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High Expense: Disability Severity and Charter School Attendance in Arizona[1] [2]

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Abstract: Much of the literature related to the skimming or cropping of students by charter schools has ignored special education students. This article examines the relationship between the severity of student disabilities and their likelihood of having attended an Arizona charter school in the 2002-2003 school year. After adjusting for student traits, local education agency characteristics, and the mix of available special education services, a multilevel logistic regression analysis suggests that students who had more severe and thus more expensive disabilities were less likely to attend an Arizona charter school. Findings from an ancillary set of hierarchical linear models suggested that special education students enrolled in charter schools were less expensive on average than similar traditional public-school special education students.

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Keywords: school choice; charter schools; special education; severity (of disability); school finance; education policy.

Costos altos: Severidad de la discapacidad y asistencia en las escuelas charter de en Arizona
Resumen: La mayor parte de la literatura relacionada con el reclutamiento de los "mejores" estudiantes (en inglés skimming or cropping) por las escuelas charters pasa por alto a los estudiantes de educación especial. Este artículo examina la relación entre la gravedad de las deficiencias de los alumnos y las posibilidades de haber asistido a escuelas charters en Arizona en el año escolar 2002-2003. Después de ajustar por los atributos de los estudiantes, las características de las agencias de educación locales y la combinación de servicios especiales, un análisis logístico multinivel de regresión sugiere que los estudiantes que tienen discapacidades más graves y por ende más caros eran menos propensos a asistir a una escuela "charter" en Arizona. Los resultados de un grupo de apoyo de modelos jerárquicos lineales indicaron que los estudiantes de educación especial inscritos en escuelas "charter" cuestan menos que el promedio de los estudiantes en educación especial de las escuelas públicas.
Palabras clave: elección de escuela; escuelas charter; educación especial; gravedad (de discapacidad); financiamiento escolar; política educativa.

Altos custos: gravidade da deficiência e presença nas escolas Charter no Arizona
Resumen: La maior parte da literatura relacionada a seletividade "dos melhores" (em inglês conhecido como skimming ou cropping) de alunos pelas charter-schools ignora a educação especial de alunos. Este artigo examina a relação entre o grau de severidade das deficiências do aluno e suas chances de terem cursado uma charter schhol no Arizona no ano escolar de 2002-2003. Após o ajuste dos atributos do aluno, características do órgão educacional local e a mistura de serviços especiais disponíveis, uma análise logística de regressão multinível sugere que os alunos que possuem deficiências mais graves e mais caras tiveram menos chances de cursarem uma charter school no Arizona. Os resultados a partir de um grupo de apoio de modelos hierárquicos lineares indicaram que alunos de educação especial matriculados nas charter schools custavam menos em média do que os alunos de escolas públicas de educação especial similares.
Palavras-chave: escolha escolar; escolas chater; educação especial; gravidade (da deficiência); finança escolar; política educacional.

Introduction

Empirical research on the effects of school choice policy has most frequently compared the outputs of charter and private schools to traditional public schools (TPS) or searched for evidence suggesting that racial, ethnic and economic segregation, concentration, or stratification has increased as the result of the implementation of these policies (Angrist, Bettinger, Bloom, King, & Cremer, 2002; Braun, Jenkins, & Griggs, 2006; Cobb & Glass, 1999; Dee, 1998; Dee & Fu, 2004; Hoxby, 1994, 1996, 2000; Lopez, Wells, & Holme, 2002; Lubienski & Lubienski, 2006a, 2006b; Perie, Vandemann, & Goldstein, 2005; Wells, Artiles, Carnochan, Grutzik, Jellison, et al., 1998; Yancey, 2000). While the debate about the effects of school choice is contentious, greater attention has been given to "skimming" or "cropping" of students in charter schools (Buckley & Schneider, 2005; Dee & Fu, 2004; Lacierno-Paquet, Holyoke, Moser, & Henig, 2002) with racial, ethnic, or social backgrounds that are considered proxies for more capable students who are easier to educate. Ironically, much of the skimming literature has largely glossed over the pertinence of the matter with respect to special education students. Recent studies conducted by Buckley and Schneider (2005)

and Lacierno-Paquet et al. (2002) are unique in that they compare the distribution of special education students enrolled in Washington D.C. charter schools to the D.C. TPSs. Perhaps what is most striking about these recent local studies as well as other national studies examining disproportionality in special education charter school student enrollments is; few if any account for differences in disability type e.g., Buckley and Schneider (2005), or they fail to account for disability severity within general categories (e.g., Guarino & Chau, 2003). Studies in the special education literature often consider disability type and severity to be the most salient dimensions charter schools officials use to selectively admit or thwart the enrollment of special education students (Howe & Welner, 2002; McKinney, 1996; Welner & Howe, 2005; Zollers & Ramanathan, 1998). This article directly addresses the matter of disability severity and the association that it has with charter school enrollments within and between disability categories. In this study, two research questions were addressed. First, how is specific disability related to charter school attendance? In addition, does disability severity within special education categories decrease the likelihood of charter school attendance?

Between disability group differences were examined to ascertain which groups of special education students had the lowest probability of attending a charter school. Focus was then shifted to within disability group differences where the log odds of charter school attendance were regressed on an expense measure of disability severity for each student. Both sets of analyses suggested that students who had more severe and more expensive disabilities were less likely to attend an Arizona public charter school in the 2002-2003 school year.

While parental preference for TPS district special education services or a different but more inexpensive mix of charter school services might be offered as alternative explanations for these findings, advocates for students with disabilities have frequently argued that charter schools have little incentive to educate students with the most severe disabilities. Such students are not only more expensive but they are more likely to perform poorly on standardized achievement tests that have become the cornerstone of state and federal school accountability systems (Howe & Welner, 2002; McKinney, 1996). Additionally, many charter schools are not equipped or staffed to properly offer services to the most severely disabled students (Estes, 2004). Heubert (1997) expressed concern that federal disability law had loopholes that could potentially be exploited by charter schools to block the enrollment of special education students who could not meet the respective entrance requirements. These early concerns, coupled with national level charter school statistics showed that a disproportionate share of special education students were enrolled in TPSs (Medler & Nathan, 1995). This led several researchers including Garn (2000) and McKinney (1996) to look more closely at the impact of disability severity on charter school enrollments of special education students in Arizona.

The state of Arizona was unique as an early adopter of school choice providing a natural setting for the study of the relationship between special education and school choice policy. The state implemented choice via charter schools and individual income tax credits for school grant donations and private school tuition in 1994 as an alternative to several failed tuition voucher drives (Garn, 1999; Timmons-Brown & Hess, 1999). Throughout the early 1990s four school voucher plans were proposed but repeatedly rejected by the Arizona state legislature. Interestingly, as recently as March of 2005, a fifth voucher proposal was put before the Arizona senate which narrowly approved the measure but was ultimately turned down by state congressmen.

This research used three sources of data obtained from the Arizona Department of Education (ADE), in conjunction including the following: administrative data with counts of students in twelve disability categories and twelve special education service categories, district finance data that contained total actual special education expenditures in each of the twelve disability

categories and total funds budgeted to each LEA's special education program, and testing data from the 2002-2003 Arizona's Instrument to Measure Standards (AIMS). The AIMS test was designed to assess student proficiency on standards set by the state in the content areas of math, reading, and writing; however, test administrators routinely collected information on students' demographic and social characteristics (gender, race/ethnicity, poverty status, mobility status, English proficiency status) and information on their specific types of disabilities. Student-level test data were matched to corresponding special education expenditure and student disability count data. Count and expenditure data were then combined to develop an expense measure of individual disability severity.

Charter Schools and Students with Disabilities

Goldhaber and Eide (2003) have recently argued that "there is little evidence on possible heterogeneous effects of school choice policies" (p. 229). Although this comment was made in the context of private schooling and the differential effects that might occur at various points in the distribution of the student population, it aptly applies to student disability and the limited attention the issue has received in the policy arena. The literature on students with disabilities who attend charter schools is mainly comprised of studies and reports issued by federal and state governments (Ahearn, 1999; 2001; Fiore, Harwell, Blackorby, & Finnigan, 2000; Medler & Nathan, 1995; Nelson et al., 2000; Riley, McGuire, & Conaty., 1998; U.S. Department of Education 2000), policy-oriented institutes (Bierlein & Fulton, 1996; Corwin & Flaherty, 1995; Guarino & Chau, 2003; Vanourek, Manno, Finn, & Bierlein., 1997), and a scant number of articles in peer-reviewed journals.

