higher Education* and numerous other publications. He is co-author of the book *Education Myths: What Special-Interest Groups Want You to Believe about Our Schools—and Why It Isn't So*, from Rowman & Littlefield.

He received a Ph.D. with Distinction in political science from Yale University in 2002 and a B.A. summa cum laude from the University of Virginia in 1995. His book *John Locke's Politics of Moral Consensus* was published by Cambridge University Press in 2005.

Friedman Foundation for Educational Choice

The Friedman Foundation for Educational Choice, dubbed "the nation's leading voucher advocates" by the Wall Street Journal, is a nonprofit organization established in 1996. The origins of the foundation lie in the Friedmans' long-standing concern about the serious deficiencies in America's elementary and secondary public schools. The best way to improve the quality of education, they believe, is to enable all parents with the freedom to choose the schools that their children attend. The Friedman Foundation builds upon this vision, clarifies its meaning to the public and amplifies the national call for true education reform through school choice.

Agudath Israel of America

Founded in 1922, Agudath Israel of America is a broadly-based Orthodox Jewish movement with chapters in major communities throughout North America. It sponsors a broad range of projects in the fields of religion, education, children's welfare, and social action. With the growth of Orthodox Jewry and its constituency in America, Agudath Israel has emerged as the leading advocate for the religious and civil rights of observant Jews, with an emphasis on education issues. Agudath Israel has played a leading role in advocating for educational options for children in Ohio and around the country.

Alliance for School Choice

The Alliance for School Choice is the nation's vanguard organization for promoting, implementing, and enhancing K-12 educational choice. In collaboration with a host of national and state allies, we create opportunities for systemic and sustainable educational reform that puts parents in charge.

Black Alliance for Educational Options

The Black Alliance for Educational Options (BAEO) is a national, nonprofit, nonpartisan membership organization whose mission is to actively support parental choice to empower families and increase quality educational options for Black children. Staunch in its belief that parental choice must be an integral part of any serious effort to reform education in America, BAEO believes parental choice programs, which lead to the creation of quality educational options, not only rescue the children who can take advantage of such opportunities but also create powerful incentives for all schools, public and private, to improve.

Buckeye Institute for Public Policy Solutions

The Buckeye Institute for Public Policy Solutions is Ohio's only free market think tank and the leading independent source of research and commentary on education, Medicaid, technology regulation reform and government accountability. Over the past 14 years, the Buckeye Institute has provided agenda-shaping analysis and research to legislative leaders, opinion leaders and the public.

Children's Scholarship Fund Cincinnati

The Children's Scholarship Fund of Greater Cincinnati aims to maximize educational opportunity at all income levels by offering tuition assistance for low-income families and promoting a diverse and competitive educational environment. Since 1999, CSF Cincinnati has been expanding school choice for local area students, helping to give all kids an equal shot at educational opportunities.

Hispanic Council for Reform and Educational Options

Hispanic CREO's mission is to improve educational outcomes for Hispanic children by empowering families through parental choice in education. We achieve this by providing parents with free information and resources, which help them to become advocates for their children.

Northwest Ohio Scholarship Fund, Inc.

The Northwest Ohio Scholarship Fund, Inc. awards need-based scholarships to low-income families who reside in Lucas, Wood or Fulton County in order that their children can attend a private school for Kindergarten through eighth grade. Each year a lottery is held in July and if a family is selected they submit financial information to determine the amount of their child's scholarship, 25%, 50%, or 75% of the total tuition up to $1,250. For more information visit www.nosf.org.

School Choice Ohio

The mission of School Choice Ohio (SCO) is to protect and expand children's educational options through ensuring choice in quality schools and other places of learning, thereby supporting systemic reform of K-12 education across the state. The founders of School Choice Ohio believe that all parents should have the Opportunity to choose which school is best for their children, regardless of their level of income.

Thomas B. Fordham Institute

The Thomas B. Fordham Institute is a nonprofit organization that conducts research, issues publications, and directs action projects in elementary/secondary education reform at the national level and in Ohio, with special emphasis on our hometown of Dayton. It is affiliated with the Thomas B. Fordham Foundation.

