# WHY DO CHARTER SCHOOLS FAIL? AN ANALYSIS OF CHARTER SCHOOL SURVIVAL IN NEW JERSEY

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*Charter school competition can only work as a policy to improve public education if schools that do not contribute to this goal are allowed to fail. We estimate survival regressions to assess the effects of various factors on the probability of school failure. We find that students' test scores are the most important determinant of survival: a one standard deviation increase reduces the probability of failure by 76%. Higher expenditures per student and a longer wait list result in smaller, but significant, reductions. Enrollment, average performance in the host district, and student demographics do not significantly affect school survival.* (JEL I21, H75)

## I. INTRODUCTION

The public education systems are failing a large segment of the population. Official data on test scores show that poor and minority students are persistently performing below grade level. Some people have argued that the best way to reform the education system is to create competition for traditional public schools (TPS) by distributing private school vouchers and by allowing charter schools to operate alongside TPS. Charter schools are the most widely available choice schools because they are public schools,[1] although they are not operated by the local school district. The number of charter schools has increased substantially in the last decade.[2] Now 41 states issue charters to schools that specify the philosophy, goals, and methods for achieving their mission and exempt these schools from some regulations that govern other public schools. State-governing agencies periodically review charter schools and may rescind the charter if a school does not attract enough students, does not meet its specified goals, or is mismanaged. Hence, like firms in a competitive market, charter schools can fail because of fiscal mismanagement or because of the inability to satisfy customer demands for quality education that includes enhancing students' cognitive and noncognitive skills or for a safe or, in other ways, superior learning environment. But only failures driven primarily by the schools' inability to improve skills will spur the desired improvement in TPS. Not only will these underperforming charter schools be removed but, perhaps more importantly, the threat of failure and the loss of the charter will incentivize teachers and administrators to provide an effective and efficient education in order to meet the expectations and goals of parents and students. Thus, the question of why schools fail is important for the assessment of the likely success of charter school competition to improve TPS education.[3]

There have been numerous studies that analyze whether charter schools are in fact improving educational outcomes. For many years researchers have investigated if charter schools

*We wish to thank the co-editor and referees for their detailed comments that substantially improved our paper.

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1. Sutton and King (2011) discuss the legal issues associated with vouchers to private schools.

2. The Center for Education Reform (2011) reports the number of charter schools increased from 1,651 in 2001 to 5,761 serving 1.9 million students in 2012.

3. Loeb, Valant, and Kasman (2011) discuss effects of competition and analyze Milwaukee public schools.

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**ABBREVIATIONS**

CPS: Chicago Public Schools
CREDO: Center for Research on Education Outcomes
NJ: New Jersey
NJ DOE: New Jersey Department of Education
SRC: School Report Card
TPS: Traditional Public Schools

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enhance students' cognitive skills, usually by comparing charter school students' standardized test scores with scores of TPS students after controlling for socioeconomic factors.[4] Some recent studies conclude that charter school students have higher graduation rates (Booker et al. 2011) and score higher on standardized tests than TPS students (Booker et al. 2007), whereas others conclude charter school students do not score higher on tests (Hanushek et al. 2007). Recent studies of high-performing charter schools use data on oversubscribed schools and find test score gains for those students randomly selected from the applicant pool to attend the charter compared to those students who were lottery losers (Abdulkadiroğlu et al. 2011; Angrist, Pathak, and Walters 2013). In addition, Dobbie and Fryer (2013) find that students who attended a high-performing charter school in Harlem are more likely to enroll in college, less likely to become pregnant (girls) or incarcerated (boys), and they score higher on cognitive tests. Studies investigating the effects of charter schools on the scores of students who remain in TPS also show mixed results (Sass 2006). Welsch (2011) concludes that competition from charter schools causes increases in resources to teaching personnel in TPS. Imberman (2011) finds that charter school students improve in noncognitive skills, measured by school attendance, compared to students at TPS. Other researchers estimate production functions to ascertain whether charter schools make efficient use of their resources and conclude that charters do not use resources efficiently but are more efficient than traditional schools (Gronberg, Jansen, and Taylor 2012).

A study particularly relevant to our work was released in October 2012 by the Center for Research on Education Outcomes (CREDO). Researchers analyze annual state-mandated standardized test scores of students attending New Jersey (NJ) elementary and middle grade charter schools and TPS for the academic years 2006–2007 to 2010–2011.[5] Their analysis of individual student records indicates that NJ charters' students made larger average annual gains than similar TPS students in both reading

and math. Their analysis of charter school average scores indicates that, in math, 40% of charter schools have significantly larger student gains than TPS and 13% have significantly lower gains than TPS. In reading, 30% of NJ charter schools had statistically significant gains exceeding those of TPS and 11% had significantly smaller gains. The researchers conclude that the results for NJ charter schools are "notably more positive" than the 16 states analyzed previously, as detailed in their 2009 report. Unlike most other charter schools studies,[6] the CREDO researchers do not implicitly assume all charter schools are the same, but they do not analyze the differences between "good" and "bad" charter schools and whether these schools survive or fail.

We look at the characteristics of individual charter schools to determine causes of failure using data of NJ charter schools. NJ has some of the top performing charter schools in the country, whereas NJ charters fail at almost twice the national failure rate.[7] We estimate a survival model that specifies the instantaneous probability of failure (the hazard rate) as a function of students' test scores (cognitive skills), and measures of noncognitive skills and financial mismanagement. We also account for the effects of per student expenditures, student demographics, competition from other charters and TPS, the length of the student wait list, as well as district and school size. We find strong evidence that failure is caused predominantly by low student test scores. Our results are robust across different specifications. Our results also indicate that higher expenditures and more students on the wait list generally increase the probability of survival.

## II. CHARTER SCHOOLS IN NJ

NJ is a high income, high population density state that has many private and public schools located in small geographical areas. As a result, NJ residents can choose between several private and public schools by relocating without changing their employment location, which is one reason NJ was ranked second in a 2001 Index of Educational Freedom among states (Green 2002;

4. "Virtually all the articles in this special issue highlight that the existing literature is inconclusive about the aggregate effect charter schools have on student achievement," write Toma and Zimmer (2012) in their introductory article in the special charter school volume of *Economics of Education Review*.

5. They calculate changes in test scores from the previous year. As NJ tests grades 3–8 and 11, they cannot analyze high schools.

6. Zimmer et al. (2012) present a tabular summary of some aspects of charter school differences by states and other geographical location but they do not analyze differences in charter schools within a location.