A report on a nationally unrepresentative group of thirty-five charter schools claimed that special education students were overrepresented in the schools they surveyed (Vanourek et al., 1997). When compared to a national figure of 10.4% in TPSs they estimated that 12.6% of the students enrolled in charter schools had disabilities, 7.7% had a formal individualized education plan (IEP), 3.5% "probably" had one in their former public school, and 1.4% had other serious learning impediments. But the report had no way of accounting for the effect of disability severity since the authors relied on the presence or likely presence of an IEP to identify whether a student had a disability in the first place.

Buckley and Schneider (2005) estimated a set of 95% highest posterior density (HPD) intervals for a sample of Washington, D.C., charter schools. They found that 5 of the 37 D.C. charter schools in their study had a larger proportion of special-education students enrolled than the average District TPS. Twenty-four of the charter schools served a smaller proportion of special education students, while eight had statistically identical enrollments. However, once all charter school data were considered, Buckley and Schneider concluded that the D.C. TPS point estimate was within the overall charter school HPD interval. This suggested from a statistical standpoint, D.C. charters enrolled the same proportion of special education students as the D.C. TPSs.

In contrast, a sample of California charter schools matched to TPSs suggested that the percentage of students with an IEP or a severe disability was not statistically different (Guarino & Chau, 2003). However, this finding was not robust. When two charter schools that focused exclusively on students with disabilities were removed from the analysis the matched group of TPS students had a higher and statistically significant percentage of students with an IEP.[3] Interestingly,

[3] Students from the Arizona School for the Deaf and Blind, a set of TPSs that exclusively serve students with disabilities, were excluded from all analyses because these schools did not submit expenditure data. No other LEA in the state of Arizona exclusively served special education students.

they also found that conversion charter schools (those that had been TPSs previously) when compared to start-up charter schools and TPSs had a greater and statistically different percentage of students with an IEP or a severe disability. This finding is noteworthy since Lacinero-Paquet et al. (2002) found a similar difference in special education enrollments between charter schools they had classified as non-market and market oriented. Both sets of authors explicitly (Lacinero-Paquet et al.) or implicitly (Guarino & Chau) proposed that the aggregate pattern of charter school special education enrollments masked what was happening between different types of charter schools. While Lacinero-Paquet et al. suggested that the degree to which a charter school was market oriented was the salient factor, Guarino and Chau speculated that cost or a hesitation to give marginal students an IEP for fear of labeling them could be possible explanations for the differences. Guarino and Chau could not test either hypothesis.

Another recent study of 22 states suggested that charter schools across the nation typically enrolled a lower proportion of special education students than TPSs (U.S. Department of Education, 2000). Unfortunately, the study did not look at the issue of between-disability category differences in charter school enrollments. In another study, Fiore et al. (2000) sampled 32 charter schools in fifteen states from a larger 1997 nationally-representative sample and concluded that enrollment of students with mild disabilities was common. But it was unusual to find students with more significant disabilities enrolled in charter schools unless the school was specifically designed to serve them. The study did not address the impact that disability severity had on enrollments within specific disability categories. Nor did it make enrollment comparisons between charter schools and TPSs.

Welner and Howe (2005) and Heubert (1997) have argued that charter schools may be able to impede the enrollment of special education students by narrowly defining the educational mission of the school. This makes it improbable or impossible for some special education students to meet the demands of the curriculum. Heubert (1997) also suggested that existing federal disability legislation does not prevent public schools from using selective admission practices so long as the admission criteria are necessary for the implementation of the service, program, or activity. He also speculated that this would probably allow some charter schools to exclude special education students and avoid legal repercussions. In Arizona specifically, McKinney (1996) concluded that students with disabilities did not have equal access to charter schools after surveying charter school principals and staff as well as ADE representatives. In discussions with officials from both groups, it became apparent in several cases that special education students were not being served properly or were potentially being denied admission to a charter school because of the cost associated with their disability.

Other studies in states including Massachusetts and Texas suggested that Arizona was not unique. Zollers and Ramanathan (1998) uncovered several cases where special education students were removed from a charter school when their disabilities were discovered. In a limited set of interviews with Texas charter school officials, Estes (2004) found no direct evidence of discrimination; however, some charter schools could not be accessed by wheelchairs and a general lack of expertise and understanding of special education and disability law was common. This in turn, was likely to affect service provision to these students.

Howe and Welner (2002) have also suggested that pressure to perform on achievement tests could be a motivating factor for exclusionary enrollment practices in charter schools especially since increasing aggregate achievement test scores is currently considered the primary indicator of a school's success. State and federal school accountability systems provide a disincentive for schools

to enroll low scoring students. As suggested earlier, some charter schools that are formed around an academically driven mission might be able to exploit existing loopholes in disability legislation and impede or prevent students with disabilities from enrolling.

Each study in its own right is informative since most have suggested a level of disparity in national aggregate enrollments of special education students in charter schools. Some have narrowed the scope and shown disparities between charter school types at a local or statewide level. Others have shown that there are differences in special education enrollments in different types of charter schools. However, most studies fall short of addressing the more nuanced matter of the relationship that within and between group disability severity is likely to have with respect to charter school enrollment. Even though some of the peer-reviewed studies have produced evidence to substantiate these claims, most were based on small-scale, qualitative studies, making it difficult to assess wider generalizability of the findings (Howe & Welner, 2002; McKinney, 1996; Zollers & Ramanathan, 1998). The finding that non-market orientated and conversion charter schools enrolled greater proportions of special education students than market oriented and start-up charter schools indicated that structural and organizational characteristics of charter schools made a difference in student level outcomes. However, these findings tell us little about what types of special education students are actually enrolled in charter schools. It is possible that enrollments are tied to disability severity and high expense even in non-market charters or in charter schools designed to serve special education students more specifically. Clearly, looking beyond proportional enrollments of special education students is necessary to better understand the effects that school choice policy has on this group of students. If high expense has motivated some or most charter schools to limit or prevent the entrance of certain types of students with disabilities, a coherent strategy includes examining the relationship between a student's expense and the log odds of charter school attendance.

Data and Methods

Student-level data from the 2003 AIMS mathematics test, matched to LEA enrollments, LEA special education service use data, and special education finance administrative data were used to investigate how specific disability and disability severity were related to charter school attendance. Special education students took the mathematics portion of the AIMS test in greater numbers than either the reading or writing domains. The AIMS test was a criterion-referenced instrument designed to assess student proficiency in the academic content standards set by the state of Arizona. The test was administered to all school aged children in the third, fifth, and eighth grades as well as high school in mathematics, reading, and writing. Until recently, students were required by state statute to take the AIMS test. Students currently take a dual-purpose assessment (the Terra Nova).

Special education student test records were selected from the main data file based on the following criteria: the child had been identified as a special education student, a specific disability category had been indicated, or the student had received a Braille or large print exam. The final data set also included the following: the student's racial/ethnic background; gender; specific disability category (speech impairment, learning disability and emotional disability), an indicator of severe disability (i.e., if the student was autistic, had a brain injury, was mentally retarded, had multiple disabilities or multiple severe disabilities with sensory impairment, had a visual impairment, or had an orthopedic disability), some other health impairment, or a hearing impairment; a limited English proficiency (LEP) indicator; a proxy for poverty status (whether Title 1 money was disbursed on behalf of the student); whether the student was an out-of-level test taker; the average daily membership (ADM) of the LEA; whether the LEA was located in a rural or urban county; the

student's enrollment status in a charter or TPS district; and a measure of the total special education expense of serving each student based on his/her specific mix of disabilities. Models also included a set of service type variables to control for differing LEA special education services mixes. Additional detail is given in Appendix A regarding construction of the independent and dependent variables.

