Institute for Research on Poverty
Discussion Paper no. 1134-97

Special Education and School Achievement: An Explanatory Analysis

Arthur Reynolds
Department of Social Work and Institute for Research on Poverty
University of Wisconsin–Madison
E-mail address: ajreynol@facstaff.wisc.edu

Barbara Wolfe
Department of Economics and Institute for Research on Poverty
University of Wisconsin–Madison

June 1997

The research was supported by the University of Wisconsin–Madison, the Netherlands Institute for Advanced Study, and the National Institute of Child Health and Human Development Grant Number HD34294.

Abstract

Since the passage of *Mills v. Board of Education* in 1972, school district spending on special education has increased dramatically nationwide. Are the high expenditures on special education justified in order to improve school performance? To shed some light on this question, we looked at the school achievement of 1,245 low-income, mostly black children in grades 1 through 6 who participated in the Chicago Longitudinal Study from 1987 to 1992. About 15 percent of the study sample received special education services, half in learning disabilities and half in other disabilities, 22 percent were retained in grade, and 50 percent changed schools more than once during their elementary schooling. Controlling for school achievement prior to placement in special education, as well as for family background, school experiences, and school attributes, children receiving special education services had lower reading and math achievement scores than other sample children who did not receive services, especially during grades 4 through 6. Children with learning disabilities benefitted less from special education services than did children with other disabilities. Grade retention and school mobility during the primary grades were associated with significantly lower reading and math achievement above and beyond prior achievement and other factors. Alternatives to special education placement services as well as grade retention, at least as they currently exist, may benefit children with learning difficulties.

Special Education and School Achievement: An Explanatory Analysis

Public concern is quite high over the large and increasing expenditures by school systems on children with disabilities. Much of this concern is with the relatively large number of students enrolled in special education as well as the related high expenditures. Do children who are screened into these programs display better school progress with the additional resources invested in them? Or are there negative consequences to children of spending time in special education? Is there a stigma associated with the program that has negative scholastic consequences? Or perhaps less motivation provided or the peer group less challenging? (See, for example, Artiles and Trent 1994.)

If the public schools are to continue to support programs that, on a per capita basis, are much more expensive than traditional schooling, it is important to ask if such spending and such programs have a positive impact on the targeted group of children.[1] Conditional on the answer to that question, the next question is, does it pass a cost-benefit test and, if so, for whom?

BACKGROUND

Following passage of *Mills v. Board of Education* in 1972 and the Education for All Handicapped Children Act in 1975 (now known as the Individuals with Disabilities Education Act or IDEA),[2] states have been required to provide appropriate public education to all school-age children with disabilities. Special education has become a major expenditure for many school districts, accounting for more than $32 billion in annual expenditures and, in fiscal year 1992, providing services to some 5.2 million school children ages 0–21 (U.S. Department of Education 1995). The number of children participating in special education has stayed relatively stable since 1980, when just over four million

[1]In Chicago, for example, the annual cost per student for special education is about $12,000, versus $6,000 for regular instruction.

[2]Components of the law apply to children from ages 0–21.

received special education services (U.S. Department of Education 1995). But the composition of disabilities which fall under the rubric of "special education" have changed. In 1980, the "learning disabled" made up less than a third of special ed students; by 1993, children with this diagnosis accounted for more than half of all children in educational programs for those with disabilities (U.S. Department of Education 1994). Thus today more than 10 percent of our schoolchildren are served by special education programs, including more than 5 percent who are included based on a diagnosis of having a learning disability. Although it is relatively easy to diagnose a child with significant physical disabilities or severe retardation, diagnosing a learning disability is far more difficult. Further, school districts have a financial incentive to accept more children into special education programs.[3] That is, special education costs tend to be covered by federal and state dollars rather than school district or local dollars. A special service, even that of an aide, that is not targeted on a child officially labeled as disabled will generally have to be financed by the school or school district while the same service targeted on a child officially diagnosed as disabled will be paid by either the federal or state government. Thus, more children officially diagnosed as having a disability can mean more dollars for the school to spend on other needs, that is, on resources for nondisabled students or accouterments for the staff.

According to IDEA procedures, teachers refer students they suspect may have a disability for evaluation by a group of specialists matched on the basis of the suspected disability.[4] This group then determines whether or not the child has a disability which makes them eligible for special education. Multiple specialists are involved and each has the responsibility to diagnose the child's disability according to his or her own specialty. Children who are so diagnosed are entitled to services under

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[3]If a school or school district, principal, etc., is rewarded on the basis of academic success, there may be an additional incentive to remove students who are performing poorly from the regular classroom and to have them labeled "disabled" and hence be excluded from the formal measure of achievement.

[4]According to Hocutt 1996, 3–5 percent of the school-age population are referred for such evaluation each year; more than 90 percent are tested while nearly three-quarters of those tested are placed in special education.

IDEA.[5] The next official step is to prepare an individualized education program for the child. This can involve a broad or limited set of services, from extra monitoring to special and separate classes with specially trained teachers and a low student/teacher ratio. Ninety-five percent of special education students are in public schools, where they spend an average of 30 percent of their time in some special education service. Parental consent is required at each step.

The two broad categories we consider below are students diagnosed with a learning disability and those with other disabilities. Nationally, somewhat more than half of all children receiving special education are diagnosed as having a learning disability. As noted above, this is the fastest growing category of children receiving special education services. Children in this group may have either a significant discrepancy between their expected performance and actual performance, or difficulty with one of more of the following: paying attention, reasoning, and/or organization.

LITERATURE REVIEW

There is but a limited literature in this area. The literature is a subset of that of educational production functions—the researcher asks whether or not a set of specific resources make a difference for student achievement. In this work, student achievement has been measured in various ways—from attendance through attitudes to scores on standardized achievement tests. The time period studied has also varied. In general, the analysts (and policy makers) are interested in the *value added* of these resources. This makes it important to study the *change or increment* in a child's achievement over time—whether it is within the school year or over some set of years of schooling. In the case of special education, the question underlying such studies is (or should be), what has the student gained from his or

[5]There are a set of officially recognized categories for such diagnosis or the establishment of eligibility for special education services. In addition, states may have additional categories or diagnoses that could lead to eligibility for special education services.

her special education services? To answer this, the analyst has to have an appropriate measure of how the student would have performed without these services. This difference will capture the value added of the special education services.

