eJEP
eJournal of Education Policy

Charter Schools' Impact on Traditional Public School Performance: Evidence from Arkansas

Mavuto Kalulu, PhD
Policy Analyst, University of Central Arkansas
201 Donaghey Ave
Conway, AR 72035
mkalulu@uca.edu

Thomas Snyder, PhD
Associate Professor of Economics, University of Central Arkansas
201 Donaghey Ave
Conway, AR 72035
tjsnyder@uca.edu

Saliou N. Ouattara
Student, University of Central Arkansas

Fall 2017

Abstract
This study estimates the effects of open-enrollment charter schools on student performance in traditional public schools in Arkansas. The paper examines the change in Iowa Assessment scores for first and second graders across Arkansas school districts between the 2014-2015 and 2015-2016 school years. The ordinary least-squares regression estimates demonstrate a positive and statistically-significant relationship between elementary charter school enrollment and traditional public school Iowa Assessment scores across districts, controlling for relevant factors. Improvements in traditional public schools' math, reading, and language test scores were greater in school districts that had a larger percentage of students enrolling in charter schools. The most influential impact of charter schools on predicted test scores was in math, where a 1% increase in elementary charter school enrollment led to a 0.13 predicted improvement in normal-curve-equivalent test scores across Arkansas school districts.

Keywords*:* charter schools; school choice; student performance; elementary education

Introduction
If a restaurant provides a better product or service than its competitor, then the competitor restaurant has to innovate or go out of business. This is the idea of "creative destruction," coined by economist Joseph Schumpeter long ago (1943), and it is conventional wisdom among economists. The same logic applies to traditional public schools. Competition from charter schools may force traditional

public schools to innovate or shut down. Since economic reasoning suggests charter schools can improve or hurt traditional public schools, an empirical investigation is necessary to provide the answer.

Charter schools are tuition-free public schools that are given more freedom in their curriculum and organization than traditional public schools. The first U.S. charter school was opened in Minnesota in 1992, and now there are more than 6,700 charter schools with about 3 million students ("Facts about Charters," 2016). This paper's focus will be on Arkansas, where open enrollment charter schools came into existence in 2001 (The Encyclopedia of Arkansas History and Culture, 2013). Arkansas grants charters for five year. The schools are accountable to the State Board of Education, which can renew the school's contract. There are currently 24 open-enrollment charter schools as of 2016. Arkansas also has conversion charter schools, which are still under the control of school districts and are only open to those students within the school district. This study will only focus on open-enrollment charter schools since they accept students across districts and provide more competition for traditional public schools.

Critics, such as Valerie Strauss from the Washington Post (2014), say charter schools may cause harm to traditional public schools in a few ways, including draining their budget and skimming the best students. Just as a restaurant may take someone's lunch money away from its competitor, a charter school may take away government money from a traditional public school. Charter schools may also attract more teachable students and leave those with special needs to traditional public schools. Do these effects cause harm to the traditional public schools or force them to improve?

To determine whether competition from charter schools affects traditional public schools, this study will examine changes in test scores in traditional public schools in Arkansas. The paper will test whether or not pressure from competing charter schools improves or worsens student outcomes in traditional public schools, controlling for relevant factors. To put the study into context, the paper reviews the current literature on charter schools and its impact on traditional public schools.

Literature Review

Several studies have attempted to identify the effect of charter schools on traditional public schools. The results are typically positive or inconclusive. For instance, Holmes, Desimone, and Rupp (2006) examined charter schools' impact on traditional public schools in North Carolina. They found that students in traditional public schools performed better when there was a nearby charter school. This result occurred despite the observation that charter schools were taking the above-average performers. However, Bifulco and Ladd (2006) also examined the effect of charter schools on traditional public school performance in North Carolina, and their results were inconclusive.

