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Milwaukee Independent Charter Schools Study: Report on One Year of Student Growth

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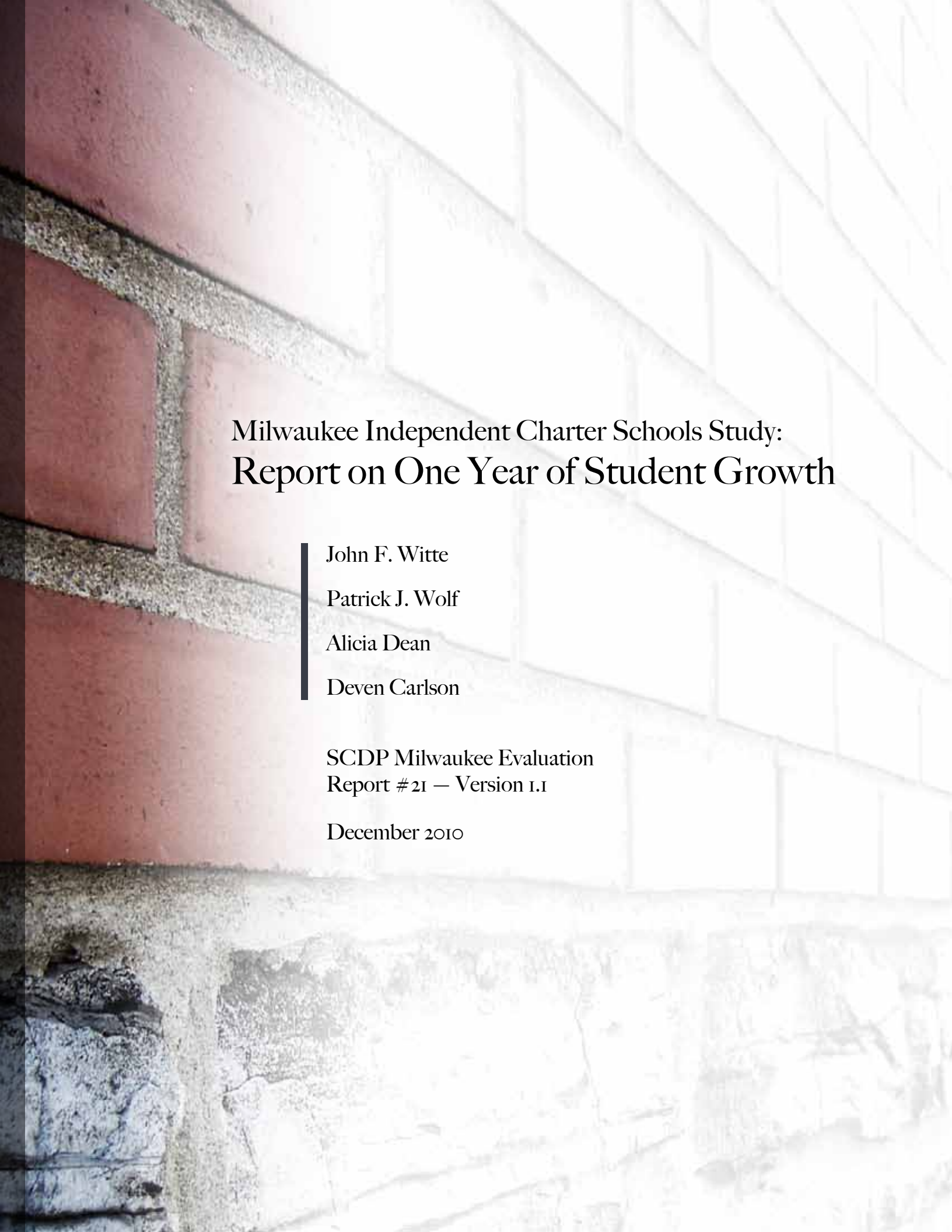

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SCDP Milwaukee Evaluation
Report #21 — Version 1.1

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The University of Arkansas was founded in 1871 as the flagship institution of higher education for the state of Arkansas. Established as a land grant university, its mandate was threefold: to teach students, conduct research, and perform service and outreach.

The College of Education and Health Professions established the Department of Education Reform in 2005. The department's mission is to advance education and economic development by focusing on the improvement of academic achievement in elementary and secondary schools. It conducts research and demonstration projects in five primary areas of reform: teacher quality, leadership, policy, accountability, and school choice.

The School Choice Demonstration Project (SCDP), based within the Department of Education Reform, is an education research center devoted to the non-partisan study of the effects of school choice policy and is staffed by leading school choice researchers and scholars. Led by Dr. Patrick J. Wolf, Professor of Education Reform and Endowed 21st Century Chair in School Choice, SCDP's national team of researchers, institutional research partners and staff are devoted to the rigorous evaluation of school choice programs and other school improvement efforts across the country. The SCDP is committed to raising and advancing the public's understanding of the strengths and limitations of school choice policies and programs by conducting comprehensive research on what happens to students, families, schools and communities when more parents are allowed to choose their child's school.

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EXECUTIVE SUMMARY

The general purpose of this evaluation is to assess the effectiveness of independent charter schools in promoting two desirable student outcomes: student achievement growth and educational attainment. Independent charter schools are authorized by non-district entities and are considered "independent" because they are not a part of the Milwaukee Public School District. We will estimate achievement growth of independent charter school students in grades 3-8 over four years in reading and math on the Wisconsin Knowledge and Concepts Examination (WKCE). Similarly, in later reports we will track student attainment, specifically whether upper-grade cohorts in our evaluation graduate from high school. Case studies of independent charter schools will help us to identify best practices in these schools and will also be addressed in future reports.

This report provides findings comparing the first year of achievement growth (2006 to 2007) of students attending independent charters to the achievement growth of a group of matched comparison students attending Milwaukee Public Schools. Our next report, to be released in spring 2011, will examine two- and three-year achievement growth.

These reports draw upon a panel of all 2,295 students attending 10 of the 14 independent charter schools in grades 3-8 in 2006-07 with test scores for that year. The four charter schools excluded in the sample either were not open for both the baseline (2006-07) and outcome (2007-08) years or did not enroll students in tested grades. That census of tested Milwaukee independent charter school students was then carefully matched to a similar-sized panel (2,295) of students attending MPS.

Using regression models that produce the most precise estimates of 2007 achievement, our comparisons of students in our sample of independent Milwaukee charters to matched MPS students exhibit few significant effects

of attending a charter school on achievement growth in either math or reading. The exception is in one of our three models for mathematics gains. When we control for prior achievement, and not for student characteristics or switching schools, students in charter schools gain approximately .105 standard deviations more in math achievement than students in MPS. Further analysis reveals that the positive impact of independent charter schools on average in math is concentrated primarily at the lower end of the achievement distribution; these schools were estimated to improve the math achievement of students at the 25th percentile of the achievement distribution by .109 standard deviations. There are no differences in any models in reading.

There are differences, however, when we disaggregate the charter impacts by charter school type. Conversion independent charters, schools which converted from private schools, hold an advantage in math and reading achievement. Prior to controlling for both student characteristics and if students switched schools, students in conversion charters make .170 standard deviations greater gains in math achievement compared to similar students in MPS schools. Once controlling for student characteristics and school switching, the effect is reduced to .114 standard deviations. Similarly, in reading, students in conversion charters make .124 standard deviations more gains than MPS students without controlling for student characteristics and switching schools. By adding these factors the effect is reduced to .054 standard deviations. At the same time, students in non-conversion, independent charter schools, schools which began as new charter schools or startups, achieve gains that are no different from their counterparts in MPS.

In addition to looking at student performance, we examine the patterns of school switching both within-sector and between-sector. We do so because school switching tends to disrupt, and therefore negatively affect, student learning. In addition, patterns of student switching alter the demographics

of schools over time. A greater number of students in MPS switched schools than students attending independent charter schools. Similarly, a much larger percentage of MPS students are switching for non-structural reasons than those in independent charters. These non-structural switchers are switching either because they are moving or are potentially dissatisfied with their current school. In any case, school switching has a negative impact on student achievement gains in our study.

We caution that the results in this report are based only on the first of four years of estimated achievement growth. Subsequent reports may well alter the general findings and conclusions.

We are appreciative of the constructive comments on a preliminary draft from outside experts as well as the SCDP Research Advisory Board and research team, particularly David Figlio of Northwestern University and Brian Gill of Mathematica Policy Research, Inc. Additionally, we thank Russell Diamond for advice on data coding. All remaining errors are the responsibility of the authors alone.