A recent article by Anne Hocutt (1996) reviews this literature. (We highlight the main elements here and refer the reader to her article.) One component of this literature studies how children with a special education diagnosis do in a regular classroom.[6] Hocutt's reading of this literature is that little accommodation is made (or if there is a differentiation, it may be to favor students who either do well or pay attention; in other words, not those needing special education). A second component of the literature studies the practices in special education classrooms compared to those in regular classrooms. These articles cite feedback with students, teaching strategies, and so forth.[7] Most such studies find differences between the two types of classrooms but the degree and dimensions of differentiation noted are inconsistent across these studies. A third component addresses outcomes of special education. Unfortunately, most of these studies suffer from methodological problems ranging from small sample sizes to the lack of an appropriate counterfactual.

- Virtually no use is made of control experiments or random assignment.
- The "selection" of students into special education and the recommendation and use of particular services for specific children makes a comparison with other children who don't have these unique characteristics relatively unsatisfactory.
- Placement in special education may be confounded with other school experiences, such as grade retention and school mobility, yet all prior studies of which we are aware do not control for these factors (but see Alexander, Entwisle, and Dauber 1994).
- Comparisons among school districts are difficult as most districts do not keep records on achievement of students in special education—at least in terms of standardized achievement tests.

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[6]Hocutt includes Baker and Zigmond 1990; Vaughn and Schumm 1996; Zigmond, Levin, and Laurie 1985 in this set.

[7]Articles that conduct such appraisals include Ysseldyke, Christenson, Thurlow, and Bakewell 1989, and Fuchs, Fuchs, and Bishop 1992.

- For many students with special education needs, the "payoff" may take place after a considerable period of time, but there are few longitudinal studies measuring the consequences of special education placement.

Hocutt's review of the more recent set of studies separates the results by type of disability. She finds that for elementary school-age students with learning disabilities, there is some payoff to special education services. This appears to be the case primarily for self-perception but also for reading ability.[8] A set of related studies of "effective schools" seems to suggest that students with special education needs do best in regular classrooms if they are in effective schools (Hocutt 1996, p. 92).

Still other research focuses on the transition of children with special education needs to work or to college. (For a review of this literature, see Wagner and Blackorby 1996.) The one finding reported in Wagner and Blackorby that is of some relevance to our study is that students with sensory or motor disabilities benefited from participation in regular classrooms while those with other diagnoses did not.

Overall, then, the literature implies that teachers with special education training provide a classroom environment which differs from that of the regular classroom; that within regular classrooms, children with special education needs tend not to get beneficial extra attention; and that there is some—albeit weak—evidence that special education is beneficial for some students with special education needs. The reader also becomes aware of the extreme difficulty of assessing the question of the impact, or value added, of special education.

Our Approach

As noted earlier, our objective is to shed light on the question of whether special education services improve the educational outcomes of elementary school-age children. Our measure of outcome is performance on standardized tests of achievement. These include the reading comprehension and

[8]These studies were conducted on very small numbers of students; one study, for example, tested 11 poor readers and 21 students with learning disabilities (Hocutt 1996, p. 88).

mathematics total subtest scores on the Iowa Tests of Basic Skills (ITBS). (See Appendix 1 and Hieronymus, Lindquist, and Hoover 1980, and Hieronymus and Hoover 1990 for more detail on the ITBS.) We rely on the ITBS because it has the advantage of being a quantified and standardized measuring tool administered to children annually from their earliest entry into elementary school—from kindergarten through grade six. Analyses were based on ITBS standard scores, which are converted from raw scores and can be used to determine cognitive growth over time and across grade levels. In kindergarten, the prereading subscale (word analysis) replaced reading comprehension. We use the child's own prior performance as the main counterfactual—that is, we have the child's standardized test score for each grade from kindergarten through grade six; thus, we can look at the value added from the child's own achievement for the year prior to placement in special education. This has the advantage that any unmeasured characteristics of the child (or family) are removed by taking the difference—or value added—for the individual child. Each child is compared to him- or herself rather than a child or children with unmeasured differences that might account for differences in their performance.

We use children in a single school system—Chicago—which has the advantage of some similarity in curriculum and program. These children are all of those who have been followed for six years and who participated in the Chicago Longitudinal Study (CLS) (see Reynolds, Bezruczko, Mavrogenes, and Hagemann 1996), a project designed to trace the school and social adjustment of the children who completed government-funded kindergarten programs in the Chicago Public Schools in 1986. Because we use children in more than twenty-five schools, we have a rather large number of observations. We follow these children year by year, from kindergarten to the sixth grade. Thus, we observe their school performance and a variety of other experiences year-by-year for seven years—a long time compared to the other studies. This is a period long enough to allow us to observe short- and medium-run impacts. Each child took the ITBS, Form 7, Level 5, as a measure of school readiness in the fall of 1985. We view this as the beginning measure of the child's cognitive ability or developmental

preparedness. In each subsequent year they also took a version of the ITBS, which is administered by the Chicago Public School system.[9] We use scores on the reading comprehension and mathematics subtests of this test.

We have a good deal of information on the school(s) in which these children are enrolled, some information on the children's families, and a particularly rich set of information on other school interventions such as retention (grade repetition) and school mobility (moves from school to school), all of which we control for in our analysis. Prior research with these data also offers insight into some associations related in particular to extended early childhood intervention. Children had the opportunity to participate up to six years in an extended early childhood intervention called the Child-Parent Center and Expansion Program. Earlier research with this data set (Reynolds 1992; Reynolds, Mavrogenes, Bezruczko, and Hagemann 1996) suggests that school mobility and grade retention are significantly associated with lower achievement test scores and school progress above and beyond other factors. We include these variables in our analysis.

The weaknesses of this study are our lack of data on the children's special education needs. We have only a few categories for the nature of the underlying disability of these children and, given the number of observations available, we place them into only two categories: those with learning disabilities and all others in special education.[10] Second, we know little about the quality of the special education services provided other than that most placements were in regular classrooms. Third, all of these children are or have been in low-income households. Indeed, the sample is representative of children at risk in Chicago who participate in government-funded early childhood programs. The results cannot be generalized outside of this population. Nevertheless, we believe that the uniqueness of our sample and

[9]The standardized testing procedure employed by the school district employs trained school personnel other than the classroom teacher to administer the test.

[10]The low incidence each year of these placements restricts our ability to use more detailed categories. The annual incidence of such placements in this sample ranges from 2 to nearly 12 percent but few are in any specific diagnostic category.

the duration of information allow us to make a contribution to the issue of whether or not special education positively serves those children from low-income households who are receiving the services.