Special Education Expense-Disability Severity Measure

The Arizona Department of Education (ADE) computes a per-pupil expenditure measure in each TPS district and for each charter school annually. This measure is the LEA's reported total expenditures in a given fiscal year divided by the LEA's average daily membership (ADM). Expenditure data are reported at the district level, however, for charters the figures are usually reported at the school level. Funds allocated to five categories are reported to the public: classroom instruction excluding classroom supplies, classroom supplies, district and school administrative costs, support services-students, and all other support services and operations. A sum of these five categories is equivalent to an LEA's total expenditure. Enrollment counts are taken on the 40th and 100th day of the school year. The average of these two counts constitutes a LEA's ADM. Unfortunately, the state per-pupil expenditure measure is not a sensitive proxy for disability severity because costs related exclusively to special education students are not demarcated. Instead, more suitable data were used to construct a disability severity measure.

Arizona LEAs report budgeted and actual special education expenditures and special education student enrollment counts for twelve specific disability categories: speech impairment, learning disability, emotional disability, mental retardation, visual impairment, hearing impairment, other health impairment, orthopedic impairment, brain injury, multiple disabilities, multiple severe disabilities with sensory impairment, and autism. Special education funding in Arizona is primarily influenced by student enrollment counts. State statute requires LEAs to submit counts of the total number of students enrolled in each specific disability category. The counts are submitted at some point in the year, and they may be continuously updated until June, the close of the school fiscal year. LEAs may also revise counts up to three years after their initial submission.[4]

Charter schools and districts in Arizona receive an identical weighted amount for students with specific disabilities based on guidelines set forth by Arizona Revised Statute 15-943. Students with more severe disabilities or a larger number of disabilities are weighted more heavily than students with single or milder disabilities. Thus, students who are more severely disabled receive greater funding. Interestingly, the state exercised little mandatory oversight of the spending of funds for special education. However, the ADE school finance department gives all LEAs the opportunity to report the total budgeted and actual funds spent on special education students in each of the twelve disability categories. These data are released in the Annual Report of the Superintendent of Public Instruction.[5] The reported budgeted and actual expenditures include all funds spent within special education program 200 and 300 in each disability category by the close of the school fiscal year. Program 200 and 300 expenditures include salaries, employee benefits, purchased services, supplies, and the following other expenses: instruction, support services student, support services instructional staff, support services general administration, support services school administration, support services business and central, operations and maintenance of plant services, facilities

[4] Student count data were obtained from the ADE Exceptional Student Services department.

[5] Budgeted and actual special education expenditure data were obtained from Volume 2 of the *Annual Report of the Superintendent of Public Instruction* for the 2002-2003 fiscal year.

acquisition and construction services, debt service, and special education title 8 funding.[6] Reported funds used under both programs are exclusively tied to costs associated with special education students. All TPS district and charter schools in Arizona report program 200 costs while some report costs associated with program 300. Program 300 expenditures include any funds given to a LEA by the federal government that are associated with the education of students with disabilities who are in some way tied to the federal government e.g., children of military personnel.

The special education expenditure/disability severity measure is a sum of the average expenditure per student disability within an LEA.[7] For example, the total special education expenditure associated with a student who had a learning and an emotional disability was the sum of the two, computed average expenditures for each disability within the LEA they attended. If a student was a dual/multi-category student, the student's total special education expense to the district was the summation of multiple mean expenditures. The final special education expenditure/disability severity measure for the *j*th student in the *k*th LEA can be written as:

$$Ln(\mathrm{A}_{jk}) = \sum_{i=1}^{12} \left(\frac{X_i}{N_i} \right)_{jk} (B_j)$$

where i = disability 1 to disability 12, j = the jth student, k = the kth TPS district/charter school, X_i = total actual expenditures in each specific disability category, N_i = the total number of student enrollments in each specific disability category, and B_j = 1 if student j had the specific disability and 0 otherwise. Students with higher total expenditures were considered to be more severely disabled.[8] Used in tandem, these two sources of data provide the best estimate of the

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[6] While this measure examines identical special education expenses in each district and charter school, charter schools can submit special education expenses under two categories (Facilities Acquisition & Construction Services, and Debt Service) that TPS districts report as expenses for students without accounting for their disability status. These categories are infrequently used by charter schools and expenditures reported here would tend to inflate the expense of special education students enrolled in charters relative to those enrolled in TPS districts.

[7] It was mentioned earlier that LEAs could submit student disability counts continuously, and after the close of the fiscal year. As a result some discrepancies arise between aggregate counts of special education student test takers and the LEA submitted counts. When derived enrollment counts were higher in the testing data, these count values were substituted for LEA submitted counts. This strategy was employed so that the final expense/disability severity measure would not produce aggregated total expenditure sums that exceeded the actual total amount spent in each district and charter school on special education. Therefore, in some cases the final expense/disability severity measure is a downwardly biased estimate of the expense/severity of each special education student in schools where the number of special education students tested exceeded the final number that was reported to the state by a LEA.

[8] Additionally, the natural log of the weighted final special education expense/disability severity measure was also computed for each student j to determine if varying group size had an effect. It can be written as:

$$\text{Ln(Weighted } \mathrm{A}_{jk}) = \frac{\sum_{i=1}^{12} \left(\overline{X}_i * N_i \right)_{jk}}{\sum_{i=1}^{12} \left(N_i \right)_{jk}} (B_j)$$

where i = disability 1 to disability 12, j = the jth student, k = the kth charter school/TPS district, $\overline{X}_i$ = total mean actual expenditures in each specific disability category i, N_i = the total number of student enrollments in each specific disability category, and B_j = 1 if student j has the specific disability and 0 otherwise. The

total special education expense associated with each student in each examined district and charter school.[9]

Student Expense: Cause or Consequence?

One criticism of using student expenditures as a proxy for disability severity is that student expense might also be considered a result of the special education services received instead of an influence on school enrollment. Endogeneity becomes a concern with respect to this viewpoint. Criticism might also be raised regarding the use of student expense as a proxy for disability severity based on the fact that the intensity of use of different types of special education services offered in average Arizona charter schools and TPS districts were different. Lower average special education student expenditures by charter schools could be attributed to the use of different but less costly types of special education services.

Studies in the special education literature suggest that students who have more severe disabilities are expensive relative to students with minor disabilities (Guarino & Chau, 2003; McKinney, 1996). Such students not only require a wider breadth of services but also services that are resource intensive—e.g., separate pullout programs instead of mainstreaming. Empirical evidence from California and Arizona show that charter schools typically use different special education services with varying levels of intensity.

Guarino and Chau (2003) found that start-up charter schools in California had a substantially different mix of special education services when compared to conversion charter schools or TPSs. A higher percentage of start-up charter schools (63.8%) mainstreamed their special education students in general education classrooms when compared to conversion charters (20.7%) and TPSs (19.3%). They also found that start-up charters only served a very small percentage of their special education students (4.1%) in separate pullout programs when compared to conversion charters (38.9%) and TPSs (20.1%). They speculated that start-up charters were more heavily reliant on the limited service delivery mode of mainstreaming because of constrained finances, limited facilities, or philosophical differences about principles of inclusion. Moreover, they could not determine if students were being served appropriately or fully.

In Arizona, there were also differences in the types of services that special education students were offered in TPS districts and in charter schools during the 2002-2003 school year. Statewide data from the ADE's ESS (Exceptional Student Services) showed that 18.9% of special education students enrolled in charter schools received services in the regular classroom with supplemental aids/services. Only 3.1% of TPS district special education students received services in

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substantive interpretations of the severity coefficient in all of the logistic regression models remained unchanged. However, the absolute value of the coefficient increased in models that used the weighted measure. Results for the unweighted expense-disability severity measure are reported since they produce a more conservative estimate of the effect.

[9] A supplemental analysis was undertaken to determine if a different expense assumption would alter the main substantive findings for students who had multiple disabilities. For students who were dual/multi-category the expense/disability severity measure was re-calculated using only the expenditure associated with the most expensive disability. Results (not shown but available upon request) suggested that the re-calculated expenditure/disability severity measure was larger in magnitude in each of the models. However, the sign of the model coefficients was consistently negative and statistically significant in each model except for the other disabilities model where the effect was not statistically significant. The results shown in Table 3 present findings based on the more conservative expenditure/disability severity measure. A second, ancillary analysis was also run where the ln(number of disabilities) each student had was included in each model along with the original expense/disability measure. While this coefficient was statistically significant, the estimate of the expense/disability severity measure changed little in magnitude.

this context. In contrast, 95.1% of TPS district special education students were served at least part-time in separate pullout programs compared to 79.9% of special education students in charter schools. The majority (64.1%) of special education charter school students spent less than 21% of the day in a pullout program while 13.4% spent at least 21% but not more than 60% of the day in a pullout program. Half of TPS district special education students (50.6%) spent less than 21% of the day in a pullout program while nearly a third (32.8%) spent at least 21% but not more than 60% of the day in a pullout program. Finally, 11.7% of TPS district students spent more than 60% of their day in a pullout program compared to 2.4% of charter school students.