7. The Center for Education Reform reports that 15% of charter schools fail. 27% of NJ charters have failed since 1996.

ranked 7 in Coulson 2006). Further, residents of the many school districts, especially urban districts, can choose among three types of public schools: TPS, magnet schools, and charter schools. The magnet schools are selective, requiring high scores on standardized tests for admission. As a result, magnet schools drawing students from urban areas are among the top ranked public schools in NJ and three are ranked in the top 50 high schools in a national ranking of public high schools.[8] Charter schools, by law, cannot use a test-based selection method. That is, charter schools cannot select the most academically talented students, like the magnet schools. So students of charter schools are expected to mirror the academic ability of students who attend the TPS, although their motivation, and that of their parents, may be higher.

In 1996, NJ became the 19th state to allow the formation of charter schools. The charter school legislation authorizes the Department of Education to issue 4-year, renewable charters to the board of the charter school with the consent of the host school district, which does not oversee the charter schools. All NJ charter schools are startups; they do not replace existing public schools.[9] NJ, like other states, issues charters to schools with varied philosophies and methods and with different educational services: some provide an 11-month school year, others operate an 8 a.m. to 5 p.m. school day and others conduct Saturday classes. Every charter school is open to any student in the state, although nearly all students reside in the host school districts because these students receive preference. If the number of applications exceeds the number of openings, enrolled students are chosen by a lottery and the unsuccessful lottery participants are put on a waiting list. In 2012, 96% of NJ charter schools report a waiting list whereas, nationally, about 65% of the schools have a waiting list.

The New Jersey Department of Education (NJ DOE) has an annual multistage approval and review process. Applications are due to the DOE by March 31 and approvals/denials are given by September 30. An expedited schedule is available for experienced charter school operators (applications are due in October with an approval by February). Approved schools must pass the School Preparedness review that allows the DOE

to assess organizational leadership and capacity by June 30 of the following year and the final charter granting decision is made by July 15. The school can then elect to open in September or take an additional planning year.[10] There were 86 charter schools operating and serving over 30,000 students in NJ during 2012–2013 school year. Overall 51 approved charter schools have been closed since 1996.[11] But not all of the closed schools became operational: 5 were denied their final charters and 16 charters were surrendered before the school opened, usually because of roadblocks put up by the local district, to site location problems or to funding problems. Charter School Laws Across the States (2012) details the problems that one applicant experienced in 2010 and reports: "This is not an uncommon story in the Garden State. Many charters are approved but never open because of district opposition and the state, as authorizer, does not step in to advocate for its schools as strong authorizers do" (p. 55).

Approved schools are given a 4-year charter that must be renewed every 5 years. The renewal process requires a detailed application, on-site visits, interviews with board members, administrators, teachers, parents and students, which "will augment the evaluation of student performance on the statewide assessment program, annual reports, monitoring visit results, and financial reports and contribute to making a decision about the renewal of the charter."[12] Charter schools that are not performing up to the standards set by the state department of education are not renewed. If a school is especially poor performing or indicates gross mismanagement, a charter may be revoked before the renewal data. Some charters are surrendered by the charter school board because of various problems with the operations of the school. Probably this decision takes the likelihood of renewal by the DOE into account. From 1996 to 2013, 111 new schools have become operational. Of those failed schools that became operational, 10 charters were not renewed, 14 charters were revoked, and 6 charters were surrendered.

The state provides parents and others with the detailed and comparative data to make informed school choices. Since 1996 the NJ DOE has issued an annual NJ school report card (SRC)

8. http://www.usnews.com/education/best-high-schools/national-rankings.

9. Recent changes will allow NJ private schools to convert to public charter schools but our sample contains only startups.

10. http://www.state.nj.us/education/chartsch/app/.

11. http://www.state.nj.us/education/chartsch/accountability/closure.htm.

12. http://www.state.nj.us/education/chartsch/accountability/renewal.htm.

for all NJ public schools (both charter and traditional), which details school and district level data. The report card data are sent to parents, summarized in local newspapers, and reported on the websites of major newspapers and of the Department of Education. The report cards provide parents with the information they need to make informed decisions: test scores, characteristics of the schools' students, the schools' resources and learning environment, school finances, and teacher/staff information.[13] Most of the variables are reported at the school level for 3 academic years. The report cards also include comparable, averaged data for other public schools in the home district, in similar socioeconomic school districts throughout the state and, for charter schools, provides 3 years of wait list and enrollment data, which provides information to evaluate the likelihood of a successful charter school application.

## III. THE SURVIVAL MODEL

NJ charter schools "die" when a school voluntarily surrenders their contract or when the NJ DOE revokes or fails to renew the school's charter. To analyze determinants of charter school survival, we estimate a hazard function specified as follows:

$$h\left(t|x\right) = h_0\left(t\right)\exp\left(\beta_1 x_1 + \ldots + \beta_k x_k\right).$$

The hazard rate $h(t)$ is the instantaneous probability of failure conditional on survival until time $t$, and $x_k$ are the determinants of survival. The baseline hazard, $h_0(t)$, is the hazard rate with all covariates set to zero. The baseline hazard can be left unspecified, which would yield the Cox survival model, or can be parameterized using a specific distribution. We found that a Weibull specification provided the best fit for the data.[14] In the Weibull case the baseline hazard depends on time as follows:

$$h_0\left(t\right) = p \cdot t^{p-1},$$

where $p$ is a parameter that is jointly estimated with the coefficients. To facilitate interpretation of the estimation results, it is customary to present

the exponents of the coefficient estimates, which are equal to the hazard ratios for a unit change in the covariate. A ratio above unity indicates a higher probability of failure and therefore a shorter survival time. In addition to parameter estimates of the survival model, we will also present unconditional and conditional estimates of the survivor function. The survivor function gives the probability of surviving just beyond time $t$, and it is defined as follows:

$$S\left(t|x\right) = \exp\left(-H\left(t|x\right)\right),$$

where $H(t)$ is the cumulative hazard, that is, the total number of expected failures until time $t$, or the integral of $h(t)$.

Even though charter schools are not-for-profit enterprises, their entrance and exit from the education market is similar to a new firm's performance in a competitive industry.[15] Demand for charter schools not only depends on charter school quality but also on school competition in the school district. We assume that the quality of a charter school's product is primarily determined by its students' cognitive and noncognitive performance. Parents directly observe a measure of product quality in the form of student test scores that are reported by the NJ DOE. Unfortunately, we do not observe good measures of noncognitive skills, but we use attendance rates as a proxy (Imberman 2011).