This project is being funded by a diverse set of philanthropies including the Annie E. Casey, Joyce, Kern Family, Lynde and Harry Bradley, Robertson, and Walton Family foundations. We thank them for their generous support and acknowledge that the actual content of this report is solely the responsibility of the authors and does not necessarily reflect any official positions of the various funding organizations, the University of Arkansas, or the University of Wisconsin. We also express our gratitude to officials at MPS, the independent charter schools, and the state Department of Public Instruction for their willing cooperation, advice, and assistance.

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INTRODUCTION

Charter schools are tuition-free public schools that are authorized to operate within an agreed "charter." The charters often specify the size of the school, its mission, specialized curricula and pedagogy, unique personnel practices, and specific goals that the school must meet over time in order to be reauthorized. To facilitate these unique schools, they are often given waivers from some of the administrative and accountability requirements of other public schools. This does not exempt charter schools from the requirements of the federal No Child Left Behind law.

Since the opening of the first charter schools in the early 1990s, charter schools have grown widely. In 2009, 5,043 charter schools served close to 1.5 million students in 40 states and the District of Columbia (Center for Education Reform 2009). Following the recent "Race to the Top" initiative, which requires states to relax charter school laws to be competitive for federal education funds, we can expect to see even further expansion of charter schools in the coming years.

Supporters see the potential of high-quality charter schools to help transform the education system by raising achievement levels, closing achievement gaps, providing competitive pressure to traditional public schools and stimulating greater innovation. They posit that giving charter schools more flexibility over such practices as hiring teachers, budgeting school funds, and selecting curricula will lead to these positive outcomes (Finn, Manno and Vanourek 2001; Payne and Knowles 2009). Further, through a system of accountability, they expect to reduce the number of low-quality charter schools that are not able to meet the standards they agreed to in their charters.

In contrast, critics are concerned about charter schools drawing away resources from traditional public schools (e.g. teachers, funding, and motivated students), increasing racial segregation, and lacking the accountability structure to close or improve low-quality charter schools (Wells *et al.* 2002). They fear charters are performing no better and sometimes worse than traditional public schools. To date the research on the performance of charter schools is mixed, ranging from negative, neutral, mildly positive, to a few specific studies which are strongly positive (Bifulco and Ladd 2006; Sass 2006; Ballou *et al.* 2006; Hanushek *et al.* 2007; Booker *et al.* 2007; Zimmer *et al.* 2009; Witte *et al.* 2007; Witte and Lavertu 2009; CREDO 2009; Hoxby *et al.* 2009; CREDO 2010; Abdulkadiroglu *et al.* 2009; Tuttle *et al.* 2010; Gleason *et al.* 2010).

This longitudinal evaluation will evaluate the impacts of independent charter schools on student achievement in Milwaukee, Wisconsin. Milwaukee is one of the few places in the U.S. that contains both district-authorized charter schools and independent charter schools (Table 1). As of the beginning of this study, the 35 district-authorized charter schools remain part of the Milwaukee Public School system. Of these 35 district-authorized charters, a total of 26 are staffed by teachers who remain employees of the school district and bound by the union-negotiated collective bargaining agreement. These schools are referred to as "instrumentality" charters. The remaining nine MPS "non-instrumentality" charter schools are permitted to hire and employ non-union teachers. Of the 14 Milwaukee public charter schools that operated independently of the district in 2006-07, nine were authorized by the University of Wisconsin-Milwaukee and five were authorized by the City of Milwaukee.

Table 1.
Types of Public Charter Schools in Milwaukee, WI, 2006-2007

Type	Number	Percentage of All
MPS Instrumentality	26	53.1
MPS Non-Instrumentality	9	18.4
MPS Total	**35**	**71.4**
Independent U of W-Milwaukee	9	18.4
Independent City of Milwaukee	5	10.2
Independent Total	**14**	**28.6**

While there has been prior research comparing student outcomes in the MPS instrumentality and non-instrumentality charter schools to those in traditional public schools (Witte and Lavertu 2009; Lavertu and Witte 2008; Witte *et al.* 2007), researchers have yet to evaluate the effectiveness of the population of *independent* public charter schools in the city. Initially using two years of panel data from 2006-07 and 2007-08, we will estimate growth models of student gains controlling for student characteristics and school switching. We estimate the impact of independent charter attendance on student achievement growth in reading and math for students in grades 3 through 8 during the baseline year of 2006-07.

We also include in this study a descriptive analysis of students who switch schools and/or move from traditional MPS schools to independent charter schools and vice-versa. School switching can change the composition of charter schools and complicate the analysis of charter effects, as charter school students move to traditional public schools and vice-versa. In addition, we identify those students who are missing from our samples (attrition) after the first year. Study attrition can bias any longitudinal analysis to the extent that the charter school students who "disappear" are systemically different from the comparison group students who leave the study. We describe these conditions in this report to demonstrate that they are not yet serious concerns.

Data access permitting, all of these analyses will be continued for three more years. In addition, we hope in the future to analyze graduation from high school for charter and non-charter students, and, through case studies, provide insights into what types of schools and educational practices seem to work best within both charter and traditional public schools.

Prior Research on Charter School Performance

The literature on charter school performance focuses on three major areas: achievement, competition, and segregation. To determine the effectiveness of charter schools, the majority of studies evaluate the achievement of students in charter schools on standardized tests relative to students in traditional public schools. Fewer studies consider the impact of charter school policy on the academic outcomes of traditional public school students through competition, or how they may influence the sorting of students into environments that are either more diverse or racially isolated. Since student outcomes for charter students are the focus of this study, we briefly describe just the first set of studies – those on student achievement. Our description is limited to a

set of meta-analyses across charter school studies and then a brief description of the two prior studies of charters authorized by the Milwaukee Public School system.

The first evaluations of charter school achievement seemed to suggest that charter schools performed no better than traditional public schools, on average. *The Charter Schools Dust-Up*, a meta-analysis of early charter schools studies, found that students in charter schools scored about the same or sometimes worse on standardized tests compared to students in traditional public schools (Carnoy *et al.* 2005). However, more recent reviews of panel studies evaluating charter school achievement contain findings which suggest results are more mixed and more positive than the findings of Carnoy *et al.* (2005).

The Carnoy *et al.* study was followed by another meta-analysis by Hill, Angel and Christensen (2006). They initially reviewed 35 charter school achievement studies that were published since 2000. In their review, they found that the impact of charter schools on student achievement is null or mixed in most published studies. These studies ranged in methodological quality and for detailed analyses they only relied on the results of the five most sophisticated studies from states with good longitudinal data: Solomon and Goldschmidt (2004) in Arizona, Hanushek *et al.* (2005) in Texas, Sass (2006) in Florida, Bifulco and Ladd (2006) in North Carolina, and Booker et al. (2004) in Texas. From these studies, there were two positive, two mixed and one negative results. Where there were positive or negative findings, the results were small in magnitude. The authors interpret the results from their review as preliminary evidence and remark that there was not yet enough research to definitively account for the impact of charter schools on student achievement.

Betts and Tang (2008) analyzed 14 rigorous studies that used either value-added longitudinal methods or lotteries. Their results were also mixed, but the overall results were on the positive side in terms of the number of studies and the effect sizes. However, there was considerable variation by grade level. They found charter schools did particularly well in reading at the elementary level. On the other hand, the results were more likely to be negative for charter high schools in contrast to traditional high schools.

Even more recently, Nicotera (2009) reviewed 140 studies and reports on 33 panel studies of charter school effectiveness. Of 81 findings regarding math achievement and 79 findings regarding reading achievement she reported that the findings are almost equally distributed across the three categories of "charter advantage," "no difference," and "traditional public school advantage," except that a plurality of the math achievement findings favored traditional public schools. However, charter effectiveness studies drawing upon data prior to 2001 overwhelmingly reported a traditional public school advantage; whereas, a plurality of studies drawing upon more recent data indicated a charter school advantage.

Two other recent national studies of public charter school performance similarly come to complex conclusions. The Center for Research on Education Outcomes (CREDO) program at Stanford University examined charter students in over 2,400 schools in 15 states and the District of Columbia, matching each charter student to a "virtual twin" based on demographic and baseline performance characteristics (Center for Research on Education Outcomes 2009). Three years later, researchers reported that 17 percent of the charter schools had increased test scores relative to their comparison traditional public schools, 46 percent generated no significant difference, and 37 percent of the charter schools decreased math scores. The low-income and English Language Learner subpopulations of students demonstrated the clearest test score benefits from attending charter schools, and students tended to gain more the longer they stayed in their charter school.