SAMPLE AND DATA SET

The children in this study are part of the Chicago Longitudinal Study (Reynolds, Bezruczko, Mavrogenes, and Hagemann 1996). Children participate in the Chicago Longitudinal Study, an ongoing investigation of the school adjustment of a cohort of 1,539 who in 1986 graduated from kindergarten in the Chicago Public Schools. These low-income, mostly black children (95 percent, the remaining 5 percent were Hispanic) were all enrolled in government-funded early childhood programs in preschool or kindergarten in twenty-five schools. Entry into these programs requires residency in a school neighborhood eligible for Title I services. Children were accepted on a most-in-need basis. In twenty of the schools, children participated in the Child-Parent Center and Expansion Program, a Head Start-like early childhood program. This sample is advantageous for studying the effects of special education placement because the children are matched on age, race, and school poverty.

The sample used in this analysis includes 1,245 children (80 percent of the original sample) who were active in the Chicago Public Schools in the spring of 1992 (sixth-grade year). The sample recovery rate is high relative to those from typical longitudinal studies, which approach 50 percent (Kessler and Greenberg 1981). The study sample is similar to the original kindergarten sample on all kindergarten characteristics (program participation, gender, kindergarten achievement). No selective attrition has been reported in prior studies of this data set. Table 1 presents descriptive statistics of the data set and a comparison to the initial or original sample of 1,539 children. The samples are nearly identical in terms of these characteristics, which include gender composition, racial composition, parent education, family size, and kindergarten test scores. There is a minor difference only on the percentage eligible for a full lunch subsidy but this difference is quite small. The table documents the low-income nature of the

TABLE 1
Characteristics of Original Sample and Grade 6 Sample

Sample	Original Sample (N = 1539)	Grade 6 (N = 1234)
Percentage girls	51	51
Percentage African American	95	95
Percentage eligible for a full lunch subsidy	93	89
Percentage of parents with high school diploma	58	59
Number of children per family	2.5	2.6
ITBS kindergarten reading achievement	59.7 (13.7)	59.6 (13.7)
ITBS kindergarten math achievement	56.7 (14.8)	56.7 (14.9)
Reading achievement	—	123.7 (17.8)
Math achievement	—	128.7 (16.7)

Note: Values for family variables in grade 6 sample are before imputation.

sample. Most are eligible for full free lunch subsidies; a significant proportion have parents who did not graduate from high school and, as noted previously, most are African American.

Table 2 describes the experience of the sample in terms of participation in special education as well as two other experiences that may influence achievement in school: grade retention and changing schools or school mobility.[11] Nearly 15 percent of the study sample were in some form of special education throughout the six grades of elementary school. The percentage increased over time, starting with only 2.3 percent in the first grade and reaching a high of nearly 12 percent by grade six. The big percentage increase occurred in third grade. Among those children who spent any time in special education, the average time was 2.1 years in a special education program. Figure 1 displays the year-by-year cumulative special education placement overall and by category.

Using data from grades three to six, we learn that during this period, 7.5 percent of children were in special education for reasons other than learning disabilities (93 children). Of these, most were in such programs for more than one year. About the same number of children were in special education due to learning disabilities (7.3 percent or 90 children) where half (45) received learning disability services for all three grades.

Grade retention is viewed as an indicator that a child did not meet basic school requirements. In this population, more children were retained than received special education: about 22 percent of these students were retained, with the largest percentage retained for an additional year of first grade. In contrast, although nearly all the children who were retained were held back for only a single year, special education students often participated in special ed for many consecutive years.

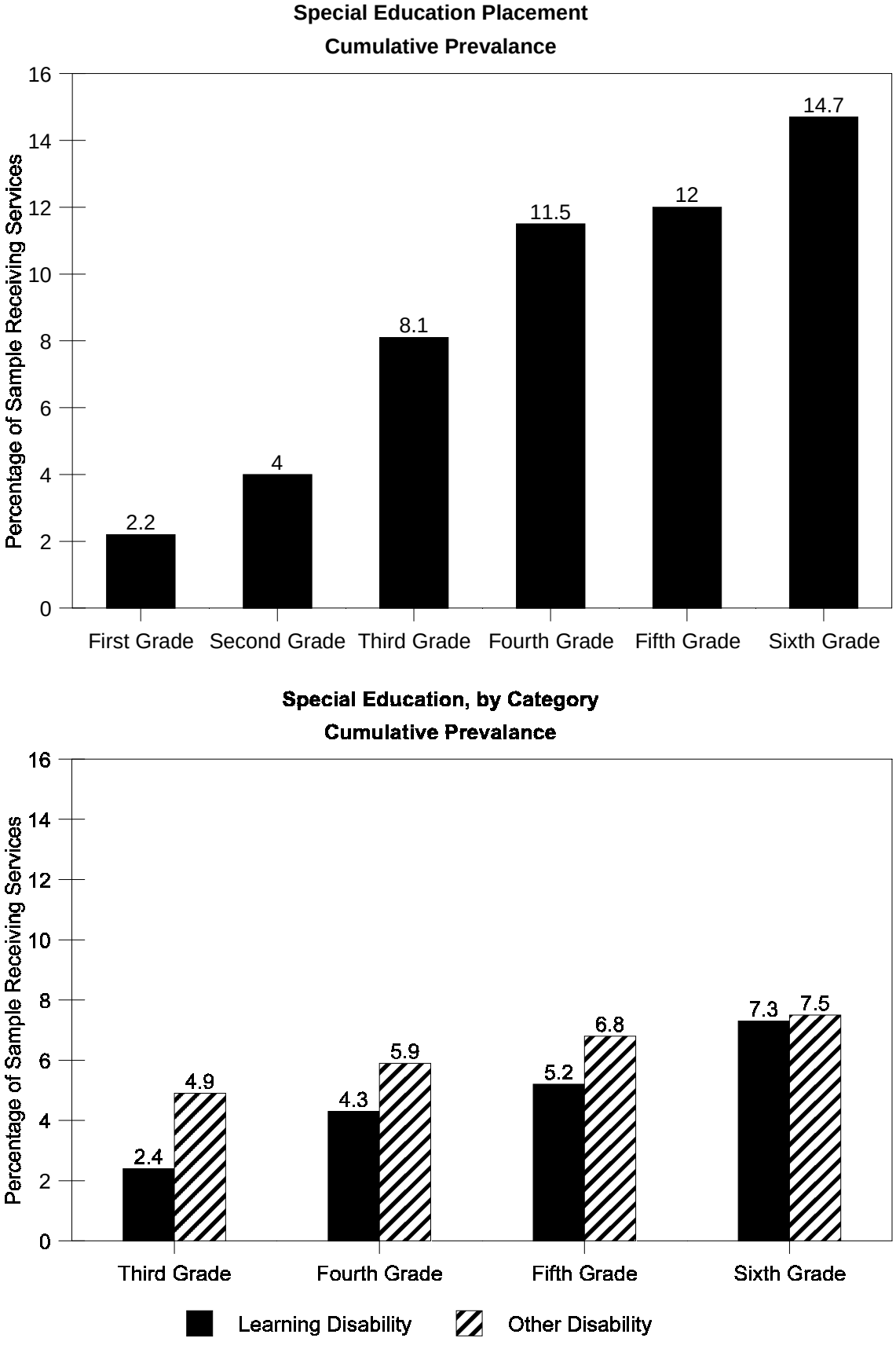
Frequency of moving resulting in a change of schools is quite high among these children: more than 70 percent moved at some time between kindergarten and sixth grade. Since moving interrupts both friendships or social networks and transfers a child into another classroom in a new school which may

[11]This information is obtained from school system records.