A direct measure of parental demand for a charter school's product is the school's wait list. This variable also captures unobserved quality attributes that are not measured by test scores, such as safety, transportation costs, daily and annual extended hours of operation.

A charter school's finances are also an important determinant of survival. Financial mismanagement is an often cited reason for school closure.[16] But the effects of higher spending are not obvious, because higher expenditures per student may improve the final product, the child's education, which in turn determines parental demand for the school. Therefore we would expect classroom expenditures to increase

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13. Hastings and Weinstein (2008) show that access to information about test scores is very important for parents' decisions on school choice.

14. Estimates using the Cox proportional hazard model, and a log-normal, or log-log specification for the hazard rate are very similar. We selected the Weibull specification using the Akaike information criterion score, as well as Cox-Snell residuals to check the fit.

15. Firm survival is, for example, affected by establishment size, the life-cycle stage, and the type of the firm's industry. Small firms generally face survival disadvantages. Industry characteristics determine the level of competition and of innovation (Audretsch and Mahmood, 1995).

16. The Center for Education Reform (2011) attributes 42% of failures to financial reasons, including low student enrollment, and 24% due to mismanagement, including fraud. Barr's (2007) analysis of press releases details that mismanagement is cited for most failures of NJ charter schools from 1999 to 2004.

survival, whereas high administrative expenditures might signal mismanagement and reduce the probability of success. To take these different effects into account we decompose total expenditure into several categories.

Survival may depend on how well charter schools compete with other schools, primarily those in the host school district(s). We include measures of competitiveness constructed with average test score of other schools in the host district. Similarly, we include the number of students in the home district TPS; more students increase the pool of potential charter school students and, we expect, the likelihood of success. The effect of school size is not clear a priori. Large charter schools may have an increased likelihood of survival because often schools start with one grade and then scale up their operations as the initial student population matures and new students get admitted, which may enable the school to learn how to best educate their students. Furthermore, there might be economies of scale that reduces the school's overhead and, perhaps, a reluctance to close a large school. However, a smaller scale might allow a stronger focus on the student population. Finally, we also consider that schools with higher percentages of poor or minority students might be less likely to survive as they might face more challenges. The next section details our data and the variables we use in the estimation.

## IV. DATA

Our primary data set consists of more than 700 school year observations over a 14-year period (2000–2013) for 111 charter schools, which operated between 1 and 16 years.[17] The number of observations per charter school differs for several reasons. New schools were started during each year in our sample and schools were closed in ten of our sample period years. Also, tests were not administered in every school during each year of operation because most startup schools chose to expand by adding grades as the first students progressed to higher grade levels. Because the state initially started testing in the 4th grade, schools that started with 1st grade students and added a grade every year would not have test score data for the first 3 years of operation. We have all data on closed schools for their last year of operations (their age at death), with the

exception of one school that closed at age 3[18] and those schools that shut down during their first year of operation. As discussed in the next section, we estimate our survival regressions conditional on surviving the first year.

The scores on the state-mandated tests of all public school students measure the school students' cognitive skills. The source for our test data is NJ's annual assessment report. Starting in 1996, the state of NJ tested all 4th grade, 8th grade, and 11th grade public school students in math, language and, sometimes, in science. Starting in 2004, tests have been phased in for grades 3, 5, 6, and 7. The High School Proficiency Test[19] is given initially in October to 11th graders throughout the sample period. We standardized the school mean scores using the state school mean and standard deviation; therefore, our data measure standard deviations from the state mean. For each charter school, the annual effectiveness measure (TESTS) is the average of the standardized results of all tests given at the school for the given year.[20]

Noncognitive skills include completing assignments on time and satisfactorily, punctuality, and behavior that is respectful of others. We recognize that the school data do not include a variable that provides information on the degree that schools improve these skills. So, we measure this type of skill with attendance rates (ATTEND) at the schools because this measure depends on the actions of the students.[21] We considered using the schools' suspension rate but it depends on student behavior and the degree that administrators punish disruptive behavior.[22]

We include the number of students on the waiting list (WAIT) in September, before the

18.  This school never reported test scores and was closed due to "deficiencies related to its fiscal operations, governance and compliance with education laws and regulations" according to NJ DOE.

19.  Students cannot graduate with a standard diploma without scoring proficient in this test, which may be taken several times.

20.  A school with students in grades 1–8 would administer math and verbal tests to students in grades 3, 4, 5, 6, 7, and 8, a total of 12 tests that would comprise the set used to calculate the school average test score.

21.  One school attributes its relatively low attendance rate of 91% due to lower attendance to the once a month Saturday school session and the students' family and other weekend commitments. So attendance does, in this case, depend somewhat on school administration policies.

22.  The percent of students suspended varied frequently year to year within schools and is not easily interpreted. Are higher suspension rates an indication of poorly behaved students or administrators attempting to increase noncognitive skill enhancement? Suspension rates were not statistically significant in unreported model estimates.

start of the school year. This variable measures parental demand for the charter school. The number of students on the wait lists is primarily determined by schools' test scores and academic quality (VanderHoff 2008). But we expect WAIT contains information that is not observable or measurable by us, including transportation costs, safety, compatibility of school hours with parents' schedule, and parents' perception of future benefits in way of postgraduate education and opportunities. Only ten of our charter schools are high school and we will present graduation and post-secondary statistics for these schools below.

Mismanagement includes some financial problems and inappropriate action of administrators toward students and staff. Lacking any measure of the later mismanagement,[23] we suggest mismanagement may be manifest as high administrative costs relative to classroom-related costs. We include expenditures per pupil in several categories provided by the NJ Comparable Spending guide: classroom expenditures (EXPENCLRM), administration expenditures (EXPENADM), maintenance expenditures (EXPENMAIN), and support expenditures (EXPENSUP).[24] Because we estimate that support expenditures affect charter school survival differently than the other expenditures, we also use the sum of the other three categories (EXPENSUM). The units of these measures are in $100 per student.

Charter school students are more likely to be a member of a minority ethnic group or from a low income family than TPS students because they tend to be in urban districts that have a larger minority and poor population than the state on average. We use two student demographics variables: the percent of students identified as Black or Hispanic (MINORITY) and the percent of students who qualify for free or subsidized lunch (POOR). Scale may be important, so we

include enrollment (ENROLL) to control for size effects. We also count the total number of students enrolled in either charter schools or TPS in the host districts as a measure of district size (ENROLLTOTAL). The units for these variables are in tens of students.