Acknowledgements

The author would like to thank Justin Castle of the Friedman Foundation and Sarah Pechan of School Choice Ohio for their assistance in preparing this study, as well as the Ohio Department of Education for providing the necessary data, and the research staff of School Choice Ohio, the Alliance for School Choice, and the Fordham Foundation for their helpful methodological suggestions.

Table of Contents

Introduction

Ohio's Educational Choice Scholarship program, often known simply as EdChoice, offers school vouchers to students in chronically underperforming public schools. Students can use these vouchers to attend the private school of their choice. This is the first empirical study to examine the program's effects. It uses publicly available data to compare test-score growth in the failing public schools eligible for vouchers with test-score growth in other Ohio schools.

Voucher Competition and Public Schools

Perhaps the most important concern about school vouchers is the effect they have on public schools. Many people acknowledge that vouchers help the students who use them, but are worried that they will make public schools worse by draining money or by "creaming" the best students.

However, the evidence on the real-world effect of voucher programs shows that this is not the case. No empirical study anywhere in the United States has ever found that public schools had worse outcomes when exposed to vouchers. And, as we will see in the next section, there is a large body of high-quality empirical evidence showing that vouchers make public schools better, not worse. The fears that public schools would be harmed by vouchers have simply failed to materialize. The research consistently has found that when students can use school choice to attend any school, public or private, the public schools make bigger academic improvements.

These findings are counterintuitive to many people, but they are not hard to explain. One reason vouchers improve public schools is because they allow parents to find the right particular school for each individual child. Every child is unique and has unique educational needs. Another reason is that, as the studies below demonstrate, vouchers do not actually drain money or cream students.

But probably the most important reason school vouchers improve public schools is because they put parents in charge. Vouchers give parents a meaningful way to hold schools accountable for teaching their students.

Under the current system, it is difficult for families to leave if a school isn't doing a good job. In other service areas, from grocery stores to health care, if a service provider isn't getting the job done, people can switch to another provider simply by making the decision to do so. With schools, however, the only way to change is to move—an extremely cumbersome and disruptive step.

Thus, to a large degree schools can take students for granted. They lack the positive incentive for better performance that, say, hospitals have because they know they must do a good job or lose patients. This is especially true for schools that serve low-income and disadvantaged students. These populations are less able to move to find a better school.

With school vouchers, if a public school is providing adequate services, parents can leave their children there and be no worse off. But if a public school is not doing an adequate job, parents can go find a private school that will serve their children better. And whichever school a family chooses, parents will have the power to hold that school accountable for teaching their children because they have the power to leave if they aren't being served.

Where parents are empowered with school choice, schools that don't adequately teach their students will lose them. This provides a competitive incentive for better performance.

Previous Research

There is a large body of empirical evidence on the question of whether vouchers improve public schools through choice and competition or harm them by draining money and creaming students. Unfortunately, this body of evidence often is not taken into account in the voucher debate.

Numerous fiscal studies have examined whether vouchers and tax-credit scholarships (a similar type of school choice program) "drain money" from public schools. This body of research has shown consistently that these programs save money both for state budgets

and for local public school districts, even after the fixed costs of public schools (costs that do not go away when students leave a school) are taken into account.[1] The largest of these studies found that America's school choice programs have saved a net total of $22 million for state budgets and $422 million for local school districts.[2]

The available evidence also does not indicate that vouchers "cream" the best students. The best analysis of this question compared voucher applicants in three cities to a representative sample of the eligible population. That study found the two populations to be virtually identical on a variety of demographic and educational indicators.[3]

The acid test, however, is what actually happens to public school outcomes when vouchers are implemented. A large body of high-quality empirical research has examined this question, using statistical methods to pinpoint the impact of vouchers on academic achievement in public schools.