Researchers at Mathematica Policy Research took advantage of lotteries at 36 charter middle schools in 15 states to conduct an experimental analysis of charter impacts. Three years after the lottery, the students offered admission to a charter middle school were performing, on average, similarly to the students who were not offered admission (Gleason *et al.* 2010). As with the CREDO study, the disaggregated results revealed interesting patterns. The urban charter schools in the study produced higher achievement gains in math for their students, compared to the control group, while the rural charter schools in the study generated relative achievement losses for their students. Low-income and low-achieving students gained more in achievement if they won their charter school admissions lottery.

Mathematica Policy Research also recently released an evaluation of 22 middle schools that are specifically part of the Knowledge is Power Period (KIPP) network of independent charter schools (Tuttle *et al.* 2010). Using a matched longitudinal panel approach similar to the CREDO study, the researchers report that in half of the KIPP schools effect sizes in math (0.48) and reading (0.28) represent 1.2 years and .9 years extra accumulated growth, respectively, for charter school students in a three year period.

Research on charter schools authorized by the Milwaukee Public School District showed students in these schools made modestly greater gains compared to traditional public school students. The first of these studies, Witte *et al.* (2007), examined the impact of charter status on achievement and student proficiency levels over several years using student fixed effects and difference-in-difference regression and logistic regression models. They found that MPS charters were performing a bit better than traditional public schools. Similarly, in a more recent paper using more years of data, Witte and Lavertu (2009) found larger gains for MPS charter school students in Milwaukee than for traditional public school students in math but not reading. These two prior studies seem to suggest that MPS charter schools are having a positive impact on the students who attend them. However, none of these prior studies evaluate data from independent charter schools because the data were previously unavailable.

The Milwaukee Context: Charter School Reform and Independent Charters

Similar to national trends, the number of charter schools in Wisconsin has grown widely from 17 in 1997 to 206 in 2009 (Evers *et al.* 2009). Charter schools serve more than 37,000 students in the state (Center for Education Reform 2009; Evers *et al.* 2009). Government officials see the potential of charter schools as part of a reform to transform public education in the state. For the first time, Governor Jim Doyle and State Superintendent Tony Evers attended the Wisconsin Charter Schools Conference in April, 2009 (Borsuk 2009). In October of 2009, President Barack Obama and Education Secretary Arne Duncan visited Wright Middle School, a charter school in Madison, to highlight the role of charter schools in the "Race to the Top" initiative. Most recently, Wisconsin has also received $86 million in federal funding over the next five years to support charter schools in Milwaukee and the state by allocating grants to new and existing charter schools.

In Milwaukee, charter schools are one among a wide variety of school choice options including charter and magnet schools affiliated with MPS, open enrollment into other public school districts, and private schools accepting vouchers under the Milwaukee Parental Choice Program. In 2006-07, charter schools in Milwaukee comprised close to a quarter of the charter schools in the state. As discussed previously, independent charters are a distinctive type of charter school in Milwaukee. They were created by 1997 legislation to be authorized by the City of Milwaukee Common Council, the University of Wisconsin-Milwaukee (UWM), the Milwaukee Area Technical College, or the University of Wisconsin at Parkside (Racine). They are not connected to MPS. Of the 9 UWM and 5 City of Milwaukee independent charters open in 2006-07, 10 are the subjects of this research. The student

enrollments by grade for the baseline year of 2006-07 for our school sample are indicated in Table 2.[1] As is apparent, UWM charter schools have many more students than City charters, and there are very few students in grade 9 compared to grades 3 to 8.

Table 2.
Milwaukee Independent Charter School Sample Enrollment, 2006-07

Grade	Schools	3	4	5	6	7	8	9	TOTAL
UWM	6	328	331	338	287	241	239	140	**1,904**
City	4	92	89	99	88	119	80	58	**625**
TOTAL	10	420	420	437	375	360	319	198	**2,529**

Source: Charter Schools page on the Department of Public Instruction website: http://www.dpi.state.wi.us/sms/xls/0607enrl.htm

Note: For the 2006-07 baseline year, there are no test score data for structural reasons for the following schools: Inlands Sea School of Expeditionary Learning (ISSEL), Milwaukee Renaissance Academy (MRA), Seeds of Health (SoHE), School for Early Development (SEDA), and Massai Institute which has closed as of 2007-08. For the first four schools, they did not test in November 2006 when schools typically test because they were not yet open. ISSEL opened in 01/2006, MRA in 08/2007, and SoHE in 08/2007. SEDA is an early education school with grade levels K4-2 and does not have data for grades 3-8, or grade 10 because it does not have these grade levels at its school. Bruce Guadalupe Community School transitioned from the oversight of MPS to being authorized as a charter by UWM in 2009-2010. In addition, in the current 2010-2011 school year, the City chartered King's Academy while UWM chartered Urban Day School, Veritas High School and a new campus of Milwaukee College Preparatory School, Lindsay Heights. Many of the students attending Lindsay Heights formerly attended the Academy of Learning and Leadership which closed in September 2010.

RESEARCH QUESTIONS AND METHODOLOGY

Through this evaluation we expect to understand whether students benefit in the short term and the long term from attending an independent charter school. We are interested in both educational achievement and attainment, as measured by grade retention and most importantly by high school graduation. Over the next three years we are also interested in evaluating what appear to be the keys to successful charter schools. We will report on attainment and best practices in future reports. In this report the primary research question is: Do Milwaukee's independent charter schools produce higher rates of student learning growth, over the short term, than do Milwaukee Public Schools? For purposes of this study, achievement is measured by performance on the reading and math sections of the Wisconsin Knowledge and Concepts Examination (WKCE) that all public school students are required to take in grades 3 to 8 and 10. The WKCE is administered in November of each school year. In the WKCE students are evaluated through short answer and multiple choice questions about their mastery in reading, math,

1 The number of students with third grade test scores in Table 3 differs from the enrollment number because the data are collected at two different times. The enrollment data are based on the September 5th enrollment count. When test scores are added into the enrollment file in November, it is very likely that additional students enrolled in the school.

language arts, science and social studies. Scores on these examinations are recorded in both scale (or developmental) scores and proficiency levels. We rely for part of our analysis on scale scores. As indicated below, at times we standardize these scale scores so they can be compared across grade levels. The first step in our analysis was to determine the comparative samples of students. Because the total number of students in independent charters for which test scores were available in 2006-07 was 2,295, we decided to include all of those students in the charter school sample. The issue was then how to create a relevant matched sample that would be similar on important observed characteristics at baseline. To do that we first selected a random sample of MPS students matched by grade. In doing so we discovered that the baseline test scores (November 2006) for that group differed from those in the independent charter schools in a number of grades. As depicted in Figures 1 and 2, the random MPS sample of students usually scored higher in 2006 than the independent charter students. Thus the random sample would have started out students at different levels of prior achievement.

Figure 1: Reading Comparisons (2006-2007)

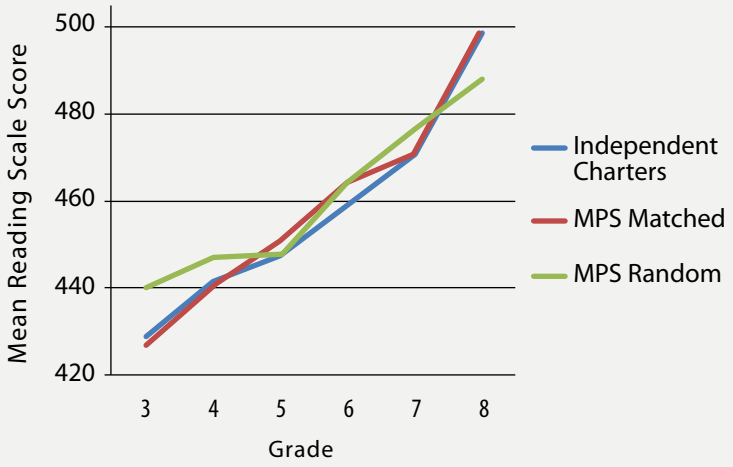
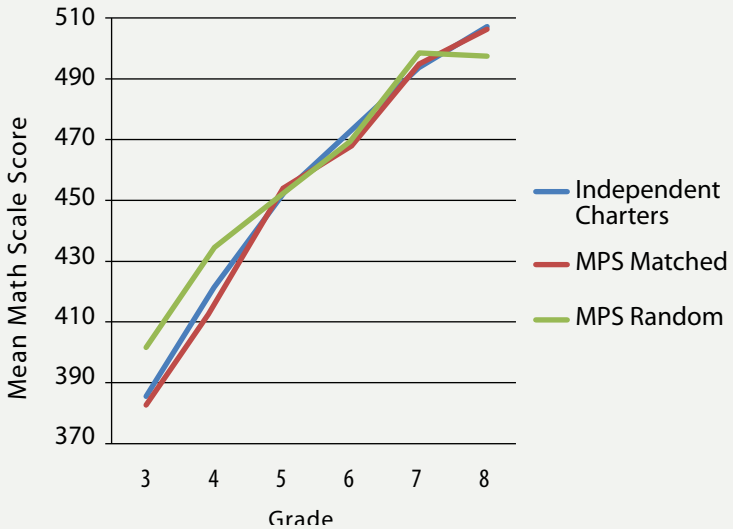