We measure competition within the host district with three variables. We control for the average TPS test score in the host district (TESTHD), and we include the number of charter schools in the district (CHARTERS). For charter schools with multiple host districts these measures are across these districts. Alternatively, we include the number of charter schools with test scores above the charter school average (CHARTERS+).

Our data primarily derive from the NJ report card and the NJ DOE-issued annual reports on test scores, enrollment statistics, and budget numbers but other data sources provide missing values. The primary reason for missing data is that the state stopped reporting statistics on charter schools that failed. For example, the 2011 report card describes data for the 2010–2011 academic year and was released during the spring of 2012. However, three charter schools were closed after the 2010–2011 school year and were dropped from the 2011 report card, so data were not reported for the "death" year for these schools. Also, sometimes values were left out of the report card, perhaps because the charter schools missed the reporting deadline. We were able to replace missing values for enrollment and race with data from the Common Core of Data from the National Center for Education Statistics and WAIT data from the 2012 annual reports submitted to the NJ DOE.[25]

Table 1 reports means and the number of observations for the schools that are open and those that closed sometime during the sample period. Also, the difference in means is reported along with the standard error of the difference. A total of 30 of a 111 schools have failed and this 27% failure rate is substantially higher than the national rate of 15%.

Closed schools report tests scores 1.18 standard deviations lower than schools that did not close. In addition, home district scores are lower in those districts that have failed schools, but closed schools also report test scores lower than their home district average, whereas open schools

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23. We considered faculty turnover but high turnover could be a measure of good management if excellent teachers were hired but left to take other jobs because charter school teachers on average earn 15% lower salaries. Also, charters are startups and hire many new teachers so would naturally have higher teacher turnover.

24. Support expenditures (indicator 6 in department data) are defined by the NJ DOE as: "… expenditures considered to be student support services under the National Center for Education Statistics definition— services supplemental to the teaching process that are designed to assess and improve students' well-being … the costs associated with physical and mental health services … expenditures of the guidance office … as well as the costs of the child study team members … the travel of these staff … " http://www.state.nj.us/education/guide/2013/intro.pdf

25. In 2012, NJ replaced the School Report Card with the School Performance Reports that do not include WAIT statistics for the charter schools.

**TABLE 1**

Means for Open and Closed Schools

|                        | Mean Open | Mean Closed | Difference | Standard Error | N Open | N Closed |
|------------------------|-----------|-------------|------------|----------------|--------|----------|
| No. of schools         |           |             |            |                | 81     | 30       |
| TESTS                  | −0.694    | −1.869      | 1.175      | 0.0880         | 603    | 132      |
| TESTHD                 | −0.917    | −1.160      | 0.243      | 0.0671         | 667    | 169      |
| ATTEND                 | 94.34     | 93.25       | 1.093      | 0.371          | 564    | 142      |
| ENROLL                 | 29.53     | 32.55       | −3.020     | 2.003          | 607    | 134      |
| WAIT                   | 28.70     | 6.165       | 22.53      | 4.635          | 576    | 142      |
| POOR                   | 61.60     | 74.55       | −12.95     | 2.551          | 584    | 127      |
| MINORITY               | 86.44     | 96.67       | −10.24     | 2.211          | 618    | 139      |
| EXPENMAIN[a]           | 20.95     | 21.30       | −0.354     | 1.091          | 557    | 119      |
| EXPENCLRM[a]           | 65.31     | 61.39       | 3.919      | 1.442          | 557    | 119      |
| EXPENADM[a]            | 27.24     | 31.10       | −3.859     | 1.133          | 557    | 119      |
| EXPENSUPP[a]           | 13.67     | 13.95       | −0.288     | 0.811          | 557    | 119      |
| CHARTERS               | 4.680     | 4.212       | 0.468      | 0.410          | 697    | 179      |
| CHARTERS+              | 1.706     | 1.128       | 0.577      | 0.196          | 595    | 129      |
| ENROLLTOT              | 2165.2    | 1823.9      | 341.3      | 152.8          | 667    | 169      |
| AGE                    | 12.33     | 8.724       | 3.610      | 0.366          | 705    | 181      |

[a]Expenditures are in $100 (2012 dollars) per student.

report scores higher than the home district average.[26] Closed schools report lower classroom expenditures but higher administrative expenditures. Also, closed schools are in smaller districts as evidenced by lower total enrollments in the home district, and they have a higher percent of minority and poor students. Schools that remain opened during the sample period have wait lists over four times that of closed schools and are in operation 3 years longer, on average. Most differences are statistically significant.

## V.   SURVIVAL ANALYSIS

### A. *Kaplan-Meier Survivor Function*

This section presents estimates of the Kaplan-Meier survivor function for the NJ charter schools that have become operational. The top half of Table 2 presents the unconditional Kaplan-Meier survival function estimates. The number right censored is equal to the number of schools that are alive at this age after the 2012–2013 school year. The estimates indicate that the probability of surviving the first year is 93%, because about 7% of the schools fail during the first year. The probability of surviving past age 5 is 80% and schools have an estimated 61% survival probability beyond age 16, which is the longest possible survival time for charter schools in NJ.[27]

The lower portion of Table 2 shows estimates of the Kaplan-Meier survivor function for charter schools with test scores below and above the overall charter school mean of −0.91. Because many schools might not report test scores for their initial years of operation and because schools may move between the two groups, the fourth column (net lost) is negative when more charter schools enter the analysis at the specified age than are right censored or failed. Only one charter school with test scores above the charter school mean failed, therefore the survivor function is constant after age 4 (the age when this school failed) and significantly higher than the survivor function for schools with scores below the mean.[28] Figure A1 in the Appendix illustrates the two survivor functions.

### B. *Estimations Results*

The estimation results are presented in Table 3. Coefficient estimates represent the hazard ratios, as described above. All specifications of our model include enrollment, wait list, attendance, test scores, and student characteristics. Our baseline specification, column (1), also

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26. These differences are also statistically significant, as shown in Table 5 below.

27. The Kaplan-Meier nonparametric maximum likelihood estimate of the survivor function is defined as follows:

$\widehat{S}(t) = \prod_{j | t_j \leq t} \left( \left( n_j - d_j \right) / n_j \right)$, where $n_j$ is the number at risk at age $t_j$ (schools that are operating and have survived until then) and $d_j$ is the number of deaths at age $t_j$. If no school dies at any particular age the survivor function remains constant.