On this subject, five studies of Milwaukee's voucher program have been conducted by four research teams, including researchers from Harvard, Stanford, the Federal Reserve Bank, the Manhattan Institute and other institutions.[4] Nine studies of voucher programs in Florida have been conducted by five research teams, including researchers from Harvard, Princeton, Cornell, the Federal Reserve Bank, the Manhattan Institute, the Urban Institute and other institutions.[5] In addition, two studies have examined the impact of voucher programs in Maine, Vermont and Texas.[6]

These studies unanimously found that public schools improve when a voucher system has been implemented. Another study of a voucher system in Washington D.C. found that vouchers had no visible impact on public schools.[7] The results of the D.C. study should come as no surprise, since the D.C. voucher program makes cash payouts to the public school system to compensate for lost students, undermining the healthy competitive incentives vouchers would otherwise provide. And even in D.C., vouchers did not visibly harm public schools.

When this research was still in its early stages, some critics noted that where schools are identified by the state as failing, the stigma of the failing grade might produce a positive effect on outcomes in those schools. If a voucher program targets failing schools, this "stigma effect" might be mistakenly identified as a voucher effect. However, the body of research that has been built up on this question has established strong evidence that the positive effect identified from vouchers is not a misidentified stigma effect. Voucher programs in Milwaukee and elsewhere that do not target failing schools (and thus cannot get mixed up with a stigma effect) have produced positive effects in eight out of nine studies, and in the ninth study (in Washington D.C.) there are special circumstances that adequately explain why the voucher failed to produce a positive effect. Among studies of Florida's failing-schools voucher, four specifically tested whether the effect was attributable to stigma; all four found a voucher effect independent of any stigma effect. It is not even clear whether a sigma effect existed; two of the studies found no such effect, one found both a voucher effect and a stigma effect, and one was inconclusive about whether there was a stigma effect.[8]

Ohio's EdChoice Voucher Program

In 2005 Ohio enacted a voucher program for students in failing public schools, the Educational Choice Scholarship program, commonly called "EdChoice." Students are eligible for vouchers if they live in the attendance area of a local public school that is chronically designated as underperforming.[9] Students can use these vouchers to attend the private school of their choice. However, students in Cleveland, who are eligible for another voucher program in that city, are not eligible for EdChoice vouchers.

Since its original enactment, the program has been expanded periodically to make a larger number of public schools eligible. Originally, a school's students were eligible for vouchers only if it had been designated in a state of "academic emergency" for three consecutive years. In early 2006, as students began to apply for the first available vouchers under the program—to be used in the 2006-07 school year—this definition was expanded. Students who attended schools designated as being in either a state of "academic watch" or of "academic emergency" for three consecutive years were eligible for vouchers in 2006-07.

Later in 2006, the definition was expanded again, but this expansion did not take effect until the 2007-08 school year. As of that

year, students are eligible for vouchers if their schools have been designated in a state of "academic watch" or "academic emergency" in any two of the previous three years.

Previous research suggests that the positive impact of vouchers on public schools may get larger as programs increase in size. This question has not been extensively studied, since most studies do not measure the impact of a voucher program over multiple years. However, the one recent study that did so found large changes in the size of the program's impact, which tracked closely with changes in the program's size (measured in terms of the percentage of students who used vouchers).[10]

Thus, the changes to the size of the EdChoice program should be considered when evaluating the program's impact. This study examines the impact in the program's first year, when it was under tighter restrictions. While we do not yet have the opportunity to evaluate the program's impact in the second year, it is reasonable to expect that the impact (whatever it is) will be larger in magnitude after the expansion than it was before it.

Method

To conduct this study, we obtained test score outcomes for all Ohio public schools in 2005-06 and 2006-07. Specifically, we obtained the number of students tested and the average scale score in each school building on Ohio's state test, broken down by grade level. We also obtained the percentage of students in each school who are white, the percentage of students in each school who are eligible for the free and reduced-price lunch program, the percentage of schools in each city that are charter schools, and a list of schools that were eligible for EdChoice vouchers in 2006-07.[11]

We used math and reading scores from grades three through eight.[12] Ohio also tests in grade ten, but since it does not test in grades nine or eleven we were unable to track these scores from year to year. Thus, our study cannot include high schools.