Figure 2: Math Comparisons (2006-2007)



To adjust for this problem we undertook a two-step procedure. First, each student in the charter panel was matched with the set of MPS students in their grade with baseline WKCE test scores within five percent of their score. There were 20 such bands with the lowest being scores from the first to fifth percentile, and the highest for those scoring from 95% to 100%. Second, the charter panelist and each MPS student within that five percent "grade band" were assigned a "propensity score" that predicted their likelihood of being in a charter school based on race, gender, English Language Learner (ELL) status, and participation in the federal Free/Reduced Price Lunch (FRL) program. The MPS student within the grade band with the charter school propensity score closest to the propensity score of a given student in the charter panel was drawn out of the panel (without replacement) to serve on the MPS comparison panel. The result of all these matches was a panel of 2,295 independent charter school students and 2,295 MPS comparison students that closely resemble the charter school students on baseline test scores and other factors that predict charter school enrollment.

The purpose of this procedure was to reduce the differences in observed characteristics between the independent charter students and a random

sample of MPS students. Figures 1 and 2 and Table 3 depict our success in improving on the extent to which our charter and comparison groups are carefully matched. These figures and table display mean comparisons by grade level for the three possible comparison samples.

In Figure 1, for reading, the Independent Charter Sample and MPS Matched Sample begin at similar points and converge in later grades. While there appears to be a gap over grades 5 through 7, these mean differences between the two sectors are not statistically significant. For math, in Figure 2, the charter and MPS matched samples are almost indistinguishable at all grades.

In Table 3, we see few statistically significant differences between means in reading and math scale scores when comparing the Independent Charter Sample and the MPS Matched Sample. With the exceptions of 4th and 6th grade math, this holds for every grade in both subjects. Both of those lingering differences between the charter and matched samples are statistically significant only at the 90 percent confidence level, the lowest confidence level that we use in this evaluation. This suggests the matching was successful. Thus, in terms of prior achievement we have created the proverbial apples-to-apples comparison.

Table 3.
Baseline (2006-07) Scale Scores of Independent Charter, MPS Matched, and MPS Random Samples

Grade	Sample	N	Mean Reading Scale Score	Reading SD	Mean Math Scale Score	Math SD	Comb Mean Scale Score	Combined SD
3	Independent	430	429	47	385	49	407	44
3	MPS Matched	431	427	47	383	47	405	42
3	MPS Random	341	440***	38	402***	50	422***	40
4	Independent	417	441	49	421	48	431	45
4	MPS Matched	420	440	53	415*	54	428	50
4	MPS Random	324	447	53	434***	47	441***	47
5	Independent	427	447	51	452	48	450	46
5	MPS Matched	430	451	49	454	41	453	40
5	MPS Random	338	448	56	452	44	451	47
6	Independent	358	460	51	473	48	466	46
6	MPS Matched	356	464	50	467*	40	466	41
6	MPS Random	330	464	54	469	44	468	44
7	Independent	346	470	51	493	43	482	44
7	MPS Matched	341	470	45	496	38	483	38
7	MPS Random	303	468	49	499	47	488*	44
8	Independent	298	499	47	507	48	503	43
8	MPS Matched	299	499	50	506	45	503	43
8	MPS Random	290	488**	55	497**	50	493**	53

***Different from Independent Charter at p<0.01, **Different from Independent Charter at p<0.05,
*Different from Independent Charter at p<0.10

Table 4 indicates that our matching algorithm was successful in producing a matched sample with important measurable student characteristics that, though imperfect, are closer than in the random sample. The matched and charter samples are very close on race and gender. Although the matched MPS sample contains populations of exceptional education and free lunch students that are closer to the charter sample than the random sample provided, the MPS Matched sample does differ significantly from the Independent Charter Sample regarding these two student characteristics. Because of these differences, in most of the analyses to follow we independently control for all of these student characteristics in our regression models.[2]

Table 4.
Comparison of Student Characteristics in Three Possible Study Samples

Sample	Black (%)	White (%)	Hispanic (%)	Female (%)	ExEd (%)	Federal Lunch (%)	ELL (%)
Independent Charter	93.93	3.86	1.80	49.67	8.38	51.64	0.04
MPS Matched	98.19***	1.44***	0.26***	49.45	16.07***	73.82***	0.04
MPS Random	59.91***	14.52***	19.76***	48.29	19.47***	83.68***	13.27***

Stars indicate MPS Matched and MPS Random different from Independent Charter at
***p<0.01, **p<0.05, *p<0.10, based on a two-tailed t-test.

Our matching protocol and baseline control variables will limit the extent to which measurable student characteristics might bias our analysis of independent charter and MPS student test score gains. Because students were not randomly assigned to the two groups, however, we cannot rule out unmeasured student characteristics as a potential source of bias. For example, if the students in Milwaukee independent charter schools are similar to our matched MPS sample in most ways except that they have more motivated parents, as demonstrated by the fact that they enrolled the student in a school of choice, then the charter students might demonstrate stronger achievement gains simply due to such a "self-selection" bias. On the other hand, if parents seek alternatives to their neighborhood public school primarily when their child is struggling, the match on baseline achievement might not fully capture the inherent educational disadvantages of charter school students, thereby biasing our analysis against better performance from charter schools.

We think that the fact that our study is situated in Milwaukee helps to reduce the threat of positive or negative unmeasured selection biases. As discussed above, many school choice options are available to parents even within the Milwaukee Public School (MPS) system. Highly motivated parents, or parents of students who are struggling in their neighborhood public school, can and likely do seek out alternative placements for their child

2 The initial difference between the charter and matched sample on free lunch status is due to incomplete free lunch data counts in a few schools. We correct for this in our models in two ways. If a student had a free lunch observation in 2007-08, 2008-09 or 2009-10, we back filled the data. In addition, for students with missing data on free-lunch or any other control variable, we include an indicator in our models controlling for this missing data. Doing so allows our regression models to draw upon the actual data in each student observation, and only that actual data, to inform the coefficient estimates of the model (Cohen and Cohen 1983).

within MPS. Since school choosers are present in both our charter and MPS matched comparison samples, concerns about self-selection bias when comparing student achievement gains across sectors are, to some extent, mitigated.

STUDENT ACHIEVEMENT GAINS: 2006-07 to 2007-08

Average Math and Reading Achievement

We employ descriptive statistics and multivariate methods to compare one year gains for students in independent charter schools and comparable, matched students in Milwaukee Public Schools. We first analyze scale scores that increase in mean and range in each successive grade as more subjects are covered in each test. These scores have excellent psychometric properties but do not allow direct comparisons across grades or direct understanding of effect sizes. For these reasons we construct standardized z scores from scale scores using the MPS district means and standard deviations for math and reading. For all MPS students this procedure would produce an average z-score of 0 with a standard deviation of 1.0.[3] Our samples may deviate from these norms at baseline and subsequently those data are relevant findings. These normalized z scores are used in the analyses in Tables 5 to 13.

In Tables 5 and 6, we report the average gains for each sample and differences in gains in math and reading between the samples. The results of this first analysis are broken out by grade level to examine the variation in student learning gains by school type across the different grades. In general, the grade-specific results are a mix of positive charter effects and no significant differences. Fifth grade charter school students gained an average of .111 standard deviations in math achievement compared to matched 5th graders in MPS (Table 5). Sixth grade charter school students gained an average of .320 standard deviations more in math than similar MPS students. Both of those positive charter school effects on math gains were statistically significant at high levels. The differences in math achievement gains for charter versus matched MPS students in 4th, 7th, and 8th grades were not statistically significant. Because of the gains in grades 5 and 6, the total effect for all grades is about .093 standard deviations higher for charter school students.