28. The state revoked the charter due to "financial problems," according to Charter School Closures, 2011. TESTS equaled −0.29, below the state average of 0 but above the charter school average of −0.91.

**TABLE 2**
Charter School Survival

| Age | Number of Schools | Failures | Right Censored | Survivor Function | Standard Error |
|---|---|---|---|---|---|
| 1 | 111 | 8 | 8 | 0.9279 | 0.0245 |
| 2 | 95 | 3 | 9 | 0.8986 | 0.029 |
| 3 | 83 | 4 | 7 | 0.8553 | 0.0348 |
| 4 | 72 | 4 | 4 | 0.8078 | 0.0401 |
| 5 | 64 | 1 | 5 | 0.7952 | 0.0415 |
| 6 | 58 | 1 | 2 | 0.7815 | 0.0429 |
| 7 | 55 | 1 | 3 | 0.7673 | 0.0445 |
| 8 | 51 | 1 | 3 | 0.7522 | 0.0461 |
| 9 | 47 | 1 | 2 | 0.7362 | 0.0478 |
| 10 | 44 | 0 | 1 | 0.7362 | 0.0478 |
| 11 | 43 | 0 | 2 | 0.7362 | 0.0478 |
| 12 | 41 | 1 | 3 | 0.7183 | 0.0499 |
| 13 | 37 | 0 | 4 | 0.7183 | 0.0499 |
| 14 | 33 | 5 | 7 | 0.6094 | 0.0616 |
| 15 | 21 | 0 | 12 | 0.6094 | 0.0616 |
| 16 | 9 | 0 | 9 | 0.6094 | 0.0616 |

| Age | Number of Schools | Failures | Net Lost | Survivor Function | Standard Error |
|---|---|---|---|---|---|
| Schools with test scores below the charter school mean | | | | | |
| 1 | 31 | 3 | −13 | 0.9032 | 0.0531 |
| 2 | 41 | 3 | −9 | 0.8371 | 0.0614 |
| 3 | 47 | 3 | 8 | 0.7837 | 0.0648 |
| 4 | 36 | 3 | −2 | 0.7184 | 0.0695 |
| 5 | 35 | 1 | 9 | 0.6979 | 0.0705 |
| 6 | 25 | 1 | −8 | 0.67 | 0.073 |
| 7 | 32 | 1 | −1 | 0.649 | 0.0736 |
| 8 | 32 | 1 | 5 | 0.6287 | 0.0741 |
| 9 | 26 | 1 | 0 | 0.6046 | 0.0751 |
| 10 | 25 | 0 | 5 | 0.6046 | 0.0751 |
| 11 | 20 | 1 | 5 | 0.5743 | 0.0772 |
| 12 | 14 | 0 | 4 | 0.5743 | 0.0772 |
| 13 | 10 | 5 | 1 | 0.2872 | 0.0987 |
| 14 | 4 | 0 | 2 | 0.2872 | 0.0987 |
| 15 | 2 | 0 | 2 | 0.2872 | 0.0987 |
| Schools with test scores above the charter school mean | | | | | |
| 1 | 7 | 0 | −9 | 1.00 | |
| 4 | 29 | 1 | 0 | 0.9655 | 0.0339 |
| 16 | 7 | 0 | 7 | 0.9655 | 0.0339 |

includes the sum of maintenance, classroom and administrative expenditures, EXPENSUM, and support expenditures, EXPENSUPP. We chose this specification because the components of EXPENSUM all reduce the probability of death by about the same percentage. This is illustrated in column (2). The other specifications of our model are the following. In column (3) we add the test scores of TPS students in the home district, TESTSHD, and the charter school competition measure CHARTERS+. In column (4) we include the total number of charter schools in the host districts, CHARTERS. Finally, in column (5) we show estimates for charter schools that had their charter either not renewed or revoked, which eliminates the six schools that had surrendered their charter (29% of failed schools). We include this specification to investigate if the factors that affect survival

differ when the decision to close rests with the NJ DOE instead of the charter school board of education.

Our analysis indicates that test scores of charter school students substantially and predominantly determine the survival of charter schools. The estimated effect of test scores is both large and significant in all specifications. The estimated hazard ratio is about 0.24, which means that a one standard deviation increase in test scores decreases the probability of dying by 76%. As will be detailed below, the estimated effect of test scores substantially reduces the probability that a school closes and the magnitude of its impact is much greater than the effect of any other variable. The number of students on the wait list also has a significant effect on the probability of failure after conditioning on TESTS and expenditures; when WAIT increases

**TABLE 3**
Weibull Regressions

|  | (1)<br>Baseline | (2)<br>Expenditure Details | (3)<br>Competition | (4)<br>Competition | (5)<br>Revoked Charters |
|---|---|---|---|---|---|
| TESTS | 0.240 | 0.231 | 0.237 | 0.240 | 0.236 |
|  | (3.72)*** | (3.72)*** | (3.62)*** | (3.69)*** | (2.72)*** |
| WAIT | 0.938 | 0.933 | 0.933 | 0.933 | 0.936 |
|  | (2.48)** | (2.72)*** | (2.61)*** | (2.65)*** | (2.37)** |
| ATTEND | 1.005 | 1.019 | 1.011 | 1.012 | 1.057 |
|  | (0.08) | (0.31) | (0.17) | (0.19) | (0.85) |
| ENROLL | 0.985 | 0.984 | 0.985 | 0.984 | 0.987 |
|  | (1.10) | (1.11) | (1.07) | (1.16) | (0.70) |
| ENROLLTOT | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
|  | (0.86) | (0.81) | (0.71) | (0.20) | (0.05) |
| POOR | 1.005 | 1.007 | 1.002 | 1.001 | 0.999 |
|  | (0.18) | (0.28) | (0.07) | (0.05) | (0.03) |
| MINORITY | 0.983 | 0.983 | 0.978 | 0.978 | 0.964 |
|  | (0.71) | (0.71) | (0.80) | (0.82) | (1.18) |
| EXPENSUM | 0.974 |  | 0.972 | 0.972 | 0.979 |
|  | (2.81)*** |  | (2.96)*** | (3.04)*** | (2.24)** |
| EXPENSUPP | 1.062 | 1.060 | 1.061 | 1.063 | 1.060 |
|  | (4.14)*** | (4.13)*** | (4.07)*** | (4.17)*** | (3.41)*** |
| EXPENMAIN |  | 0.971 |  |  |  |
|  |  | (2.90)*** |  |  |  |
| EXPENADM |  | 0.962 |  |  |  |
|  |  | (2.24)** |  |  |  |
| EXPENCLRM |  | 0.988 |  |  |  |
|  |  | (0.65) |  |  |  |
| TESTSHD |  |  | 0.735 | 0.716 | 0.491 |
|  |  |  | (0.60) | (0.61) | (1.06) |
| CHARTERS+ |  |  | 1.100 |  |  |
|  |  |  | (0.33) |  |  |
| CHARTERS |  |  |  | 0.981 | 1.037 |
|  |  |  |  | (0.10) | (0.17) |
| N | 651 | 651 | 651 | 651 | 635 |
| No. of subjects | 81 | 81 | 81 | 81 | 75 |
| No. of failures | 21 | 21 | 21 | 21 | 15 |