Because of privacy restrictions, our test score data do not include outcomes for any case in which a school has fewer than ten students tested in a grade level. Thus, these cases are excluded from our data. However, because we weighted the data by number of students tested (see below) these cases were unlikely to have had an impact on our findings in any event.

For each school building, we calculated the difference in average scale score in a subject (math or reading) from one grade level in 2005-06 to the subsequent grade level in 2006-07. For example, we calculated the difference between a school's average math score in grade 3 in 2005-06 and its average math score in grade 4 in 2006-07, between its average math score in grade 4 in 2005-06 and its average math score in grade 5 in 2006-07 and so forth.

Tracking a cohort of students from year to year in this manner is crucial to sound scientific analysis because it removes most of the impact of confounding variables such as demographic factors and unobserved characteristics. While tracking a cohort by school building does not provide the same statistical quality as tracking individual students, it is still a good scientific method. And since Ohio does not publicly release data based on individually tracked outcomes (as, for example, Florida does), this type of analysis is the only one possible with publicly available data.

Since some cities in Ohio have a robust charter school sector, it was important to control for the presence of charter schools. There is not an existing scientific standard for how to do this, since previous studies on the impact of voucher programs on public schools have not typically had to deal with the presence of numerous charter schools. We used a straightforward method of controlling for the percentage of schools in each city that are charter schools. For most of the more than 700 cities in Ohio, the percentage was zero or close to zero. However, for some it was quite large (e.g. Lorain, 36 percent; Dayton, 31 percent; Cleveland, 28 percent; Toledo, 26 percent).

We then conducted a linear regression analysis for each test score change variable that we had calculated. In each analysis, the test score change variable was the dependent variable. The independent variables were the percentage of students in each school who were white, the percentage of students in each school who were eligible for lunch programs, the percentage of schools in the city that

were charter schools, and a dummy variable (0 or 1) for whether the school was eligible for vouchers in 2006-07.

To ensure compatibility, we conducted separate analyses on each change variable rather than combining them. Ohio does not report test score results on a single developmental scale that spans all grades (as, for example, Florida does).

We weighted the data in each analysis by the number of students tested in 2005-06 in the grade and subject that served as the starting point for the appropriate change variable. For example, when conducting a regression on the change between grade 3 math in 2005-06 and grade 4 math in 2006-07, we weighted by the number of students tested in grade 3 math in 2005-06.

The schools eligible for EdChoice vouchers are obviously low-performing schools. If positive effects are identified in low-performing schools when compared to the general population of schools, this result may be due to a statistical phenomenon known as "regression to the mean." As schools approach the low end of the performance spectrum, they have more statistical "room," so to speak, to move upward rather than downward. This may produce the artificial illusion of a positive effect.

To test our results for the presence of regression to the mean, we conducted the analyses again using only schools located in districts designated by the state as "major urban—very high poverty." That is, we excluded both voucher-eligible and non-voucher-eligible schools that were not located in such districts (since most voucher-eligible schools were located in such districts, this did not have much effect on the number of voucher-eligible schools in our data set). If positive results for voucher-eligible schools occur even when we confine the data to very-high-poverty urban districts, this would suggest that such results are not tainted by regression to the mean.

There are a total of 15 school districts designated by the state as "major urban—very high poverty." However, we excluded the Cleveland school district from these analyses because that city has its own voucher program and we need to make sure any public-school impact from the Cleveland voucher program does not impact our analysis of the public-school impact of the EdChoice voucher program.[13] Thus, our second round of analysis included schools from a total of 14 school districts.

Results

The results of our main analyses are summarized in Table 1. They indicate that the EdChoice program had a positive effect on academic outcomes in public schools that were eligible. Specifically, a positive effect was identified in some grades, and no negative effects were identified in other grades.

The results of our follow-up analyses to test for regression to the mean are summarized in Table 2. The results are virtually unchanged from the main analyses. This suggests that the results are not tainted by regression to the mean.