TABLE 2
Characteristics of Students: Kindergarten through Grade 6

	Grade Retention		Special Education		School Mobility	
Grade	N	% of Study Sample	N	% of Study Sample	N	% of Study Sample
K	14	1.1	—	—	-362	-29.3
1	110	8.9	28	2.3	305	24.7
2	46	3.7	39	3.2	274	22.2
3	58	4.7	92	7.5	331	26.8
4	29	2.4	109	8.8	351	28.4
5	16	1.3	108	8.8	272	22.0
6	—	—	147	11.9	—	—
	Total ever retained		Total ever placed		Percent ever changed schools	
	273	22.1	182	14.7	71.2	
			Mean years: .42		Mean: 1.54	

FIGURE 1
Special Education Placement in the Study Sample



conduct programs and curriculum in different ways, these moves may well have negative consequences for children. Hence, we pay particular attention to school mobility as it is one potential reason for a decline in school performance.

RESULTS

We conduct regression analysis using the achievement score for reading and math for each year from grades one to six as our outcome measure(s). We include the achievement scores of the students for the grade completed the prior year as pretests (i.e., the scores from grade one are included in the regression for grade two and so forth). These regressions can therefore be regarded as value added or change regressions in which we are interested in the determinants of the growth or improvement in performance on standardized achievement tests. However, we use this formulation such that we do not require the coefficient on the score that is matched to be equal to one.

Our core independent variable of interest is participation in special education. Beginning in grade three, we can use additional information to divide special education into two types: learning disability and other disability or other special education placements.[12] Data were obtained from year-by-year longitudinal school system records, and divided according to federal definitions of special education. Those with a specific learning disability are kept in the category of learning disability; all others, such as those who are denoted as seriously emotionally disturbed, speech impaired, mentally retarded, visually impaired, hard of hearing, deaf, orthopedically impaired or other health impaired, multiply handicapped or deaf/blind are in the "other special education" placements category. We also include grade retention as a control variable to explore the impact of retention on pupils' performance, and we also include a

[12]Because of the low incidence of many special education classifications, it was not possible to successfully analyze each category of placement.

measure of school mobility. We expect that pupils who changed schools are likely to experience difficulty adjusting and so expect a negative sign on this variable.

Since we hypothesize that children who performed at a higher level in the previous grade might respond differently to either grade retention or special education, in an alternative set of estimates (see Tables 5 and 6), we add interaction terms between each of these variables and their prior matched achievement test score. These interaction variables permit the impact of special education and of retention to differ across pupils. A priori we expect that children with higher achievement may benefit more from special education than those with very low scores; but we expect that pupils with higher achievement who were retained may be retained for other reasons and we expect that their performance may well deteriorate at a higher rate than children who are retained primarily due to poor academic performance.

In addition to these variables, which are the focus of our interest, we include a rich variety of control variables. These include demographic and background variables such as sex, race, parents' education, number of siblings, the child's eligibility for fully subsidized free lunch as a measure of family income; two measures of level of investment and interest in school—the number of years of participation in early childhood intervention and whether the parent was involved in the school that year; and finally a rich set of factors characterizing the school including measures of the student body (percentage African American and percentage low income), overall achievement levels at the school (percentage of children in the school performing above the national norm for reading); a measure of pupil turnover that is likely to be disruptive—the annual proportion of pupils in the school who turned over or changed school and entered this school as continuing pupils; and two measures of the school resources—size of the school and the average per pupil expenditure during the children's fifth grade year (1990–91).

We also investigated the family- and child-level predictors of special education placement, grade retention, and school mobility. The best predictors of years in special education (for first to sixth grades) were math achievement in kindergarten, gender (girls spent less time in special education), age at kindergarten entry, and years of participation in the Child-Parent Center and Expansion (CPC) Program (0 to 6 years). The major predictors of grade retention were gender (girls were less likely to be retained), reading and math achievement in kindergarten, and participation in the CPC Program. The major predictors of school mobility, measured as the number of school changes from third grade to sixth grade, were kindergarten math achievement, years of CPC Program participation, eligibility for free lunch, and gender (see Appendix 2 for all model coefficients).

Predictors of Reading and Math Achievement

The regression results for reading achievement scores are presented in Table 3; those for math achievement in Table 4. Both provide evidence that, in general, even after controlling for prior achievement test performance, students do not do better in terms of standardized achievement if they are placed in special education. With few exceptions—and only a single exception that is statistically significant—students in special education do not perform better on these standardized tests but rather do worse than would be expected based on their last year's score. This is the case for both reading and math achievement test scores. The single exception is among children in fourth grade who have "other disabilities" where our estimates have a positive and statistically significant coefficient. The positive sign on the third-grade indicator, even though not significant, is consistent with this and suggests that, for children with disabilities that are not learning-based, a special education placement may be useful over these grades. The findings in the two sets of regressions are similar and hence somewhat more convincing.

Our inability to differentiate between our two categories of special education placements prior to grade three does not permit us to explore whether these children would also gain if placed in special

TABLE 3
Regression Analysis of Reading Achievement on School Experiences, Social Background Characteristics, and School Factors at Selected Grade Levels

Variables	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
School Experiences						
Grade retention	4.5	-3.4***	.301	-2.0	-4.7**	-2.9
Special education placement	-1.5	-4.2**				
Learning disability			-3.2	-3.3**	-3.3**	-4.1***
Other disability			2.0	2.5*	-5.4***	-4.5***
School mobility	.447	-2.6***	-2.0**	-.998	-.696	-2.2***
Prior reading achievement	.386***	.608***	.546***	.469***	.504***	.513***
Prior math achievement	.143***	.240***	.265***	.326***	.438***	.343***
Demographic and Background Factors						
Gender	2.6***	1.5**	2.1***	1.6***	2.4***	1.6***
Race	-3.2*	.615	-6.0***	-2.9*	.109	-1.9
Parent education	1.5*	.711	.954	1.7**	.793	.109
Eligibility for free lunch	-1.6	.266	-.632	-.069	-1.0	-.558
Number of children	.039	-.544**	-.250	.031	-.348	.137
Missing data index	.434	-.191	.480	-.562	.025	.302
Participation in early childhood intervention	2.5***	.855	-.337	-.835	.682	-.467
Parent involvement in school		1.6*	1.1	-.348	2.7***	1.1
School Factors						
Percent annual mobility	-.078***	-.009	-.093***	.015	-.055*	.016
Percent at/above national norm for reading	.123***	.045	.002	.050	.085**	-.002
Percent black	.010	.003	-.019	.008	-.034**	.003
Percent low income	.034	.002	-.022	.015	.045	-.022
Per pupil expenditure	3.1E-04	5.7E-04	1.3E-04	-8.0E-04**	7.4E-04**	4.5E-05
Number of students	.004***	.005***	-.003**	-3.4E-04	.003**	-9.4E-04