***Significant at 1% level; **significant at 5% level.

by ten students, the probability of failure decreases by 7%.

This shows the importance of parental demand, and the unobservable forces that drive this demand, on the decision to close a school.

Expenditures are statistically significant in all models. The hazard ratio of 0.97 for EXPENSUM indicates that a $100 increase in spending per student reduces the probability of failure by 3%.[29] We estimate that increases in administration expenses decrease the probability of failure. This result is not consistent with our speculation that higher administration expenditures signal mismanagement. The model in column (2) illustrates that the effects of higher expenditures on classroom activities, administrative functions, and building maintenance have similar effects on the hazard ratio. In contrast, the probability of success declines with increases in

support expenditures: a $100 per student increase in support expenditures increases the probability of failure by 6%.

The reasons for the negative estimate of support expenditures on the probability of success are not obvious and likely differ for closed schools because this type of expenditure appears more subject to individual interpretation than other categories of expenditures. The negative effect does not appear to occur because of more special education students: in results not reported here, we do not find evidence that the percent of special needs students affects EXPENSUP.[30] We speculate on three possible causes. First, support expenditures that include staff salaries, trips for some personnel, and electronic equipment may

29. Note that the units for the financial variables are $100 per student.

30. The magnitude of the estimated support effect does not depend on the percent of special education students; the effect of special education students does not have a significant effect, which is not surprising because the average is about 1% of students in the sample.

be masking financial mismanagement because of nepotism in staff hiring and purchases of equipment that has educational and personal use. Also, personnel doing the same function at different schools may be classified as either support or classroom expenditures. For example, a nationally recognized charter school has two teachers in each classroom. Some of the activities of the second teacher may be assessing students' special needs and advising them about future schooling. Other schools may have a single classroom teacher and a counselor to evaluate, to advise, and to create special programs for individual students, which would increase support expenditures. So, maybe schools that shift resources from classroom expenditures to support expenditures are more likely to fail. Lastly, reverse causation may be influencing the parameter estimate: higher probability of failure could induce some schools to spend more on support and divert these funds from the other expenditures in EXPENSUM. This may occur if the state department of education puts poor-performing schools on probation and gives them a chance to develop a remediation plan. This plan may involve increased support expenditures, for example, hiring consultants.[31] Therefore, while we acknowledge the difficulty with interpreting EXPENSUPP, the level of support spending may contain information used in the Department of Education's evaluation of school performance that is not directly measurable by outside researchers but is important for determining factors that contribute to success.[32]

ATTEND has no effect on survival. This suggests that students' noncognitive skills do not influence school success, a conclusion based on a weak measure of noncognitive skills. Similarly, charter school survival is not affected by the percentages of minority and poor students or by the total number of students enrolled in public schools in the home district.

31. For example, one school that was closed in July 2013 spent $0 on support for the years 2009 and 2010 and then increased spending to about $1800 for 2011 and 2012.

32. There is no reason to suspect that other explanatory variables might be endogenous. Enrollment and wait list are determined before the public knows anything about the closure decision. For test scores, the potential closure warning of the school might induce schools to increase their efforts. In a regression of test scores on its lag and dummy variables, a closure dummy and a death year dummy indicates that closed schools are consistently performing worse, and not significantly different in their death year. The opposite holds for support expenditures. These results are available upon request.

**TABLE 4**

Predicted Effects on Conditional Survival Probabilities

|  | Age 5 | | Age 10 | |
| --- | --- | --- | --- | --- |
|  | Survival | Elasticity | Survival | Elasticity |
| Baseline closed schools | 0.85 | | 0.68 | |
| 10% TESTS | 0.98 | 1.53 | 0.96 | 4.12 |
| 10% WAIT | 0.86 | 0.12 | 0.69 | 0.15 |
| 10% EXPENSUPP | 0.84 | −0.12 | 0.66 | 0.29 |
| 10% EXPENSUM | 0.89 | 0.47 | 0.75 | 1.03 |

Charter school competition, either measured by the number of high-performing charter schools or by the total number of charter schools in the host district has no effect on charter school survival. This might indicate that there is sufficient demand for good schools, as is also indicated by the high proportion of NJ charter schools with a wait list. Moreover, the average test scores of TPS students in the home district have no effect on failure. Finally, the estimates reported in column (5) indicate that test scores still dominate the decision to close when the decision is made by the state board of education and not by the charter school board of education.

### C. Survival Predictions

In order to demonstrate the estimated effects of our covariates on the probability of survival, we perform the following exercise: we predict the survivor function at the mean values for closed schools using the baseline specification, column (1). Then we analyze the effects of test scores, wait list, and expenditures by predicting the effect of a 10% increase in each of the variables on the survival probability. To make the percentage changes comparable, we use a 10% increase in raw test scores to assess the effect of increasing academic performance. Table 4 presents the predicted survival probabilities at years 5 and 10 and the corresponding elasticities. Graphs of the survivor functions are shown in Figure A2 in the Appendix.

The test score elasticity is more than three times the spending elasticity, which is the second highest elasticity. If schools could increase the mean test scores by 10%, without changing any other factor, the probability of survival at 5-year would increase by 15% and the 10-year survival rate would increase by 41%. A 10% increase

in the average raw test score of failed schools corresponds to an increase of about 1.5 standard deviations in the standardized test score. The average standardized test score for closed schools is −1.845 and changes to −0.345.