The positive effects identified in this study, while not revolutionary, are substantial in size. This is especially true considering that they represent only one year's worth of growth. For purposes of comparison, the standard deviations of the relevant change in test scores for all schools in our data set are listed in Table 3. As the table makes clear, if the benefits of vouchers compound over multiple years, schools will have realized a full standard deviation's worth of improvement in three to four years in math and seven years in English.

A standard deviation represents one-sixth of the entire distance from the lowest-scoring school in the data set to the highest-scoring school. Thus, a policy with the potential to improve educational outcomes at a school by about a standard deviation in three to four years, or even seven years, must be considered substantial.

Conclusion

This study identifies some substantial beneficial effects on academic outcomes in public schools from EdChoice vouchers, and no harmful effects. Given that only one year's worth of growth was available for analysis, and that the program was operating under stricter limits in its first year, the presence of substantial benefits is strong testimony to the potential of vouchers for improving the quality of public schools.

Table 1

EdChoice Vouchers Improve Academic Outcomes in Ohio Public Schools			
Subject	**Grade Level**	**Size of Voucher Effect**	**Significance**
Math	3-4	(-1 scale point)	0.486
	4-5	+5 scale points	0.007**
	5-6	(-1 scale point)	0.498
	6-7	+5 scale points	0.001***
	7-8	(-1 scale point)	0.527
Reading	3-4	(-1 scale point)	0.151
	4-5	(0 scale points)	0.910
	5-6	(+2 scale points)	0.327
	6-7	+2 scale points	0.043*
	7-8	(+1 scale point)	0.372

*Note: Results are for the change in schools' average scale scores in each subject on the Ohio state test. The "Significance" column gives the p-value for each result; † = p <= 0.1; * = p <= 0.05; ** = p <= 0.01; *** = p <= 0.001. Control variables were included for the percentage of students in each school who are white and low-income, as well as for the percentage of schools in each city that are charter schools. Results were weighted by number of students tested.*

How Do I Read This Chart?

Regression analysis is used to isolate the impact of one or more variables on a given outcome. For example, we might use regression analysis to measure the impact of variables like height and age on the number of points a basketball player scores per game. The results are typically reported in the format used in the chart above – each result has a value for the effect size (technically called a "coefficient") and a value for the statistical certainty (the "significance" or "p-value"). Results are only meaningful where the statistical certainty reaches at least a certain minimum level—conventionally set at 95 percent certainty, represented by a p-value of 0.05, although results above 90 percent certainty (p-value 0.1) can be reported as moderately certain. Other results, where the statistical certainty does not reach this level, are regarded as statistical "noise" and do not represent real effects. Traditionally the meaningful results are noted using asterisks. Additionally, in the table above the results that are not statistically certain enough to be meaningful are put in parentheses.

As an illustration, an analysis of basketball scores might be reported like this:

	Size of Effect	Significance
Height over 6 feet	+7 points per game	0.003**
Age over 30	-11 points per game	0.041*
Hair color brown	(-8 points per game)	0.784

This table shows that:

- Players over six feet tall score seven more points per game than players under six feet tall (once the influence of height is isolated from the influence of other factors in the analysis).
- Players over age 30 score eleven fewer points per game than players under age 30 (once the influence of age is isolated from the influence of other factors in the analysis).
- Having brown hair has no visible impact on points scored per game.

Table 2

Results Do Not Appear to Be Affected by Regression to the Mean

Analyses repeated using only schools in "major urban-very high poverty" districts

Subject	Grade Level	Size of Voucher Effect	Significance
Math	3-4	(-1 scale point)	0.487
	4-5	+4 scale points	0.031*
	5-6	(-5 scale point)	0.108
	6-7	+5 scale points	0.001***
	7-8	(-1 scale point)	0.495
Reading	3-4	(0 scale point)	0.940
	4-5	(+1 scale points)	0.644
	5-6	(+1 scale points)	0.704
	6-7	+3 scale points	0.014*
	7-8	(0 scale point)	0.777