* = p < .1; ** = p < .05; *** = p < .01

TABLE 4
Regression Analysis of Math Achievement on School Experiences, Social Background Characteristics, and School Factors at Selected Grade Levels

Variables	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
School Experiences						
Grade retention	8.2***	-6.8***	1.9	-4.5***	-3.5**	-4.0**
Special education placement	-4.2*	-6.3***				
Learning disability			-5.6***	-3.4***	-5.2***	-2.1**
Other disability			.247	1.9*	-9.0***	-.438
School mobility	.106	-2.7***	-1.4**	-1.4***	-.190	-1.2**
Prior reading achievement	.194***	.288***	.225***	.104***	.145***	.147***
Prior math achievement	.293***	.398***	.493***	.668***	.833***	.790***
Demographic and Background Factors						
Gender	1.7***	- .641	.152	.329	.675	.575
Race	-.915	.981	-5.1***	-1.9	-.826	-.737
Parent education	1.8**	.184	.967	-.077	1.3**	-.036
Eligibility for free lunch	-1.9*	-.920	.110	-.851	-.401	-.690
Number of children	.226	-.334*	.133	-.029	-.196	.099
Missing data index	.566	.320	-.112	-.417	.239	-.199
Participation in early childhood intervention	2.9***	1.7**	-.575	-1.1**	.803	.355
Parent involvement in school		1.6**	.944	1.1*	-.011	-.779
School Factors						
Percent annual mobility	-.035	-.039	-.044*	.029	-.048**	.045**
Percent at/above national norm for reading	.040	-.069**	.023	.052**	.115***	.025
Percent black	.037**	.013	.008	.008	-.012	.030***
Percent low income	-.066**	-.036	-.013	-.034	.032	-.012
Per pupil expenditure	8.1E-04**	-2.4E-05	-2.7E-04	-6.5E-06	2.8E-04	-1.6E-04
Number of students	.006***	.002**	-.001	-5.9E-04	.001	-3.9E-06

* = p < .1; ** = p < .05; *** = p < .01

education in earlier grades. The results do provide evidence that after grade four, students with these placements do not gain but fall further behind. This evidence suggests that special education placements might be best targeted on the earlier grades, especially grades three and four and on students with disabilities other than learning disabilities.

Turning to our other results we note the following:

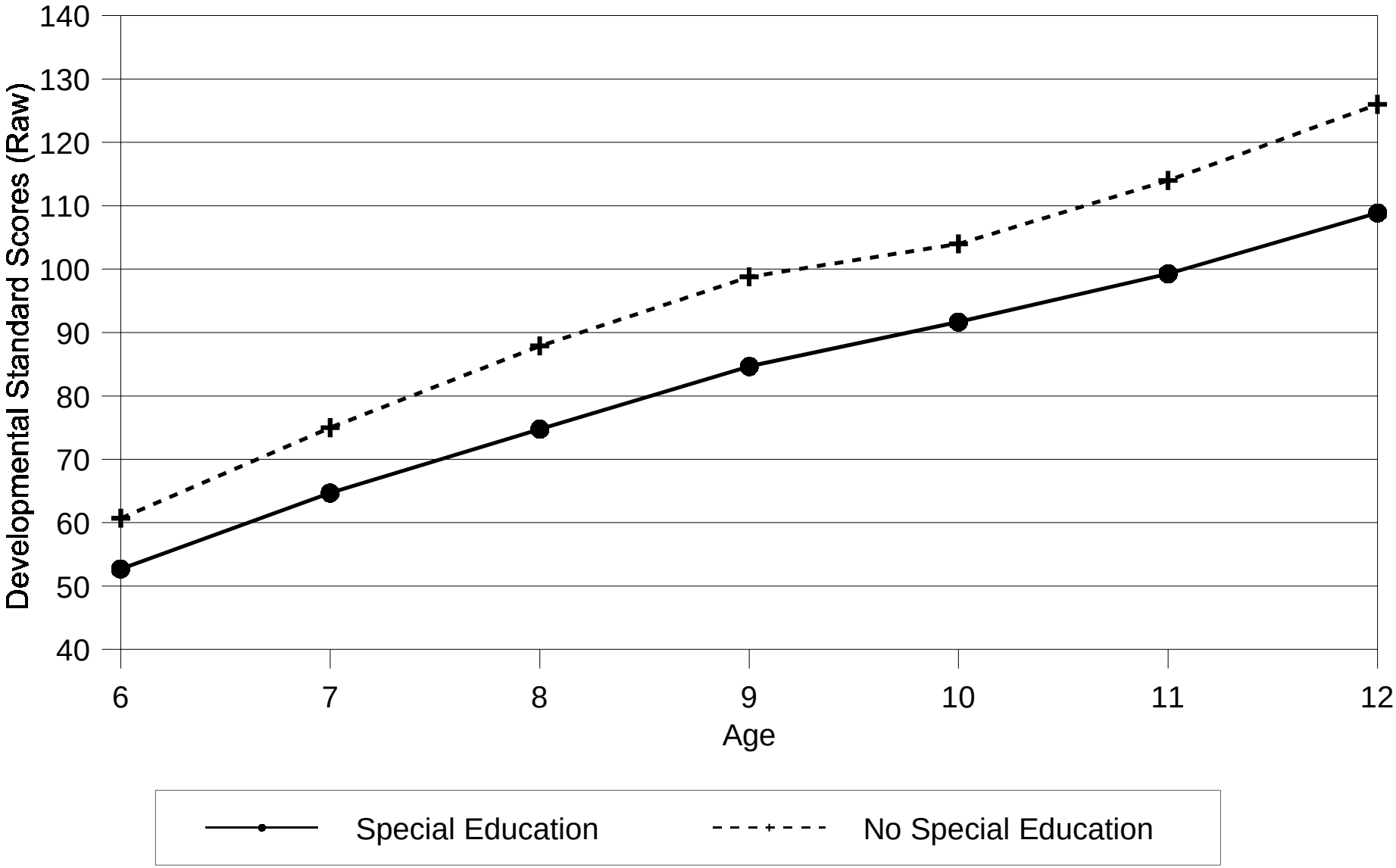
- Children placed in special education tend to grow further and further apart in terms of achievement. Note the generally significant and large coefficients on prior test scores. We chart this trend in Figure 2.
- Children who are retained tend to do worse after repeating that grade. The only exceptions to this are for first grade (kindergarten retention), especially in the case of math achievement. Hence it appears that some children just beginning school may be too immature to advance to the next grade and do better if they are held back. This may also be the case for third graders, though the results are not statistically significant. Thus, it may be advantageous, at least temporarily, to hold back a young child who seems to be foundering when he or she begins school. Retention in the primary grades appears to have a detrimental effect, however.
- Children who move from school to school reduce their achievement. This is not unexpected: moving from school to school is disruptive; the child is likely to face a new curriculum, new books and other materials, and new classmates and teachers. Young children who move face many challenges and increased uncertainty. We see the impact in the negative and generally significant results on our measure of school mobility in these achievement equations. The only exception is the first grade, which represents a move as primary schooling begins. This seems to be a preferable time for children to switch (and change from the school they attended as kindergartners) compared to moves later in the elementary school years.