If spending increased by 10%, or $1,138 per student, the probability of survival at year 10 would increase by 10.3%.[33] An increase in support by 10%, or $137 per student, reduces the survival probability by 2.9% at 10 years. Finally, a 10% increase in WAIT, 6.75 students, increases the survival probability at 10 years by 1.5%.

## VI. WELFARE AND POLICY IMPLICATIONS

We expect competition among firms in free markets to increase societal welfare because firms that meet consumer needs more efficiently will displace inefficient firms that do not provide the goods and services customers demand. In theory, the public education industry could work the same way: local school boards could close inefficient TPS and remove staff that were not providing the skill enhancement parents and students demand and replace these with more efficient schools and teachers. In practice, labor rules, hiring and firing customs, and political power of entrenched interests often restrict the replacement of inefficient schools and teachers. Competition from charter schools could provide a mechanism to increase efficiency: students leave the least efficient TPS and the local district may be forced to close these schools because of lack of students.

Public school enrollment data from 2001 to 2013 suggests this mechanism is working in NJ. For urban school districts that contain schools where students perform poorly on tests and where graduation rates are low, the increases in the number of charter schools and in charter school enrollment mirrors decreases in the number of TPS students. For example, in Newark, the largest state public school district, 15 schools closed and the number of students in TPS decreased by 6,187.[34] During this period,

the number of charter schools increased from 9 to 23 and the number of charter school students increased by 8,880. Similarly, in the three districts, excluding Newark, with the most charter schools, Jersey City, Camden, and Trenton, enrollment in TPS has decreased by 5,226 and the total number of TPS decreased by 9, whereas charter school enrollment has increased by 5,755 and four more charter schools are operating.[35] Charter school competition also appears to be increasing efficiency in Chicago. In 2013, TPS closures in the Chicago public school district made national headline news. According to the Chicago Department of Education the schools they had decided to close were undersubscribed and non-high-performing schools were to be closed.[36] These closures took place at a time when overall public school enrollment in Chicago has fallen, whereas charter school enrollment has soared.[37] Moreover, a study of previous school closures in Chicago found that displaced students who were able to attend higher performing schools improved academically (De la Torre and Gwynne 2009).

Our analysis of NJ's charter school approval and renewal policies suggests that these policies increase the welfare of students who attend charter schools and possibly also of those who attend TPS because of the competitive pressure that resulted in the closure of some ineffective TPS and some underperforming charter schools. However, the students who attended the failed charter schools might still incur a welfare loss if their alternatives are worse. This does not appear to be the case. We find that, as documented in Table 5, students in charter schools that later closed were scoring significantly below their home district's average, whereas students in charter schools that have "survived" until the end of the 2012–2013 school year score above their district's average. This indicates that displaced students might be better off attending TPS in their school district

33. TPS spend 7% more than the average charter school. This increase in spending would mean that the failed schools would spend on average $400 more that the average TPS.

34. After the 2011–2012 school year, seven Newark Public Schools were closed: five were elementary/middle schools with grades 1–8 and two were high schools with grades 9–12. Four of the five elementary/middle schools were in the bottom 40% of test scores and enrollment. Newark also added several small magnet schools many with enrollments less than 100 students, such that the number of schools in the district decreased by 1.

35. These districts contained 7.7% of TPS students and 56% of charter school students in 2012. In these three districts, 7 charter schools were closed but 11 new charter schools started so the charter schools increased by 4. Two charter schools were closed in Newark.

36. http://www.cps.edu/About_CPS/Policies_and_guidelines/Pages/2013GuidelinesforSchoolActions.aspx.

37. "There are 28,289 fewer students in all Chicago public schools (CPS) (district and charter) since 2000. But there are 75,680 fewer students in CPS-run, noncharter schools. (All 54 schools slated for closing are district-run). That enrollment loss has come at the same time enrollment in charter schools has increased by 47,391 students" (Vevea and Lutton 2013).

**TABLE 5**

Charter School Test Scores Compared to Home District Averages

| | Mean Charter Schools | Mean Home District TPS | Difference | Standard Error |
|---|---|---|---|---|
| Open schools | | | | |
| TESTS | −0.6929 | −0.9031 | 0.2102 | 0.0382 |
| Closed schools | | | | |
| TESTS | −1.8627 | −1.1981 | −0.6646 | 0.0585 |

**TABLE 6**

Charter High Schools Compared to Home District Averages

| | Mean Charter Schools | Mean Home District TPS | Difference | Standard Error |
|---|---|---|---|---|
| Graduation rates | | | | |
| Schoolwide | 91.96 | 72.11 | 19.84 | 3.07 |
| Minority students | 89.58 | 70.40 | 19.17 | 3.84 |
| Dropout rates | | | | |
| Schoolwide | 0.12 | 4.95 | −4.83 | 1.19 |
| Minority students | 0.19 | 6.41 | −6.23 | 1.41 |
| Post-secondary attendance | | | | |
| Schoolwide | 72.67 | 57.76 | 14.91 | 6.62 |
| Minority students | 71.33 | 58.80 | 12.54 | 4.68 |

and that the closed charter schools were not offering a better alternative. Our results on the effect of the wait list confirm that these underperforming schools were in relatively low demand.

Nevertheless, there might be costs associated with changing schools or facing longer commutes.[38] It might also be the case that some schools focus on students who are especially troubled academically and have more disciplinary problems than those in their host district. Perhaps, a school like this would have been closed because of low performance as measured by the standard metrics, but, if this were the case, these schools should declare a special mission and then be measured by a different standard.

The fact that closed schools are not only performing much worse than their district on standardized tests as documented in Table 5, but that those districts are also performing worse than other districts on average might indicate that the state needs to do more to provide alternative public school options in those districts. Generally, charter schools are not attracting the most problematic students from the district, usually positive self-selection into charter schools is assumed. Angrist, Pathak, and Walters (2013) find, for example, that in Massachusetts charter students are performing at least as well on standardized test when they enter charter schools as students who attend other public schools in their host districts. Therefore, with the exception of schools with special missions, there is no reason to assume charter schools are attracting the worst students from an underperforming district and it is very likely that the charter schools failed

because they did not contribute a solution to the district's academic problems.