*Note: Results are for the change in schools' average scale scores in each subject on the Ohio state test. The "Significance" column gives the p-value for each result; † = p <= 0.1; * = p <= 0.05; ** = p <= 0.01; *** = p <= 0.001. Control variables were included for the percentage of students in each school who are white and low-income, as well as for the percentage of schools in each city that are charter schools. The Cleveland school district was excluded. Results were weighted by number of students tested. in the table above the results that are not statistically certain enough to be meaningful are put in parentheses.*

Table 3

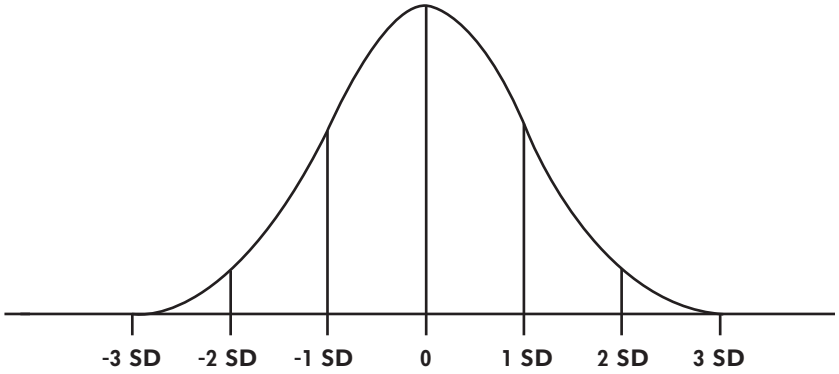
EdChoice Voucher Effects Are Substantial

Subject	Grade Level	Size of Voucher Effect	Statewide Standard Deviation in Relevant Grade & Subject	
			2005-06	2006-07
Math	4-5	+5 scale points	17 scale points	18 scale points
	6-7	+5 scale points	19 scale points	14 scale points
Reading	6-7	+2 scale points	14 scale points	14 scale points

What Is a Standard Deviation?

Standard deviations are a way of measuring how much variation there is in a given set of values. For example, there is a lot more variation in the amount of money people make per year than there is in the number of children they have, so the standard deviation for income will be much larger than the standard deviation for number of children.

In practice, a standard deviation is about one-sixth of the distance between the lowest and highest points in the data set. So, to continue the income example, if the lowest income is $20,000 and the highest income is $80,000, the standard deviation is $10,000. (Technically, a standard deviation is equal to one-sixth of the distance between the left and right ends of the bell curve.)



Standard deviations are a common way to gauge the size of an effect. If a study finds that a certain policy produces an improvement of "five points," is that a large impact or a small impact? It depends on how broad a scale you're dealing with. Five points out of ten is a very large impact. Five points out of a hundred is not so large, but may still be quite substantial. Five points out of a thousand is probably trivial. Standard deviations allow us to measure how broad the scale is by measuring how far apart the high and low ends of the distribution are.

Endnotes

[1] Most of these studies are available in the research database hosted on the Friedman Foundation's website (www.friedmanfoundation.org/friedman/research/ShowResearch.do).

[2] Susan Aud, "Education by the Numbers: The Fiscal Effect of School Choice Programs, 1990-2006," Friedman Foundation for Educational Choice, April 2007.

[3] William Howell and Paul Peterson, *The Education Gap: Vouchers and Urban Schools*, second edition, Brookings Institution, 2006, p. 61-65.

[4] Caroline Hoxby, "Rising Tide," *Education Next*, Winter 2001; Jay Greene and Greg Forster, "Rising to the Challenge: The Effect of School Choice on Public Schools in Milwaukee and San Antonio," Manhattan Institute, October 2002; Rajashri Chakrabarti, "Impact of Voucher Design on Public School Performance: Evidence from Florida and Milwaukee Voucher Programs," manuscript, 2006; Rajashri Chakrabarti, "Can Increasing Private School Participation and Monetary Loss in a Voucher Program Affect Public School Performance? Evidence from Milwaukee," manuscript, 2006; Martin Carnoy, et. al., "Vouchers and Public School Performance: A Case Study of the Milwaukee Parental Choice Program," Economic Policy Institute, 2007.