In other places, the studies typically find positive effects of charter school competition. Winters (2012) examined charter schools' impact on traditional public schools in New York City. Using student-level data, he found that reading test

scores were higher in traditional public schools that had a higher percentage of students leave for a charter school. The lowest-performing students benefited in both math and reading when there was more competition from charter schools. Using panel data, Booker, et al. (2008) examined the effect of charter schools on student performance in traditional public schools in Texas. They found higher test scores for traditional public school students when there was a greater percentage of students leaving for charter schools. A panel data study by Linick (2016) provides some evidence that the competitive pressure of charter schools affects resource allocation in traditional public schools in Ohio. In another similar study, Cebula, Hall, and Tackett (2016) found that non-public school enrollment was associated with higher public district test scores in West Virginia.

Nationwide studies have shown either positive or inconclusive effects of school choice. Hoxby (2003) constructed an index of public school choice and found that cities with more choice had higher math and reading scores. However, Davis (2013) used a national longitudinal dataset on students and schools and found no strong relationship between charter school competition and traditional public school performance.

This study focuses on Arkansas, which is one of the most rural states in the nation (Bureau of Census, 2010). This paper will focus on the performance effect of open-enrollment charter schools on traditional public schools. To the authors' knowledge, no other paper looks this relationship in Arkansas. However, studies have looked at the effectiveness of charter schools in Arkansas. Between 2011 and 2014, Ritter, et al. (2016) found that Arkansas students enrolled in an open charter schools performed better in math benchmark exams (grades 3 through 8) than similar students who enrolled in a traditional public school. Scores in literacy had no statistical differences between charter school and traditional public school students. A parent satisfaction survey in fall 2015 by Ritter et al. (2016) found that most parents of students in open charter schools indicated many areas that were stronger in the charter school than their prior school.

The positive performance of charter schools in Arkansas may not be gratifying if they are causing harm to students in traditional public schools. Charter schools can harm traditional public schools in several ways. Since funds are supposed to follow the student to a charter school, a drop in enrollment in a traditional school district may lead to fewer resources available for school districts as federal and state per pupil allocations are redirected to charter schools. Cook (2016) finds that open-enrollment charter school competition affects traditional public schools indirectly by depressing appraised housing valuations resulting in school districts losing property tax revenues. While this study does not test resource allocation, it does look at the overall effect on student scores in traditional public schools.

Data

The authors use various sources to estimate the performance effect of charter schools on traditional public schools in Arkansas school districts over the 2014-2015 to 2015-2016 school years. This section briefly describes and justifies the variables below.

Dependent variables

The authors use the normal curve equivalent (NCE) of the Iowa Assessment scores by first and second graders across Arkansas school districts. To construct the dependent variable, the authors subtract the 2014-15 NCE district test scores from the 2015-16 scores. This study was restricted to these two years because data for the main variable of interest, a district's charter school enrollment, was only available for 2014-15 and 2015-16. Over this period, Arkansas has changed its public school exams from PARCC to ACT Aspire. However, students in grades one and two continued to take the same exam (Iowa Assessments) both years. Hence, this paper restricts the analysis only to elementary schools that have first and second graders. The following describes the dependent variables:

- **Composite:** the change in the district's normal curve equivalent (NCE) composite test scores between the 2014-2015 and 2015-2016 school years. The normal curve equivalent is a measure of where a student falls along the normal curve. It ranges from 0 to 100.
- **Language:** the change in language NCE test scores between 2014-2015 and 2015-2016 school years.
- **Math:** the change in math NCE test scores between 2014-2015 and 2015-2016 school years.
- **Reading:** the change in reading NCE test scores between 2014-2015 and 2015-2016 school years.

The authors collected all NCE level data from the Office for Education Policy,[1] and calculated the changes in order to create variables that reflect the effect of charter schools drawing students from public schools.

Independent Variables

- **Elementary Charter Enrollment**: the percentage of public elementary students in a district that enrolled in a charter school. The higher the percentage, the higher the competition. The charter enrollment was restricted to elementary schools because the dependent variable is restricted to elementary students.
- **Private**: a dummy variable to account for competition elementary public schools face from elementary private schools. "1" means there is at least 1 private school in the district and 0 means otherwise. Including private school competition as a control variable helps isolate the effect of charter school enrollment on test scores. The authors obtained data for private schools from the Arkansas Department of Education (ADE) data center.[2]

School inputs

- **Per Pupil Expenditure:** the natural log of per pupil expenditures. Net current expenditures were divided by the average daily attendance. If per-pupil expenditure differed in districts that lost students to charter schools,

[1] http://www.officeforeducationpolicy.org/arkansas-schools-data-norm-referenced/

[2] https://adedata.arkansas.gov/statewide/Schools/PrivateSchools.aspx

then excluding it as a control could bias the results. Data obtained from the ADE data center.