To address the issue of endogeneity, the first multivariate analysis was run where total student expenditures predicted charter school attendance. A second multivariate analysis used total student expenditures as an outcome instead. To address any concern about Arizona charter schools serving special education students more economically with a different mix of services, both of the multivariate analyses included a set of LEA level and special education service mix use intensity variables to isolate the effect of different LEA special education service mixes.

It is possible that a student's special education expense may be attributed to the services he or she received, especially if the mix of services offered by the LEA was standardized. However, it is crucial to recognize that a student's expense may instead be considered the direct result of a student's specific disabilities. The following section provides further discussion on this matter.

IEP Formulation in Arizona

Federal legal statute mandates that special education service provision be directed by an IEP. An IEP is supposed to be developed around a student's specific needs. If a LEA rigidly adheres to the IEP process, a special education student's cost to the LEA cannot be directly determined by the LEA. Rather, a student's disability type and the severity of the disability jointly determine the types of service they receive.

To receive special education services in Arizona, a student must first have an IEP developed. The Individuals with Disabilities Education Act (IDEA) stipulates that parents, the student's regular and special education teachers, a district representative, an academic evaluation interpreter, a transition services representative, and even the child (if he or she is old enough to understand and contribute) must participate in the formulation of the IEP. The IEP identifies and addresses each child's unique educational needs in an environment that is least restrictive to learning. The IEP must minimally include: what, where, and how long special education services will be provided; the child's annual academic, social, or behavioral goals; how the child's progress will be tracked and how parent(s) will be notified of that progress; an assessment of the child's current performance, which is used to decide eligibility for services; modifications or accommodations to be received on standardized tests; a statement of the type of special education services to be received and the training that those providing the services will have or need to implement them; a description of the extent to which a child may or may not participate with non-disabled children in the regular classroom setting; course descriptions required at age 14 or younger to reach post-school goals; (at age 16 or younger) transition services required for graduation; and a statement that requires telling a student at legal adulthood that certain rights will transfer to him or her.

Once the IEP has been developed, the parents of the child are required to approve the plan. If they do not, the IEP must be renegotiated with the other IEP team members. If an agreement still cannot be reached, parents can file a due process complaint with the LEA. The complaint can be taken to the state department of education if a resolution is still not reached at the district level. Once an IEP has been agreed upon, but before it can be implemented and special education services are started, parents must give written permission to the LEA.

The initial IEP process has been structured by legal statute so that the child's unique needs should be fully addressed. The IEP formulation and approval process places prescribed requirements on the LEA to provide all needed services in the most appropriate settings. It is possible that special education services offered at the time of the formulation could be constrained by LEA resource and facility limitations, or philosophical practices based on inclusion. However, the child's parent(s) would have to explicitly agree to limited services or a reduction in services if the student transferred to a different school district. Parents might also lack resources to advocate for their child, or they may simply be unaware and uninformed about their child's special educational needs and their parental rights to contest an IEP that did not fully accommodate their child.

In summary, this discussion suggests how student expense can be used as a proxy for disability severity based on the IEP formulation process. However, given the possibility that student expense may also be considered a consequence of services received, additional models that used a student's total special education expense as an outcome were estimated. As mentioned earlier, all multivariate analyses included a set of LEA level special education service mix use intensity variables. An explanation of these secondary analyses follows a discussion of the main analyses.

Generalized Estimating Equation, Logistic Regression Models and Hypotheses

The primary dependent variable for this study was binary making the use of logistic regression methods rather than OLS regression methods a statistically appropriate choice. For a number of reasons discussed more thoroughly in Menard (1995) and Berry (1993) OLS estimates of the probability of charter school attendance would likely be nonsensical—i.e., greater than one and negative. In addition, error variance would likely be heteroskedastic.

The logistic regression models were estimated with a generalized estimating equation (GEE). The GEE approach was taken because special education students were nested within districts/schools. Usually, residuals are correlated in nested data (Raudenbush & Bryk, 2002). This correlation, if ignored, will bias model fit statistics and standard errors, leading to erroneous conclusions about the statistical significance of substantive effects. The GEE approach not only adjusts the coefficient standard errors but also has the added advantage of producing a solution that is consistent and asymptotically normal when correlational structure is misspecified (Diggle et al., 1994). This feature allowed for the multilevel, logistic regression models to be estimated without specifying a covariance structure. Model coefficients are therefore unbiased as are the statistical tests on the regression coefficients.

Charter school attendance is conceptualized as a function of student characteristics, family background, LEA characteristics, and the total expense associated with educating specific categories of special needs students. The general logit model can be expressed in the following form:

$$\text{logit}(\hat{Y}_{ij}) = \alpha + \beta_1 X_{1ij} + \beta_2 X_{2ij} + \beta_3 X_{3ij} + \beta_4 X_{4ij} + e_{ij}$$

where the $\text{logit}(\hat{Y}_{ij})$ is a vector of the predicted log of the odds of charter school attendance for the *i*th student in the *j*th LEA; X_{1ij} is a vector of student characteristics associated with the *i*th student in the *j*th LEA; X_{2ij} is a vector of familial characteristics associated with the *i*th student in the *j*th LEA; X_{3ij} is the total expense associated with all of the *i*th student's disabilities in the *j*th LEA; X_{4ij} is a vector of LEA characteristics associated with the *i*th student in the *j*th LEA; and e_{ij} is the unique error term associated with the *i*th student in the *j*th LEA. A set of six logistic regression models were estimated to study between and within-group expense/disability severity and the relationship it had to the log odds of charter school attendance. The dependent variable was coded such that a "1" corresponded to charter school attendance and a "0" indicated TPS district attendance. Two models were estimated for each set of disabilities. The

first model excluded the special education service type variables. The second model added these variables to hold their effect constant.

Between Group Models

The between group models were estimated to examine the relative group odds of being enrolled in a charter school net of other confounding factors and within-group expense/disability severity. These models provide an indication of which general groups of special education students were less likely to attend a charter school in Arizona. Students were categorized into one or more of the following five student disability categories including emotional disability, speech impairment, learning disability, severe disability, and other disabilities. These categories were used because a small number of charter school students in several of the individual disability categories necessitated the construction of a composite measure of severe disability and other disabilities. Students were considered severely disabled if they had one or more of the following impairments/disabilities: mental retardation, autism, multiple disabilities, multiple severe disabilities with sensory impairment, orthopedic impairment, brain injury, or visual impairment. Students with a hearing impairment or some other health impairment were classified as having other disabilities. LEAs that enrolled students with a speech impairment, learning, or emotional disabilities received identical weighted amounts from the state. Greater funding was given to LEAs for students who had a severe disability or some other disability. Students with learning disabilities were used as the contrast group in the between group model. If average charter schools were typically unable to accommodate special education students who had more severe disabilities there should be differences between the various group odds. It was hypothesized that students classified with more serious disabilities (those who had a severe disability) would have lower log odds of attending a charter school than students with a learning disability.

The Within-group Models

The within disability group analysis provide estimates of the log odds of charter school attendance for students in each general disability group taking into account the specific effect of their expense/disability severity. Separate sets of models were estimated for each of the five disability groups.[10] If average charter schools limited services to special education students whose needs made them more expensive to educate, it could be expected that those students who had the most severe and expensive impairments within each general disability category would also have the lowest log odds of attending a charter school.