In reading, the gains for 6th grade charter students were an average of .148 standard deviations higher than their matched MPS counterparts, and the charter school advantage in reading gains in 7th grade was an average of .105 standard deviations (Table 6). Both of those differences were statistically significant at high confidence levels. No statistically significant gain score differences in reading were observed between charter and matched MPS students in 4th, 5th, or 8th grade.

3 We computed normalized z scores by grade level in both years for reading and math. For example, the formula for ZMath2007 in Grade 3 would be ((Grade 3 ScaleMath2007– Grade 3 MPS district mean scale score)/(Grade 3 MPS district standard deviation)).

Table 5.
Standardized Mean Math Achievement by Grade, 2006-07 to 2007-08

Grade 2007	Group	Average Math Gains 2006-2007 (Change)	s.e.(diff)
4	Charter	.032	
	MPS Matched	.031	
	(Difference)	**(.001)**	**.055**
5	Charter	.216	
	MPS Matched	.105	
	(Difference)	**(.111)****	**.052**
6	Charter	.121	
	MPS Matched	-.199	
	(Difference)	**(.320)*****	**.056**
7	Charter	-.048	
	MPS Matched	-.063	
	(Difference)	**(.015)**	**.054**
8	Charter	-.036	
	MPS Matched	-.113	
	(Difference)	**(.077)**	**.060**
All Grades	Charter	.059	
	MPS Matched	-.034	
	(Difference)	**(.093)*****	**.025**

***p<0.01, **p<0.05, *p<0.10

Note: Two sample t-tests were run to test the significance of differences in average gains between our MPS Matched sample and Charter sample. Response weights were included in the estimation of differences in means.

Table 6.
Standardized Mean Reading Achievement by Grade, 2006-07 to 2007-08

Grade 2007	Group	Average Reading Gains 2006-2007 (Change)	s.e. (diff)
4	Charter	-.005	
	MPS Matched	.003	
	(Difference)	**(-.008)**	**.059**
5	Charter	.012	
	MPS Matched	.022	
	(Difference)	**(-.010)**	**.052**
6	Charter	.092	
	MPS Matched	-.056	
	(Difference)	**(.148)*** **	**.052**
7	Charter	.063	
	MPS Matched	-.042	
	(Difference)	**(.105)** **	**.049**
8	Charter	.031	
	MPS Matched	.001	
	(Difference)	**(.031)**	**.056**
All Grades	Charter	.034	
	MPS Matched	-.008	
	(Difference)	**(.042)** **	**.025**

***p<0.01, **p<0.05, *p<0.10

Note: Two sample t-tests were run to test the significance of differences in average gains between our MPS Matched sample and Charter sample. In some cases, the changes in means may not sum exactly because of rounding. Response weights were included in the estimation of differences in means.

The Distribution of Math and Reading Growth

It is equally as important to understand the distribution of gains as it is to note averages. The "density," which approximates the number of individuals at specific points in the achievement distribution, is provided in "kernel" diagrams in Figures 3 and 4. Examining the kernel density distributions of both sectors in reading and math will help us to understand the shape of the growth in our samples. For both reading and math, the distributions are mostly overlapping and are normally distributed. If we were to see non-overlapping distributions this would indicate a great variation in performance between the two sectors. For math, MPS matched students have somewhat more students just below the middle of the distribution, while the charter school distribution has more students to the right of the mean. In reading (Figure 4) there is a slight advantage for charter students above the mean. The range of students scoring at the high end and low end are very similar in both sectors.

Figure 3:
November 2007 Standardized Math Growth for All Students in Grades 4-8

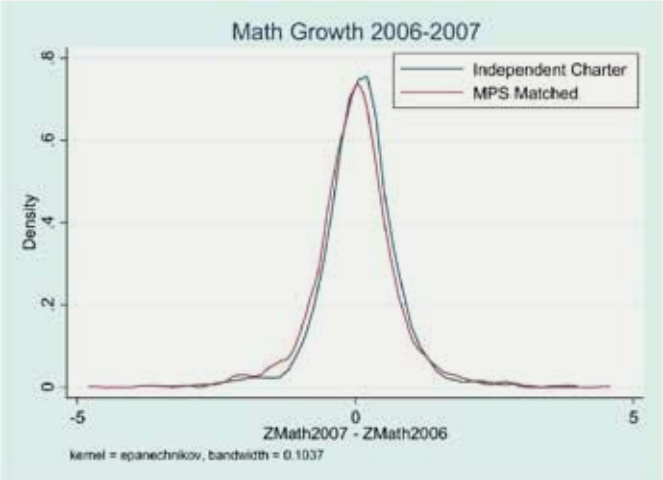
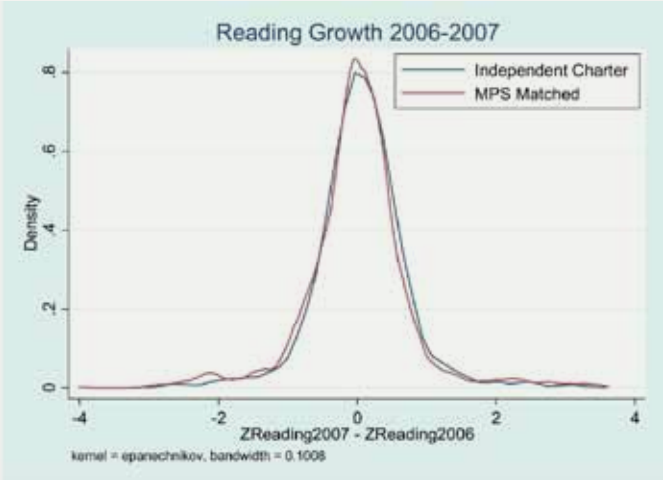


Figure 4:
November 2007 Standardized Reading Growth for All Students in Grades 4-8



We further examine the gains of independent charter school students compared to students in MPS in reading and math with a non-parametric measure called Somers' D.[4] With this ordinal measure we calculate the difference in the probability that a given independent charter school student will demonstrate more or less gains than a matched MPS student. Positive and significant values for independent charter school students indicate they are making more gains than their MPS counterparts. As indicated in Table 7, the results of

4 Following the procedure employed by Witte et al. 2010 to compute the Somers' D statistic, we first compared the growth of two given students (e.g. a comparison) in the two samples. Then, if the student was in MPS and achieved greater growth they were assigned a score of -1. Similarly, a charter school student who achieved greater growth was assigned a score of +1. If each of the students exhibited the same growth they were assigned a score of 0. The scores from each of these comparisons were summed and then divided by the total number of comparisons to get the Somers' D coefficient.

this quite different approach largely confirm the difference of mean results indicated in Tables 5 and 6. There are significant advantages for charter students overall in both math and reading, with the math gains most prominent in grades 5 and 6 and the reading gains in grades 6 and 7.

Table 7.
Somers' D Statistics for Math and Reading Growth: 2006-07 to 2007-08

Subject/Grade	Somers' D Coeff. (s.e.)
Math 4	.006(.043)
Math 5	.100(.043)**
Math 6	.236(.041)***
Math 7	.048(.046)
Math 8	.053(.049)
Math All Grades	**.086(.020)*** **

Subject/Grade	Somers' D Coeff. (s.e.)
Reading 4	.027(.043)
Reading 5	-.000(.043)
Reading 6	.128(.043)**
Reading 7	.114(.046)**
Reading 8	.032(.049)
Reading All Grades	**.056(.020)** **

***p<0.01, **p<0.05, *p<0.10, two-tailed. Results unweighted

Models for Math and Reading Achievement

Using an analytic sample of 3,357 students in grades 3 to 7 in the independent charter and MPS matched sectors during the 2006-07 school year, we estimate the impact of independent charter school attendance on growth in reading and math controlling for student characteristics and switching schools.[5] To control for potential differences by grade, we include grade indicator variables in all equations. We control for baseline achievement by including the student's prior year (2006) test scores in both subjects. The basic model is represented by the following equation:

$$\text{(eq 1)} \qquad Y_{2007,i} = \beta_0 + \beta_1 C_i + \beta_2 Y_{2006m,i} + \beta_3 Y_{2006r,i} + \beta_4 G_i + \beta_5 X_i + \beta_6 Sch_i + \varepsilon_i$$

In this equation for each student *i*, β_1 represents the effect of student enrollment in a charter school in 2006-07 (C=1) and β_2 and β_3 estimate the impact of baseline math and reading achievement. With this specification, the contribution of the baseline test to the estimate of the second year test is unconstrained in that β_2 and β_3 can