[5] Jay Greene, "An Evaluation of the Florida A-Plus Accountability and School Choice Program," Manhattan Institute, February 2001; Jay Greene and Marcus Winters, "Competition Passes the Test," *Education Next*, Summer 2004; Rajashri Chakrabarti, "Closing the Gap," *Education Next*, Summer 2004; David Figlio and Cecelia Rouse, "Do Accountability and Voucher Threats Improve Low-Performing Schools?" National Bureau of Economic Research, August 2004; Martin West and Paul Peterson, "The Efficacy of Choice Threats within School Accountability Systems: Results from Legislatively Induced Experiments," *Economic Journal*, March 2006; Rajashri Chakrabarti, "Impact of Voucher Design on Public School Performance: Evidence from Florida and Milwaukee Voucher Programs," manuscript, 2006; Cecilia Rouse, Jane Hannaway, Dan Goldhaber and David Figlio, "Feeling the Florida Heat? How Low-Performing Schools Respond to Voucher and Accountability Pressure," National Center for Analysis of Longitudinal Data in Education Research, November 2007; Greg Forster, "Lost Opportunity: An Empirical Analysis of How Vouchers Affected Florida Public Schools," Friedman Foundation for Educational Choice, March 2008; Jay Greene and Marcus Winters, "The Effect of Special-Education Vouchers on Public School Achievement: Evidence from Florida's McKay Scholarship Program," Manhattan Institute, April 2008.

[6] Christopher Hammons, "The Effects of Town Tuitioning in Vermont and Maine," Friedman Foundation for Educational Choice, January 2002; Jay Greene and Greg Forster, "Rising to the Challenge: The Effect of School Choice on Public Schools in Milwaukee and San Antonio," Manhattan Institute, October 2002.

[7] Jay Greene and Marcus Winters, "An Evaluation of the Effects of D.C.'s Voucher Program on Public School Achievement and Racial Integration after One Year," Manhattan Institute, January 2006.

[8] The two studies that found no stigma effect were Greene and Winters, "Competition Passes the Test," and Chakrabarti, "Closing the Gap." The one that found both a stigma effect and a voucher effect was Figlio and Rouse, "Do Accountability and Voucher Threats Improve Low-Performing Schools?" The one that was inconclusive about whether there was a stigma effect was Forster, "Lost Opportunity."

[9] Students living in "open enrollment" districts who are enrolled in charter schools or entering kindergarten also are eligible for vouchers if the district has been designated as underperforming.

[10] Forster, "Lost Opportunity." We also obtained Ohio test score data for 2004-05, intending to compare test score changes before and after the implementation of the program. However, the test score data we received were missing data for numerous grade levels and subjects. As a result, only a handful of year-to-year cohort changes were trackable, which would not provide a sufficient basis for a meaningful comparison. We inquired as to why the data were missing, but received no reply.

[11] Test score data were obtained from the Ohio Department of Education. Demographic and charter school data (for 2005-06) were obtained from the U.S. Department of Education's Common Core of Data. The list of voucher-eligible schools was obtained from School Choice Ohio.

[12] A recent study by the same author, measuring the impact of vouchers on public schools in Florida, examined only math scores (see Forster, "Lost Opportunity"). This method was used because previous studies generally had found greater statistical clarity in math scores than in reading scores. No analysis of reading scores was conducted in association with that study; this was not an instance of "file-drawer bias." The change in method between that study and this one, in which reading scores are now included in the analysis, was prompted by the release of an unrelated study in Washington D.C. that found the reading scores, not the math scores, yielded greater statistical clarity (see Patrick Wolf, et. al., "Evaluation of the D.C. Opportunity Scholarship Program: Impacts After Two Years," U.S. Department of Education, June 2008).

[13] To ensure that Cleveland's voucher program did not taint our original analyses, we conducted them again with all Cleveland schools excluded. All of the results that had been statistically significant remained unchanged (the coefficients were the same when rounded to the nearest whole point) and all the results that had been statistically insignificant remained so.

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