Hierarchical Linear Models

In addition to the GEE logistic analyses a set of hierarchical linear models (HLM) were also estimated where student expense was treated as the dependent variable. This approach was taken to address the issue of reverse causality between expense/disability severity and charter school attendance. The within-LEA model estimating the special education expense of the *i*th student in the *j*th TPS district/charter school for all disabilities can be expressed in the following form:

$$\text{Ln(Special Education Expense)}_{ij} = \beta_0 + \beta_1(\text{Female}_{ij}) + \beta_2(\text{Black}_{ij}) + \beta_3(\text{Hispanic}_{ij}) + \beta_4(\text{Native American}_{ij}) + \beta_5(\text{Asian}_{ij}) + \beta_6(\text{Other Ethnicity}_{ij}) + \beta_7(\text{Poverty Status}_{ij}) + \beta_8(\text{LEP Status}_{ij}) + \beta_9(\text{Out of Level Status}_{ij}) + \beta_{10}(\text{Mobile}_{ij}) + \beta_{11}(\text{Emotional Disability}_{ij}) + \beta_{12}(\text{Speech Impairment}_{ij}) + \beta_{13}(\text{Severe Disability}_{ij}) + \beta_{14}(\text{Other Disability}_{ij}) + r_{ij}$$

[10] The model examining the log odds of charter school attendance within the severe disability group dropped the asian student category. There were no Asian students with a severe classification.

where β_0 is the intercept, $\beta_1 - \beta_{14}$ are slopes, and r_{ij} is unique error associated with the *i*th student in the *j*th TPS district/charter school. In each model, β_0 is allowed to vary from LEA to LEA and represents deviation from the average LEA intercept i.e., u_{0j}. $\beta_{0,}$ is a function of the *j*th TPS district/charter school's characteristics:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Ln(ADM)}_j) + \gamma_{02}(\text{Urban}_j) + \gamma_{03}(\text{Charter School}_j) + \gamma_{04}(\%\ \text{Service Type}_j) + u_{0j}$$

The γ_{03} coefficient indicates whether student special education expenditures were lower in charter schools. The γ_{04} coefficient represents a set of special education service type variables included to account for the differences in the use of the various types of special education services between LEAs. Separate, two-level models were estimated for each of the five disability categories.

Model Control Covariates

All GEE logistic regression models and HLMs included a set of control covariates. This set of variables included LEP, racial/ethnic, and poverty status primarily because of the precedent set by previous research. For example, Artiles et al. (2005) found that students who had LEP were referred to special education programs at a higher rate than native English speakers. Several other studies have suggested that some ethnic groups, particularly black and Native American students were more frequently placed into special educations programs and diagnosed with specific disabilities than students from other ethnicities/racial groupings (Goodale & Soden, 1981; Harry & Anderson, 1994; Herrera, 1998). How poverty status affects charter school enrollment is still ardently contested. Some studies have shown that charter schools enrolled larger proportions of poorer students than TPSs, while other studies suggest the converse.

Another issue that required consideration was the practice of allowing Arizona special education students to take the AIMS statewide assessment out of grade level. Many out-of-level test takers tended to have more significant disabilities. In addition, charter schools tended to test a larger proportion of their students out of level. However, it was impossible to distinguish between the legitimate practice and the alleged practice of testing students out of level to invalidate test scores so that they would not be included in aggregate level reviews of school performance. Students were included in these analyses irrespective of the validity of their test score.

All regression models included a school mobility indicator. School mobility is typically associated with a variety of negative scholastic consequences including higher dropout rates (Rumberger & Larson, 1998), behavioral problems (Simpson & Fowler, 1994), and lower achievement test scores (Simpson & Fowler, 1994; Swanson & Schneider, 1999).

As discussed earlier, final models included the percentage of students who had received different types of special education services in the LEA. Nearly 97% of special education students received services in one of four mutually exclusive categories including: service type A—outside the regular class less than 21% of the day; service type B—outside the regular class for at least 21% but not more than 60% of the day; service type C—outside the regular class for more than 60% of the day; and service type S—regular class with supplemental aids/services. Preliminary models were estimated with all four service type variables entered as a block. Models shown in the multivariate regression tables included only those service type variables that had a statistically significant effect.

Finally, LEA size (ADM) and location were included in each model because of the potential for selection bias that could result from both parental preference for a smaller school environment, or a larger service area that could provide a greater number of educational choices in a more centralized geographic area. Some parents of students with disabilities might be inclined to seek a wider variety of educational services that are more likely to be offered in larger schools and TPS districts. These LEAs are more likely to be located in urban areas. Moreover, LEAs situated in urban

areas will also be more likely to enroll students with disabilities because of the greater numerical concentration of such students in the school or district's geographic vicinity.

LEA size functions as a control for economies of scale that larger schools and districts are likely to have in terms of offering special education services. An economy of scale makes larger LEAs more adept and economically efficient in terms of meeting the needs of a diverse population of special education students because of the centralization of resources and educational services. It is also possible that some larger districts with greater budget capacity and larger student populations might be able to allow for special education program spending to encroach upon general education spending (Chambers et al. 2005, Sugarman 2002).

Results

A comparison of group mean proportions shown in Table 1 suggested that the profiles of special education students differed in a variety of ways when accounting for their LEA attendance status. A larger proportion of special education charter school students were female, white, of Native American origin, or of some other ethnicity. They were also more likely than TPS district students to have changed schools during the year and to have tested out of level. Not surprisingly, charter school students with disabilities attended smaller districts/schools than special needs TPS students.

In contrast, a larger proportion of TPS district special education students were Hispanic or had an LEP status. A larger proportion were poor or eligible for Title I funds, and a disproportionate number attended schools in more urbanized counties (see *Table 1*). There was a 14% difference in the enrollment of poorer special education students, a 15% difference in Hispanic student enrollments, and an 11% difference in LEP enrollments. Average special education students who attended TPS districts were almost $3000 more expensive than their counterparts who had attended average charter schools.

These sample data, like the state figures discussed earlier, suggest that charter schools were more reliant on mainstreaming (type S services) and time restricted pullout programs (type A services). TPS districts enrolled much larger proportions of their special education students in time intensive pullout programs (type B and C services). Importantly, the overall special education service type distribution was remarkably similar when compared to the overall state figures. The sample data did show that students who had received type C services were slightly over-represented while those who received type A services were slightly under-represented when compared to the state figures.

Table 2 suggests there were also differences between LEA types in terms of the proportion of students enrolled with different types of disabilities. Average TPS districts enrolled a disproportionate share of students with a speech impairment or a severe disability when compared to average charter schools. The finding related to the speech impairment category might be explained by the large mean differences between TPS district and charter schools in the proportion of special education students who were Hispanic or had a LEP status. Such students are referred to special education at a higher rate than other students. Additionally, Arizona charter schools enrolled a larger proportion of students with emotional disabilities. Finally, results in Table 2 further suggest that students who had learning disabilities were the most representative type of special education student in both types of LEAs while those classified with other disabilities were least representative.

Table 1
Mean proportions and mean differences between special education students enrolled in charter (n=1,222) and TPS districts (n=23,916), 2002-2003

Variable	LEA Type	Mean Proportion	Std. Deviation	Mean Difference	99% C.I. Lower	Upper
Female	TPS	0.33	0.47	-0.05[b]	-0.09	-0.01
	Charter	0.38	0.49			
Black	TPS	0.07	0.25	0.00	-0.03	0.01
	Charter	0.07	0.26			
White	TPS	0.46	0.50	-0.05[a]	-0.09	-0.01
	Charter	0.51	0.50			
Hispanic	TPS	0.36	0.48	0.15[b]	0.13	0.19
	Charter	0.21	0.41			
Native American	TPS	0.08	0.28	-0.07[b]	-0.09	-0.04
	Charter	0.15	0.36			
Asian	TPS	0.01	0.10	0.00	-0.01	0.01
	Charter	0.01	0.09			
Other Ethnicity	TPS	0.02	0.12	-0.03[b]	-0.05	-0.02
	Charter	0.05	0.22			
Poverty Status	TPS	0.45	0.50	0.14[b]	0.11	0.18
	Charter	0.31	0.46			
LEP	TPS	0.15	0.36	0.11[b]	0.10	0.13
	Charter	0.04	0.19			
Urban	TPS	0.72	0.45	0.05[b]	0.01	0.08
	Charter	0.67	0.47			
Mobile	TPS	0.14	0.34	-0.08[b]	-0.12	-0.05
	Charter	0.22	0.42			
Out of level test taker	TPS	0.43	0.50	-0.12[b]	-0.15	-0.08
	Charter	0.55	0.50			
ADM (district size)	TPS	968.57	609.41	683.45[b]	663.31	703.60
	Charter	285.12	235.81			
Total Student Special Education	TPS	$4294.97	5080.05	$2995.03[b]	$2798.47	$3191.58
	Charter	$1299.94	2404.66			
Service Type A	TPS	0.44	0.15	-0.14[b]	-0.17	-0.11
	Charter	0.58	0.39			
Service Type B	TPS	0.32	0.13	0.20[b]	0.18	0.21
	Charter	0.12	0.23			
Service Type C	TPS	0.19	0.10	0.13[b]	0.13	0.15
	Charter	0.06	0.14			
Service Type S	TPS	0.02	0.04	-0.18[b]	-0.18	-0.20
	Charter	0.20	0.37			