We turn to the two variables measuring school involvement: (1) parent involvement in the school and (2) early participation in a preschool program offered by the Chicago Public Schools, and note some, though limited, evidence that children do better if their parents are involved in school and that the child's participation in early childhood programs plays a positive role in the first and second grade. After that the variable is never statistically significant, suggesting that the gains that have been reaped remain and are captured by the prior test scores.

Regarding school factors, we note that not only do children do worse if they move schools, but they also seem to do worse if a greater proportion of children in their school have changed schools since

FIGURE 2

Reading Achievement, Kindergarten to Grade 6



Special Education N = 178
No Special Education N = 1,052

the previous year.[13] Presumably we would prefer a measure of classroom mobility since the child is likely to be impacted primarily if fellow classmates have moved. Unfortunately, we do not have such a measure; hence, the variable included should be viewed as a proxy for the desired measure of mobility. As such, it provides quite clear evidence that school mobility is disruptive to all children, not just the "movers" themselves.

Finally, we note that attending school with students who "do better" in school conveys advantages to the average child. This was especially the case for math achievement in grades four and five as the coefficient on percent at or above the national norm is positive and significant.

Further Results on Special Education

Tables 5 and 6 have the same specification as, respectively, Tables 3 and 4, but add two interaction terms. One is an interaction between the prior matched test score and special education placement; the other is with the matched prior test score and grade retention. The idea is to see if there are particular students who might gain (or lose) from such special treatment. The interaction between these scores and special education tends to be significant; seven out of ten coefficients are statistically significant at the 1 or 5 percent level. But the pattern is not consistent.[14] Part of the problem may be that high multicollinearity prevented us from interacting the test score with the two categories of placement in special education. We therefore view these results as suggestive that the question of which children would benefit from special education should be explored further with larger samples of children.

The interaction of prior test scores with retention suggests that those with the lowest test scores in the prior grade gain most from retention while those with better standardized scores tend to decline

[13]The positive coefficient in grade 6 measures something different, as most children shift schools and attend a middle school in grade 6; hence this variable should not be thought of in the same way as that for the earlier grades.

[14]The missing interaction terms are due to high collinearity terms which prevented the results from converging when the interaction terms were included in the estimates.

TABLE 5
Regression Analysis of Reading Achievement on School Experiences, Social Background Characteristics, and School Factors at Selected Grade Levels

Variables	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
School Experiences						
Grade retention	4.5	25.2***	-10.3	14.9	75.7***	35.0
Special education placement	-1.5	-10.9				
Learning disability			-37.6***	7.1	43.8***	-63.2***
Other disability			1.9	2.7*	-5.9***	-5.7***
School mobility	.447	-1.5	-1.8**	-.851	-.495	-1.1
Prior reading achievement	.386***	.622***	.526***	.477***	.552***	.497***
Prior math achievement	.143***	.246***	.267***	.324***	.414***	.321***
Demographic and Background Factors						
Gender	2.6***	1.6**	2.0***	1.7***	2.0***	1.4**
Race	-3.2*	1.7	-5.6***	-2.4	.353	-3.9**
Parent education	1.5*	.467	1.0***	1.5***	.324	.168
Eligibility for free lunch	-1.6	-.100	-.547	-.015	-.316	-.483
Number of children	.039	-.582***	-.092	.025	-.519**	.062
Missing data index	.434	-.014	.396	-.517	-.099	.370
Participation in Early Childhood Intervention	2.5***	.900	-.271	-.924	.579	-.870
Parent involvement in school		3.6***	3.0***	.804	3.1***	1.8*
School Factors						
Percent annual mobility	-.078***	-.019	-.099***	.012	-.067**	.016
Percent at/above national norm for reading	.123***	.43	-.006	.046	.061*	-.014
Percent black	.010	-.002	-.020	.006	-.040***	.019
Percent low income	.034	.002	-.023	-.013	.016	-.054*
Per pupil expenditure	3.1E-04	4.8E-04	1.8E-04	-8.8E-04**	7.7E-04	3.7E-04
Number of students	.004***	.005***	-.003**	-4.7E-04	.001	-7.4E-04
Interaction						
Prior reading achievement * grade retention		-.476***	.146	-.201*	-.866***	-.370*
Prior reading achievement * special ed.		.103	.498**	-.134	-.553***	.637***

* = p< .1; ** = p < .05; *** = p < .01

TABLE 6
Regression Analysis of Math Achievement on School Experiences, Social Background Characteristics, and School Factors at Selected Grade Levels