- **Pupil-Teacher Ratio:** the number of students per teacher. If the pupil-teacher ratio caused student to enroll in charter schools and affected student performance, then it is necessary to use to as a control variable to isolate the relationship between charter school enrollment and student peformance. Data obtained from the National Center for Education Statistics.
- **Salary:** the natural log of the average teacher salary. If teacher salary affected enrollment in charter schools and student performance, then excluding it as a control could bias the results. Data obtained from the ADE data center.

Socio-economic variables

- **Poverty Index:** a poverty indicator that provides information about the level of poverty in a school by giving greater weight to students in greater need. One would expect poor districts to perform worse than rich districts. The index is calculated by the Office for Education Policy. Poverty index = ((# of students on free lunch *2) + # of students on reduced price lunch)/total enrollment. The dataset multiplies the index by 100. If poverty is driving students to charter schools and affecting student performance, then excluding it as a control could affect the coefficient on charter enrollment.

Demographics

- **White:** the percentage of white students enrolled in elementary schools in a school district. If demographics explain both charter school enrollment and student performance, then we need to control for it to isolate the effect of charter enrollment on student performance. Data obtained from the ADE data center.

Descriptive Statistics

Table 1 (Appendix A) provides descriptive statistics of the variables. The outcome measure in this study is the change in the Iowa Assessment scores for traditional elementary public schools. Ideally, this paper would have examined the impact of charter schools at all grade levels. However, the authors were constrained by the lack of continuity in the assessment exams for all the other grades except for first and second grades.[3] Apart from the composite NCE, the authors also examined the effect on each of the individual components of the composite score: language, math, and reading. Between the 2014-15 and 2015-16 school years, school districts improved their performance by an average of 0.05 points, with the change ranging from -9.21 to 9.60. The improvement in the overall score seems to be driven by the improvement in math rather than language and reading, which both show a drop in performance on average.

[3]The Partnership for Assessment of Readiness for College and Careers (PARCC) assessments replaced the Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP). In the 2015-16 school year, Arkansas changed the assessments from PARCC to ACT Aspire.

The main independent variable of interest is charter school enrollment. Charter schools provide potential competition for traditional public schools. The authors opted to use a more direct measure of competitive pressure rather than the number of charter schools within a certain specified geographical area because the presence of a charter school does not necessarily mean that the school district is pressured by it. Similar to Winters (2012), this paper measures competitive pressure by the percentage of a traditional school district's students that leave to enroll at charter schools. A district that loses a higher percentage of its students to charter schools faces more competitive pressure than a district that loses fewer students. To control for the existence of other forms of competition, this study includes a dummy variable *private.* Thirty-one percent of the school districts have private schools within their boundaries.

Analysis

This study examines the change in test scores for first and second graders (Iowa Assessments) in traditional public schools between school years 2014-2015 and 2015-2016. Table 2 (Appendix B) displays four ordinary least-squares (OLS) regressions with robust standard errors. The explanatory variable of interest in each model is the elementary charter enrollment, which is measured as the number of students in the district that attended an elementary open-enrollment charter school as a percentage of the total enrollment of elementary school students in the district. The null hypothesis is that competition from charter schools does not affect the student performance in public schools. The alternative hypothesis is that charter school enrollment affect the performance of students in traditional public schools. Control variables include the 2014-2015 Iowa Assessment score, per pupil expenditure (logged), teacher salary (logged), poverty index, pupil-teacher ratio, percentage of white students, and private school enrollment in each district.

Model 1 in Table 2 (Appendix B) examines the determinants of the change in the composite Iowa Assessment scores (0-100 scale) across Arkansas school districts. For every 1% increase in elementary charter school enrollment across school districts, the predicted composite Iowa test scores increases by 0.11 points. The coefficient is statistically significant at the 1% level. The coefficients on the poverty index and white population are statistically significant with the predicted signs. The coefficients on the other control variables are not statistically different from zero.