[a] $p<.01$; [b] $p<.0001$

Table 2
Mean proportions and mean differences between special education students enrolled in charter schools (n=1,222) and TPS districts (n=23,916) by specific disability type, 2002-2003

Disability Type	LEA Type	Mean Proportion	Std. Deviation	Mean Difference	99% C.I. Lower	Upper
Learning Disability	TPS	0.74	0.44	-0.02	-0.05	0.002
	Charter	0.76	0.43			
Speech Impairment	TPS	0.20	0.40	0.05[b]	0.02	0.07
	Charter	0.15	0.36			
Severe Disability	TPS	0.09	0.29	0.03[b]	0.02	0.05
	Charter	0.06	0.24			
Emotional Disability	TPS	0.08	0.28	-0.03[a]	-0.04	-0.01
	Charter	0.11	0.31			
Other Disability	TPS	0.06	0.25	-0.01	-0.02	0.01
	Charter	0.07	0.26			

[a] $p<.01$; [b] $p<.0001$

These descriptive results suggest that there were several compositional differences between charter and TPS district special education populations. These results could also suggests that cropping of special education students in Arizona charter school occurred on several dimensions including disability severity, gender, ethnicity, language proficiency, and poverty status. The GEE logistic and HLM analyses provide firmer footing for the argument that the majority of charter schools in Arizona enrolled special education students whose needs were more in line with their budgetary constraints or available services.

Table 3 shows the results of the between and within-group GEE logistic regression models. The between group model estimated the relative log odds of charter school attendance for the five general disability categories including learning, speech, severe, emotional, and other disabilities net of each student's total special education expense/disability severity and other personal, family, and LEA characteristics. There were several notable findings.

Relative to students with a learning disability, those who had an emotional or severe disability were less likely to have attended a charter school net of their expense to the school (see *Model 1*). The respective odds ratios showed that these special education students were 2.16 times less likely, and 1.64 times less likely to have attended a charter school when compared to the odds of students with a learning disability. These results provide an answer to the first research question and give support to the first hypothesis. Students with disabilities who were ranked by the state as more severe were less likely to have attended a charter school

It is also important to note that once the intensity of use of different types of special education services was considered, the between group log odds of attending a charter school no longer varied (*see model 2).* The magnitude of the effect of student expense/disability severity diminished slightly; however, it remained a statistically significant predictor of charter school attendance. This suggests that the LEA special education service mix, or the intensity of service use explained between disability group attendance differences. However, the fact that the expense/disability severity indicator continued to predict charter school attendance net of the special education services that are typically used most intensively in charter schools further suggests that student expense can be used as an accurate proxy for disability severity. The odds ratio for this coefficient indicates that for a one unit increase in a student's log total special education expense, the log of the odds of charter school attendance decreased by 0.25 units, or the odds decreased by 28%

(*see model 2*). Clearly, irrespective of disability type, more expensive students were less likely to have attended a charter school. The within-group analysis can then determine if this was the case for all of the examined categories.

Table 3
GEE logistic regression models, charter school attendance in Arizona, 2002-2003

Variable	Between Group Model 1			Between Group Model 2			Learning Disability Model 1			Learning Disability Model 2			Speech Impairment Model 1			Speech Impairment Model 2		
	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio
Constant	14.49[c]	1.64	-	8.36[c]	2.09	-	15.30[c]	1.87	-	8.92[b]	2.53	-	18.25[c]	2.88	-	10.29[b]	3.25	-
Female	0.17[a]	0.15	1.19	0.24	0.16	1.28	0.11	0.16	1.11	0.17	0.16	1.18	-0.23	0.29	0.80	0.02	0.27	1.02
Black	0.03	0.34	1.03	0.34	0.38	1.41	0.10	0.40	1.11	0.42	0.44	1.52	0.10	0.36	1.10	0.28	0.38	1.33
Hispanic	-0.74[b]	0.26	0.48	-0.55	0.31	0.58	-0.76[a]	0.33	0.47	-0.61	0.35	0.55	-1.13[b]	0.42	0.32	-0.89	0.52	0.41
Native Amer.	1.22	0.78	3.39	1.69[a]	0.79	5.43	1.39	0.85	4.01	1.70[a]	0.82	5.46	-0.21	0.80	0.81	0.14	1.13	1.14
Asian	0.38	0.35	1.46	0.47	0.40	1.60	-0.08	0.44	0.93	-0.32	0.46	0.72	-0.32	0.66	0.73	-0.50	0.44	0.60
Other Ethnicity	0.29	0.34	1.34	-0.02	0.46	0.98	0.15	0.39	1.17	0.07	0.48	1.07	0.25	1.69	1.29	0.18	1.20	1.20
Poverty Status	-0.87[a]	0.44	0.42	-0.86	0.57	0.42	-1.05[a]	0.49	0.35	-0.96	0.61	0.38	-1.17	0.79	0.31	-1.26	0.92	0.28
LEP	-0.69	0.58	0.50	-0.66	0.72	0.52	-0.63	0.68	0.53	-0.56	0.72	0.57	-1.53	0.99	0.22	-0.53	0.88	0.59
Ln(Dist. ADM)	-2.54[c]	0.30	0.08	-2.33[c]	0.29	0.10	-2.56[c]	0.32	0.08	-2.24[c]	0.32	0.11	-2.77[c]	0.42	0.06	-2.38[c]	0.49	0.09
Urban District	1.88[b]	0.64	6.56	1.91[b]	0.67	6.76	1.75[b]	0.66	5.74	1.57[a]	0.63	4.78	2.89[a]	1.24	17.93	2.77[a]	1.32	16.01
Out of level	0.32	0.22	1.37	0.40	0.23	1.50	0.34	0.23	1.40	0.45	0.25	1.57	-0.04	0.57	0.96	0.37	0.58	1.45
Mobile	0.04	0.25	1.05	0.09	0.24	1.09	0.19	0.21	1.21	0.23	0.25	1.26	-0.49	0.58	0.61	-0.62	0.67	0.54
Ln(Total Sped.Exp.)	-0.38[c]	0.06	0.68	-0.25[a]	0.05	0.77	-0.46[c]	0.08	0.63	-0.32[c]	0.08	0.73	-0.69[c]	0.15	0.50	-0.62[c]	0.15	0.54
% Service type A	-	-	-	0.06[b]	0.02	1.06	-	-	-	0.05b	0.02	1.06	-	-	-	0.08[c]	0.02	1.08
% Service type S	-	-	-	0.08[c]	0.01	1.08	-	-	-	0.07[c]	0.01	1.07	-	-	-	-	-	-
Emot. disability	-0.77[a]	0.36	0.46	-0.10	0.34	0.90	-	-	-	-	-	-	-	-	-	-	-	-
Speech impair.	0.25	0.31	1.29	0.18	0.31	1.20	-	-	-	-	-	-	-	-	-	-	-	-
Severe disability	-0.49[a]	0.23	0.61	-0.40	0.27	0.67	-	-	-	-	-	-	-	-	-	-	-	-
Other disability	-0.36	0.45	0.70	0.08	0.46	1.08	-	-	-	-	-	-	-	-	-	-	-	-
n	25,138			25,138			18,622			18,622			4,879			4,879		
-2LL	4372.01			3422.44			3276.71			2707.51			661.52			478.46		
Nagelkerke's R^2	0.60			0.69			0.61			0.68			0.62			0.73		

[a] $p \leq .05$ [b] $p \leq .01$ [c] $p \leq .0001$

Table 3 (continued)