Variables	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
School Experiences						
Grade retention	28.1***	3.1	1.9	6.7	326.0***	181.3***
Special education placement	1.4	-45.3***				
Learning disability			-5.6***	27.6***	151.9***	-17.5***
Other disability			.247	2.2**	-12.1***	.033
School mobility	.203	-2.1***	-1.4**	-1.1**	.924**	-.560
Prior reading achievement	.179***	.289***	.225***	.098***	.110***	.149***
Prior math achievement	.294***	.392***	.493***	.698***	.956***	.780***
Demographic and Background Factors						
Gender	1.6**	-.543	.152	.338	.012	.427
Race	-.553	1.3	-5.1***	-1.6	.081	-.783
Parent education	1.6**	.116	.967	-.120	-.811*	.022
Eligibility for free lunch	-2.1**	-.596	.110	-.744	1.5***	-.526
Number of children	.342	-.294	.133	-.071	-.627***	.088
Missing data index	.621	.391	-.112	-.407	-.208	-.146
Participation in Early Childhood Intervention	2.5***	1.7***	-.575	-1.0**	.337	.176
Parent involvement in school	4.6***	.953	.944	.447	-.035	.555
School Factors						
Percent annual mobility	-.019	-.033	-.044*	.030	-.092***	-.052***
Percent at/above national norm for reading	.043	-.047	.023	.053**	.053**	.021
Percent black	.038**	.009	.008	.005	-.042***	.032***
Percent low income	-.071**	-.030	-.013	-.034	-.054***	-.027
Per pupil expenditure	8.7E-04**	9.8E-05	-2.7E-04	-8.6E-05	3.7E-04*	1.9E-05
Number of students	.006***	.003**	-.001	-4.6E-04	-.002***	1.6E-04
Interaction						
Prior math achievement * grade retention	-.397*	-.169**		-.119	-3.2***	-1.7***
Prior math achievement * special education	-.109	.623***		-.363***	-1.7***	.161***

* = p < .1; ** = p < .05; *** = p < .01

further. The results are consistent across grades and the two achievement tests with a single, not statistically significant exception. These results provide some evidence that only for the lowest performers should grade retention be considered, at least in terms of aiding school academic achievement.

As a final test of our findings we estimated our models over longer intervals: kindergarten to third grade, fourth to sixth grade, and kindergarten to sixth grade or the entire period of observation. Table 7 reports the metric (unstandardized) regression coefficients for these school experiences (full model results are available from the authors). The results of these more aggregated models are consistent with our other results, though somewhat less enlightening. They suggest that special education does not add to a student's performance on either reading or math achievement test scores but rather may be associated with a decline in the child's expected performance. The grade retention shows similar results with the exception that the impact over grades four to six for reading is not statistically significant. All other signs on these variables are negative and statistically significant in both the models for reading and math achievement scores. Likewise, the estimated effects of school mobility from kindergarten to third grade is significantly negative at the end of third grade. School mobility during grades 4 through 6 has no such effects, however.

The models that add the interaction terms suggest one main exception to these results: some evidence that students who performed better (higher) on the earlier reading test may benefit from special education, especially in the kindergarten to third grade and the kindergarten to sixth grade periods.

CONCLUSION

As evidenced by the cutbacks in eligibility for Supplementary Security Income (SSI) passed in the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, the public at large is clearly concerned with the very high expenditures for children with disabilities. Special education is no

TABLE 7

Estimated Effects of Special Education Placement, Grade Retention, and School Mobility at Three Time Intervals

Cumulative Variable	Change in achievement from Kindergarten to Third Grade	Change in achievement from Fourth grade to Sixth Grade	Change in achievement from Kindergarten to Sixth Grade
Reading Achievement			
Years of special education	-1.9*		-2.8**
Learning disabled special ed.		-2.3**	
Other special ed.		-1.8*	
Any grade retention versus none	-11.4**	-1.6	-10.5**
Years of school mobility	-1.5**	-0.9	0.04
Math Achievement			
Years of special education	-2.3**		-3.0**
Learning disabled special ed.		-2.2**	
Other special ed.		-1.9**	
Any grade retention versus none	-9.1**	-3.1*	-11.5**
Years of school mobility (0–5)	-0.8*	-1.0*	0.04

Note: Coefficients are adjusted for the same explanatory variables as reported in Tables 3 and 4. K–3 and K–6 models used kindergarten achievement as pretests; 4–6 model used third grade achievement as pretests.

* = $p < .1$; ** = $p < .05$; *** = $p < .01$.

exception to that set of concerns. Hence we have attempted to ask whether and for whom special education services are effective in terms of improving academic achievement.

Our results, which are limited to the services provided in one urban school district (Chicago) to one cohort of low-income children, suggest that these services have limited effectiveness. Only in the earlier grades, and only for children with disabilities other than learning disabilities (such as hearing, visual, or physical handicaps) does the program seem to add in a significant way to their achievement in reading and math. While we do not know with certainty what their performance would have been without these services, the use of their test scores in the year prior enables us to capture a reasonable approximation of the counterfactual. Expenditures on special education services may, in many cases, be better utilized in other ways or in combination with other educational and family services.

Grade retention also adds to the cost of educating today's youth. Here we find that in some cases retention in kindergarten may be associated with better school performance in the future. This is consistent with a view that school readiness is important and that readiness is not perfectly correlated with a child's age. For some children, then, beginning school a bit later could lead to better performance. Alternatively, reducing the likelihood of grade retention, especially from first grade onward, generally may be the best approach to improving children's school success. Our finding that participation in the CPC Early Intervention Program lowers the risk of grade retention is consistent with previous studies in this data set and in others (Reynolds 1994; Reynolds, Bezruczko, and Hagemann 1996). Greater investments in early childhood education programs may reduce the incidence of grade retention as well as other academic problems. Apart from early intervention, school practices and programs other than grade retention warrant further attention and experimentation.

Finally we note the negative impact of mobility on educational achievement. Moving children who are in the early elementary grades clearly seems to detract from their performance on these standardized tests. Further, attending a school in which a sizable proportion of students are

geographically mobile detracts from the average child's performance on such tests. Perhaps some special intervention or counseling could improve these results, but the uncertainties and disruption associated with attending a new school seem to take a toll. Making parents aware of the possible negative implications of these moves may be a way to reduce their frequency. Intervention programs that attempt to counteract the negative effects of school mobility—such as orientation programs and family-school partnerships—might also be useful (Jason, Danner, and Kurasaki 1993; Smardo 1987).

Do these results imply that there is little we can do for children who have learning disabilities, other significant disabilities, or who move during the school year or between grades while in elementary school? We are not so pessimistic. Special education programs may work for particular subsets of children and components of programs may work for others. But rather than simply continue to spend large sums of money (as much as $12,000 yearly per child) on these programs, we should evaluate which programs (components) work for which children and better target our dollars and efforts. Early detection and intervention strategies which are in place before problematic behaviors occur represent one promising strategy (Price et al. 1988). The children and the public stand to gain from such evaluation and reform.

APPENDIX ONE
Description of Variables

School Achievement Outcomes (dependent variables)

Reading and mathematics achievement (Kindergarten to Grade 6)

Reading comprehension and mathematics total subtest scores on the ITBS (Hieronymus and Hoover 1990) were used as measures of school achievement in the explanatory model. Both nationally standardized subtest scores have demonstrated high reliability (KR-20s > .90) and predictive validity (Hieronymus and Hoover 1990). In grades 1 and 2, children were administered the ITBS Primary Battery (Hieronymus, Lindquist, and Hoover 1980) and, in grades 3–6, the ITBS Multilevel Battery. The reading comprehension subtest ranged from 47 to 54 items. The mathematics total subtest ranged from 88 to 101 items. Norm-referenced in 1988, the ITBS is group-administered each year in April. Analyses were based on ITBS standard scores, which are converted from raw scores and are comparable across grade levels. In kindergarten, the prereading subscale (word analysis) replaced reading comprehension.