Model 2 (Appendix B) examines the determinants of the change in the math Iowa Assessment scores across Arkansas school districts. For every 1% increase in elementary charter school enrollment across school districts, the predicted math test scores increase by 0.13 points. The coefficient is statistically significant at the 1% level. As in model 1, the coefficients on the poverty index and white population are statistically significant with the predicted signs. The coefficients on the other control variables are not statistically different from zero.

Model 3 (Appendix B) examines the determinants of the change in the reading Iowa Assessment scores across Arkansas school districts. For every 1% increase in elementary charter school enrollment across districts, the predicted reading scores increase by 0.07 points. The coefficient is statistically significant at the 5% level.

Similar to models 1 and 2, the poverty index and the white population have coefficients significantly different from zero. However, unlike those models, the coefficient on the 2014-2015 reading score is negative and statistically significant at the 1% level. Districts with higher Iowa Assessment scores in 2014-2015 have lower growth in their reading scores.

Model 4 (Appendix B) examines the determinants of the change in the language Iowa test scores across Arkansas school districts. For every 1% increase in elementary charter school enrollment across districts, the predicted language scores increase by 0.08 points. The coefficient is statistically significant at the 10% level. The 2014-2015 language score is negatively related to the growth in language scores across districts. The coefficients on the poverty index and white population have the predicted sign and statistical significance. Each of the models in table 2 gives support to the idea that competition from charter schools improve public school performance. The strongest support effect is in mathematics.

In Table 3 (Appendix C), the authors run several regressions to test the sensitivity of their results. The regressions use the change in the Arkansas school district composite Iowa Assessments as the dependent variable. The statistical significance and magnitude of the coefficient on Elementary Charter Enrollment remains stable across the regressions. An increase in charter school enrollment of 1 percent results in an increase in test scores of approximately 0.10 points across Arkansas school districts. The coefficient on the White demographic variable also remains statistically significant and positive across the different regressions. The coefficient on Per Pupil Expenditure is not significantly different from zero in any regression on any model. Poverty does have a negative effect on test scores.

Conclusion

The number of open-enrollment charters schools in Arkansas is growing, and the performance of the charter schools have been positive. However, critics of charter schools typically say that the emergence of charter schools will harm traditional public schools. The charter schools may skim the best students and may leave those with special needs to traditional public schools. If so, the authors would expect to see charter school enrollment negatively affect the average student performance in traditional public schools. The evidence suggests the opposite. The study finds a significant positive change in test scores with charter school options. One may argue that the Arkansas charter schools cause racial stratification, leaving a better-performing homogenous group in traditional public schools. However, evidence from Ritter, et al. (2016) show that the students enrolled in charter schools perform better than those who do not go to the charter schools. One may say that these results suffer from a problem of endogeneity. It is possible that charter schools open where traditional schools are doing well. However, that is not the case. The study controls for the previous scores. As in the private market place, businesses must improve when there is more competition. Traditional public schools and charter schools may face the same pressure to improve when there is competition.

A limitation of this study is that it includes only two years of data to draw conclusions. Also, many Arkansas school districts have a very small (less than 1 percent) of their students attending charter schools. However, given the data presented, there is no evidence of harm to traditional public schools. The evidence also does not suggest that spending per pupil and teacher salary affects test scores. Researchers can expand on this topic with more data availability, but the current evidence should not persuade Arkansas public officials to limit charter schools.

References

Bifulco, R., & Ladd, H.F. (2006). The impacts of charter schools on student achievement: evidence from North Carolina. *Education, Finance, and Policy,* 1(1), 50-90. Retrieved from http://www.mitpressjournals.org/doi/pdf/10.1162/edfp.2006.1.1.50

Booker, K., Gilpatric, S.M, Gronbert, T., & Jansen, D. (2008). The effect of charter schools on traditional public school students in Texas: are children who stay behind left behind? *Journal of Urban Economics,* 64(1), 123-145. Retrieved from http://www.sciencedirect.com/science/article/pii/S0094119007001210

Cebula, R.J., Hall, J.C., & Tackett, M.Y. (2017). Non-public competition and public school performance: evidence from West Virginia. *Applied Economics,* 49(12), 1185-1193. doi: 10.1080/00036846.2016.1213364.