What are the long-run welfare implications of these closure policies? While we do not directly observe the trajectories of students in NJ, we can calculate the differences in high school graduation and post-secondary performance between charter high schools and regular TPS.[39] These statistics are shown in Table 6 for 2012.[40]

The data show that graduation rates are higher and dropout rates are lower in charter schools relative to the TPS in their home districts. Furthermore, rates of post-secondary school attendance are significantly higher. The one charter high school in this sample that was closed in 2012 had a graduation rate of 40%. There were only ten charter high schools in 2012 because the majority of charter schools are elementary and middle schools. Successful middle school charters tend to place their graduates in elite prep and boarding schools, although summary statistics for these placements are not reported for all schools. For example, one Newark charter schools details in its state-mandated Annual Report from 2012 that 8th grade graduates go to Newark magnet schools, elite private day schools, and elite boarding schools in equal proportions.

Overall, the statistics we have presented indicate that attending a successful charter school might have both positive short-term and positive long-term effects on students compared to those

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38. The state recognizes welfare losses to students of the closed charter school: "the top priority is ensuring that students are not disrupted by this closure. The NJ DOE works with local public schools, both district and charter, to find a school that meets the needs of each individual student." http://www.state.nj.us/education/chartsch/accountability/closure.htm.

39. The NJ DOE collects student level data but does not make this data available for analysis.

40. The NJ DOE has started to publish cohort specific graduation rates in 2011 and actual post-secondary attendance in 2012. The post-secondary rates include both 2-year and 4-year colleges and are from the NJ 2012 School Performance Report.

attending TPS in the district, and that a rigorous renewal process is necessary to encourage real change in underperforming districts.

## VII.   CONCLUSION

One policy recommendation to improve public education in the United States introduces competition to monopolistic elementary and secondary local school districts by creating charter schools. Welfare gains stem from the increased pressure on TPS to enhance performance and the provision of better schools for students who attend schools in underperforming districts. For these gains to be realized, states must authorize charter schools that are expected to satisfy parents' demands for educating students and providing other services. And the successful authorizers must be reexamined periodically. If charter schools are to provide the competition necessary to improve the scholastic performance of students in TPS, the choice schools that do not improve student performance must be removed from the menu of choices in the education market. Our analysis of NJ charter schools suggests that the state is following the prescribed policy: NJ has a rigorous, multistage approval process and the rate of school closures is nearly twice the national average.

Our analysis also indicates that charter school failures are predominantly because of the failure of students to perform satisfactory on standardized state exams. Statistics also show a drop in TPS enrollments in the four largest urban school districts that mirror increases in enrollments in charter schools that on average outperform their districts on standardized tests. Moreover, charter high school students have higher graduation rates and higher rates of secondary school attendance.

## APPENDIX

### FIGURE A1
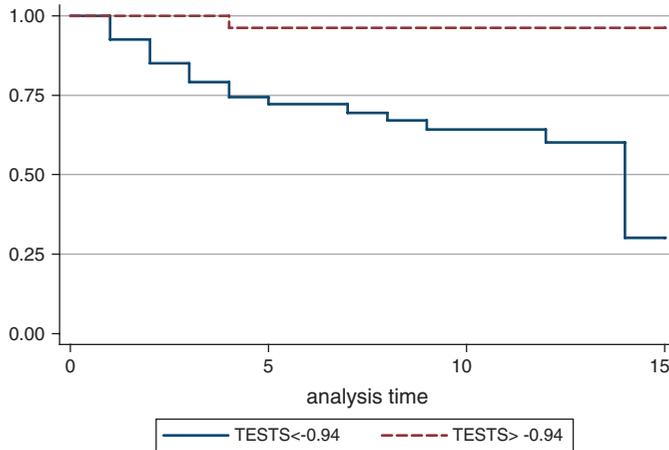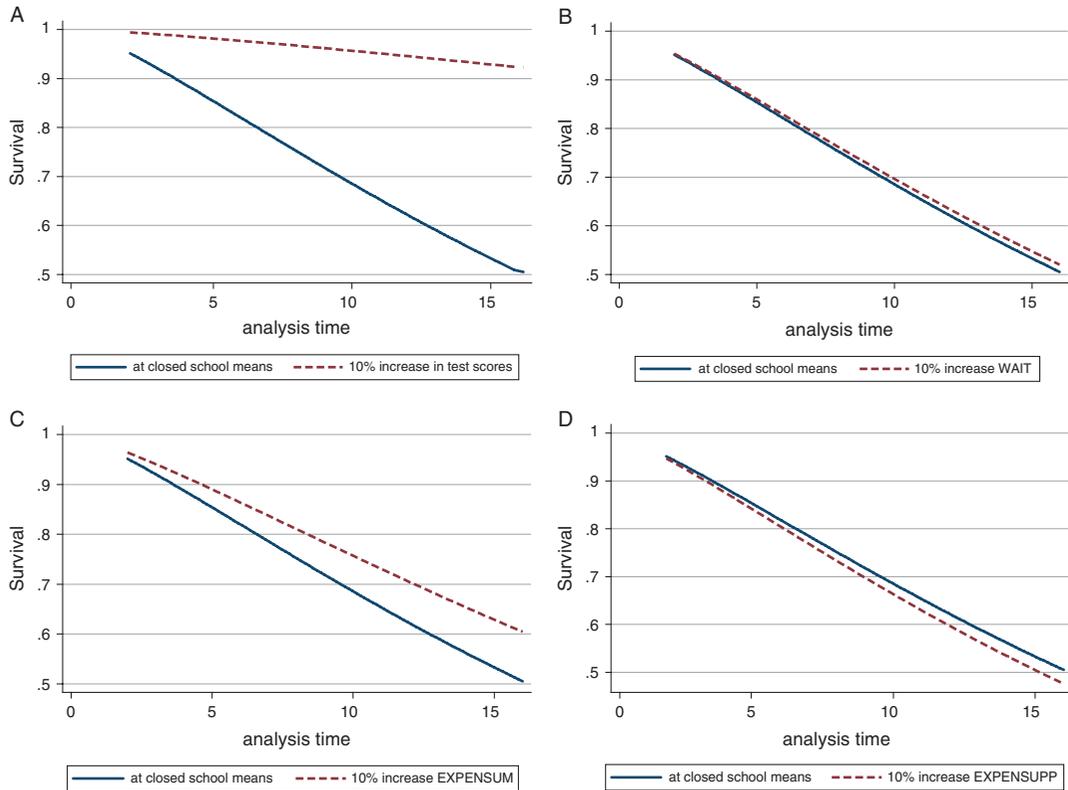
Kaplan-Meier Survival Estimates

**FIGURE A2**

A. Predicted Survivor Function, B. Predicted Survivor Function, C. Predicted Survivor Function, D. Predicted Survivor Function



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