Key Explanatory Variables (independent variables)

Special Education

Special education placement. For each of grades 1 to 6, we coded whether children received special education services in their respective schools. Students assigned to special education classrooms (self-contained or otherwise) were coded 1; all others were coded 0.

Cumulative special education placement was measured as the number of years receiving special education services (0 to 6 years). The most frequent classification of special education during the elementary grades was learning disability. Behavioral disorders and mild mental retardation were less prevalent. Based on the observed distribution of placements across classifications, we separated coded learning disabilities (by year and cumulatively) and all other special education placements for grades 3 to

6. Because of the low incidence of many special education classifications, it was not possible to successfully analyze each category of placement. Data were obtained from year-by-year longitudinal school system records.

Grade Repetition

Grade retention. As above, we measured both yearly and cumulative grade retention. A student was coded as retained in grade if he or she had identical grade codes in consecutive school years between kindergarten and sixth grade. For cumulative grade retention, children on record as repeating a grade at least once between kindergarten and grade 6 were coded 1; all other children were coded 0 (promoted or not retained). Because very few children were retained more than once, grade retention was defined cumulatively (i.e., ever retained). Data on retention were obtained from a grade-by-grade analysis of the school system's computerized records.

Instability

School mobility. Based on school system records, we coded the incidence of school mobility after each school year from kindergarten to grade 5 (1 = mobile, 0 = otherwise). The cumulative measure was the number of years students changed schools between kindergarten and sixth grade. In cases where students were missing school information in one of two consecutive grades, they were coded as mobile.

Demographic and Background Variables

Gender. Gender was coded 1 for girls and 0 for boys.

Race/ethnicity. Race was coded 1 for blacks and 0 for Hispanic children. There are no white children in the sample.

Number of children. Parents reported the number of children in the family (including the target child) during elementary school and we used this value in the analysis.

Parent education. Parents reported their highest level of educational attainment during their children's elementary school years (grades 2 to 6). For the analysis, we entered a dummy variable for high school graduation.

Eligibility for free lunch. Parents reported whether their child was eligible for the full or reduced federal lunch subsidy. For the analysis, we used a dummy variable for full subsidy versus reduced lunch and no subsidy.

Other School Involvement Indicators

Missing family background. To account for missing data on family demographics, a dummy variable was computed for students with missing data on any family background variable. This missing-data variable was included as a model variable after imputing missing cases as follows: parent education (missing = 0), lunch subsidy (missing = 1), parent expectations (missing = 14), and number of children (missing = 3). The inclusion of a missing-data variable helps maintain statistical power and assess the impact of missing data on outcomes (Cohen and Cohen 1983).

Participation in extended early childhood intervention. Students who participated in the Child-Parent Center and Expansion Program from preschool to grade 2 or 3 were coded 1; children with less extensive participation were coded 0. Program participation began at age 3 and continued up to grade 3 in selected schools. Previous studies of the program have indicated that extended participation is most associated with school achievement and progress (Reynolds 1994).

Parent involvement in school. A yearly and cumulative measure of parent involvement in school indexed family school participation. During each of grades 1 to 6, teachers rated parental school involvement on the item "Parents participation in school activities." It was rated on a scale from 1, poor/not at all, to 5, excellent/much. For the analysis, we created a dummy variable of greater than average participation (ratings of 4 or 5). The cumulative measure was the number of years with relatively

high school participation. Although teacher reports have a subjective component, the focus on general school relations is clearly an area about which teachers have knowledge (Reynolds 1991; Stevenson and Baker 1987). Principal components analysis suggested that ratings of parent involvement were distinct from ratings of school adjustment.

School-Level Variables

Five school characteristics were used to index school-level influences on student achievement which also could be associated with special education placement and other model variables. These characteristics were for children's fifth grade school year (1990–91). All data came from the Illinois Board of Education.

School-level mobility. Mobility was the percentage of students in the school who change schools during the year.

School-level achievement. Achievement was coded as the percent of students who scored at or above the national average in reading achievement on the spring 1991 ITBS.

School low income. This was measured as the percentage of families in the school region who were classified as low-income or poor.

Per pupil expenditure. This was the average annual per-pupil expenditure for the 1990–91 school year.

School size. This was measured as the number of students attending the elementary school. Almost all schools were kindergarten to grade 8 schools.

APPENDIX TWO
Predictors of Special Education Placement, Grade Retention, and School Mobility

Years in Special Education (grades 1–6)

Variable	B	T	Sig T
Years of program	-.037391	-2.147	.0320
Free lunch	.025023	.232	.8164
Race (1 = black)	.259183	1.681	.0931
Sex (1 = girls)	-.242733	-3.645	.0003
Age in month	.026914	3.010	.0027
Number of children	-.012597	-.522	.6016
Missing data	-.007775	-.173	.8624
Math achievement in kindergarten	-.014909	-5.311	.0000
Parent education	-.075694	-.942	.3464
Reading achievement in kindergarten	-.006200	-2.030	.0426
(Constant)	-.042558	-.072	.9423

Grade Retention (grades K–6)

Variable	B	T	Sig T
Years of program	-.016923	-2.812	.0050
Free lunch	.077138	2.071	.0386
Race (1=black)	.065591	1.230	.2188
Sex (1=girl)	-.119118	-5.174	.0000
Age in months	-.003166	-1.024	.3060
Number of children	.007314	.877	.3806
Missing data	.008791	.567	.5707
Math achievement in kindergarten	-.004702	-4.846	.0000
Parent education	-.044014	-1.585	.1133
Reading achievement in kindergarten	-.005371	-5.087	.0000
(Constant)	.984590	4.845	.0000

School Mobility (number of school changes from 3rd to 5th grade)

Variable	B	T	Sig T
Years of program	-.070001	-5.253	.0000
Free lunch	.164459	1.994	.0464
Race (1=black)	-.017225	-.146	.8840
Sex (1=girl)	-.098618	-1.935	.0533
Age in months	.001091	.159	.8734
Number of children	-.004690	-.254	.7995
Missing data	.122829	3.580	.0004
Math achievement in kindergarten	-.005045	-2.348	.0190
Parent education	-.061366	-.998	.3186
Reading achievement in kindergarten	.001344	.575	.5655
(Constant)	.991439	2.204	.0278

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