Cook, J. (2016). The effect of charter competition on unionized district revenues and resource allocation. *Working Paper No. 229.* National Center for the Study of Privatization in Education.

Davis, T.M. (2013). Charter school competition, organization, and achievement in traditional public schools. *Education Policy Analysis Archives,* 21(88), 1-33. Retrieved from http://www.redalyc.org/pdf/2750/275029728087.pdf

Encyclopedia of Arkansas History and Culture. (2013). Charter Schools. Retrieved from http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?entryID=4475

Facts about Charters. (2016). Retrieved from http://www.publiccharters.org/get-the-facts/public-charter-schools/faqs/

Holmes, G.M., Desimone, J. & N.G., Rupp (2006). Friendly competition: does the presence of charter schools spur public schools to improve? *Education Next,* 6(1), 67-70. Retrieved from http://educationnext.org/files/ednext20061_67.pdf

Hoxby, C.M. (2003). School choice and productivity. Could school choice be a tide that lifts all boats? In Hoxby, C.M. *The Economics of School Choice.* National Bureau of Economic Research, University of Chicago Press.

Retrieved from http://www.nber.org/chapters/c10091.pdf

Linick, M.A. (2016). Examining charter school policy and public school district resource allocation in Ohio. *Education Policy Analysis Archives,* 24(19), 1-31. Retrieved from http://epaa.asu.edu/ojs/article/view/2178/1728

Ritter, G.W., Wolf, P.J., Anderson, K., Foreman L., Rhinesmith, Swanson, E. (2016). *Arkansas Charter School Program Evaluation: School Years 2011-12 through 2013-14*. Office for Education Policy, University of Arkansas. Retrieved from http://www.arkansased.gov/public/userfiles/Learning_Services/Charter_Schools/AR_Charter_Schools_Evaluation_FINAL_REPORT_2011-14.pdf

Schumpeter, J. (1943). *Capitalism, Socialism, and Democracy.* London and New York: Routledge.

Strauss, V. (2014). A dozen problems with charter schools. *Washington Post,* May 20. Retrieved from https://www.washingtonpost.com/news/answer-sheet/wp/2014/05/20/a-dozen-problems-with-charter-schools/

U.S. Census Bureau. (2010). 2010 Census urban and rural classification and urban area criteria. Retrieved from https://www.census.gov/geo/reference/ua/urban-rural-2010.html

Winters, M. (2012). Measuring the effect of charter schools on public school student achievement in an urban environment: evidence from New York City. *Economics of Education Review,* 31(2), 293-301. Retrieved from http://www.sciencedirect.com/science/article/pii/S0272775711001476

Appendix A

Table 1: Descriptive Statistics

VARIABLES	Mean	Std. Dev	Min	Max
District performance measure				
Change in composite NCE	0.0506	3.092	-9.210	9.600
Change in language NCE	-0.396	3.607	-10.73	9.520
Change in math NCE	2.257	3.831	-8.980	14.120
Change in reading NCE	-0.187	2.811	-8.910	9.430
Competitive pressure				
Charter School Enrollment	0.606	3.360	0.000	44.120
Private	0.317	0.466	0.000	1.000
District initial performance				
Initial composite NCE	51.680	5.0280	37.060	66.070
Initial language NCE	51.500	5.728	33.580	65.520
Initial math NCE	50.840	6.325	34.320	67.800
Initial reading NCE	51.340	5.412	35.380	64.640
Average classroom salary	44,280	4,669	32,611	59,732
Log of classroom salary	10.690	0.103	10.390	11.000
Per pupil expenditure	3,591	366.1	2,852	5,744
Log of per pupil expenditure	8.181	0.0963	7.956	8.656
Economic status measure				
Poverty index	118.8	27.160	0	191
Pupil-teacher ratio	13	1.698	7.640	17.250
Elementary school enrollment	2,019	3,108	335	23,363
% white students	74.030	25.030	2.000	98.000
N=227				