5 We had 1,179 missing test scores for 2007-08 in math and 1,182 in reading. For students who switched sectors after taking tests in November 2006, if we could locate their tests in 2007 in the new sector, we included them in the analysis attributing their growth results to their initial sector placement. This is standard practice for "crossovers" in randomized field trials. Also in this case it is safe to conclude that most of the sector switching took place over the summer, thus the majority of learning occurred for this first year in their initial sector. In subsequent years, as crossover enrollment increases, we will handle analysis of crossovers in multiple ways. See Witte *et al.* 2010.

take any value.[6] β_4 represents a vector of grade-specific contributions to the intercept (especially important in this context where the dependent variable by design increases by grade). In addition, β_5 represents the impact of a set of student-level characteristics, X_i, such as gender and race/ethnicity, and β_6 represents the impact of switching schools either within the same sector or between sectors (Sch_i=1).[7]

In addition to understanding the main effect of attending an independent charter or a traditional school, we are also interested in two different types of charter schools. Some of the independent charter schools were initially private schools that changed school sectors by converting to public-school charters (i.e. conversion charters). Other charters were either startup schools or former public schools (i.e. non-conversion charters). We capture and test for the differential effects of these two types by estimating equation 2.

$$\text{(eq 2)} \qquad Y_{2007,i} = \beta_0 + \beta_1 CC_i + \beta_2 NCC_i + \beta_3 Y_{2006m,i} + \beta_4 Y_{2006r,i} + \beta_5 G_i + \beta_6 X_i + \beta_7 Sch_i + \varepsilon_i$$

In this specification we split the charter indicator variable in equation 1 into conversion charters (CC) and non-conversion charters (NCC), with the effects captured by estimating the β_1 and β_2 parameters.

The outcomes of interest are 2007-2008 reading and math scale scores taken from the Wisconsin Knowledge Concepts Examination (WKCE) in grades 4 to 8. Student characteristics included are those typically found in studies of charter school performance and they include free and reduced lunch status, exceptional education status (ExEd), race, and gender. English language learner status was not included because there were very few ELL students in the charter schools. The race indicator is coded as 1 for black and 0 for non-black as the reference group. We collapse racial groups other than blacks into the non-black category because there are substantially fewer whites, Hispanics, Asians, and Native Americans in the sample.[8] Because there were some differences in the matched samples on baseline, we applied weights to cases based on their inverse proportions regarding student characteristic variables. Students with atypical characteristics were weighted more and students with typical characteristics were weighted less. However, the weighted results reported below are substantively similar to the results from estimating the same models on unweighted samples. The models account for the clustering of students within schools and employ robust standard errors.

6 Some researchers have used differences in test scores as the dependent variable by subtracting the first year test score from the second. However, if we want to model achievement growth controlling for prior achievement, this has the effect of constraining the effect of prior achievement to 1.0, which empirically is not the true parameter. Thus, we favor the estimation model in Equation 1.

7 We include all switching between schools including switches that may occur for "structural" reasons, meaning switches that have to be made because the student is at the terminal grade in the school. This is done because other research has shown that all switches have an impact on tests taken in the year the switch is made. See Zimmer *et al.* 2009. Further, although one could argue that structural switching is likely to be part of the charter program and should not be controlled, we cannot definitively determine if such switches were program related (i.e. charter slots not available or charter schools deny) from residential or other reasons for changing schools.

8 There are initially 3,789 blacks and 144 non-blacks in the sample.

Our last set of models examines potential variation in charter school impacts using quantile regressions. We include these models because the charter impacts on student learning gains may not be constant among students with different levels of achievement. Charter impacts are examined at the 10th, 25th, 50th, 75th and 90th percentiles of the baseline achievement distribution. All of the controls described for the previous set of models are included in these models. For the quantile regressions, bootstrapped standard errors are estimated and account for the clustering of students within schools.

Results for Models of Charter Impacts on Math and Reading Achievement, 2006-07 to 2007-08

Table 8.
Models of Independent Charter Sector Impacts on Math Achievement, 2006-07 to 2007-08

Model	1	2	3
	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)
Charter 2006	.105(.049)**	.073(.047)	.055(.047)
2006 Score- Math	.609(.027)***	.606(.025)***	.603(.025)***
2006 Score- Reading	.211(.021)***	.162(.020)***	.161(.020)***
Black		-.270(.051)***	-.269(.051)***
Female		.012(.027)	.009(.027)
ExEd		-.337(.058)***	-.341(.059)***
Free_Lunch		-.019(.025)	-.015(.025)
Switch Sch.			-.074(.033)**
Intercept	-.053(.022)**	.261(.060)***	.284(.060)***
R^2	.572	.586	.588
F	879.23	.	.
N	3357	3357	3357

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Model estimated with robust standard errors. Most of the variables included in the models are indicator variables. The reference category for both conversion charter and non-conversion charter is MPS. For the black indicator variable the reference category is non-black which includes whites, Asians, Hispanics and Native Americans. Male is the reference category for female. For ExEd, Free_Lunch and Switch School variables the reference categories are not indicating this status. Grade level dummies and indicators for missing values of Free_Lunch and ExEd are not included in the above estimates.

Table 9.
Models of Independent Charter Sector Impacts on Reading Achievement, 2006-07 to 2007-08

Model	1	2	3
	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)
Charter 2006	.037(.033)	.007(.029)	-.012(.029)
2006 Score- Reading	.554(.023)***	.500(.025)***	.499(.025)***
2006 Score- Math	.253(.022)***	.246(.020)***	.243(.021)***
Black		-.165(.044)***	-.164(.046)***
Female		.060(.025)**	.057(.026)**
ExEd		-.316(.057)***	-.321(.057)***
Free_Lunch		-.129(.033)	-.124(.033)***
Switch Sch.			-.081(.031)**
Intercept	.002(.020)***	.279(.054)***	.306(.058)***
R^2	.574	.590	.591
F	558.85	.	.
N	3354	3354	3354

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Models estimated with robust standard errors. Most of the variables included in the models are indicator variables. The reference category for both conversion charter and non-conversion charter is MPS. For the black indicator variable the reference category is non-black which includes whites, Asians, Hispanics and Native Americans. Male is the reference category for female. For ExEd, Free_Lunch and Switch School variables the reference categories are not indicating this status. Grade level dummies and indicators for missing values of Free_Lunch and ExEd are not included in the above estimates.

First year results comparing the gains of students in independent charter schools to those in MPS are mixed. For most of the main effects for reading and math in Tables 8 and 9, the charter coefficients are not significant at conventional levels of statistical significance. The exception is for math when we just include prior test scores in the estimation model (Table 8, column 1). In that specification, charter school students gain approximately .105 standard deviations more than MPS students. However, when we include student characteristics (Table 8, column 2) and then student characteristics and school switching (Table 8, column 3) as control variables, charter school students do no better in math than the matched MPS students. As indicated in Table 9, there are no significant differences in reading for charter schools under any estimation.

Consistent with prior research, students in both the MPS and independent charter sectors with higher prior achievement (2006 test scores) have higher second-year test scores than students with lower prior achievement. Similarly, students who receive exceptional education services also exhibit lower second-year achievement compared to non-disabled students. Switching schools, also consistent with prior research (Zimmer *et al.* 2009; Witte and Lavertu 2009) consistently has a negative impact on subsequent student achievement.

Table 10.
Models of Conversion and Non Conversion Independent Charter Impacts on Math Achievement, 2006-07 to 2007-08

Model	1	2	3
	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)
Conversion Charter 2006	.170(.054)***	.136(.056)**	.114(.054)**
Non-Conversion Charter 2006	.080(.061)	.050(.059)	.034(.059)
2006 Score - Math	.606(.027)***	.603(.024)***	.601(.025)***
2006 Score - Reading	.209(.021)***	.161(.020)***	.160(.020)***
Black		-.249(.057)***	-.250(.057)***
Female		.010(.026)	.007(.027)
ExEd		-.344(.060)***	-.348(.060)***
Free_Lunch		-.004(.026)	-.001(.026)
Switch Sch.			-.070(.032)**
Intercept	-.053(.022)**	.230(.072)***	.254(.072)***
R^2	.572	.587	.588
F	715.27	.	.
N	3357	3357	3357

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Models are estimated with robust standard errors. The reference category for both conversion charter and non-conversion charter is MPS. For the black indicator variable the reference category is non-black which includes whites, Asians, Hispanics and Native Americans. Male is the reference category for female. For ExEd, Free_Lunch and Switch School variables the reference categories are not indicating this status. Grade level dummies and indicators for missing values of Free_Lunch and ExEd are not included in the above estimates.