Variable	Severe Disability Model 1			Severe Disability Model 2			Emotional Disability Model 1			Emotional Disability Model 2			Other Disability Model 1		
	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio	β	Emp. S.E.	Odds Ratio
Constant	17.68[c]	2.81	-	12.33[b]	4.34	-	13.43[c]	1.87	-	23.59[c]	3.87	-	20.38[c]	4.34	-
Female	1.03[b]	0.40	2.80	1.35[b]	0.46	3.86	1.10[b]	0.37	3.01	1.31[b]	0.42	3.71	0.94[c]	0.29	2.57
Black	-0.21	0.63	0.81	-0.01	0.94	0.99	0.02	0.51	1.02	1.09	0.58	2.97	0.47	0.51	1.60
Hispanic	-1.23[a]	0.55	0.29	-0.59	0.75	0.55	-1.00[a]	0.51	0.37	-1.62	1.07	0.20	-1.36[a]	0.63	0.26
Native Amer.	0.61	0.92	1.85	1.65	1.03	5.23	-0.63	0.89	0.53	2.02	1.51	7.56	0.71	1.07	2.04
Asian	-	-	-	-	-	-	-2.35[a]	1.14	0.10	-6.65[c]	1.55	0.00	1.07[b]	0.50	2.91
Other Ethnicity	1.26[a]	0.63	3.54	0.34	0.85	1.40	0.87[a]	0.44	2.38	-0.17	0.85	0.85	-0.13	0.96	0.87
Poverty Status	-0.25	0.53	0.78	0.09	0.60	1.10	-0.21	0.50	0.81	-0.79	0.78	0.46	-0.45	0.57	0.64
LEP	-0.59	0.68	0.55	-0.98	0.99	0.38	-0.52	0.69	0.60	-2.31[b]	0.82	0.10	0.72	0.63	2.06
Ln(District ADM)	-3.45[c]	0.50	0.03	-3.33[c]	0.59	0.04	-2.55[c]	0.37	0.08	-3.85[c]	0.64	0.02	-3.95[a]	0.84	0.02
Urban District	3.54[c]	0.87	34.30	3.62[b]	1.04	37.39	2.08[a]	0.87	8.00	3.75[b]	1.16	42.46	3.09[a]	1.27	21.99
Out of level	0.19	0.43	1.22	0.61	0.56	1.84	-0.47	0.51	0.63	-0.97	0.66	0.38	0.11	0.36	1.12
Mobile	-0.36	0.69	0.70	-0.94	0.80	0.39	-0.82	0.87	0.44	0.23	0.48	1.26	-0.01	0.68	0.99
Ln(Total Sped.Exp.)	-0.33[c]	0.05	0.72	-0.27[c]	0.07	0.76	-0.30[c]	0.09	0.74	-0.25[b]	0.09	0.78	-0.11	0.09	0.89
% Service type A	-	-	-	0.06[a]	0.03	1.06	-	-	-	-	-	-	-	-	-
% Service type B	-	-	-	-	-	-	-	-	-	-0.16[c]	0.04	0.85	-	-	-
% Service type C	-	-	-	-	-	-	-	-	-	-0.03	0.02	0.97	-	-	-
% Service type S	-	-	-	0.10[c]	0.02	1.10	-	-	-	-	-	-	-	-	-
n	2,332			2,332			2,109			2,109			1,648		
-2LL	237.93			171.90			288.26			126.23			336.34		
Nagelkerke's R^2	0.68			0.77			0.76			0.90			0.61		

[a] $p \leq .05$ [b] $p \leq .01$ [c] $p \leq .0001$

Five sets of within-group models examined the relationship between expense/disability severity and the log odds of charter school attendance in Arizona. While there was considerable variation in terms of the impact of other covariates on charter school attendance within each disability category, the direction of the expense/disability severity coefficient was consistently negative in each of the five sets of models. With the exception of the students who had other disabilities, all the other within-group analyses included statistically significant expense/disability severity coefficients. Beyond this exception, more severely disabled students (i.e., those who were more expensive) within each of the other four disability categories were less likely to have attended a charter school in the 2002/2003 school year—between 1.28 and 1.86 times less likely once the intensity of use of special education services was accounted for.

Similar to the between groups models, the within-group models show a decrease in the magnitude of the effect of higher expense/greater disability severity on charter school attendance once relevant service mix variables were included. Most importantly, these findings provide an answer to the second research question concerning the impact of disability severity on charter

school attendance. They also give support to the corresponding hypothesis in four of the five disability categories.

For reasons discussed earlier, the HLM analyses presented in Table 4 used the natural log of student's total special education expense/disability severity as the dependent variable. Six sets of models were estimated including a set for each of the five disability categories and a set for all disabilities. Even though the implied sequence of causation has been reversed in these models, substantive interpretation regarding student expense was nearly analogous to that of the GEE logistic regression analysis. Net of student characteristics, other LEA characteristics, and the intensive use of different types of special education services, charter school students were on average less expensive than their respective peers. The charter school coefficient was negative and statistically significant in each main effects model. Importantly, moderately large to large ICCs (.54 to .96) suggested that over half to almost all of the variability in the expense of average special education students occurred between LEAs (*see all models*). This suggested that the use of a multilevel model to account for clustered data was methodologically appropriate.

In summary, students with more severe disabilities who were enrolled in charter schools were on average less expensive than those students enrolled in TPS districts. It is also important to point out that like the GEE logistic analyses, the magnitude of the charter school coefficient in each set of HLM models decreased slightly once the intensity of use of special education services was accounted for in each set of models.[11] This finding suggested that the intensive use of certain types of special education services explains some of the expense differential between LEA types. However, most of the differential is still present even after service mix use intensity was considered.

The GEE logistic and HLM results jointly suggested that average expenditure differentials between charter schools and TPS districts existed within each of the five general special education groupings after controlling for the intensive use of different types of special education services. A previous discussion proposed that different but more inexpensive services in charters might explain expenditure differentials within groups of special education students. Descriptive state level data lends some support to the assertion that special education service offerings were different in Arizona charter schools and TPS districts. However, these analyses have shown that the special education students enrolled in charter schools were less expensive than their counterparts enrolled in TPS districts even after accounting for differences in LEA special education service offerings.

There was one noteworthy difference between the two sets of analyses. The expense/disability severity measure in the GEE logistic "other disabilities" model was negative but non-significant. The HLM "other disabilities" models showed that charter schools generally enrolled less expensive students with other disabilities. The failure of the "other disabilities" GEE logistic model to show a statistically significant difference may suggest that the use of the empirical standard errors in the GEE context may have been overly stringent. It should also be pointed out that the two analyses are not strictly analogous since the outcome variables are different.

[11] HLM models were also estimated without the service mix use intensity variables for the purpose of comparison. They are not shown.

Table 4
HLMs, Ln(total special education expense) for special education students in Arizona state, 2002-2003

Fixed Effect	All Disabilities		Learning Disability		Speech Impairment		Severe Disability		Emotional Disability		Other Disability	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Constant	2.86[b]	0.92	4.03[d]	1.01	1.06	1.34	-1.53	1.48	0.11	1.73	-1.59	1.90
Charter School	-2.79[d]	0.34	-2.60[d]	0.36	-2.30[d]	0.47	-2.36[d]	0.56	-2.90[d]	0.60	-2.24[c]	0.62
Female	0.01	0.01	-0.01	0.01	-0.05[a]	0.02	-0.002	0.07	0.04	0.04	0.15	0.12
Black	0.07[b]	0.03	-0.02	0.02	0.08	0.05	0.02	0.14	-0.02	0.05	0.32	0.25
Hispanic	0.03	0.02	-0.03[a]	0.02	0.004	0.03	0.07	0.10	0.002	0.04	0.12	0.16
Native American	0.02	0.03	-0.03	0.02	-0.01	0.05	0.06	0.20	-0.11	0.08	-0.04	0.30
Asian	0.11	0.07	0.05	0.05	-0.05	0.08	-	-	0.19	0.14	0.64	0.43
Other Ethnicity	0.18[c]	0.05	0.09[b]	0.03	0.03	0.12	0.20	0.26	0.09	0.10	0.95[a]	0.39
Poverty Status	-0.004	0.02	0.02	0.01	-0.05	0.03	0.13	0.12	0.06	0.05	0.22	0.18
LEP	0.06[b]	0.02	0.03[a]	0.01	0.05	0.03	0.11	0.12	0.11	0.08	0.60[b]	0.21
Ln(Dist. ADM)	0.58[d]	0.15	0.45[b]	0.16	0.69[c]	0.19	1.38[d]	0.24	1.08[c]	0.29	1.19[d]	0.31
Urban District	-0.27	0.30	-0.27	0.32	-0.19	0.36	0.33	0.35	-0.24	0.45	0.24	0.44
Out of level	0.09[d]	0.02	-0.01	0.01	0.42[d]	0.03	0.25[b]	0.08	0.09[b]	0.03	0.06	0.12
Mobile	0.01	0.02	0.02	0.01	0.05	0.03	-0.14	0.11	-0.01	0.03	-0.30	0.17
% Service Type A	0.02[c]	0.004	0.02[d]	0.005	0.03[b]	0.01	-	-	-	-	-	-
% Service Type B	-	-	-	-	0.04[c]	0.01	-	-	-	-	-	-
% Service Type C	-	-	-	-	-	-	-	-	0.04[a]	0.02	-	-
% Service Type S	-	-	-	-	-	-	-0.04[d]	0.01	-	-	-	-
Emot. disability	0.61[d]	0.02	-	-	-	-	-	-	-	-	-	-
Speech impairment	0.45[d]	0.02	-	-	-	-	-	-	-	-	-	-
Severe disability	0.73[d]	0.02	-	-	-	-	-	-	-	-	-	-
Other disability	-0.73[d]	0.03	-	-	-	-	-	-	-	-	-	-
Random Effect	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.
Intercept u_{0j}	5.75[d]	0.47	6.31[d]	0.51	5.18[d]	0.53	3.69[d]	0.55	7.84[d]	0.85	5.47[d]	0.80
ICC	0.84		0.96		0.92		0.56		0.95		0.54	
-2LL	74,581.4		29,551.0		11,219.1		9,470.0		4,898.3		7,553.4	
n	25,138		18,622		4,879		2,332		2,109		1,648	