Appendix B

Table 2: 2014-2015 to 2015-2016 Arkansas District Change in Iowa Test Scores				
Variable	Composite	Math	Reading	Language
	(1)	(2)	(3)	(4)
2014 Score	-0.0901	-0.1030	-0.1951***	-0.1416**
	0.0575	*0.0644*	*0.0530*	*0.0589*
Elementary Charter Enrollment (%)	0.1070***	0.1269***	0.0745**	0.0838*
	0.0323	*0.0357*	*0.0361*	*0.0432*
Per Pupil Expenditure (logged)	-0.9894	-0.7766	-1.3619	-1.7364
	3.2449	*3.7767*	*3.0664*	*3.7639*
Salary (logged)	0.5846	-0.3924	0.3066	3.1693
	3.3885	*4.1966*	*3.6933*	*3.9382*
Poverty Index	-0.0232**	-0.0346***	-0.0224**	-0.0218**
	0.0092	*0.0110*	*0.0109*	*0.0107*
Pupil-Teacher Ratio	*0.1455*	*0.1580*	*0.1015*	*0.0556*
	0.2227	*0.2540*	*0.2154*	*0.2685*
White	0.0333***	0.0289*	0.0259**	0.0290**
	0.0129	*0.0169*	*0.0110*	*0.0138*
Private	-0.3165	-0.3873	-0.3391	-0.7636
	0.4565	*0.5593*	*0.4829*	*0.5222*
Constant	4.9531	18.0832	17.2468	-13.0425
	27.1329	*33.8355*	*29.4870*	*32.8741*
N	227	227	227	227
F	4.3200	3.4600	3.3300	3.6600
R-Squared	0.1296	0.1058	0.1260	0.0924

*Notes: OLS estimates reported above. The dependent variable is the change in Iowa Assessment scores of 1st and 2nd graders for the 2014-15 and 2015-16 school years in Arkansas school districts. Robust standard errors are in italics. *10% significance level, **5% significance level, and ***1% significance level.*

Appendix C

Table 3: 2014-2015 to 2015-2016 Arkansas District Change in Iowa Test Scores						
Variable	Composite (1)	Composite (2)	Composite (3)	Composite (4)	Composite (5)	Composite (6)
2014 Score			-0.0594	-0.0624	-0.0920	-0.0901
			0.02	*0.0541*	*0.0572*	*0.0575*
Elementary Charter Enrollment (%)	0.1046***	0.1009***	0.0999***	0.0991***	0.1165***	0.1140***
	0.0397	*0.0377*	*0.0365*	*0.0349*	*0.0332*	*0.0353*
Per Pupil Expenditure (logged)				-0.5984	-1.1223	-0.9809
				3.36	*3.28*	*3.24*
Salary (logged)				1.4256	0.3185	0.5532
				3.3300	*3.3700*	*3.3900*
Poverty Index					-0.0231**	-0.0232**
					0.0092	*0.0092*
Pupil-Teacher Ratio		*0.2775***	*0.2982***	*0.2309*	*0.1275*	*0.1469*
		0.117	*0.119*	*0.227*	*0.225*	*0.222*
White	0.0367***	0.6306***	0.0434***	0.0443***	0.0351***	0.0334***
	0.0093	*0.0088*	*0.0105*	*0.0118*	*0.0121*	*0.0129*
Private School Enrollment						-0.3189
						0.4560
Constant	-2.7300***	-6.2567***	-4.0546	-13.4392	8.9610	5.1931
	0.736	*1.8*	*2.52*	*26.1*	*27.1*	*27.1*
N	227	227	227	227	227	227
F	8.3008	7.2230	5.8573	4.1930	4.5113	4.3019
Adjusted R-Squared	0.0695	0.0884	0.0914	0.0840	0.1000	0.0977

*Notes: OLS estimates reported above. The dependent variable is the change in composite Iowa Assessment scores of 1st and 2nd graders for the 2014-15 and 2015-16 school years in Arkansas school districts. Robust standard errors are in italics. *10% significance level, **5% significance level, and ***1% significance level.*