Table 11.
Models of Conversion and Non Conversion Independent Charter Impacts on Reading Achievement, 2006-07 to 2007-08

Model	1	2	3
	Est. (s.e.)	Est. (s.e.)	Est. (s.e.)
Conversion Charter 2006	.124(.044)***	.076(.027)***	.054(.028)*
Non-Conversion Charter 2006	.003(.040)	.019(.038)	.036(.039)
2006 Score -Reading	.551(.023)***	.499(.026)***	.498(.026)***
2006 Score -Math	.249(.022)***	.243(.020)***	.240(.021)***
Black		-.142(.053)***	-.143(.054)***
Female		.058(.025)**	.055(.026)**
ExEd		-.326(.058)***	-.329(.058)***
Free_Lunch		-.111(.035)*	-.108(.035)***
Switch Sch.			-.077(.031)**
Intercept	.001(.020)***	.245(.059)***	.272(.062)***
R^2	.576	.591	.592
F	591.52	.	.
N	3354	3354	3354

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Models estimated with robust standard errors. Most of the variables included in the models are indicator variables. The reference category for both conversion charter and non-conversion charter is MPS. For the black indicator variable the reference category is non-black which includes whites, Asians, Hispanics and Native Americans. Male is the reference category for female. For ExEd, Free_Lunch and Switch School variables the reference categories are not indicating this status. Grade level dummies and indicators for missing values of Free_Lunch and ExEd are not included in the above estimates.

There are more nuanced results when this main effect is further analyzed by the type of charter school and the distribution of student achievement. These results are depicted in Tables 10 through 13. Some of the independent charter schools were *conversion schools*, being previously private schools in the Milwaukee Parental Choice (voucher) Program. Although four out of 10 charter schools were conversion charters, there are many fewer students in our sample in these schools. As indicated in Appendix Table A-1, there are only 522 students in the conversion charter schools, compared to 1,361 students in the non-conversion charter schools.

In Table 10 the effect of conversion charter schools on math achievement is positive, compared to our matched MPS sample. For example, in model 1 in Table 10 the effect of conversion charter schools on math achievement growth, not controlling for student characteristics and switching schools, indicates that students in these

schools are performing, on average, .170 standard deviations better than students in MPS schools. Controlling for student characteristics and school switching, the effect remains statistically significant and reduces to .114 standard deviations in model 3 of Table 10. Students in non-conversion charter schools perform no differently in math compared to similar MPS students.

In reading, students in conversion charter schools appear to be outperforming students in non-conversion charter schools and also outperforming students in MPS schools. Specifically, in model 1 of Table 11 students in conversion charters make, on average, .124 standard deviations more gains than their MPS counterparts in reading, without controlling for student characteristics and school switching. When we control for these factors the effect reduces to .054 standard deviations but remains statistically significant in model 3 of Table 11. Students in non-conversion charter schools perform the same as their counterparts in MPS.

When we examine the impact of independent charter schools at different points in the distribution of student achievement, we find these charter schools have their strongest positive effects for students starting at baseline at the low end of the achievement distribution. This is the result after controlling for student characteristics and school switching. Specifically, in math in Table 12, the effects for students at the 25th percentile of the achievement distribution are estimated to be .109 greater gains than students in MPS. However, similar quantile regressions in reading show charter impacts do not vary for students with different starting levels of achievement (Table 13).

Table 12.
Results of Quantile Regression for Charter Impacts on Math Achievement

Math (N= 3357)	**.10**	**.25**	**Median**	**.75**	**.90**
Charter Main Effect					
Charter	.113(.059)*	.109(.040)***	.046(.033)	.034(.042)	.041(.052)
Charter Effect Decomposed in Conversion and Non-Conversion Charters					
Conversion-Charter	.202(.143)	.151(.077)*	.086(.054)	.040(.071)	.046(.096)
Non-Conversion Charter	.090(.085)	.081(.055)	.036(.036)	.029(.040)	.037(.060)

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Tabled results control for race, free lunch status, exceptional education, grade, switching schools and prior achievement. The point estimates for these controls are not included in the table but are available upon request. Bootstrapped standard errors are estimated and account for clustering of students within schools.

Table 13.
Results of Quantile Regression for Charter Impacts on Reading Achievement

Reading (N= 3,354)	**.10**	**.25**	**Median**	**.75**	**.90**
Charter Main Effect					
Charter	.003(.065)	-.013(.050)	-.023(.026)	-.017(.024)	-.011(.030)
Charter Effect Decomposed in Conversion and Non-Conversion Charters					
Conversion-Charter	.044(.052)	-.002(.090)	-.010(.049)	.017(.035)	-.009(.046)
Non-Conversion Charter	-.038(.087)	-.014(.053)	-.029(.039)	-.021(.042)	-.021(.042)

***p<0.01, **p<0.05, *p<0.10

Note: Test scores measured as standardized scores. Tabled results control for race, free lunch status, exceptional education, grade, switching schools and prior achievement. The point estimates for these controls are not included in the table but are available upon request. Bootstrapped standard errors are estimated and account for clustering of students within schools.

SCHOOL SWITCHING, SECTOR SWITCHING AND STUDY ATTRITION

School and Sector Switching

There are a number of students in both MPS and independent charter schools who switched schools from Year 1 to Year 2. As shown in our models above, switching schools has a negative effect on student achievement, thus it is important to take this into account in our estimates and understand the nuances of switching for each sample. Students switch schools for different reasons. Some students leave their school for structural reasons, meaning they are in a terminal grade and they have no other option but moving to a new school the next year. Alternatively, students may leave their school for a non-structural reason like their family is moving or they are not satisfied with the school climate and/or quality. A non-structural switch can be modeled by identifying students who switch in non-terminal grades. In our analyses, we classify these as two types of within-sector switchers. In other words, we identify who switches within sector (students who move from one school to another in the same sector) and whether their switch is for a structural or a non-structural reason. In addition, we track between-sector switchers, students who began in one sector (charter or MPS) at baseline and switched to the other sector in Year 2. Then we identify those students who never made a switch, who are classified as non-switchers.[9]

Table 14.
Switching, by Sector and Type of Switch, 2006-07 to 2007-08

	MPS Matched (%)	Independent Charter (%)
Non Switchers	1,064 (51.9)	1,486 (78.9)
All Within Sector Switchers:	949*** (46.3)	31*** (1.65)
Structural	495*** (24.1)	10 (0.530)
Non Structural	454 (22.1)	21 (1.12)
Between Sector Switchers	37 (1.80)	366 (19.4)
Total Non Missing N = 3,933	2,050	1,883

Stars indicate MPS different from Independent Charter statistics at ***p<0.01, **p<0.05, *p<0.10, based on a two-tailed t-test. Structural switchers are students in grade 5 in 2006-07 and grade 6 in 2007-08, as well as those in grade 8 in 2006-07 and grade 9 in 2007-08.

9 Due to data limitations we cannot explicitly track eighth to ninth grade school switchers in Year 2 so there is an assumption that all of these switchers are structural switchers.

In Table 14 it is clear that a greater number of students in independent charter schools do not switch compared to similar students in MPS. Close to 50 percent of the MPS matched baseline sample switched schools in one way or another between November 2006 and November 2007. Part of the reason that there is little within-sector switching by charter students is that they are much more likely to switch to MPS schools. While 31 students switched charter schools, 366 switched from charter schools to MPS. One of the clear explanations for this is that there are fewer charter slots in charter middle and high schools so students have no alternative but to switch. In contrast, very few (37 of 2,050) MPS students switched into independent charters during the first year. Part of the explanation for this, and the large number of within-sector switching in MPS, is simply that there many more school options in MPS than in independent charter schools.

Study Attrition

The overall percent of missing students from the study after the first year is 13.6 percent.[10] However, as indicated in Table 15, there is considerable difference between the two samples, with 9.96 percent missing in MPS and 17.3 percent missing from the independent charters. Students in both independent charters and MPS may have left for private schools in the MPCP program or may have moved out of the city of Milwaukee. We have tracked students between sectors (i.e. "crossovers") using test score and enrollment data, but we undoubtedly missed some students who will be recovered in subsequent years. We do not have the data to track students into private schools, which are likely to account for more missing in the charter schools. Given that we anticipated sample attrition at 20 percent annually, these results are slightly optimistic. Also as expected, missing students are not the same as non-missing students. The relevant data are portrayed in Table 15. Missing students are likely to be better students, less likely to be black or on free lunch. Although these differences are not large we corrected for these characteristics in our statistical models presented above.