[a] $p \leq .05$ [b] $p \leq .01$ [c] $p \leq .001$ [d] $p \leq .0001$

Conclusion

The descriptive analyses assessed whether the profiles of the average special needs students attending charter schools and TPS districts differed. The results of the demographic analyses indicated that special education charter school students were disproportionately female, white,

Native American, and of some other race/ethnicity. A larger proportion of charter school special education students had an emotional disability. In contrast, special education students who attended a TPS district were disproportionately poorer, Hispanic, LEP, more expensive to serve, and more likely to have a speech impairment or severe disability.

In light of the historical findings of McKinney (1996) and Garn (2000), the GEE logistic and HLM regression analyses of this study showed that it would be highly premature to rule out arguments suggesting that charter schools in Arizona restricted the enrollments of more severely disabled students intentionally, or unintentionally. While the effects of parental preference cannot be completely discounted, these findings considered as a whole suggested that average Arizona charter schools geared their educational services to a narrowly defined group of special education students in the 2002-03 academic year.

Importantly, these results are not inconsistent with earlier findings from McKinney's 1996 study, and they could be taken as indirect evidence that average charter schools in Arizona during the 2002-2003 school year lacked administrators with specialized knowledge of disability law, facilities, or appropriate staff to properly address the needs of more severely disabled students. Clearly, one implication is that many parents could have been forced to enroll their more severely disabled special needs children in TPS districts. Alternatively, Arizona charter school admissions policies and educational missions may have been structured in ways that discouraged many parents from enrolling their more severely disabled children. Given the data limitations, it was not possible to ascertain if parents of the most severely disabled students voluntarily or involuntarily chose TPS districts over charters because appropriate services or enrollment barriers existed. Data from Arizona charter schools concerning the way services were implemented, the quality of those services, and the degree to which services met the needs of their respective students could be collected in a future study to determine the effect that they have on enrollment.

Results also suggested that the intensive use of different types of special education services explains only a small part of the average student special education expenditure differential that existed between LEA types. Advocates for charter schools could be inclined to suggest that additional funding might be needed to induce charters to make their enrollment policies less restrictive to the most severely disabled students. Increased funding could be helpful if for instance, as Garn (2000) suggested, charter schools were required by the state to pick up the transportation costs of all special education students intent on attending a school. Currently, charter schools in Arizona are not mandated by legal statute to provide transport even though they receive a fixed amount for this purpose. Charter schools can refuse to pay for transportation, effectively eliminating choices for parents who cannot afford to pay privately. Additional funds could also induce charters to staff or equip their school facilities to better address the requirements of a variety of special education students creating less worry among parents who are unconvinced that a charter school can adequately provide services to their unique child.

Such an approach does raise several questions, however. If the state gave additional per-pupil funding for special education students solely to charter schools as an inducement to ease or eliminate enrollment barriers and improve services to the most severely disabled students, is this the most efficient use of resources? And does this suggest that charter schools might lack certain organizational and economic efficiencies more common to larger TPS districts in terms of the implementation of special education programs? Changing special education funding formulas might be considered a rash action given that Chaikind et al. (1993) found that the costs of special education have remained fairly constant over time. Perhaps the ways in which charter schools allocate or choose not to allocate existing special education funds has an impact on enrollments as well. Sage policy makers in Arizona might reconsider the way special education funding is allocated

in addition to focusing more attention on how charter schools actually utilize special education funds. Parents of special education students could be surveyed regularly to determine how well LEAs follow the IEP process, the rationale used to choose the LEA their child attends, the quality and type of services offered, and whether they've experienced difficulty placing their child in specific LEAs and why.

This study focused exclusively on special education students enrolled in Arizona TPS districts and charter schools. As discussed earlier, the limited regulatory environment and strong political support for quasi-market style interventions in public education earmarked the state as somewhat distinct. Thus, the findings and conclusions drawn may have limited applicability in other states with large numbers of charter schools where regulatory environments are different. In other states that have less restrictive charter school laws where there is less fiscal oversight of special education spending in charter schools, similar attention to resource availability and allocation might be warranted to induce charter schools operators to provide more severely disabled students better access to alternative education opportunities.

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Appendix

Charter School Attendance—Students attending a charter school district received a one and TPS district students a zero. TPS districts were included in the contrast category.

Gender—Female students received a one and males a zero. Male students served as the contrast category.

LEP—Those students identified by a school as having LEP were assigned a one and a zero otherwise. Non-LEP students were included in the contrast group.

Out of Level Test Takers—Students that had taken the AIMS exam at a different grade level other than the grade they were enrolled in were classified as out of level test takers. Such students were coded with a one. All others received a code of zero. On level test takers were included in the contrast category.

Poverty Status—Each school identified the Title 1 status of their students. If the student had been coded with a "yes" for Title 1 status they received a code of one. All other students received a zero. Non-title 1 students were used as the contrast group.

Student Mobility –An indicator for student mobility was also included in the multivariate analyses. Students indicated whether they had begun the school year in the school they were currently attending. Students who answered "no" to this question were given a code of one. All other received a zero. Non-movers were included in the contrast category.

Race/Ethnicity—Constructed from a six-category indicator. Students were coded with a one if they met the condition and zero if they did not. The regression models included an indicator for Black, Asian, Native American, Hispanic and other racial/ethnic status. White students were used as the contrast group.

County Location—A geographic indicator was included in each set of analyses. If the school or district was located in Maricopa or Pima County it was classified as urban. All other school/district locations were considered rural. The binary variable was coded one for urban and zero for rural. Districts/schools in rural county locations were included in the contrast group.

District ADM—District ADM was computed as the (Σ of all schools' ADM for each district)/(number of schools in the district). A monotonic transformation of this result - ln(District ADM) - was used as a proxy for the district's size because the distribution was positively skewed. The state of Arizona defines ADM, "*as the total enrollment of fractional students and full-time students, minus withdrawals, of each school day through the first one hundred days or two hundred days in session, as applicable, for the current year. Withdrawals include students formally withdrawn from schools and students absent for ten consecutive school days, except for excused absences as identified by the department of education. For computation purposes, the effective date of withdrawal shall be retroactive to the last day of actual attendance of the student.*"

Special Education Service Type—LEAs report the number of students receiving different types of special education services to the ADE. Of the twelve categories that can be reported, nearly 97% of special education students received services listed under four categories including: Service Type A—

outside the regular class less than 21% of the day; Service Type B—outside the regular class for at least 21% but not more than 60% of the day; Service Type C—outside the regular class for more than 60% of the day; and Service Type S—regular class with supplemental aids/services. The proportion of students receiving each of these four types of special education services were computed for each LEA.

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