10 Missing from the entire analysis, and not counted in attrition statistics are 36 students from the original 4,590 who had nonsensical data for 2007-08. These were students, mostly from two independent charter schools who had implausible grade changes from year 1 to 2. Without these students, the proof sample is 4,554. We continue to attempt to correct these data.

Table 15.
Baseline Student Characteristics for Non Missing and Missing Independent Charter and MPS Matched Students

	Non Missing		Missing	
	MPS Matched	Independent Charter	MPS Matched	Independent Charter
Female (%)	1,021 (49.8)	925 (49.1)	105 (46.2)	206 (52.2)
Black (%)	2,016*** (98.3)	1,773 (94.1)	220** (96.9)	366 (92.8)
Non Black (%)	34*** (1.7)	110 (5.84)	7*** (3.1)	28 (7.1)
Free Lunch (%)	1,518*** (74.0)	1,521 (80.7)	163** (71.8)	244 (61.9)
ExEd (%)	332*** (16.2)	161 (8.6)	34*** (14.9)	30 (7.6)
Baseline Grade 3 (%)	390 (19.0)	379 (20.1)	41* (18.0)	51 (12.9)
Baseline Grade 4 (%)	388 (18.9)	366 (19.4)	32 (14.1)	51 (12.9)
Baseline Grade 5 (%)	392 (19.1)	376 (19.9)	38 (16.7)	51 (12.9)
Baseline Grade 6 (%)	326 (15.9)	316 (16.7)	30 (13.2)	42 (10.6)
Baseline Grade 7 (%)	305* (14.8)	320 (17.1)	36*** (15.8)	26 (6.6)
Baseline Grade 8 (%)	249*** (12.1)	126 (6.7)	50*** (22.0)	173 (43.9)
TOTAL (N)	2,050	1,883	227	394

Stars indicate MPS Matched different from Independent Charter statistics at ***p<0.01, **p<0.05, *p<0.10, based on a two-tailed t-test. Percentages are rounded to the tenth decimal point.

A more important threat to the inferences permitted by this study would be if missing students were different between MPS and charter students regarding their achievement. As indicated in Table 16, apart from the number of missing students (discussed above), there is only one grade on the baseline reading test where missing MPS and charter students differ significantly. Thus on the most important control variable, there is essentially no difference between the students we were able to track and those we were not. There are more differences on student characteristics in the grades in which students are missing (Table 15). However, in these cases, which include race, free lunch, and exceptional education, the missing differences mirror the differences in the original samples (see Table 4). Thus while attrition did not improve on the initial sample differences, they also did not make them worse. As indicated previously, because of the baseline differences in student characteristics, we weighted our analysis by the inverse proportions of student characteristics and baseline scores. In the multivariate analyses these variables were also used as control variables.

Table 16.
Average Baseline Achievement for Non Missing and Missing Independent Charter and MPS Matched Students by Grade

	Non Missing		Missing	
	MPS Matched	Independent Charter	MPS Matched	Independent Charter
Grade 3 (N)	(390)	(379)	(41)	(51)
Average Math	384	387	371	376
Average Reading	429	428	405**	432
Grade 4 (N)	(388)	(366)	(32)	(51)
Average Math	416	422	404	420
Average Reading	441	441	434	442
Grade 5 (N)	(392)	(376)	(38)	(51)
Average Math	455	452	446	451
Average Reading	451	448	451	441
Grade 6 (N)	(326)	(316)	(30)	(42)
Average Math	468	474*	463	461
Average Reading	465	460	453	453
Grade 7 (N)	(305)	(320)	(36)	(26)
Average Math	496	493	493	494
Average Reading	471	471	467	464
Grade 8 (N)	(249)	(126)	(50)	(173)
Average Math	505	503	514	511
Average Reading	498	495	500	501
TOTAL (N)	2,050	1,883	227	394

Stars indicate MPS Matched different from Independent Charter statistics at ***p<0.01, **p<0.05, *p<0.10, based on a two-tailed t-test.

Perhaps more important, the differences are driven by 8th graders who leave the charter schools for high school. They account for 43.9 percent of the missing students from the charter sample. These students are undoubtedly either going to private high schools or out of district, perhaps using open enrollment. The paucity of high school slots in the independent charter schools is driving this untraceable exodus of sample students. We discuss the implications of attrition and possible future analyses in the *caveats* section below.

CAVEATS

There are three issues that affect the explanatory power of these analyses. First, the results in this report are based only on the first of four years of estimated achievement gains. Second, as in all studies of urban education there are missing data due to sample attrition—13.6 percent of panelists in both sectors were missing in Year 2. Although this number is lower than expected and lower than in a number of other studies, it does raise concerns in that both study attrition and between-sample attrition was non-random, most importantly with higher achieving baseline students as missing. This could affect accurate overall population estimates of gains, but because there were almost no baseline test differences between missing students from either sample, we believe our sample comparisons are accurate and should remain so. We nevertheless weighted for these differences accordingly, and in future analyses we could perform a number of analyses in addition to the full sample analyses done here. For example, we could eliminate from the study the paired students of missing students. Another way to control for attrition as well as crossovers would be to limit the samples to only students who are not missing and in the same sectors (i.e. non-crossovers) in all years. The latter approach was recently employed in the longitudinal study of the Milwaukee voucher program (Witte *et al.* 2010). Thus we feel confident that attrition can be handled well in future years even if the non-random nature of that attrition becomes worse. Finally, the findings about the performance of students who are non-black are limited because of the very small numbers of non-blacks in the sample. These racial groups that are enrolled in independent Milwaukee charter schools in very small numbers include whites, Hispanics, Asians, and Native Americans.

SUMMARY AND CONCLUSIONS

This report is the first of three reports about the performance of independent charter students in Milwaukee compared to a matched sample of students in the Milwaukee Public Schools. The results of one year of achievement growth are mixed. Using regression models that produce the most precise estimates of 2007 achievement, when we compare students in all independent Milwaukee charters to matched MPS students there are few significant effects of attending a charter school on achievement gains in either math or reading. The exception is in one of our three models for mathematics gains. When we control for prior achievement, and not for student characteristics or switching schools, students in charter schools gain approximately .105 standard deviations more than students in MPS. There are no differences in any models in reading. An analysis of differences within charter schools provides a more nuanced picture. Students in conversion (from private) independent charter schools perform better than their MPS counterparts in both math and reading after controlling for student characteristics and school switching. Further for mathematics, but not reading, the gains were for students with baseline scores near the bottom of the initial achievement distribution. Because students in conversion charters are only approximately 13.3 percent of all charter students in our analytic sample, these results were not enough to make the general result statistically significant.

We also analyzed school and sector switching and attrition from our study. Although considerable school switching occurred between 2006 and 2007, there was more overall switching among MPS students. That is one reason we control for that switching in estimating our models. The switching in the two samples was very different, however. In MPS almost all the switching was between MPS schools. For charter students almost all the switching was sector switching to MPS schools. We suspect this is because charter students going into middle and high schools had many fewer options in charter schools than in MPS schools.

Attrition was relatively modest at approximately 13.6 percent of the Year 1 sample, with higher numbers of missing students in charter schools. Overall attrition was not random, with better students from higher socio-economic status families more likely to be missing. There was also some non-random attrition between sectors, but not in baseline test scores which was our primary concern. The differences in student characteristics between charter and MPS matched students resulted from differences in the original 2006 samples. We adjusted for these differences with weights and control variables in our multivariate analysis.

As indicated in the Executive Summary and throughout the analysis, we caution that the results in this report are based only on the first of four years of estimated achievement gains. Subsequent reports may well alter the general findings and conclusions.

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APPENDIX

Table A-1:
Descriptive Statistics for Variables in the Achievement Model

	Conversion Charter	(%)	Non-Conversion Charter	(%)	MPS Matched	(%)
Black	434	(83.1)***	1,339	(98.4)	2,016	(98.3)
Female	266	(51.0)	659	(48.4)	1,021	(49.8)
ExEd	58	(11.1)***	103	(7.57)***	332	(16.2)
Free_Lunch	307	(58.8)***	1,214	(89.2)***	1,518	(74)
Switch School	58	(11.1)***	339	(24.9)***	986	(48.1)
School Type N	522	-	1,361	-	2,050	3,933 TOTAL

Note: The columns Conversion Charter, Non-Conversion Charter and MPS Matched contain the N for each variable in the achievement model. School Type N is not a total of these columns; rather it is the total N for each school type.

***Different from MPS Matched at p<0.01, **Different from MPS Matched at p<0.05,

*Different from MPS Matched at p<0.10, two-tailed test.

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